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selected theme will be displayed upon depressing the Select/Goto command.

To additionally sort the theme by a single topic, position the cursor key to the desired topic and depress the Select/Goto key. Use the cursor to return to a topic.

To sort by more than one topic, position the cursor over each desired topic and depress the Select key. When finished, press Select/Goto to display a multiple-topic guide.

To sort by one or more attributes, position the cursor over each desired attribute and press the Select key. When finished, move the cursor to a topic and press Select/Goto to retrieve the theme/attribute-sorted TV guide.

Other than express recording, all recording activities are controlled with the Record Memo screen 16 of FIG. 4. The Record Memo screen 16 is accessed with a Record Memo key. When the Record Menu key is depressed, the following titles enclosed in horizontally-arranged selection boxes 114 will appear at the top of the opening screen. From left to right:

[Pending Recordings]	[Recorded Programs]	[Linked Titles]	[On-Grid Prog.]
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Each Record Memo key command will highlight a new selection, rotating from left to right, and wrapping around to Pending Recordings after the right most position. FIG. 19 is a flow diagram defining the Record Memo command.

FIG. 20 shows a Channel Customization screen 116, which is an example of one embodiment of a channel selection menu. The screen 116 allows the user to customize channels to match viewing interest, providing a compact listing as well as eliminating undesired channels during up down scanning. During schedule update, a list of all cable channels available at the subscriber's cable system (or broadcast stations for over-the-air subscribers) is also delivered to the VCR. This unabridged set of channels may be customized using screen 116.

The channel customization screen 116 has two fields, a 3 column field 118 listing up to 36 unabridged channels and a single column field 120 listing 12 favorite MY channels. The latter is a replica of the channel descriptor column 122 (FIG. 1) of the opening grid guide. Additional pages are available (using the page key to swap between the pages) to accommodate systems with more than 36 channels. Each cell 124 in the 3 column field 118 contains the following information: Channel number and program service name (such as HBO or station KTVU, 2). The cell 124 is color-coded to indicate the following states:

ON, default state before any customization, with the cell 124 in light green background.

MY, favorite channels listed in the single column field 120, also shown in the three column field 118 with a blue background.

OFF, a channel deleted from all guides, as well as during Channel Up/Dn scanning (still accessible using the ten key channel keypad). OFF cells have a gray background.

When first installed, the system assigns the first 12 (listed in numerical order) channels as MY favorites. The channel status may be changed by selecting a channel and picking a state, MY, ON, or OFF using the SELECT key. Since only 12 favorites are allowed, the user must first remove a favorite channel by changing the status of an existing favorite channel to OFF or ON. When that is done, the first column will automatically open up a space for the next MY selection. When a new MY is selected, the MY column 120 will automatically insert the new selection in the prescribed order. The order of listing in the MY favorite channel column 120 is as follows:

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All favorite broadcast stations will be listed first in numerical order. Next, all cable services will be listed in alphabetical order.

A new cable service, which displaces a previous service, will be inserted under the previous status. Example: If the channel was MY, the new service will be MY. However, a new cable service that appears on a new channel will be initialized ON.

In another embodiment of the channel customization method, any number of channels may be arranged to suit the preference of the viewer. In this approach, column 54 is not required and is not displayed. Instead, any channel listed in the three-column field may be re-ordered in any sequence desired. In this method, a channel whose order is desired to be changed is selected using a cursor. A destination slot is then selected and the transfer is made, with intervening channels being adjusted in position towards the source slot. For example, to move channel 30 DIS to the number one slot (shown occupied by channel 2, KTVU), the source channel (DIS) is first highlighted by positioning the cursor and pressing the SEL/GOTO key. The selected channel will then appear as slightly offset from its normal position (not shown in the drawing). The Up/Down cursor commands are then used to move the cursor to the destination slot (KTVU); and the SEL/GOTO key is then pressed again. Channel 30 (DIS) will then appear in the first slot, and all channels that were previously from the destination slot to just above the source slot will be moved down one slot. If a channel is moved to a lower position rather than a higher position, all channels previously from the destination slot to just after the source slot will be moved up one slot.

In yet another embodiment of the channel customization method, the viewer can re-order channels using a drag and drop method. Again, the cursor is used to select a channel in a source slot. An image representing the channel symbol is then dragged into the desired destination slot for the channel and dropped, and intervening channels are adjusted as discussed above.

Another embodiment employs channel customization prompt menus to re-arrange channels. In this approach, each channel label is sequentially displayed over time in a default sequence (such as numeric/alphabetic sequence, or according to the previously selected user-sequence). The channels are preferably displayed one at a time. The viewer can select a priority for each channel as it is displayed or can skip to the next channel label. If a priority is given, the channel will be moved into the channel slot corresponding to the entered priority, as if it were selected and moved into that slot as discussed above. The priorities that may be assigned range from 1 to 9, the highest number on the numeric keypad (in some embodiments 0 is used to represent 10). Note that the total number of channels that can be re-arranged is not limited to the number of priorities (9). For example, the user could assign the same priority (such as number 1) to as many channel labels as desired. The last selected channel label would then appear in the number 1 slot, with the remainder immediately following below, according to the order in which they were selected.

FIG. 21 shows a front panel 130 for a remote controller of the schedule system. The top half of the front panel 130 corresponds to a conventional remote controller for a television set and a VCR. Included are a dual function ten key keypad 132, with the alternate functions of each key and its digit shown, a TV/VCR toggle key 134, volume and channel up/down keys 136, and VCR control keys 138. The lower half of the front panel 130 contains control keys that are specific to the schedule system. Included are a What's On

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Tape key 140, a What's On TV key 142, a Theme key 144, a Record Memo key 146, a Record It key 148, a Link It key 150, a Help/Menu key 152, a Select/Goto key 154, Left, Right, Up, Down and Page Cursor keys 156, a Return TV/VCR key 158 and a Cancel/Undo key 160. The use of these keys has either been explained above or is apparent from their labels.

FIGS. 22A and 22B are block diagrams of television schedule systems/tape controllers 180 and 182 in which the user interface is used. The schedule system/controller 180 is applicable to existing television equipment, where the schedule system is separate from the basic television equipment. Programmable tuner 202 is shown as part of a cable decoder. The schedule system/controller 182 is shown as integrated into a VCR 211. In this version, a cable decoder is not required, and tuner 207 is part of the VCR 211. It should be clear from these two systems 180 and 182 that the schedule/tape controller may be integrated into other television equipment, such as a cable decoder or a TV/Monitor receiver. It is also practical to implement the entire schedule/tape controller in a remote controller by adding a text display, such as an LCD screen, on remote controller 212.

In the system 180, programmable tuner 202, which may be part of a cable decoder unit, receives a TV signal from antenna 200 and/or from cable input 205. Tuner output 216 goes to a vertical blanking interval (VBI) decoder 222, which may be a closed caption decoder or a high speed teletext decoder. Listing information and other support information, such as cable channel assignment data, will be transmitted over the VBI by one or more local stations or cable channels several times a day or continuously.

When update is required, programmable tuner 202 will be tuned automatically to the station or cable channel carrying the data. After the VBI signal is processed by CPU 228, the listing data is stored in schedule memory 232, while the cable channel assignment data is stored in cable-specific RAM memory 238. This data is used to convert generic TV source names, such as HBO, to channel assignments for the specific cable system.

Other information transmitted to the schedule/tape controller 180 and stored in the system RAM memory 240 includes clock update data to set system clock 230 automatically, schedule update time, which may vary from once a day to a continuously transmitted format, new theme categories, and last minute schedule change data.

For a What's on TV request, the listing stored in schedule memory 232 is retrieved, processed by CPU 228, and outputted to video display generator 224. Video switcher 226 is enabled by CPU output 246 to select the video display generator 224 output whenever schedule data is to be presented to the TV/monitor 210.

When a request to time-shift record a program is made, the title of the program and its record parameters (channel, start time and length) is copied from the schedule memory 232 to the Record Memo RAM memory 236. When the system clock 230 matches the schedule time, the CPU 228 will issue a channel command to the programmable tuner of the cable decoder 202 (tuning it to the selected channel), and a power on and record command to VCR 206 by means of an infrared remote driver 214 directed at infrared input ports of these two devices. In the VCR integrated version 182, the command to the tuner 207 is made on a wired bus 264.

In addition to programming by selecting a title from the on-screen schedule, it is also possible to program the VCR 206 or 211 and the cable decoder 202 or 207 with remote controller 212. In this mode, programming information is entered into the remote controller 212, and at the desired activation time, the remote controller 212 will issue pro-

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gramming commands to the proper TV device. While there are universal remote controllers that offer programming capability, none allow the user to enter generic names, such as station and cable channel names, and have the CPU convert the names to specific channels for tuning the VCR or the cable decoder. This is implemented by incorporating CPU 28 and the cable-specific RAM 238 in the remote controller 212.

Remote controller 212 and infrared remote driver 214 are capable of emulating the infrared command instructions required by the cable decoder 202 and VCR 206. The command emulation codes for the remote driver 214 are stored in cable decoder IFR code RAM/ROM memory 239. Commands for popular cable decoders and VCRs are pre-programmed in ROM. Alternatively, the infrared commands of the original remote controller may be learned by aiming the controllers at the IFR input receiver 264 and storing the command codes in RAM memory 239 after processing by CPU 228. This process is well known in the art of universal remote controllers and need not be detailed here.

As shown in FIG. 22A, the VCR 206 and cable decoder 202 may be manually controlled by remote controller 212, or it may be automatically controlled by infrared remote driver 214.

During recording, the tape index location of the VCR 206 will be transmitted over control/data bus 270 to the CPU 228. This start address information is stored in tape directory RAM memory 234, together with the program title. The bus 270 also carries VCR control commands for recording, playback, tuner selection, and other functions, including power on/off.

Once a program is recorded, its title and other program information is stored in a section of the Record Memo RAM memory 236. To play back a recorded program, the What's on Tape request will cause a directory of recorded programs on the tape to be displayed. When a program is selected for playback from this directory, the tape will fast forward or reverse to the tape index location specified in the Tape Directory RAM memory 234.

In the system 182, schedule/tape controller 220 is embedded in the VCR 211. The VCR tape mechanism 252 contains all the record and playback electronics of the video recorder, less the programmable tuner 207. Data recorded on the control track of a tape is coupled to the CPU 228 over input bus 258 and output bus 256. The art of recording data on the control track is well known, for example, in recent VCRs with indexing capability. CPU 228 commands to the VCR 211 are carried over bus 254. When schedule information is to be displayed, video switcher control input 246 selects the display generator on line 218. At other times, video switcher 226 selects the output of the VCR mechanism 252 on line 250. Schedule information may be downloaded from the VBI. Alternatively or supplementally, it may be downloaded from a telecommunication line 370 to modem 268 and to CPU 228 via line 266. Other means of delivering schedule information can be employed, including the use of a sub-carrier channel on the cable service.

It should now be readily apparent to those skilled in the art that a system and method incorporating a novel user interface capable of achieving the stated objects of the invention has been provided. The user interface that is configured to compensate for the particular nature of the television schedule information. The user interface has a cursor operation that compensates for an irregular grid format of the television schedule information. The user interface presents the schedule information in a format that compensates for limited resolution of the television display.

The user interface presents supplemental schedule information in overlays that obscure a minimum amount of useful other information. Order of presentation of the schedule information in the interface is customizable by user preference.

II. Cable Decoder Controller

Turning now to FIG. 23, there is shown a system 2010 for interfacing a cable television decoder 2012 to a VCR 2014 incorporating a television scheduling system of the type disclosed in my above-referenced issued U.S. Pat. No. 4,706,121, which is hereby incorporated by reference in its entirety. As is conventional, the cable signal is supplied to the cable decoder 2012 on cable 2016, and the decoded output of the decoder 2012 is supplied to the VCR 2014 through cable 2018 on a fixed channel. The decoded output on the fixed channel is also selectively supplied to a television set 2019, as indicated at 2021. The VCR 2014 receives commands from its remote controller 2020. A cable decoder remote control emulator 2022 is connected at 2023 between the VCR 2014 and the cable decoder 2012. All channel selection codes supplied to the VCR 2014 by its remote controller 2020 are converted by the remote control emulator 2022 to command codes recognized by the cable decoder 2012. The remote control emulator 2022 also suppresses execution of the channel selection codes supplied to the VCR 2014, in order to keep the VCR 2014 tuned to the fixed channel on which the decoded cable signal is supplied.

When the cable decoder mode is selected, channel indicator 2074 (FIG. 24) of the VCR will show the channel selected by the cable decoder unit. There are two reasons for using the VCR 2014 to display the channel number instead of the cable decoder 2012: The cable unit may now be hidden from sight, which is desired by most users, and it provides improved infrared isolation of the VCR remote controller 2020 signal from unwanted pickup by the cable decoder remote input 2056 (FIG. 24). The benefit of using the VCR 2014 for channel display is that the cable decoder unit 2012 can be made transparent to the user.

One aspect of making the cable decoder unit 2012 transparent to the user relates to the time of control of the cable decoder. Just as the schedule system controls the VCR to begin recording at a desired activation time, the cable decoder is also controlled and set to the desired channel at that time. The desired activation time is stored in memory, along with the channel of the selected program, and these stored values are later used to control the cable decoder. The desired activation time is typically the broadcast time of the selected program. It should also be noted that in order to allow for possible inaccuracies in the local system clock time and for variations in the actual broadcast times, the effective broadcast time employed by the schedule system and remote control emulator will typically include a guard time on the order of a few minutes to either end of the scheduled program time period. Controlling the cable decoder at the time of broadcast is critical to making the cable decoder transparent to the user, because if the cable decoder were not controlled at that time, one schedule request could interfere with another schedule request or with a user manual channel selection. This storing in memory of both channels and desired activation times for program selections is performed whether or not the program selections are being entered through an interactive electronic schedule system or are simply being entered manually from a printed television schedule guide.

The remote control emulator 2022 drives an infrared emitter, which is positioned in front of an infrared input on the cable decoder 2012. Thus, the remote control emulator 2022 replaces the conventional cable decoder remote controller. The user communicates with the system using the VCR remote controller 2020. For the user, the system 2010

appears to function in the same manner as would the VCR 2014 connected to the TV 2019 with no cable decoder 2012 present. This means that all functions, including on screen programming and the TV schedule system, provided with the VCR 2014 are fully functional and are operated uniformly by the user and interact with the user uniformly.

Further details of portions of the VCR 2014 and the cable remote emulator 2022 are provided in FIG. 24. As indicated at 2024, the remote emulator 2022 is supplied together with the VCR 2014. The VCR 2014 includes a programmable tuner 2026 connected to an RF modulator 2028 by cable 30. The cable decoder 12 is connected to the programmable tuner 2026 by the cable 2018, and the RF modulator 2028 is connected to the TV 2019 by cable 2032. The remote controller 20 supplies its inputs to a remote receiver 2034 in the cable remote emulator 2022. The remote receiver 2034 is connected to a central processing unit (CPU) 2036 by line 2038. The CPU 2036 is implemented with a commercially available microprocessor integrated circuit, such as those available from Intel Corporation, Santa Clara, Calif., or Motorola, Inc., Phoenix, Ariz. The CPU 2036 is connected to a random access memory 2044 and to cable decoder code memory 2046, which may be either a random access or a read only memory, by buses 2048 and 2050. The CPU 2036 is connected to a remote driver circuit 2052 by the line 2023. The remote driver circuit 2052 is connected to an infrared emitter 2054, which is positioned in front of remote input 2056 of the cable decoder 2012. The CPU 2036 is connected to the programmable tuner 2026 through a latch 2070 by lines 2071 and 2076 and to a channel display 2074 by line 2072. The latch 2070 is also connected to the CPU 2036 by line 2058. The latch 2070 allows the channel data to be shown on the display 2074 to be separated from data which is supplied to the programmable tuner 2026. Data is supplied to the programmable tuner 2026 only when the latch is enabled on line 2058.

In operation, the cable remote emulator 2022 is either programmed to learn the cable decoder 2012 remote controller codes in the conventional manner for teaching a remote controller to learn the commands of a foreign controller, which are then stored in the cable decoder code memory 2046, or the memory 2046 contains conversion codes stored in ROM for the more popular cable decoder 2012 models. The TV schedule system, which also utilizes the CPU 2036, is set to the cable mode by a command from the remote controller 2020. This causes the programmable tuner 2026, also forming part of the TV schedule system, to be non-responsive to the remote controller 2020 channel commands, as a result of a suitable control signal on line 2058, so that the tuner will remain tuned to the fixed channel for the cable decoder 2012, typically channel 3 or 4. However, the channel commands are stored in memory 2044. Whenever the TV schedule system requires channel information, it will refer to the stored channel information. For example, when the TV schedule system is opened, it will point to the channel currently being viewed/recorded. When a program is selected from the TV schedule system, the system will automatically generate codes recognizable by the cable decoder 2012 to change the channel on the cable decoder 2012. When a cable input is not being used, the latch 2070 is enabled on line 2058, so that channel commands on line 2071 are supplied to the programmable tuner 2026.

Remote controller 2020 commands are infrared coupled to the CPU 2036 and stored in memory 2044. When the system 2010 includes a cable decoder 2012, all channel tuning commands from the remote controller 2020 are inhibited in favor of cable decoder channel commands recognized by the cable decoder and produced by the CPU

2036 through conversion from the channel tuning commands. The conversion code is contained in a ROM, or a RAM if the system 2010 has a "learn" mode. After a delay to prevent potential conflict of two infrared signals, the converted code is coupled to the cable decoder remote input 2056 by the infrared emitter 2054. The process of emulating codes recognizable by the cable decoder 2012 is done in a conventional manner known in the art. All other commands from the remote controller 2020 are acted upon in the system 2010 unchanged.

Thus, as discussed above, in one embodiment a system for interfacing a cable television decoder having an input for receiving television signals including a plurality of channels and an output for directing a selected channel from the television signals to a television or television accessory includes a programmable tuning means for selecting a desired television channel signal (connected to the output of the cable television decoder to receive the selected channel on a fixed channel from the cable television decoder), means (connected to the programmable tuning means) for inhibiting the programmable tuning means from tuning to the selected television channel when the cable television decoder is operational, means for emulating the channel selecting commands of the cable television decoder, means (connected to the emulating means) for transmitting emulated channel selecting commands from the emulating means to the cable television decoder, and means (coupled to the emulating means) for making television channel selections. The means for making television channel selections also includes means for setting a desired activation time for a channel selection, and the system includes a memory (connected to the emulating means) for storing television channel selections and desired activation times for the television channel selections.

While the preferred embodiment is directed to controlling the tuner of a cable decoder, the teachings of the present invention are equally applicable to the control of a tuner of a satellite receiver, a telecommunication fiber optic tuner/receiver used to receive TV programming, or any TV tuner apparatus with a tuner that preselects television programs for recording by a VCR. By controlling the preselection TV tuner, the VCR on-screen unattended recording programming functions need not be duplicated by the preselection TV tuner apparatus. Moreover, the viewer is not burdened with the task of programming more than one TV apparatus.

It should now be apparent to those skilled in the art that a novel system for interfacing a cable television decoder to a television accessory capable of achieving the stated objects of the invention has been provided. The system and method provides a single tuning arrangement which will coordinate channel selection information between a cable decoder and a television schedule system, a VCR or any television device. The tuning arrangement is compatible with already installed equipment. The single tuning arrangement eliminates duplicative programming effort and preserves the advanced features of television devices, such as on-screen programming of unattended recording, even when operating behind cable decoders and other TV apparatus with preselection tuners.

III. Background Guide

This aspect of the invention is directed to a convenient background mode for the electronic guide which presents several lines of guide information, typically occupying the bottom quarter of the screen, overlaying the current television program. The background mode enables the viewer to manually or automatically scroll through preselected portions of the schedule information. This preselected informa-

tion is not just limited to information about a single current (or otherwise selected) program. This background scrolling guide is particularly convenient during a lull in television programming, such as a commercial break. As a supplement to the full-screen foreground guide, the background mode eliminates the need to master the advance navigation commands of the full-screen guides.

Due to the limited amount of listing information that can be displayed in the background guide, preselection of the listing is essential. An indiscriminate scrolling of every listing in a typical one week guide would require 8 hours, even if each listing is scrolled at a rate of one per three seconds. Limiting the listings to a fixed time period, such as the current day, current hour, or primetime is a first step toward implementing a useful background guide. Other selection criteria, such as channel or theme, can be logically combined to further filter the listings down to a total that can be read in a fraction of an hour.

In existing non-interactive scrolling guides available on some cable systems, the listing cannot be controlled by the viewer. Each time the viewer switches the tuner to the guide channel, the listings is at some random point in the one week guide. Listings are grouped chronologically, by day and start time. Under each group are channel identifiers arranged numerically or by cable source name if it is a listing for cable-TV programming. Without user interaction, there is little chance that the viewer will randomly tune to the guide channel and see desired listings at the desired time and channels without a tedious wait. For an interactive background guide, the ability to resume and continue forward from the last listing is highly desirable.

In the present invention, there is a concept of a guide session which allows the user to open the background guide repeatedly, interleaved with non-background guide activities, such as watching TV or using the foreground guide. During a session, specific setup criteria for the background is persistent and stored in electronic memory. This may include the time-period over which the listings are scrolled, whether the scrolling is manual or automatic, the channel of the last listing, whether sorting by theme has been setup, whether sorting by favorite channels has been setup. One or all criterion may be manually changed without terminating a session. Some criteria may be automatically changed if the cursor or setup of the foreground guide is changed. A session is completed if the background guide has not been accessed for a certain period of time, or the user manually selects a new session. A typical setup screen for the background schedule guide is shown in FIG. 25, in which setup screen 3010 occupies all of television screen 3020.

During a session, each time the viewer opens the background guide, the initial listing will continue from (or repeat) the last listing displayed in the previous background guide access. The pointer to the current listing within a set of schedule information is known as a tab. The tab can be advanced by manual or automatic scrolling. Additionally, if the current system clock time catches up to a tab in a time-indexed set of schedule information, the tab will be pushed forward from then on in step with the system clock until overridden by a user. A session does not end when scrolled to the end of the time period window, but repeats itself when all listings in a time-period have been scrolled. By providing persistent storage of the last time-period, the last listing, or tab, within the time period, the last channel, and the setup criteria for the foreground guide, the viewer is freed from the chore of remembering and reentering a host of background setup criteria each time the background guide is opened. This is illustrated in FIGS. 26a and 26b. FIG. 26a

shows the display of a background guide 3110. If at three o'clock the user suspends the background guide for an hour, and then reactivates it within the same session, the display upon reactivation would be as shown in FIG. 26b. Background guide display 3120 of FIG. 26b is determined by the same stored operating characteristics such as theme, time period, manually scrolling, automatically scrolling, etc., as were used for the display of FIG. 26a. Note that the tab, or the pointer to the current listing, has been pushed forward from three o'clock to four o'clock by the advancing time on the system clock. The status of displays 3110 and 3120 are substantially the same, except that the passage of time causes the displayed schedule information to only partially overlap.

In the preferred implementation, pressing the background guide command once will start display of a background guide. It will list programs according to

During a session, each time the viewer opens the background guide, the initial listing will continue from (or repeat) the last listing displayed in the previous background guide access. The pointer to the current listing within a set of schedule information is known as a tab. The tab can be advanced by manual or automatic scrolling. Additionally, if the current system clock time catches up to a tab in a time-indexed set of schedule information, the tab can be pushed forward from then on in step with the system clock until overridden by a user. The tab is pushed forward as broadcasts end. If the system clock surpasses the tab, once all programs at the tab time setting are over, the tab setting will be advanced.

The default setting for the tab when the guide is first opened is the earliest start time of any program that is still being broadcast at the time the guide is opened. The tab is then advanced, and listings printed, repeatedly, until the guide screen space is filled. From that point on the tab can be advanced by either manual scrolling or automatic scrolling. Automatic scrolling can be at a fixed number of listings per time period, or can simply be from the tab being pushed forward by program broadcasts ending, as described above.

A session does not end when scrolled to the end of the time period window, but repeats itself when all listings in a time-period have been scrolled. By providing persistent storage of the last time-period, the last listing, or tab, within the time period, the last channel, and the setup criteria for the foreground guide, the viewer is freed from the chore of remembering and reentering a host of background setup criteria each time the background guide is opened. This is illustrated in FIGS. 26a and 26b. FIG. 26a shows the display of a background guide 3110. If at three o'clock the user suspends the background guide for an hour, and then reactivates it within the same session, the display upon reactivation would be as shown in FIG. 26b. Background guide display 3120 of FIG. 26b is determined by the same stored operating characteristics such as theme, time period, manually scrolling, automatically scrolling, etc., as were used for the display of FIG. 26a. Note that the tab, or the pointer to the current listing, has been pushed forward from three o'clock to four o'clock by the advancing time on the system clock. The status of displays 3110 and 3120 are substantially the same, except that the passage of time causes the displayed schedule information to only partially overlap.

In the preferred implementation, pressing the background guide command once will start display of a background guide. It will list programs according to previous criteria selected by the setup menus for the background guide and the foreground guide. Depending on the prior setup, the background guide may automatically scroll, or may be

manually stepped using the Page Up/Dn keys. The channel of the background listings may be sequenced by pressing the Channel Up/Dn key. Depending on the background mode selected, pressing a Channel key will cause the listing to jump to the next channel that is defined either by the Channel Up/Dn keys, or according to the sequence defined under the foreground guide. Pressing the TV, Guide, or Theme key will terminate the background guide display, but not the session.

To change the mode of the background guide, the background guide command is entered again while a background guide is displayed. A background guide setup menu will be displayed displacing the background listings. One such setup screen 3010 is shown in FIG. 25, in which setup screen 3010 is shown to cover the entire television screen 3020. In alternative embodiments, the setup screen occupies only the same portion of the television screen as the background guide. From the setup menu, the viewer may select another background mode:

20 Scroll current listings for all channels. This is the default mode when a new session is started.

Scroll listings for current channel,

Scroll listings according to the selection criteria when the foreground guide mode was last exited,

25 Scroll according to the theme criteria when the theme guide was last exited.

The setup menu also allows the viewer to change the time period from the default period. The default time period is the current time to programs starting in the next 3 hours. The time period is shown by start time block 3030 and end time block 3040. At the end of the time-period, the listing will loop back to the start of the time-period. If there is a Primetime command, actuating this command will cause the time-period to be automatically set to the designated primetime. The viewer can also select a new session, in which all the default selections (including the default time-period) will be reinstated.

The following is a detailed description of each mode:

1) All selected channel scroll. This is the default mode when a new session is started. The first listing of the background guide is for the program on the current tuner channel. Pressing the page up/down key momentarily will manually advance the listings starting with the listing group for the current time. When all channels with the current start time is displayed, the next group of listings for the next start time will be displayed. Pressing the page key for 3 seconds, or longer, will start automatic scrolling of the guide. The guide will scroll through all channels which have been declared favorites in the foreground grid guide. If the favorite channel menu has not been setup, by default, all channels will be considered favorites. Typically, all channels listed in the opening few pages of the grid guide are favorite channels.

a) Pressing a channel key will cause the listing to jump to the next channel listed in the grid guide. The Up channel key will cause listing to advance to the next higher listed channel, and to the previous listed channel for the Down channel key. Pressing the page key momentarily will cause scrolling to stop. The next page key command will resume manual scrolling of the background guide.

b) Pressing the primetime command will change the time-period to match the primetime period. The latter has a default time of 7 PM to 11 PM, but may be defined by the user when setting up the foreground guide.

c) The viewer can immediately change tuner channel to one that is displayed in the background guide by pressing the Enter key. The background mode is not exited, and the viewer may continue scrolling the background guide.

d) To exit, press TV or any other mode command.

e) To resume the background mode last selected, press the background guide key. If the session is not over, the guide will continue from the last listing displayed.

While a background guide is displayed, pressing the background guide command key will toggle presentation of the setup menu. Another mode can be selected without ending the current session. For example, a single channel mode can be selected and scrolled over the current time-period. Pressing the background guide command again will toggle back to TV viewing with a background guide.

2) Single channel scroll. This mode may be selected by pointing to the Single Channel mode in the setup menu, or by entering the number #2 key. The single channel background guide is almost identical to the single channel foreground guide, except that only one or two programs is displayed.

a) Pressing the page up/down command will manually display listing for the selected channel. If the page key is held down for three seconds, or longer, the guide will scroll at a predetermined rate automatically in the direction of the selected channel key (up or down). To return to manual scrolling, press the page key momentarily and release.

b) Pressing either the up/down channel key will cause the listing to jump to the listing for the next channel.

c) The viewer can immediately change tuner channel to one that is displayed in the background guide by pressing the Enter key. The background mode is not exited, and the viewer may continue scrolling the background guide.

d) To exit, press TV or any other mode command.

e) Press the background guide command to resume listing. If a new session is not started, the first displayed listing will continue from the last listing scrolled before exiting the background mode.

Pressing the background command will open the setup menu. A different time-period can be selected if desired. Alternatively, the user can select New Session, to reset to the default time-period. Or the viewer can select another background mode. After the setup menu selection is completed, pressing the background guide command will restart display of the background guide.

3) Scroll according to the criteria setup for the guide. This background mode preselects display listing according to the guide mode that was last active. It can be the grid guide, or the theme guide. This mode provides an alternative way of viewing the listings normally seen on the grid guide or the theme guide, whichever was last viewed. Specifically, the start time is indicated by the leading edge of the grid guide cursor. The default time-period is 3 hours. This background guide will scroll through the listings of channels that are defined in the grid guide.

A typical application for this mode is as follows: assume that the viewer has started browsing the grid guide and decides to return to TV viewing. During the next commercial break, the viewer can open the background guide to resume displaying listings of programs starting at the cursor position in the grid guide. This eliminates the need to specify favorite channels in the background guide duplicating the setup effort of the grid guide. Likewise, if the viewer was brows-

ing the theme guide, the background guide will resume listings of programs at the cursor position in the theme guide. This eliminates the need for the reviewer to setup theme and subtheme criteria in the background mode.

a) Pressing the Enter key will cause the tuner channel to change immediately to the listed channel in the background guide.

b) Pressing the page key will manually advance the listings. Momentarily holding the page key down for several seconds will cause the display to automatically scroll. Pressing any page key again will cause the scrolling to stop and to resume manual advancing of the listings.

c) To exit, press TV or any other mode command. Channel presentation on the grid guide.

It is desirable to list programs in the order of most favorite channels instead of sequentially by channel number or alphabetically as in a printed television guide. A channel menu is provided to allow the viewer to arrange channel listings in the preferred order. In this way, the most favorite channels will be grouped together, on one or two pages, greatly reducing the need to perform channel paging. This is usually a one-time installation menu that allows the user to define channels that are favorites, and to be listed in the grid guide in a preferred order.

The channel select menu provides a list of all channels that can be received by a viewer. From this list, channels can be designated as favorites. Favorite channels are automatically given certain priorities. For example, in the event that the schedule memory is insufficient to store all the listing information downloaded from broadcast, program notes and other descriptive information for non-favorite channels will be discarded before discarding such information for favorite channels. In case of severe shortage of memory space, listings for non-favorite channels will be discarded first.

The channel select menu also allows the viewer to decide on the listing priority of favorite channels on the grid guide. In one implementation, the channel select menu is a list of all channels, arranged in columns. The first column on the left, from top to bottom, will be the order in which channel listings will appear in the grid guide. Once favorite channels are designated, they will automatically be grouped together in the left-most columns. For example, if there are four favorite channels, such as CNN, DISN, HBO and SHO, it is possible to position SHO as the first channel in the grid guide. To do this, highlight the location where the new channel is to be moved. In this case, CNN is first highlighted. Next select the preferred channel, SHO. When this is done, CNN, DISN, and HBO will shift down one slot, and SHO will be entered into the first slot.

The channel select menu is maintained in a persistent (a non-volatile) memory and is used by foreground and background guides and serves as user input selection criteria when listing program in the grid guide, or to determine the order and which channels are to be listed in the background guide.

It should further be apparent to those skilled in the art that various changes in form and details of the invention as shown and described may be made. It is intended that such changes be included within the spirit and scope of the claims appended hereto.

What is claimed is:

1. A background television schedule system for displaying television schedule information on a television including a television screen on which is displayed a primary display, the background television schedule system comprising:

set-up display controller, coupled to said television, for assisting a user in selecting a television program listing

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arrangement, and for displaying on said television user selections of said television program listing arrangement;

a memory, coupled to said television, for storing said user selections;

activation controller, coupled to said memory, for activating and suspending operation of said background television schedule system; and

background display controller, coupled to said television and to said memory, for displaying background schedule information over a portion of said television screen in response to an activation of operation of said background television schedule system, said primary television display being displayed on said television screen in conjunction with said background schedule information, said displayed background schedule information being determined according to said user selections.

2. The background television schedule system of claim 1, wherein said set-up display controller comprises means for displaying said television program listing arrangement over a portion of said television screen in response to said user selections, said primary television display being displayed on said television screen in conjunction with said television program listing arrangement.

3. The background television schedule system of claim 1, further comprising a system clock, wherein said background display controller comprises means for automatically defining a time period for coverage by said background schedule information according to said system clock and a predetermined span of time, and means for defining a time period for coverage by said background schedule information in response to user inputs.

4. The background television schedule system of claim 1, wherein said memory is further for storing at least one preferred television channel, and wherein said preferred television channels are defined by user inputs, and wherein

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said preferred television channels are displayed in said background schedule information.

5. The background television schedule system of claim 4, further comprising scrolling means for scrolling preferred television channels in said displayed background schedule information, wherein said scrolling means scrolls said preferred television channels in response to user inputs, and wherein said scrolling means automatically scrolls said preferred television channels after predetermined intervals of time.

6. The background television schedule system of claim 4, further comprising means for arranging said preferred television channels in a desired order in response to user inputs.

7. A background television schedule system for displaying television schedule information on a television, said background television schedule system comprising:

a set-up display controller, coupled to said television, for assisting a user in selecting a television program listing arrangement, and for displaying on said television user selections of said television program listing arrangement;

a memory, coupled to said television, for storing said user selections;

a CPU, coupled to said memory, for activating and suspending operation of said background television schedule system; and

a background display controller, coupled to said television and to said memory, for displaying background schedule information on said television in response to an activation of operation of said background television schedule system, said displayed background schedule information being determined according to said user selections.

* * * * *

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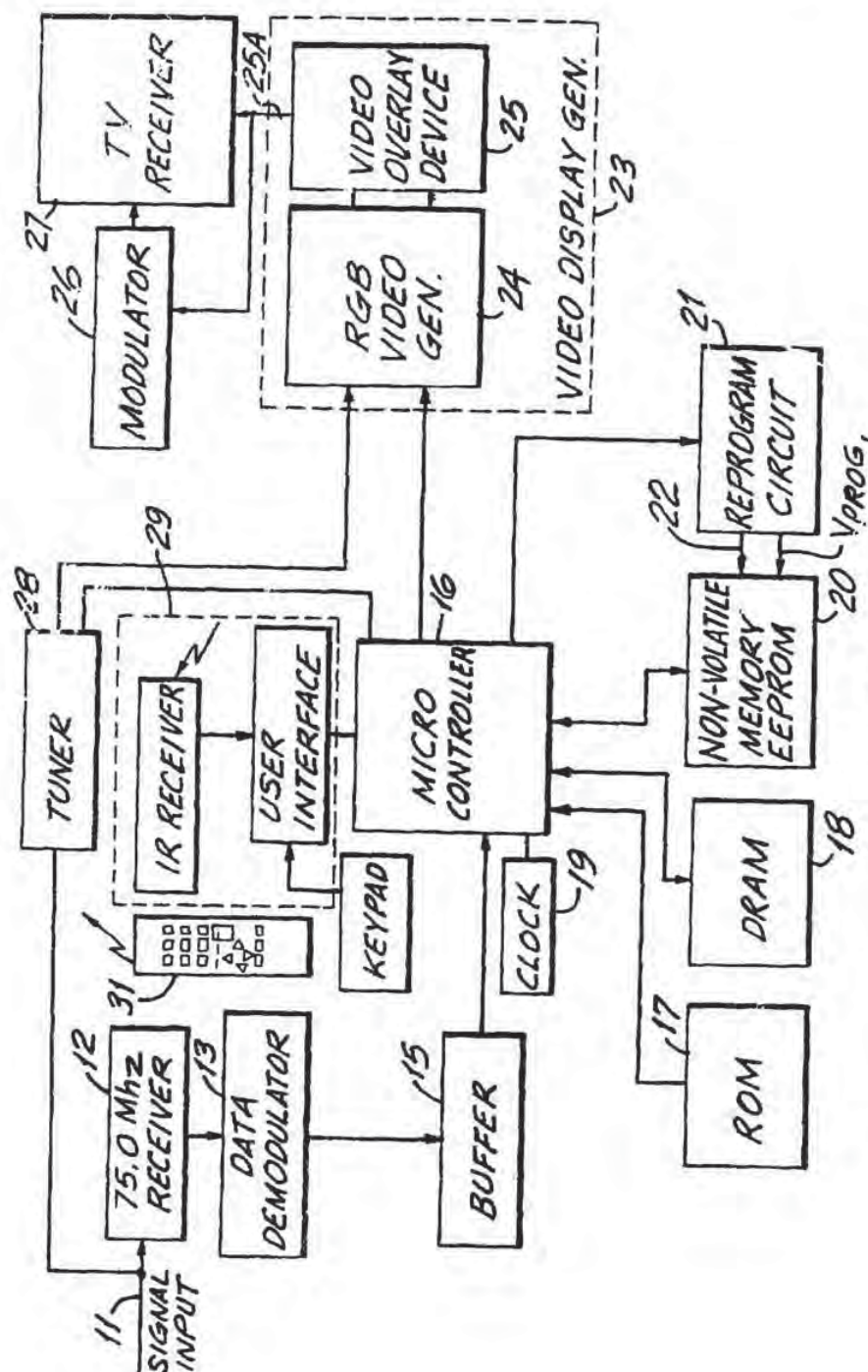


FIG. 1

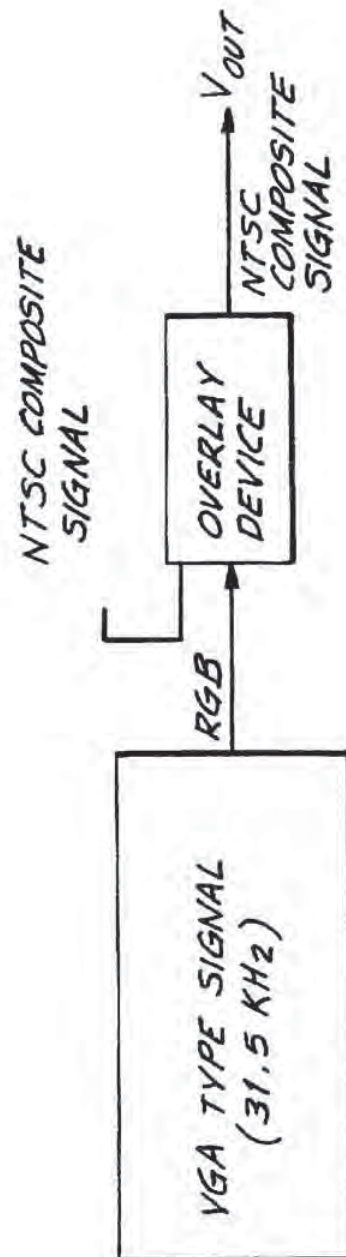
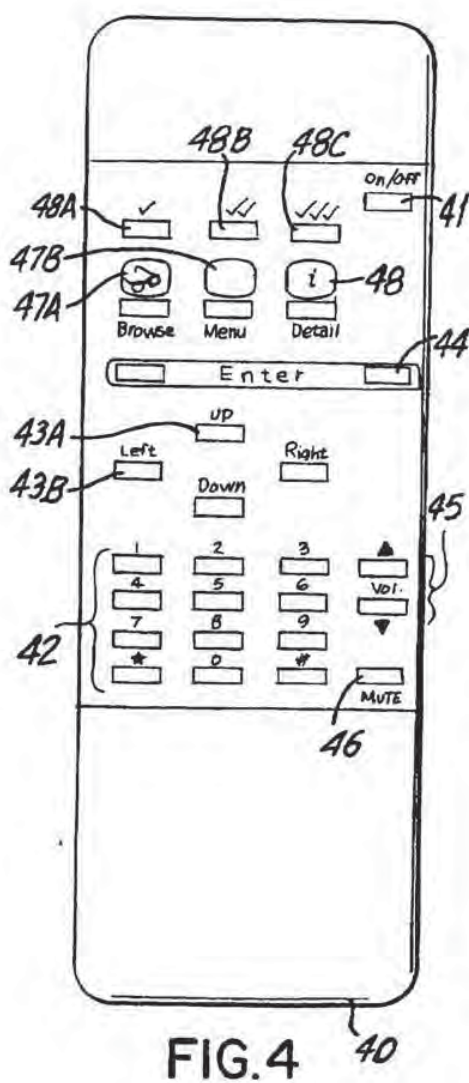
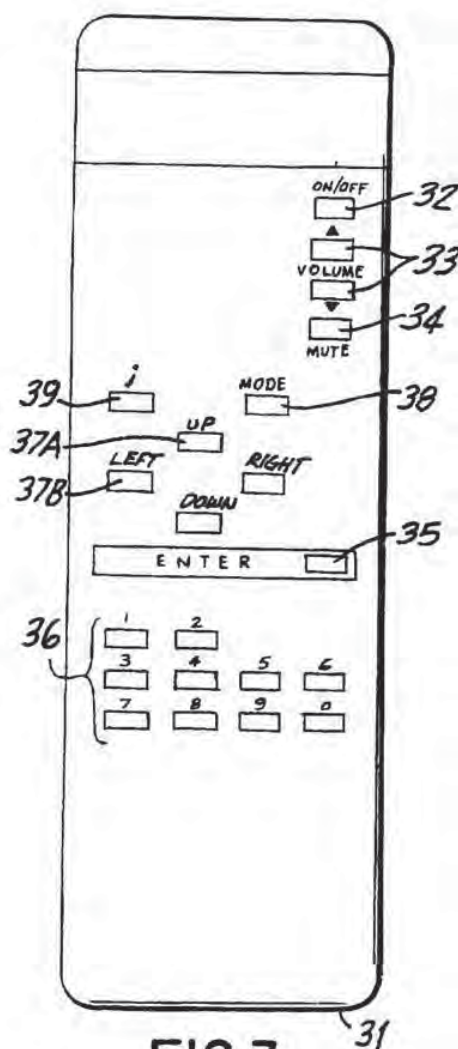


FIG. 2



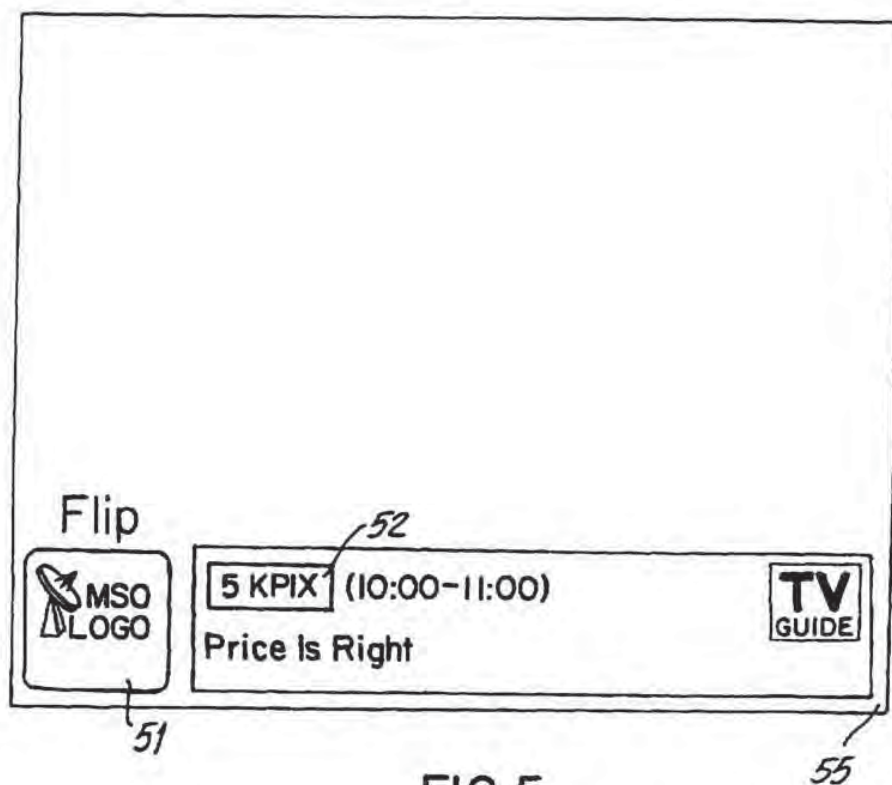
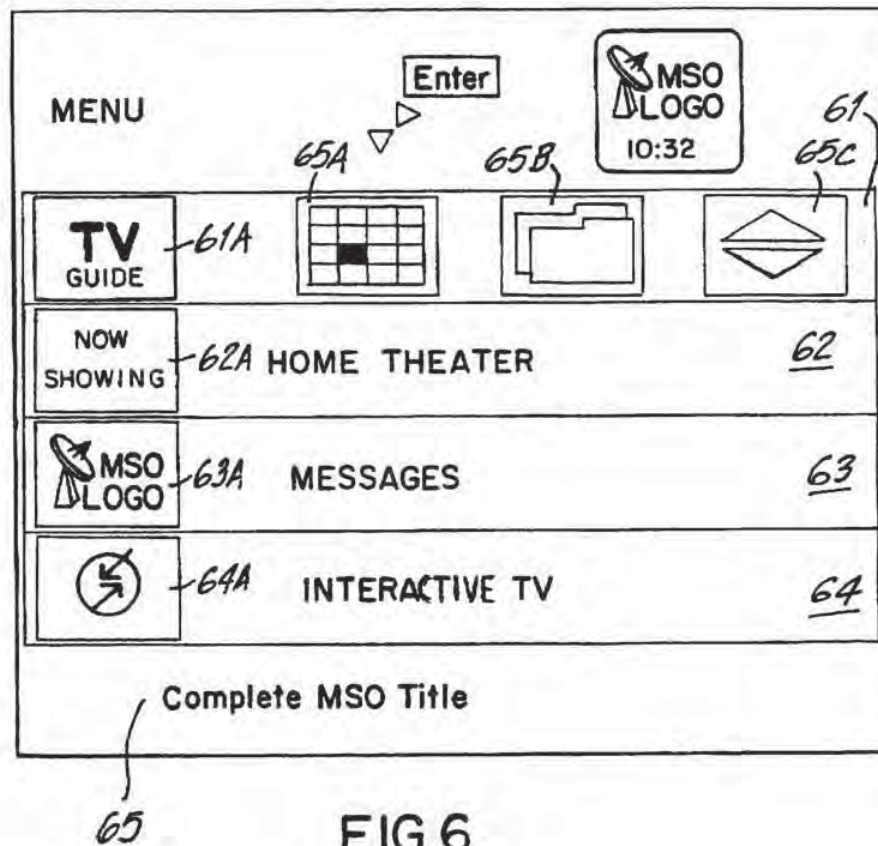


FIG. 5



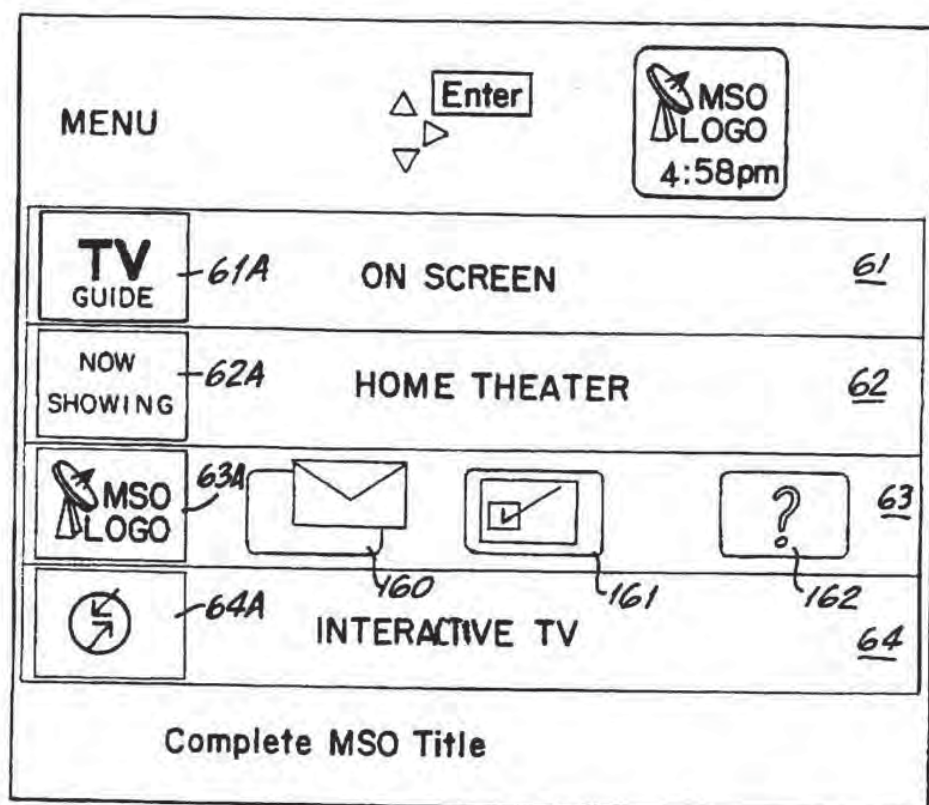


FIG. 6A

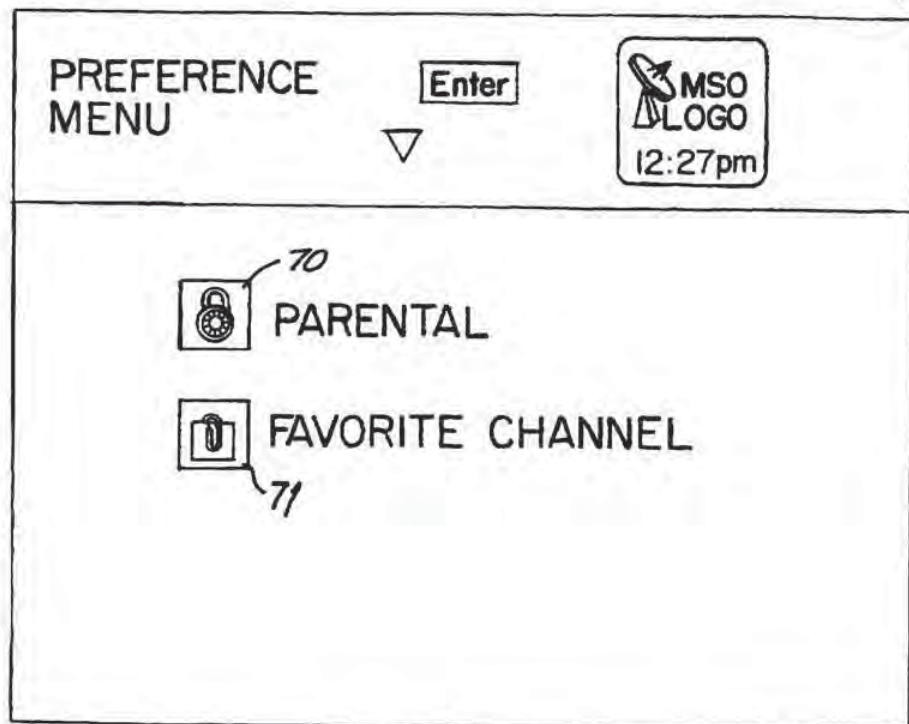


FIG.7

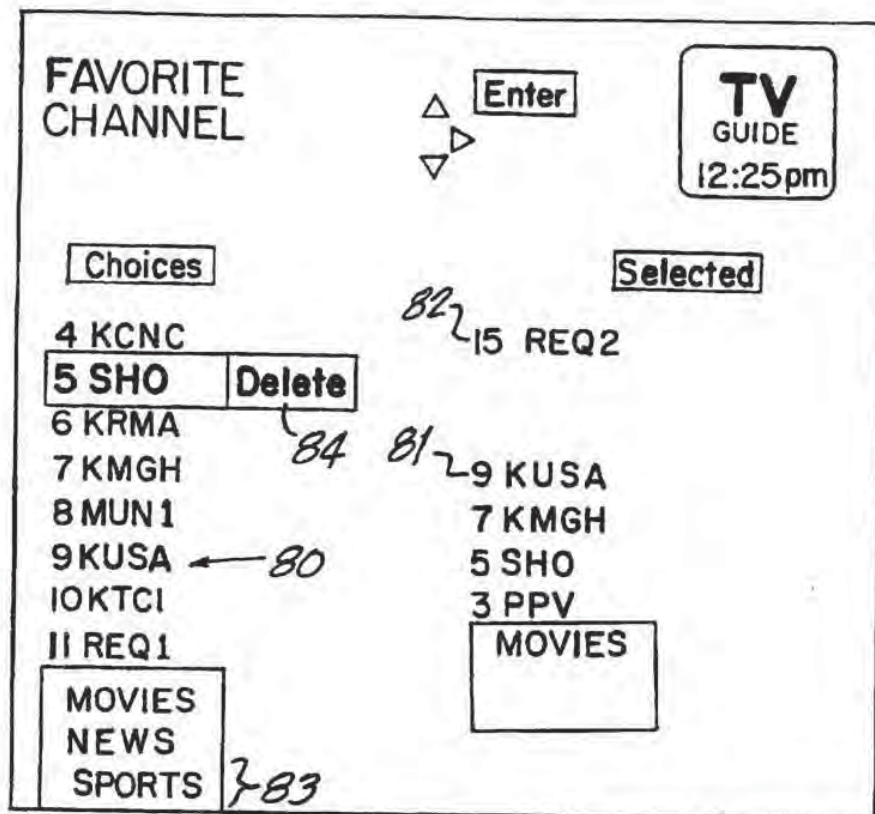


FIG.8

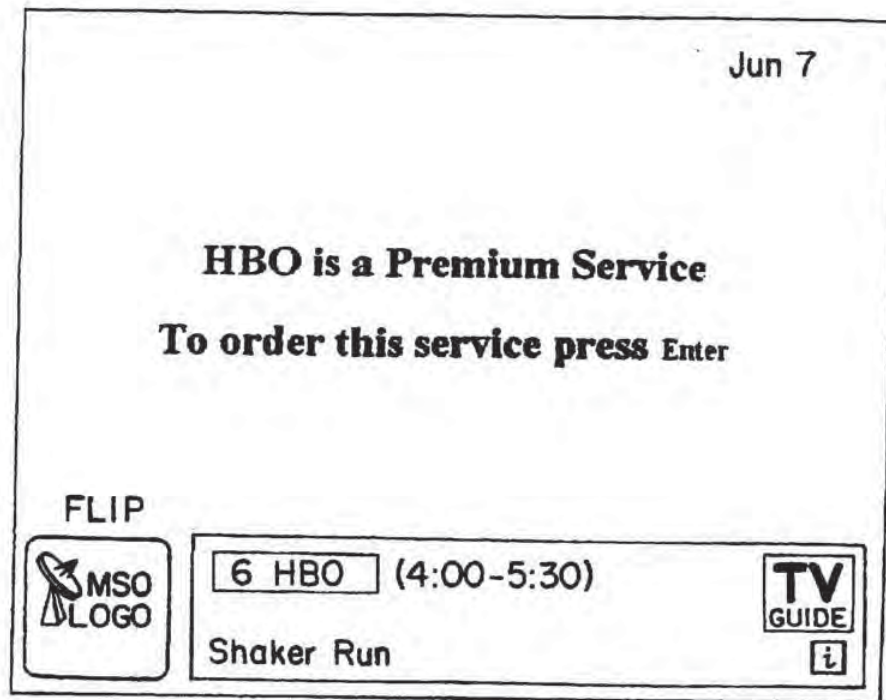


FIG.9

Premium Services	Enter	 5:03pm
HBO	Home Box Office \$10.40/Month	
SHO	Showtime \$9.95/Month	
DIS	The Disney Channel \$9.95/Month	
TMC	The Movie Channel \$1.50/Month	
MAX	Cinemax \$9.95/Month	
PLA	Playboy at Night \$4.95/Evening(5:00pm to 3:00am)	
ACT	Action \$5.95/Day(11:00pm to 3:00pm)	
Movie, special events and family programming!		
You are not a Subscriber. Press Enter to Subscribe!		

FIG. 10

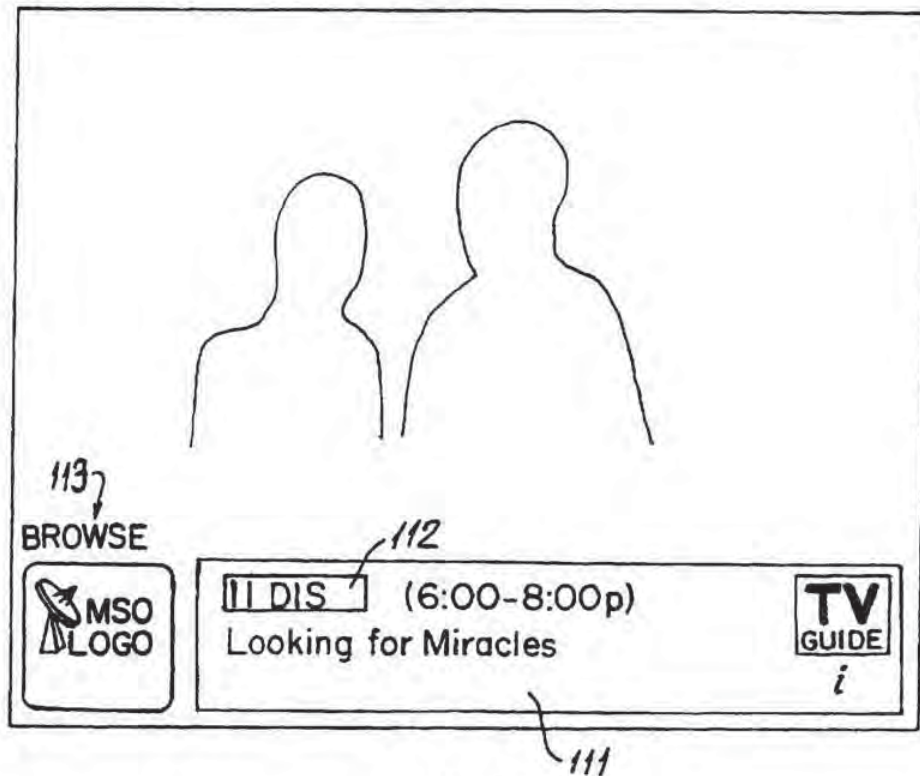


FIG. II

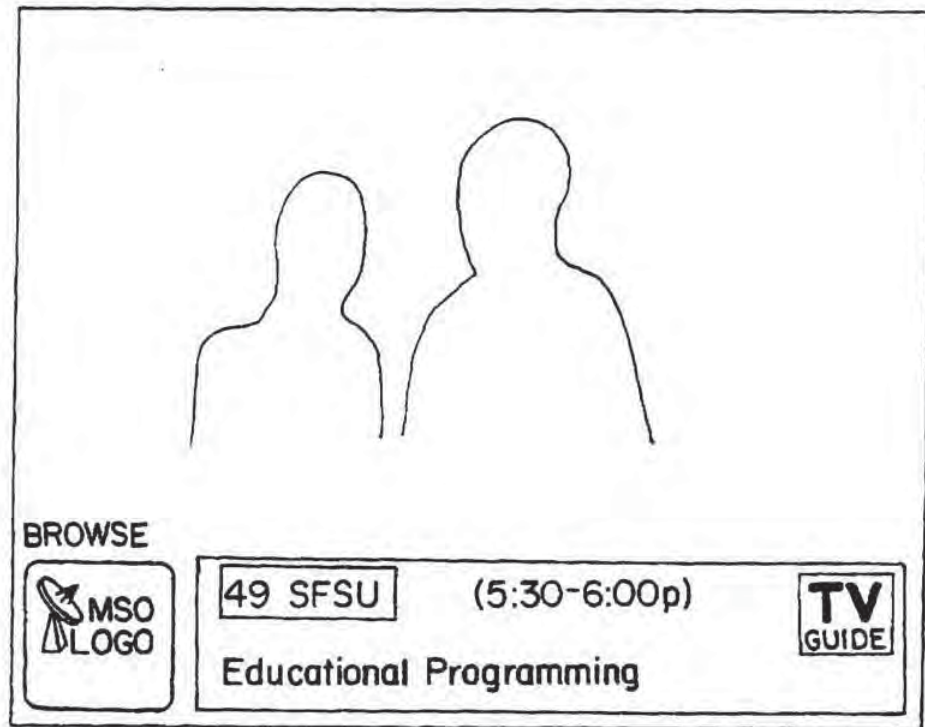


FIG. 12

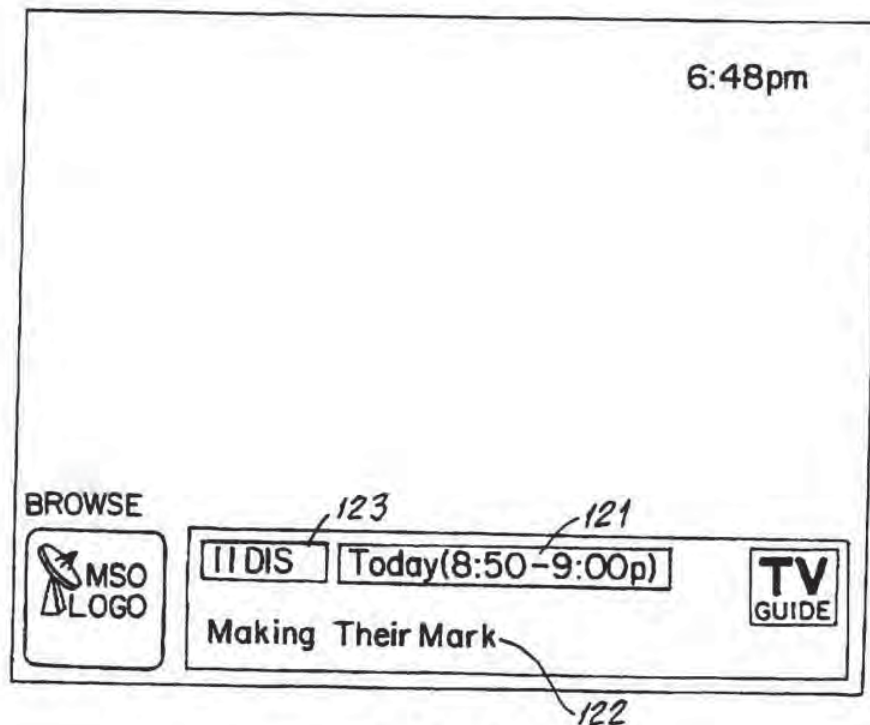


FIG. 12A

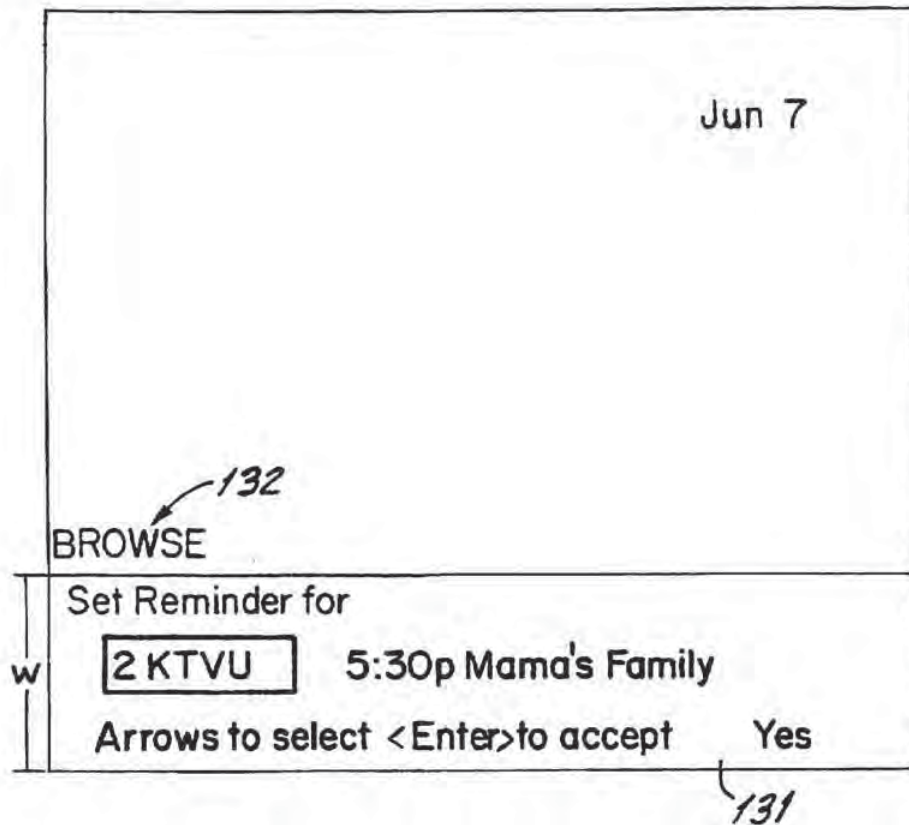


FIG.13

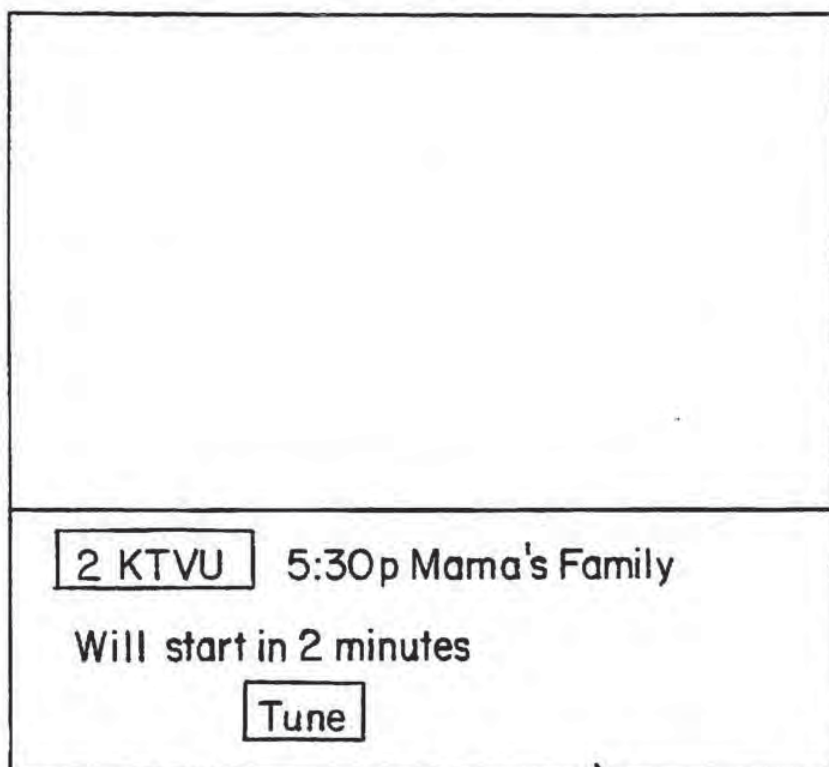


FIG.14

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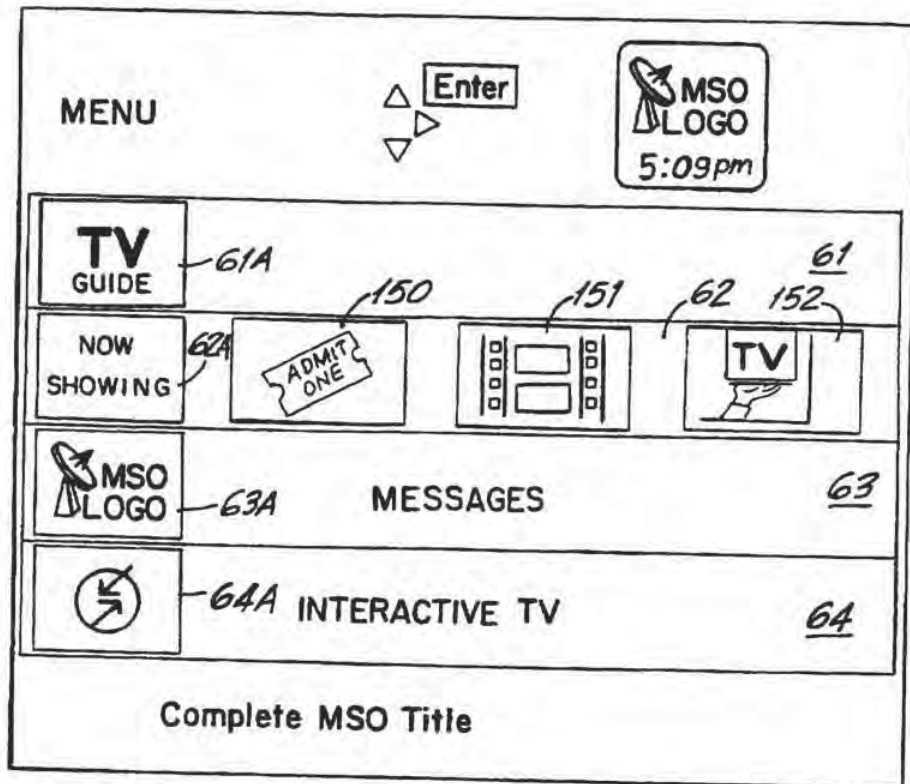


FIG.15

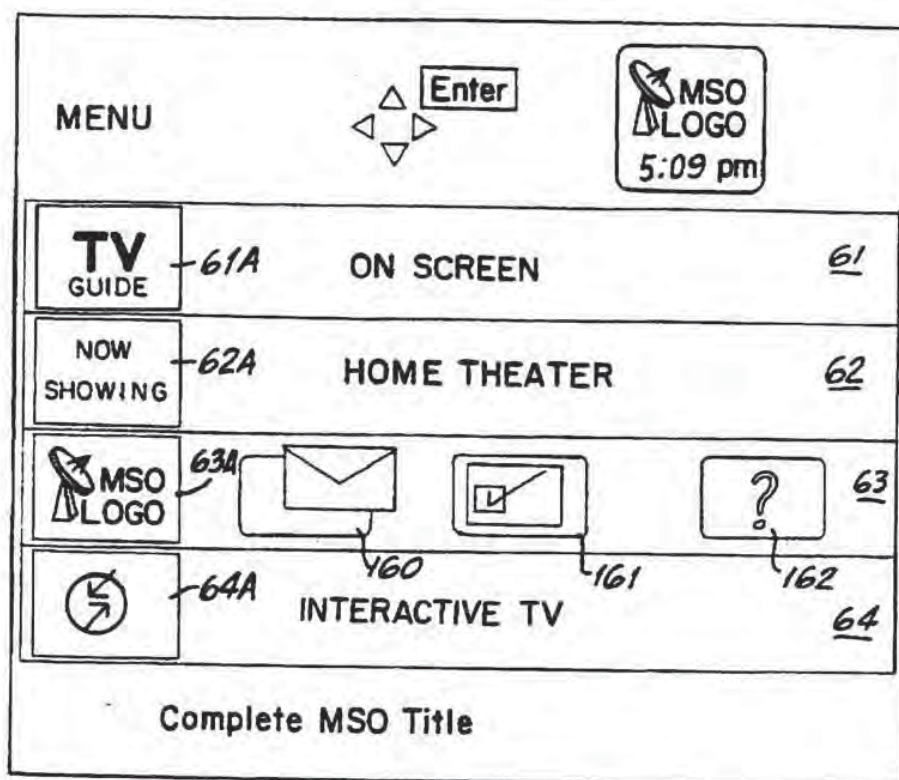


FIG. 16

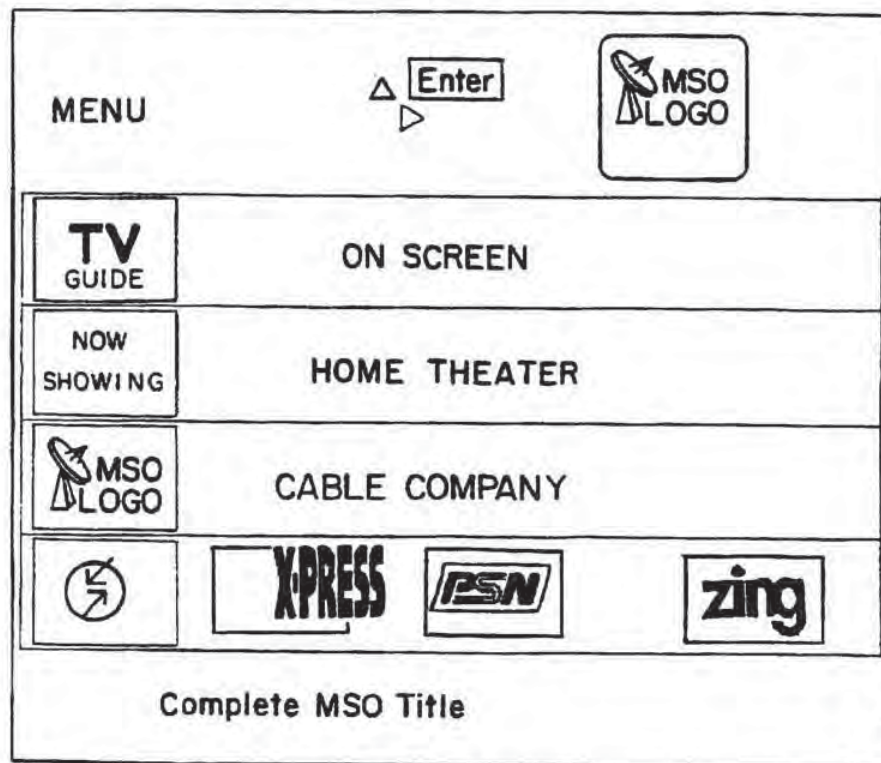


FIG. 17

All-180 Listings				TV GUIDE 7:13 pm 182 183	
				Enter 184 i	
4 KRON	Baseball (4:30-7:30p)			i	
Today	7:00p	7:30p	8:00p	8:30p	
4 KRON	Baseball	Ent. Tonight	Fresh Prince	Blossom	
5 KPIX	Evening Shade	Major Dad	Murphy Brown		
6 HBO	JFK: In His Own Words	JFK			
7 KGO	Jeopardy!	Wheel of Fortune	Day One		

FIG. 18

FIG. 19

Listings By ²⁰¹ Channel ^{202a} ^{202b} ^{202c}

3

PREV

4

KRON

5

KPIX

Today

TV
GUIDE

6:50 pm

4:30p	Baseball	1
7:30p	Entertainment Tonight	
8:00p	Fresh Prince	
8:30p	Blossom	
9:00p	Perry Mason: Notorious Nun	1
11:00p	News	
11:30	Tonight	
12:30a	David Letterman	

FIG. 20

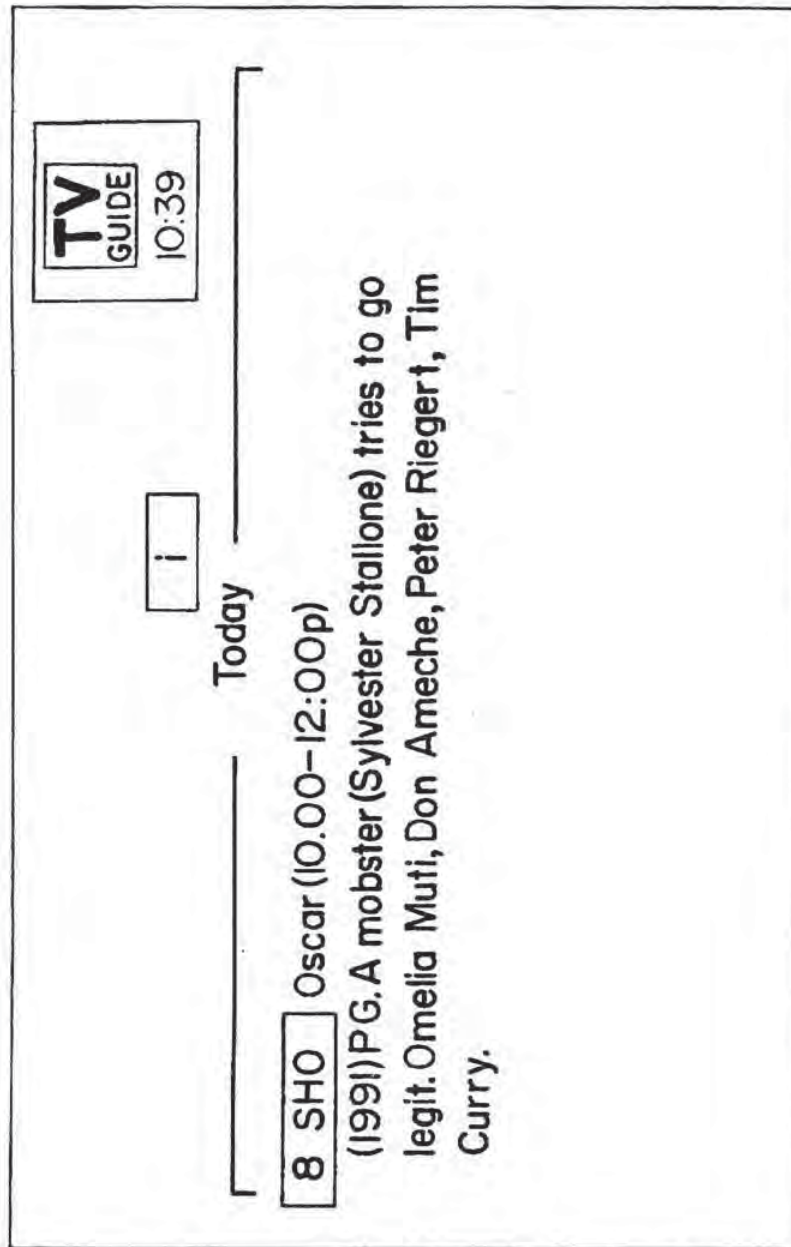


FIG. 21

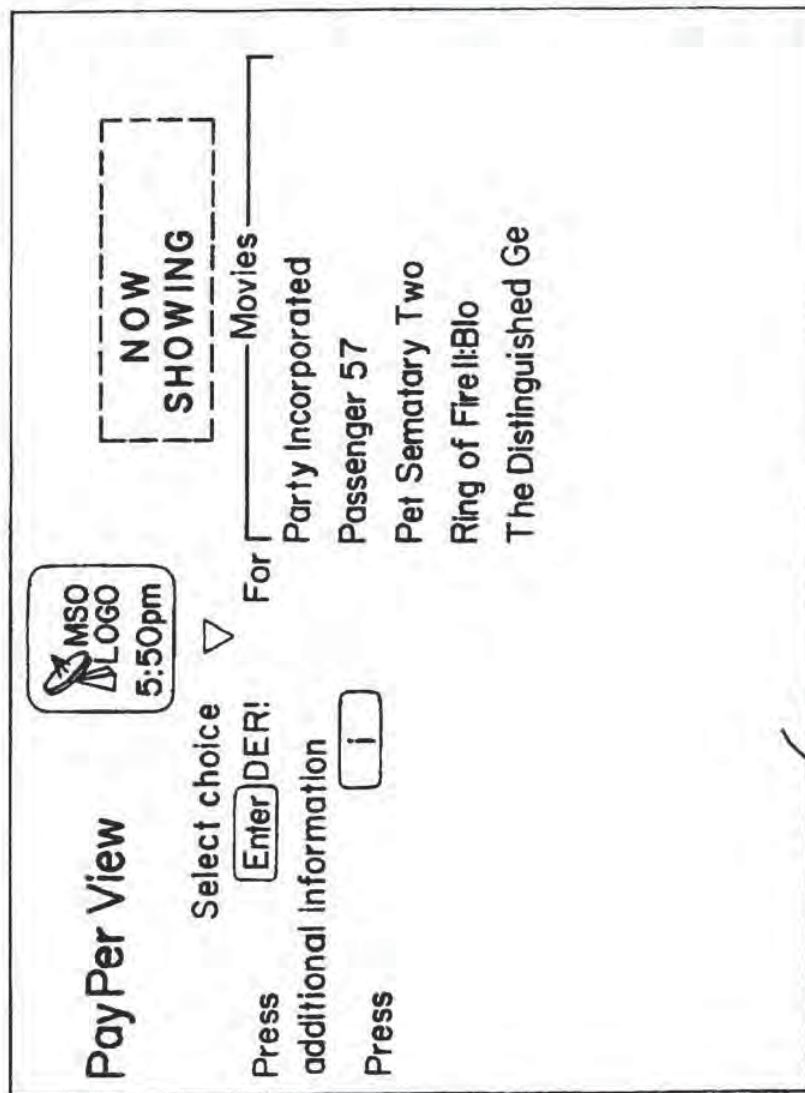


FIG. 22

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Pay Per View	Enter	 5:49 PM		
Ordering				
Passenger 57		\$ 3.99		
What time would you like this show to start?				
Today 9:00p ^{230B} Tomw 12:00p Tomw 6:00p ^{230C}				
^{230A}				
Would you like to see a countdown onscreen just before the show start	Yes	No		
<table border="1"><tr><td>PPV /</td></tr><tr><td>/ Source</td></tr></table>			PPV /	/ Source
PPV /				
/ Source				

FIG.23

Pay Per View Confirmation	◀	Enter	 5:49pm						
You have requested to order:									
Passenger 57		\$ 3.99							
NO, I DO NOT WANT TO ORDER.									
<table border="1"><tr><td>PPV</td><td>/</td><td></td></tr><tr><td></td><td>/</td><td>Source</td></tr></table>				PPV	/			/	Source
PPV	/								
	/	Source							

FIG.24

Pay Per View Confirmation					
You have requested to order:					
Passenger 57	\$ 3.99				
Yes, I would like to order					
Passenger 57 has been Ordered!					
Tune to Channel 1 Today at 9:00pm.					
<table border="1"><tr><td>PPV /</td><td></td></tr><tr><td>/</td><td>Source</td></tr></table>		PPV /		/	Source
PPV /					
/	Source				

FIG.24A

LISTINGS		 Listing 					6:06P AUG 16
5:00	5:30	6:00	6:30	7:00	7:30	8:00	
NBC	4	News					
ABC	6	News					
CBS	10	CBS News					
Fox	28	Club Paradise (5:00)					
PBS	29	Mystery!					
COM	30	Tribute to Carson					
HBO	33	Gremlins 2: The New Batch					
ESN	34	Tennis (4:30)					
AMC	35	Arise my Love (5:00)					
DSC	37	Natural World					
NIK	38	I Love Lucy					

FIG.25

Premium Services	Enter	 5:03pm
▽		
HBO	Home Box Office \$10.40/Month	
SHO	Showtime \$9.95/Month	
DIS	The Disney Channel \$9.95/Month	
TMC	The Movie Channel \$1.50/Month	
MAX	Cinemax \$9.95/Month	
PLA	Playboy at Night \$4.95/Evening(5:00pm to 3:00am)	
ACT	Action \$5.95/Day(11:00pm to 3:00pm)	
Movie, special events, and family programming!		
You are not a Subscriber. Press Enter to Subscribe!		

FIG. 26

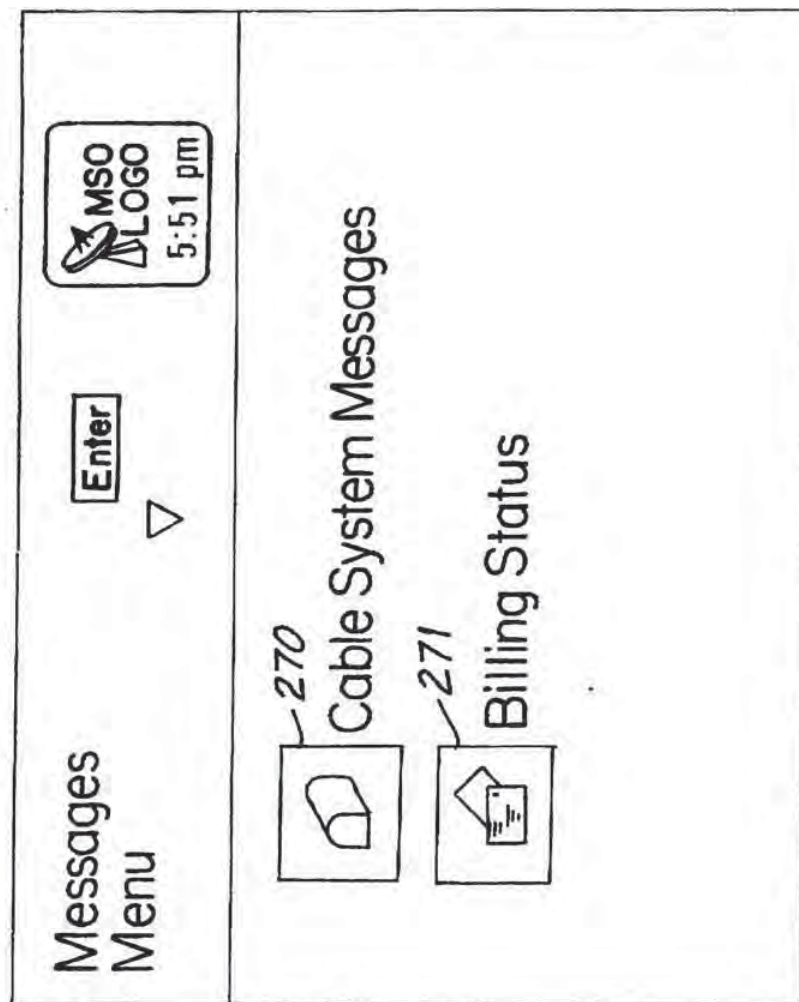


FIG. 27

Cable System Messages	 Pay Per View is featuring "Batman Returns" this month. Get a free sneak peek of HBO this weekend.	Complete MSO Title
------------------------------	--	---------------------------

FIG.28

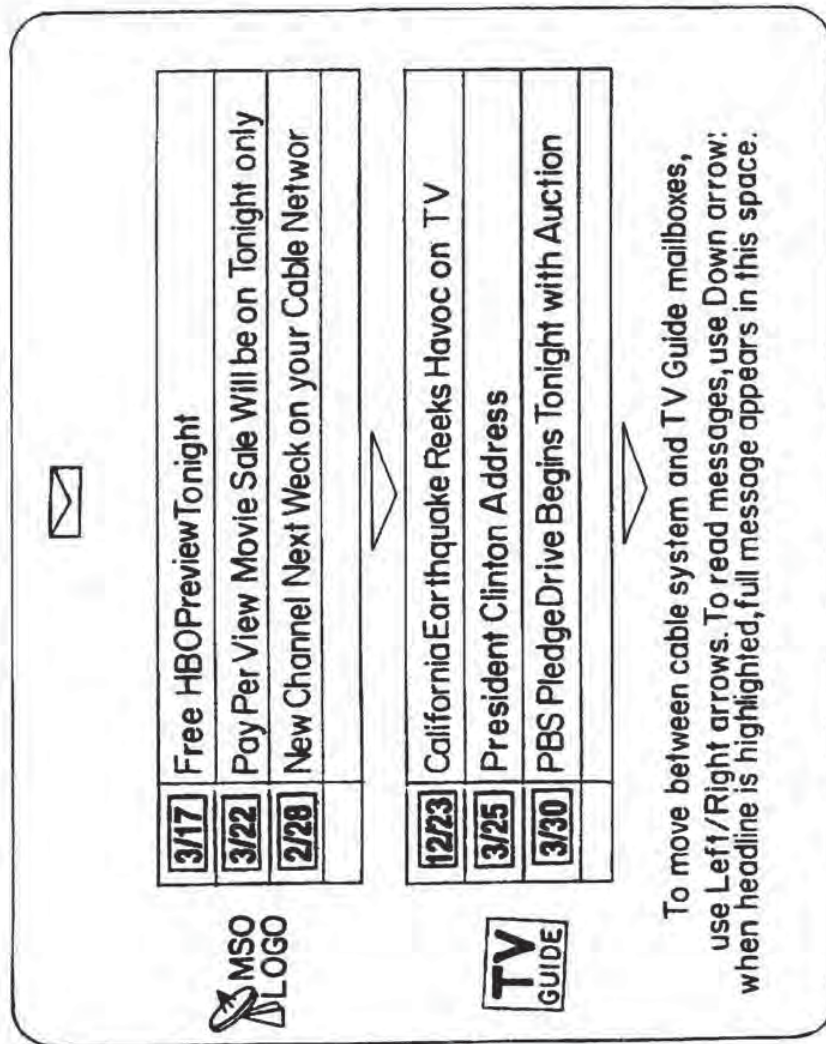


FIG. 28A

Billing		 5:52 pm	
Name:	TV Guide Onscreen	Acct. #:	12345-098765-08-9
Billed From:	05/25/93	Billed To:	06/25/93
FOR CUSTOMER SERVICE CALL: 790-0900		Total:	\$3.99
Date	Time	Service / PPV Event	Cost
06/07/93	9:00 p	PASSENGER 57	\$3.99

FIG.29

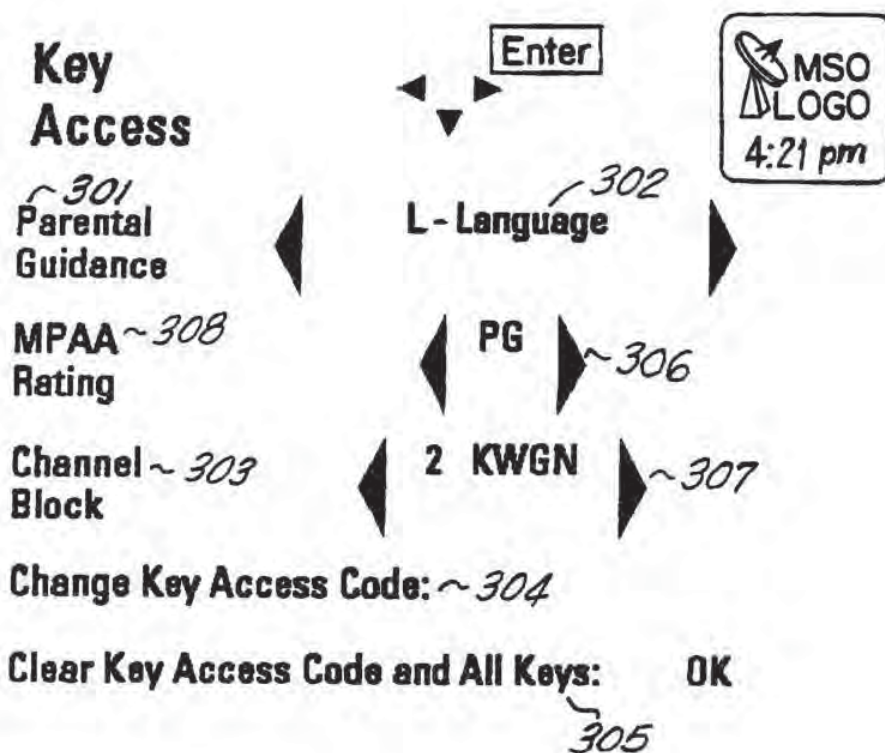


FIG.30

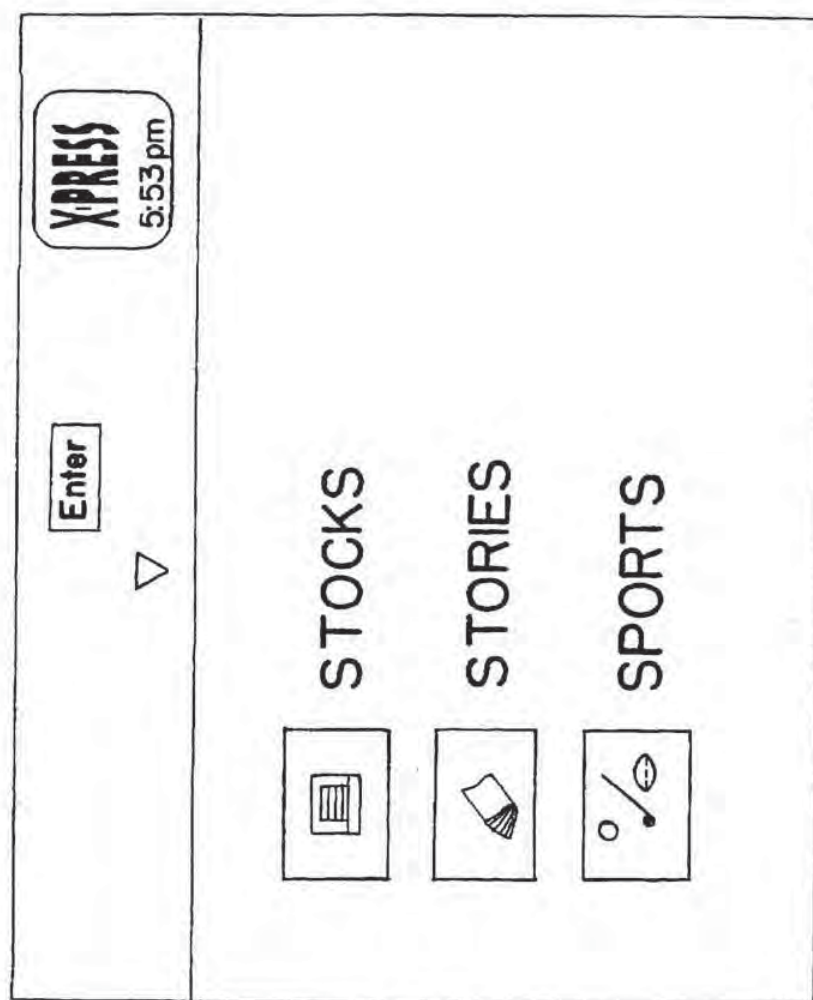


FIG. 31

Quote Watch

Alarms

X-PRESS

5:53 pm

Symbol

Last

Vol(100s)

Change

CMCSA	18	5415	-0.25
CVC	29.75	129	-0.125
JOIN	10.5	22	0
LBTYA	18.125	873	0.625
LBTYB	18	0	1.5
TCOMA	18.25	22970	-0.5
TCOMB	19.25	51	-0.375
TUNE	5.375	407	-0.125

Portfolio Value is 433200 and your gain is 443

△

△

FIG. 32

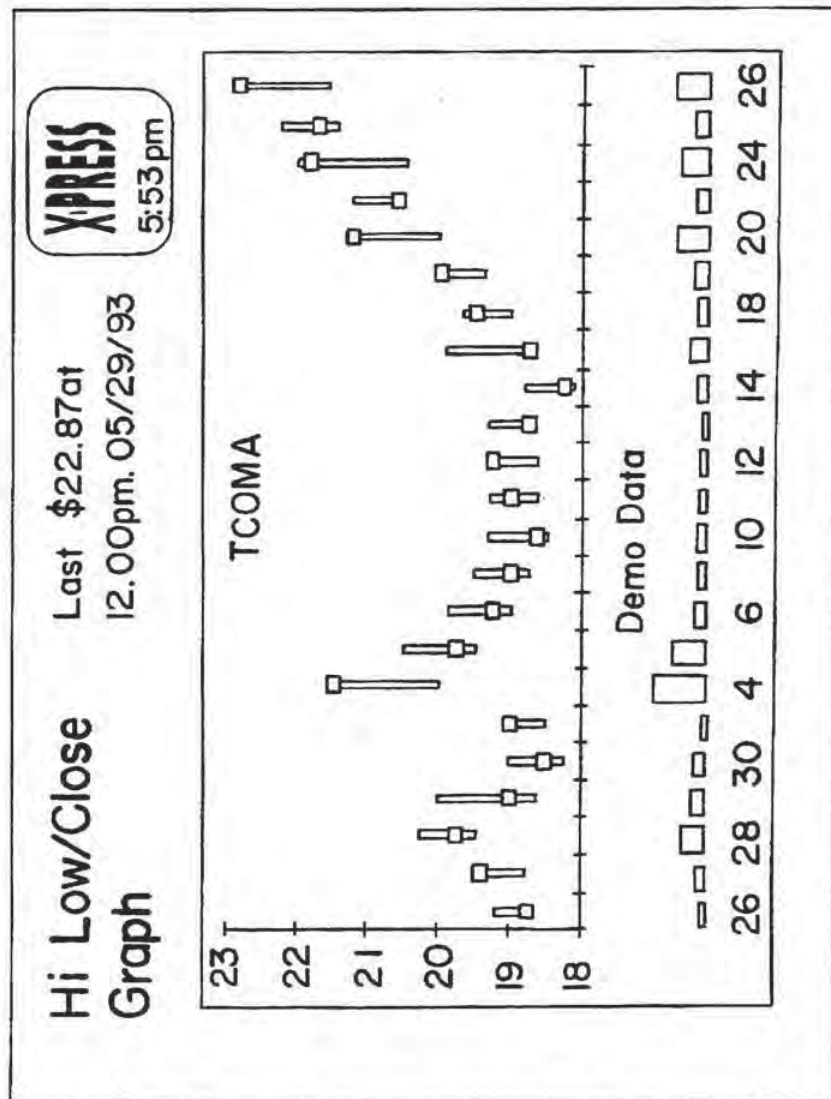


FIG. 33

STORIES



US World News

Cubans use Vitamins to combat epidemic

Geneva - A costly campaign to provide vitamins to all Cubans has helped curb a mysterious epidemic that has afflicted thousands with vision problems, a World Health Organization official said yesterday.

The outbreak of optical neuritis has dimmed the vision of about 20,000 Cubans and a related malady has affected 6,000 other people, mostly women.

FIG.34

SPORTS



Major League Baseball

Yesterday in National League Action

Colorado 7, Houston 5

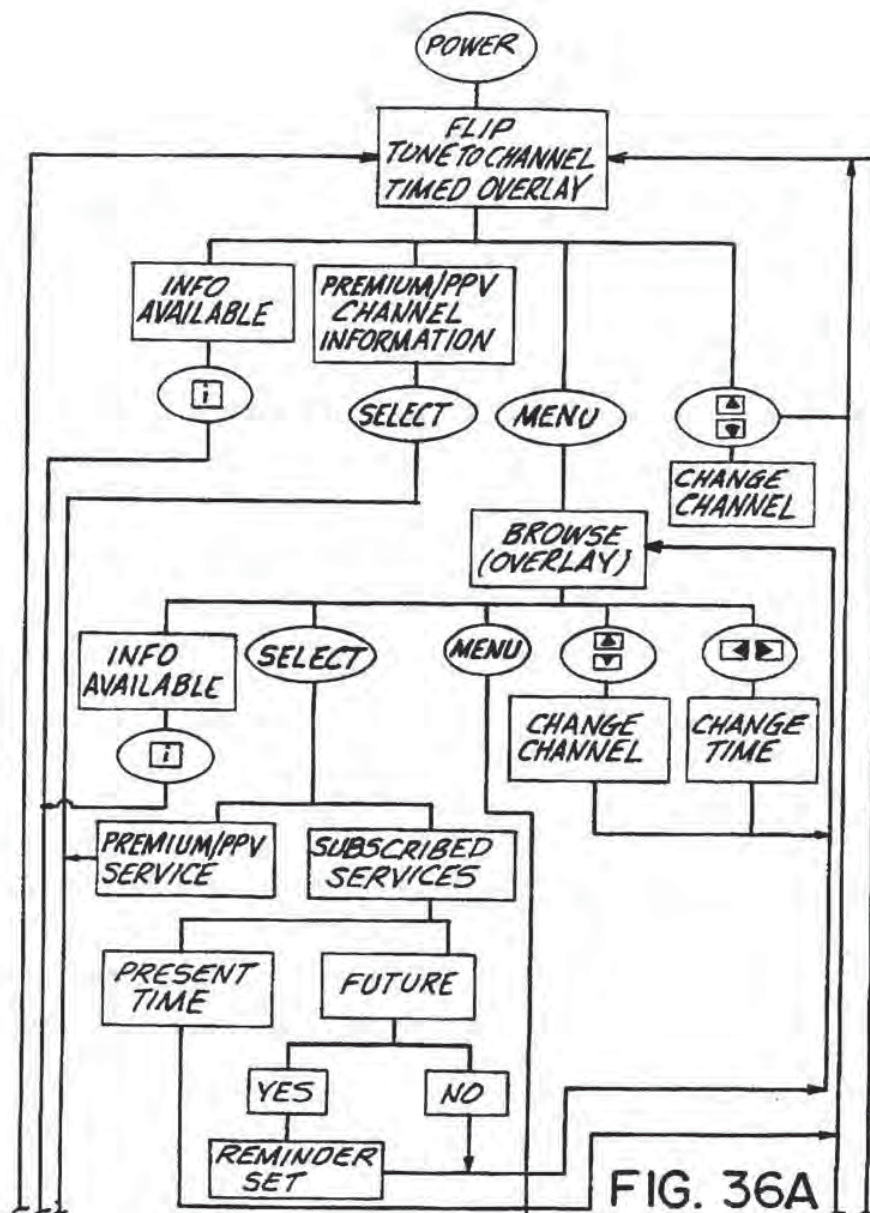
San Francisco 5, Chicago 4

Yesterday in American League Action

Detroit 4, Boston 1

Toronto 4, Milwaukee 2

FIG.35



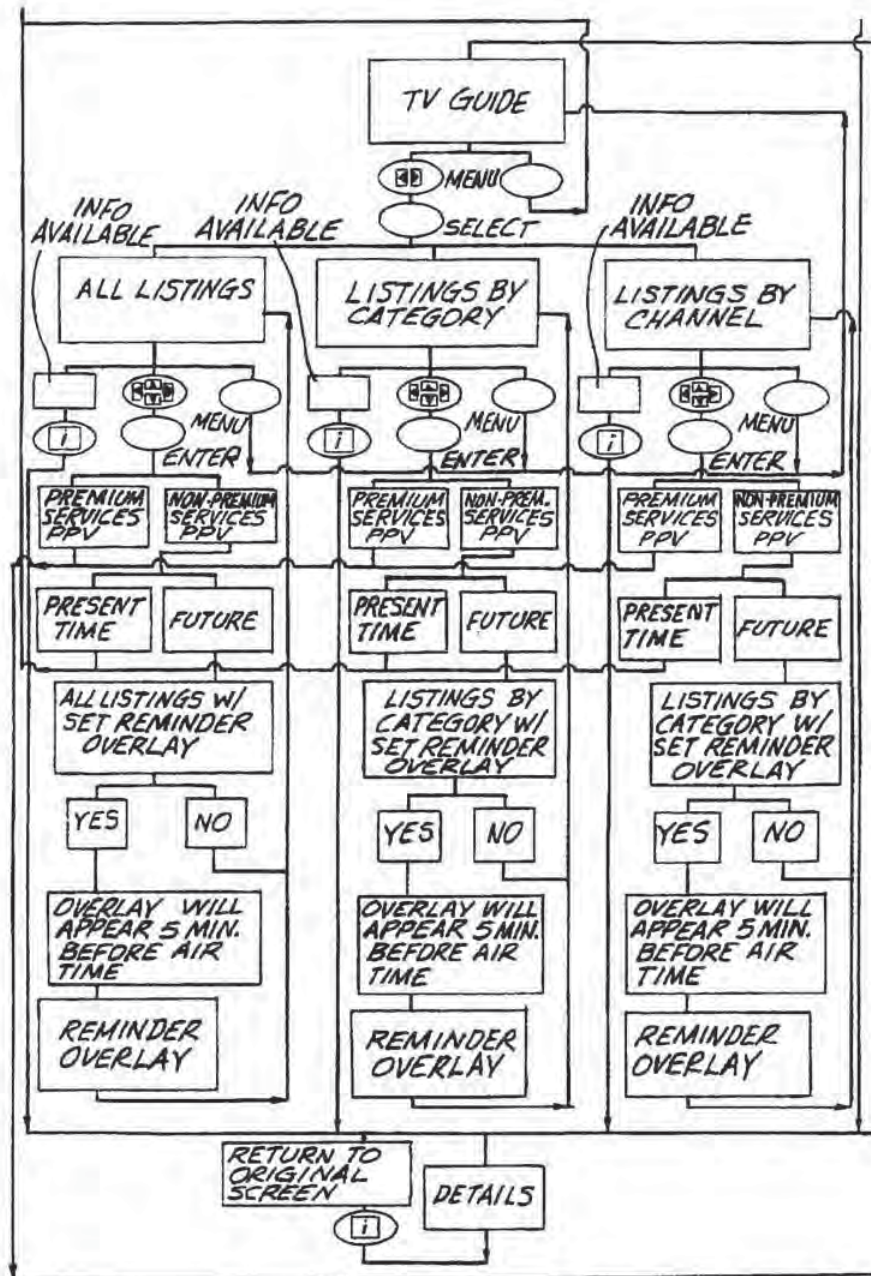


FIG. 36B

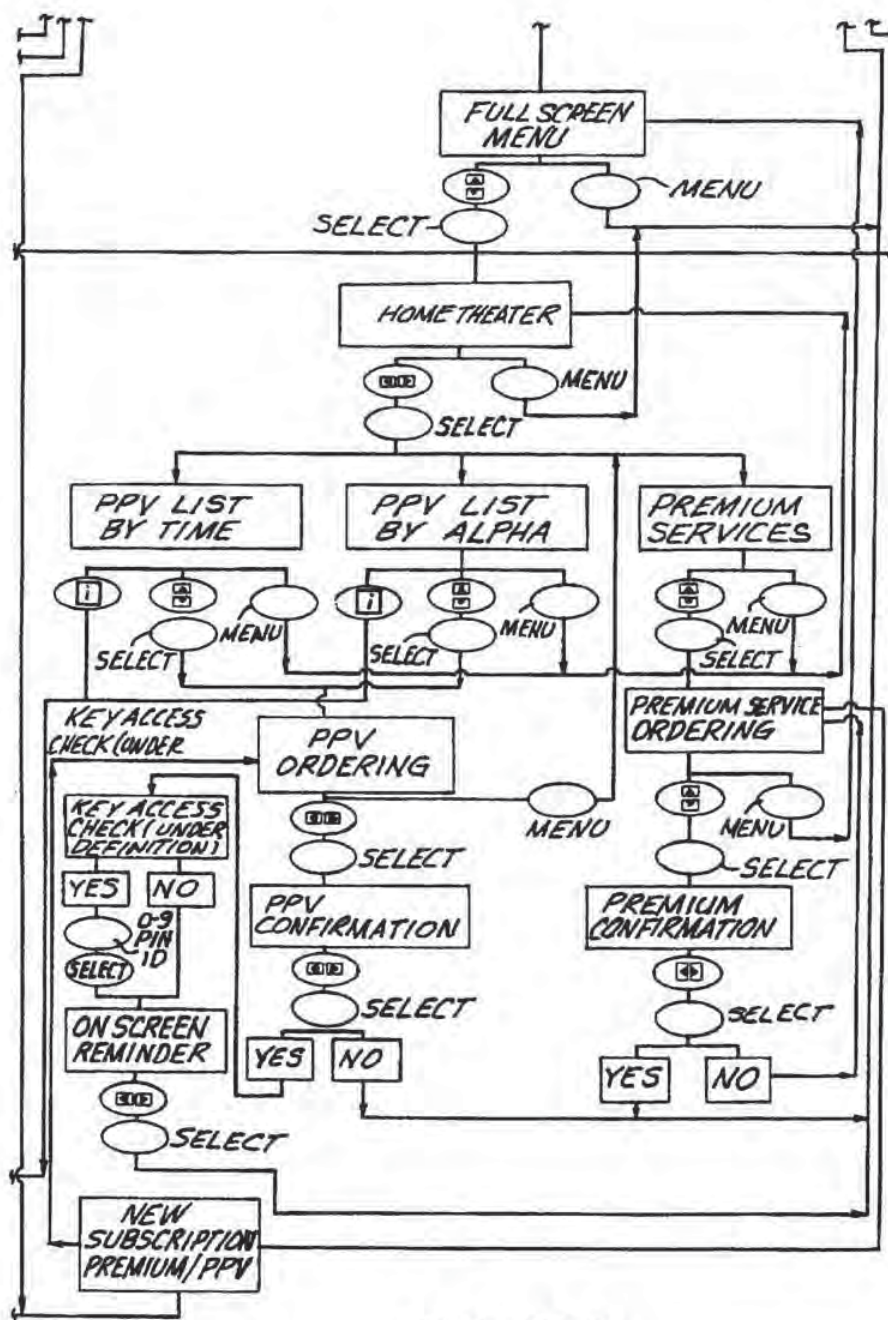


FIG. 36C

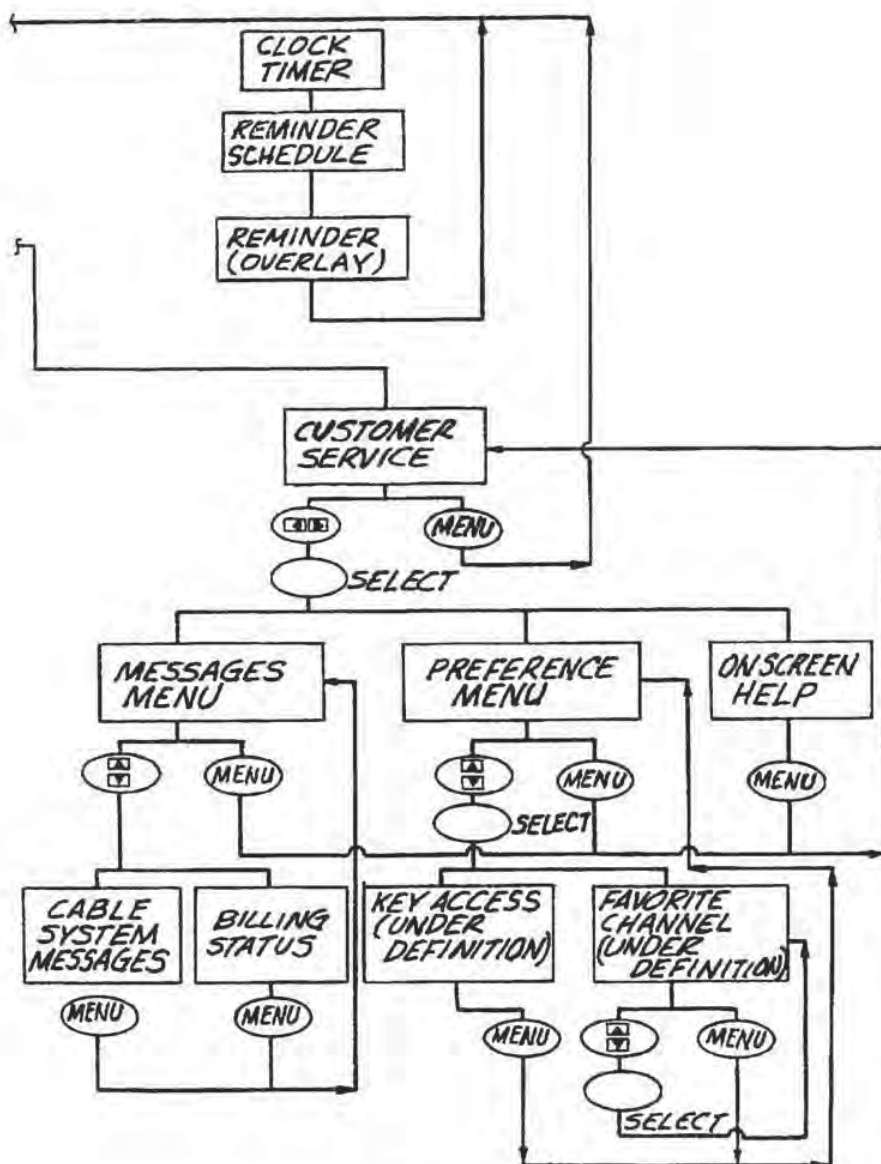


FIG. 36D

201

TV
GUIDE

LOCATOR

Broadcast:	◀	2 KWGN	3 PPV	4 KCNC	▶
Cable:	◀	41 A&E	3 AMC	24 BET	▶
Premium:	◀	21 DIS	18 ENC	14 HBO	▶
PPV:		11 REQ1	15 REQ2		

Clear ALL favorite channels

Favorite Channel

Included

Excluded

Press * — Lines to illustrate text

FIG. 37

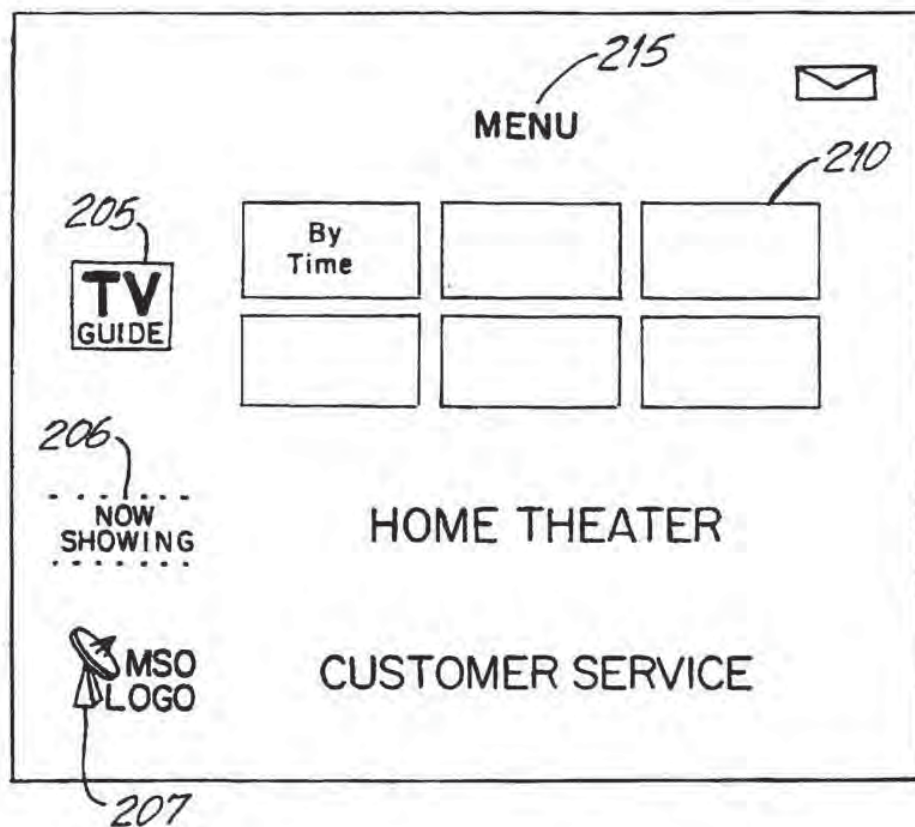


FIG.38

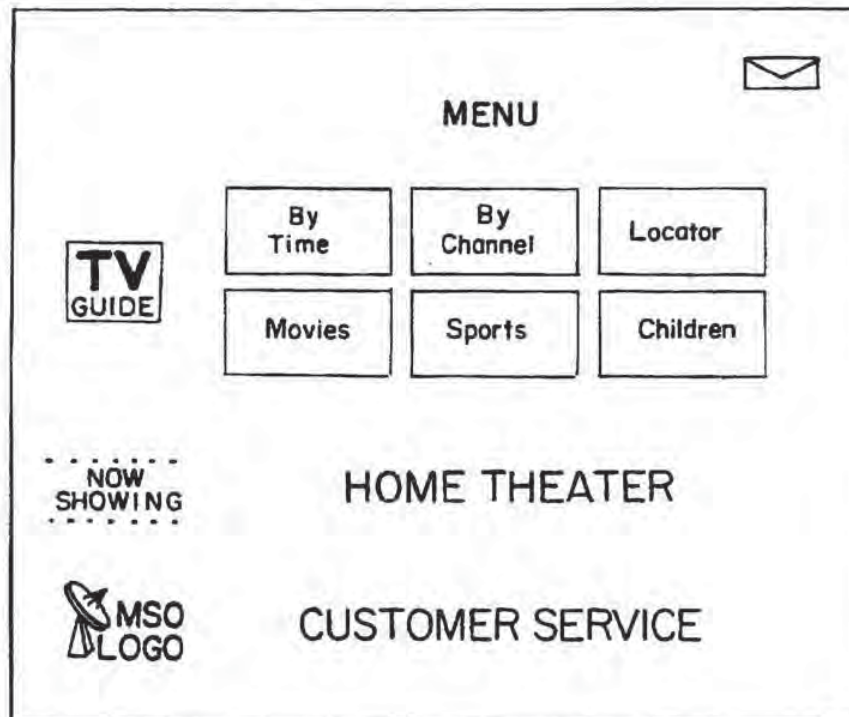


FIG.38A





TODAY 7:30PM





	Extra	Extra Line			
51CSPN2		Gov't Program(10-10a)			
52 SPICE		Mom and Dad Save the World (4-6p)		i	
53 KWHHD		Religious Programming (12-12m)			
54 MUN2		Public Access(12-12m)			
2 KWGN		NBA Basketball (6-30-9p)		i	

Mom and Dad Save the World \$4.99

You have requested this program at 4PM.

To complete the ordering process,
enter your four-digit purchase code.

Purchase Code:

* * * *

FIG. 38B

TV GUIDE	
Movie Rating:	◀  PG PG-13 R ▶
Parental Guidance:	◀ Adult Themes Sexual Situations ▶
Channel:	◀ 2 KWGN 3 PPV 4 KONC  ▶
Locked Program:	To lock out a program or series. see "Help"
Lockout Code:	Clear Change

FIG. 39

260

TV
GUIDE

SETUP

275
Text Location:

Lockout Code:

265
Purchase Code:

270

This button sets the text location to the bottom of the
Screen.
Press to select

FIG. 40

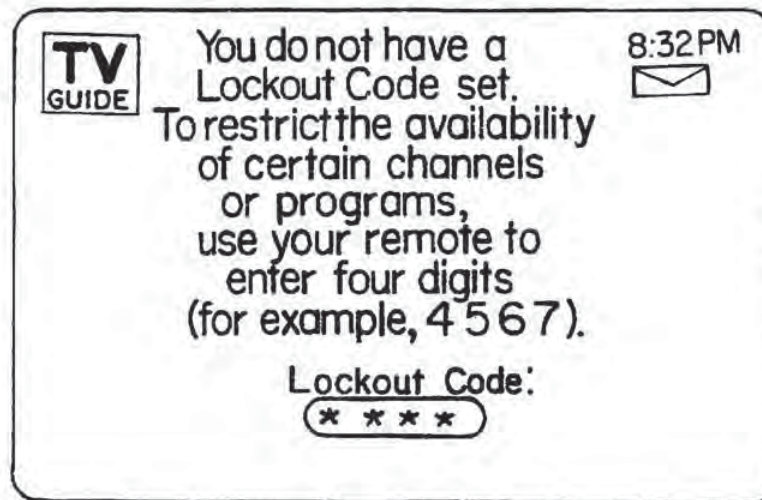


FIG. 40A

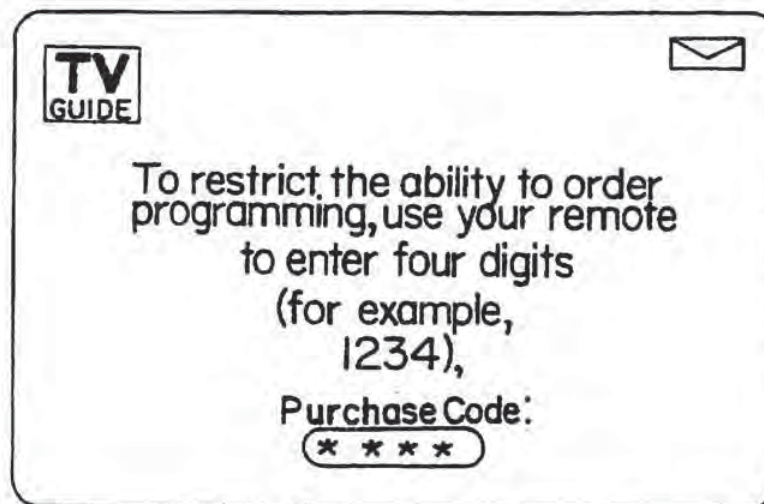


FIG. 40B

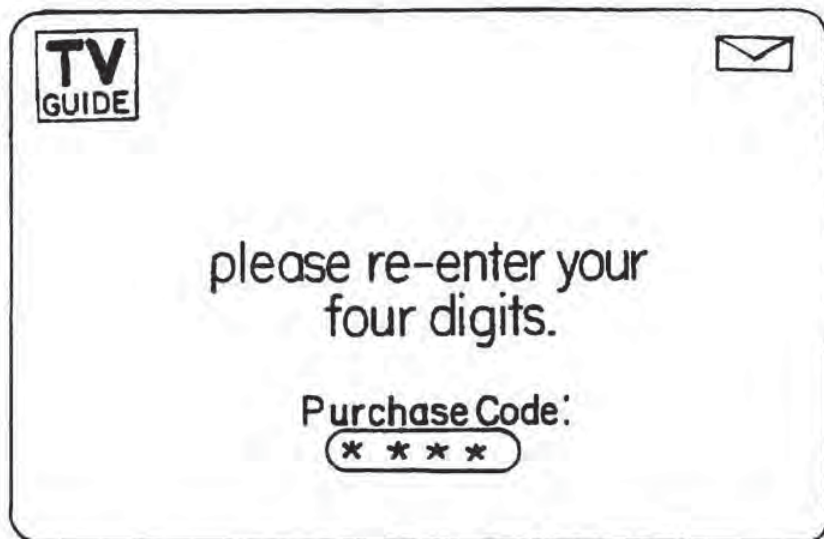


FIG. 40C

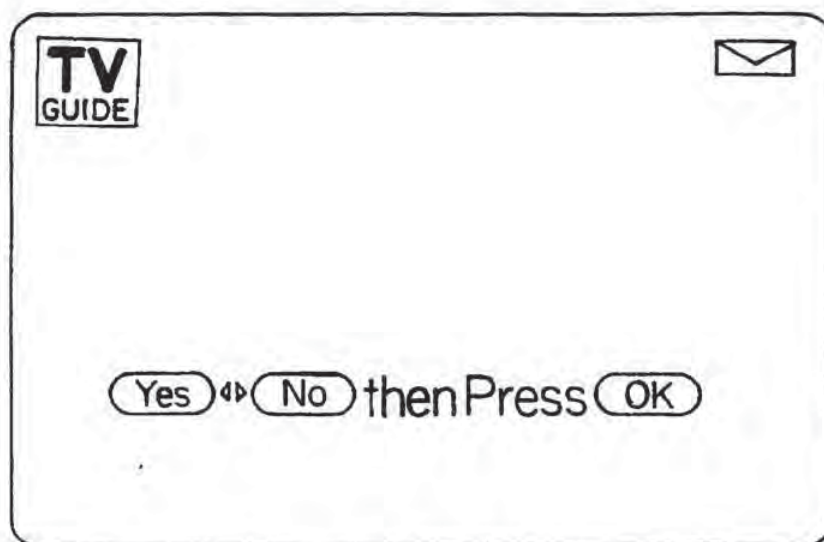


FIG. 40D

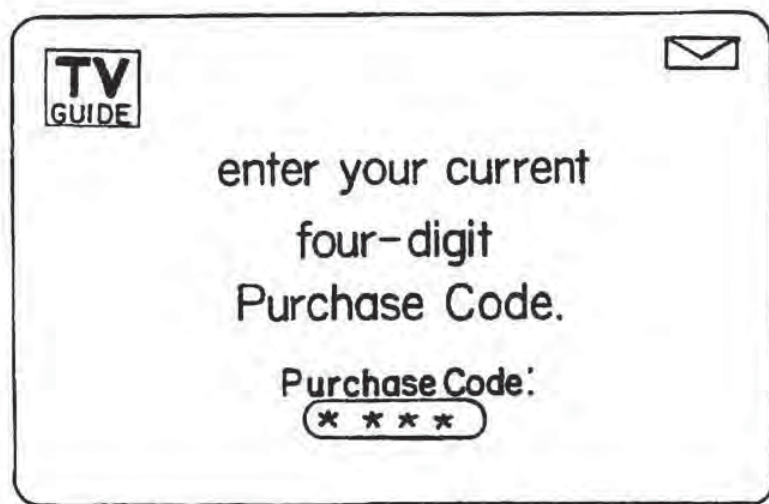


FIG. 40E

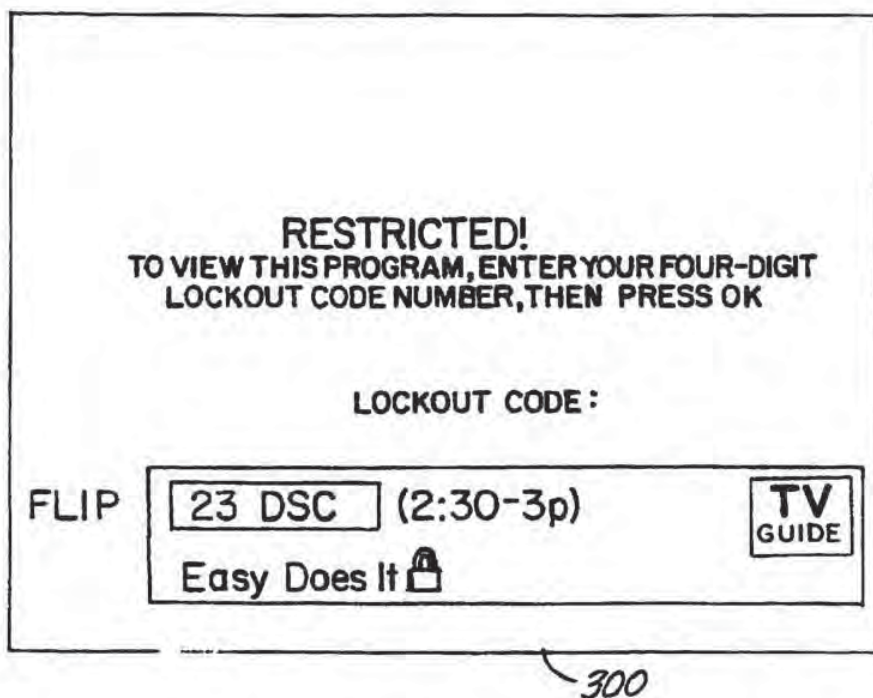


FIG. 4I

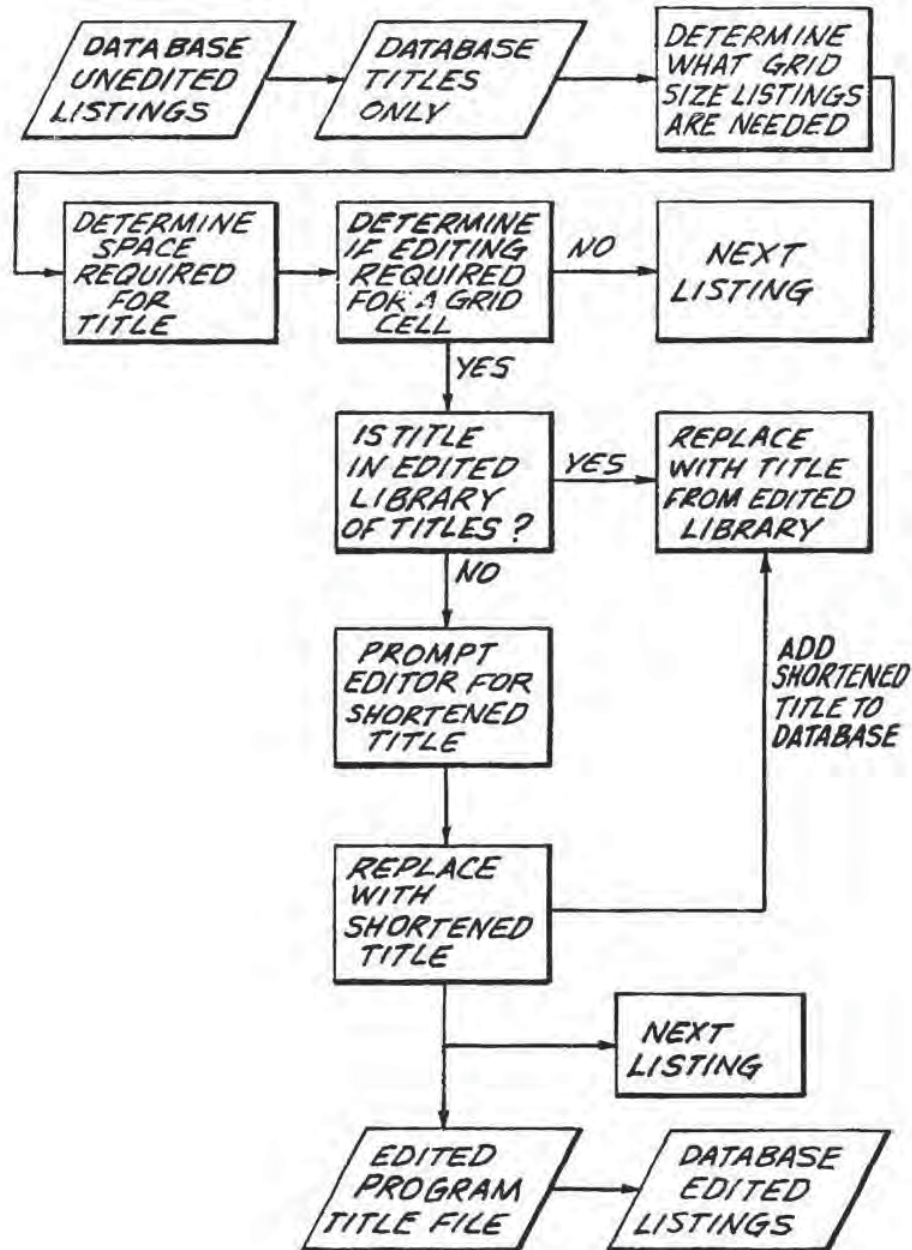


FIG. 42

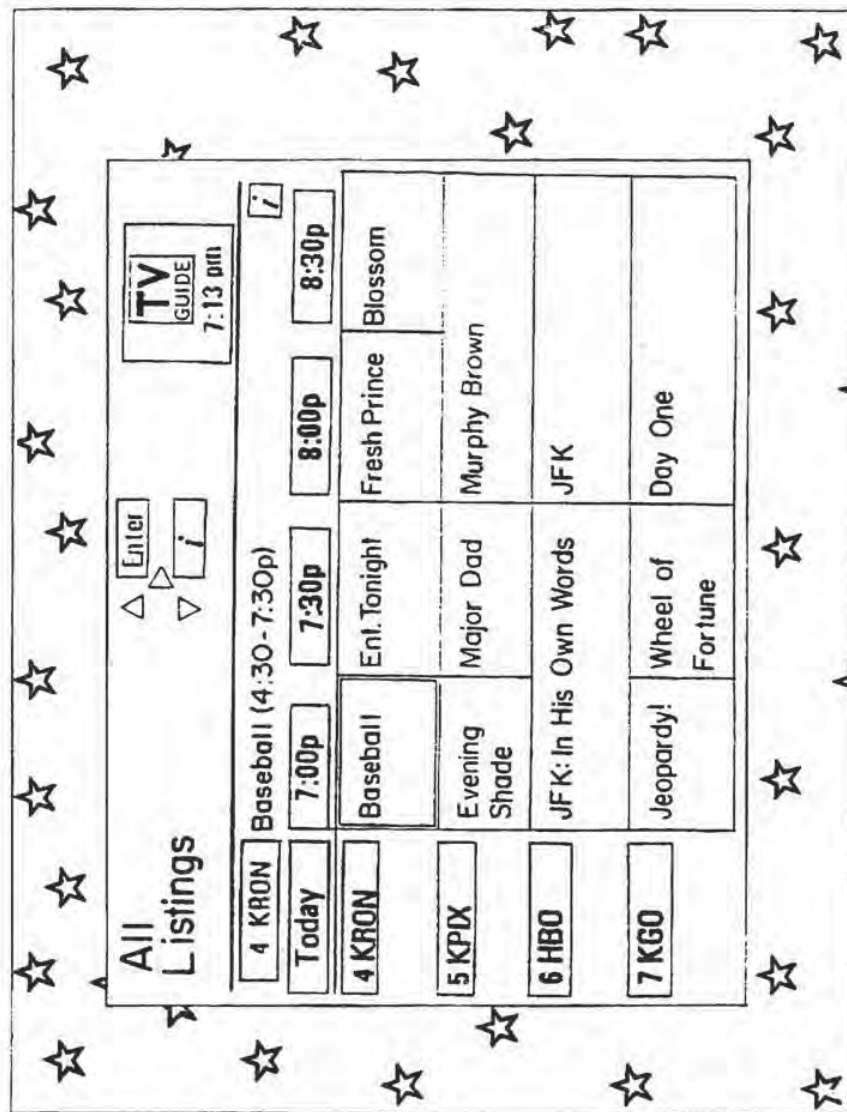


FIG. 43A

		Baseball (4:30-7:30p)			
		7:00p	7:30p	8:00p	8:30p
4 KRON	Today	Baseball	Ent. Tonight	Fresh Prince	Blossom
4 KRON		Baseball	Ent. Tonight	Fresh Prince	Blossom
5 KPIX		Evening Shade	Major Dad	Murphy Brown	
6 HBO		JFK: In His Own Words	JFK		
7 KGO		Jeopardy!	Wheel of Fortune	Day One	

FIG. 43B

ELECTRONIC TELEVISION PROGRAM GUIDE SCHEDULE SYSTEM AND METHOD

This is a continuation-in-part of application Ser. No. 08/119,367 filed on Sep. 9, 1993 now U.S. Pat. No. 5,585,866.

BACKGROUND OF THE INVENTION

This invention relates to an electronic program schedule system, which provides a user with schedule information for broadcast or cablecast programs viewed by the user on a television receiver. More particularly, it relates to an improved electronic program guide that provides the user with a more powerful and convenient operating environment, while, at the same time, increasing the efficiency of navigation by the user through the guide.

Electronic program guides for television systems are known in the art. For example, one prior system used an electronic character generator to display textual schedule information on the full screen of a television receiver. Other prior systems presented electronically stored program schedule information to a user for viewing while allowing the user to select display formats. Still other systems employed a data processor to input user-selection criteria, then stored only the program schedule information meeting these criteria, and subsequently used the stored information to automatically tune a programmable tuner or activate a recording device at the time of broadcast of the selected television programs. Such prior systems are generally discussed in "Stay Tuned for Smart TV," published in the November 1990 issue of *Popular Science*.

Collectively, the prior electronic program systems may be difficult to implement and cumbersome to use. They also fail to provide viewing capabilities that address in a more realistic manner the viewing habits of the users of these electronic program systems. Moreover, many of these systems are complex in their design and are expensive to implement. Ease of use and economy are primary concerns of television program distributors and viewers as they contemplate dramatic increases in the number and nature of program networks and other television-based services. And, as the number of television channels available to a user increases dramatically with the advent of new satellite and cable-based technologies, the utility of these prior systems substantially diminishes.

These prior-art systems also fail to provide the user with sufficient information, for example pricing and the like, about pay-per-view events, premium services or other packaged programming to which the user does not subscribe, nor do they provide the user with the capability to automatically purchase such programming on demand or impulse. Moreover, these prior-art systems are deficient in that they fail to provide an efficient and automatic method of updating or replacing the application software programs that implement the electronic guide at the user sites, relying instead on manual or other cumbersome forms of revision or replacement or hardware-based systems that can not be updated without physical replacement of integrated circuits and/or other parts.

Nor do these prior electronic guide systems have the capability of linking the user to other applications or information systems which are not part of the electronic program guide application or data.

Nor do these prior electronic guide systems provide video promotion of television programs and services that are functionally linked and visually displayed in an integrated

fashion. Program promotion is an important element of the effective marketing of television programming. The promotion of pay-per-view pay (i.e., "a la carte") programs and other unregulated program services is particularly important to cable television operators in the wake of re-regulation by the federal government. The current method of promoting such programming using video is through dedicated "barker" channels that use full screen continuous trailers (i.e., previews) which may or may not be accompanied by prices and ordering information. Recently, such promotional videos have been shown in split screens where part of the screen shows general schedule information for a time period roughly corresponding to the time period during which the general program being promoted is shown. Accordingly, there exists a need for an electronic program guide which can provide improved display and linking of video promotions with program schedule information and order processing functions.

The prior electronic program guides also fail to provide the user with a simple and efficient method of controlling access to individual channels and individual programs. The amount of adult situations involving sex and violence has steadily increased during the last 40 years. The issue of how this affects children or other viewers has gained national attention. Providing a parent with the ability to lock-out a channel is a well known and widespread feature of certain television receivers and cable converter boxes. Despite this availability, the feature is seldom used by parents. The main impediments to its effective use are the cumbersome ways in which it is generally implemented, as well as the requirement that entire channels be blocked in order to block access to any objectional programming. A channel-oriented parental lock is unfair to other programmers on the blocked channel—who, for example, offer adult-oriented programming in the evening and youth-oriented programming the following morning—and inconvenient for viewers who want access to such programs. Thus, there is a particular need for a system which provides password control to individual programs and channels using a flexible and uncomplicated on-screen user interface.

The prior electronic program guides are also deficient in that they do not provide the user with the ability to view on demand current billing status and, thus, a need exists for a system which can provide the user with current billing information on the user's demand.

An additional problem with prior program guides is that when displaying schedule information in grid format, i.e., columns representing time slots and rows representing channels, program titles generally are width-wise truncated to fit into the cells of the grid. The width of a grid cell varies with the duration of the program. Since a 30 minute program is allotted only a small amount of space for the program title and description, titles and/or descriptions for half and even full hour programs often must be truncated in order to fit into the allotted space. Some systems simply cut off the description of a program without abbreviating it in any way, such that the user is unable to determine the subject matter of the program. For example, a recent television program display included the following text in a grid cell: "Baseball: Yankees v." Although some systems partially alleviate this problem by providing two lines of text in each grid cell, this solution is not ideal because program descriptions may still be truncated.

A similar problem arises as the time slots change, either automatically or in response to a user control command. Typically, 90 minutes of schedule information is displayed at one time and the 90 minute window is shiftable in 30-minute

increments. In the case where a 30 minute shift causes a 30 minute size grid cell to display, e.g., a two-hour movie, it is likely that the full title of the movie will not fit into the cell. Truncation of the title is thus required in this situation as well. In this case, while two lines of text may be desirable to fit the title in the 30 minute cell, the 60 and 90 minute cells may require only one line of text to display the title.

The prior electronic program guides also lack a method for creating a viewing itinerary electronically while still viewing a program currently appearing on the television receiver. Moreover, these prior program guides leave much guess work for the user as he navigates through a sequence of channels. When skimming through channels to ascertain the program then being displayed on any channel, commonly known as "channel surfing," the user needs to guess which program is currently being aired from the video encountered as the user surfs through the channels. Since much—in some cases, up to 30%—of the programming appearing on any given channel at any given time is advertising or other commercial programming, the user is not provided with any clues as to what program is appearing on a selected channel at a given time and must therefore wait until the advertisement or commercial is over before ascertaining the program then appearing on the selected channel. Thus a need exists for a program guide which displays current program schedule information for each channel as the user surfs through the available channels.

Accordingly, there is a need in the art for a simplified electronic program schedule system that may be more easily implemented, and which is appealing and efficient in operation. There is also a need to provide the user with an electronic program schedule system that displays both broadcast programs and electronic schedule information in a manner not previously available with other electronic program schedule systems, particularly those using a remote controller.

For example, there is a particular need for a flexible program schedule system that allows a user to view selected broadcast programs on a portion of the screen of the television receiver while simultaneously viewing program schedule information for other channels and/or services on another portion of the screen. There is also a need for such a program schedule system that permits the user to select from a plurality of selectable display formats for viewing the program schedule information. It is also preferred to have a system that indicates to the user those keys on the remote controller that are active in any particular mode of operation. There also exists a need for such a system that will give a user the capability to set a programmable reminder for viewing a program scheduled to air at a future time.

There is also a need for an electronic guide system providing the user with comprehensive information about pay-per-view events, premium services or other packaged programming to which the user does not ordinarily subscribe, and which provides the user with the capability to automatically purchase such programming on demand or impulse. There is also a need for an electronic guide system providing a reliable and efficient method of updating or replacing the application software that implements the electronic guide at the user sites.

There also exists a need for an electronic program guide that operates as a shell or window to provide the user with the capability to access other applications or information systems that are not part of the electronic program guide application or data.

SUMMARY OF THE INVENTION

It is accordingly an object of the present invention to provide a system that will allow the user to view a broadcast

program while, at the same time, interactively viewing program schedule information for other programs.

It is another object of the present invention to provide the user with the ability to select from among a plurality of display formats for the program schedule information.

It is yet another object of the present invention to indicate to the user of the program schedule system those keys on the remote controller active in the particular mode of operation of the system at the time of use.

It is a still further object of the present invention to provide the user of the electronic program schedule system with the capability of setting programmable reminder messages for any future program.

It is yet a further object of this invention to provide the system user with comprehensive information about pay-per-view events, premium services or other packaged programming to which the user does not subscribe and the capability to automatically purchase such programming on demand or impulse.

It is another object of the present invention to provide an electronic guide system that provides a reliable and efficient method of updating or replacing the application software programs that implement the electronic guide at the user sites.

It is still another object of the electronic program guide to operate as a shell or window to provide the user with the capability to access other applications or information systems which are not part of the electronic program guide application or data.

It is yet another object of the electronic program guide to provide a system whereby video promotion of television programs and services are functionally linked and visually displayed in an integrated fashion to facilitate the marketing and sale of such programs and services.

It is still a further object of the present invention to provide password control for access to individual programs, as well as channels, using a protected interactive flexible and uncomplicated on-screen interface.

Another object of the present invention is to provide the user with current programming information for all programs as the user surfs through the available channels.

It is yet a further object of the present invention to provide a system in which the user can access his current billing information on demand.

It is another object of the present invention to provide a system which overlays television program listings against varying background views.

It is yet another object of the present invention to provide an improved display of text in the grid cells comprising a page of television program listings.

These and other objects of the invention are achieved by an electronic program schedule system which includes a receiver for receiving broadcast, satellite or cablecast television programs for a plurality of television channels and a tuner for tuning a television receiver to a selected one of the plurality of channels. A data processor receives and stores in a memory television program schedule information for a plurality of television programs to appear on the plurality of television channels. A user control apparatus, such as a remote controller, is utilized by a viewer to choose user control commands and transmit signals in response to the data processor which receives the signals in response to user control commands. A television receiver is used to display the television programs and television program schedule and other information. A video display generator receives video

control commands from the data processor and program schedule information from the memory and displays a portion of the program schedule information in overlaying relationship with a television program appearing on a television channel in at least one mode of operation of the television programming guide. The data processor controls the video display generator with video control commands, issued in response to the user control commands, to display program schedule information for any chosen one of the plurality of television programs in overlaying relationship with at least one television program then appearing on any chosen one of the plurality of channels on the television receiver.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram showing various components of the preferred embodiment of the invention herein.

FIG. 2 is a block diagram showing the combination of program and schedule information by the video overlay device utilized in the preferred embodiment of the invention.

FIG. 3 depicts a remote controller that can be used in connection with the preferred embodiment of the electronic program guide system of the present application.

FIG. 4 depicts an alternative embodiment of the remote controller shown in FIG. 3.

FIG. 5 shows an overlay appearing on a television screen in one mode of operation of the preferred embodiment of the present invention.

FIG. 6 is a menu that appears on a television screen in a MENU mode of operation of the preferred embodiment of the present invention.

FIG. 6A is yet another menu that appears on a television screen in a MENU mode of operation of the preferred embodiment of the present invention.

FIG. 7 depicts a Viewer Preference Menu that appears on a television screen in one aspect of the preferred embodiment of the present invention.

FIG. 8 shows a Preferred Channel selection submenu.

FIG. 9 shows an impulse ordering menu that appears on a television screen in one aspect of the preferred embodiment of the present invention.

FIG. 10 shows a Premium Services submenu that appears in one mode of operation of the preferred embodiment of the present invention.

FIG. 11 shows a graphic overlay appearing on a television screen in a BROWSE mode of operation of the preferred embodiment of the present invention.

FIG. 12 shows a graphic overlay appearing on a television screen in a BROWSE mode of operation of the preferred embodiment of the present invention having different information from that shown in FIG. 11.

FIG. 12A shows a graphic overlay appearing on a television screen in a BROWSE mode of operation in the present invention displaying schedule information for a time and channel other than that shown in FIG. 11.

FIG. 13 shows a graphic overlay appearing in a REMINDER mode of operation of the preferred embodiment of the present invention.

FIG. 14 shows yet another graphic overlay appearing in a REMINDER mode of operation of the preferred embodiment of the present invention.

FIG. 15 is yet another menu that appears on a television screen in a MENU mode of operation of the preferred embodiment of the present invention.

FIG. 16 is yet another menu that appears on a television screen in a MENU mode of operation of the preferred embodiment of the present invention.

FIG. 17 is yet another menu that appears on a television screen in a MENU mode of operation of the preferred embodiment of the present invention.

FIG. 18 shows a grid listing of schedule information displayed in an All Listings mode of operation of the preferred embodiment of the present invention.

FIG. 19 shows schedule information displayed in a Listings By Category mode of operation of the preferred embodiment of the present invention.

FIG. 20 shows schedule information displayed in a Listings By Channel mode of operation of the preferred embodiment of the present invention.

FIG. 21 shows information displayed in response to a user's request for supplemental programming information.

FIG. 22 shows programming, ordering and video promotional information displayed in a Pay-Per-view mode of operation of the preferred embodiment of the present invention.

FIG. 23 shows an ordering submenu used in conjunction with the mode of operation shown in FIG. 22.

FIG. 24 shows yet another ordering submenu used in conjunction with the mode of operation shown in FIG. 22.

FIG. 24A shows yet another ordering submenu used in conjunction with the mode of operation shown in FIG. 22.

FIG. 25 shows another grid listing of schedule information displayed in an All Listings mode of operation of the present invention.

FIG. 26 shows a Premium Services submenu that appears in one mode of operation of the preferred embodiment of the present invention.

FIG. 27 shows a Messages menu that appears in one mode of operation of the preferred embodiment of the present invention.

FIG. 28 shows exemplary messages used in connection with the menu of FIG. 27.

FIG. 28A is an alternative message menu.

FIG. 29 shows billing information used in connection with the menu of FIG. 27.

FIG. 30 shows a Key Lock Access menu that appears during one mode of operation of the preferred embodiment of the present invention.

FIG. 31 shows a menu appearing in connection with an Interactive Television mode of operation of the preferred embodiment of the present invention.

FIG. 32 shows information that appears in a Quote Watch menu in connection with the Interactive Television mode of operation shown in FIG. 31.

FIG. 33 shows other information that appears in connection with the Interactive Television mode of operation shown in FIG. 31.

FIG. 34 is a menu showing information that appears in a news display in the Interactive Television mode of operation of the preferred embodiment of the present invention.

FIG. 35 is a menu showing information that appears in a sports display in the Interactive Television mode of operation of the preferred embodiment of the present invention.

FIGS. 36A-D collectively form a flow chart showing the operation logic required for implementation of a computer program for the electronic program guide.

FIG. 37 is a menu showing a Locator screen for locating channel numbers and defining favorite channel lists.

FIG. 38 is an alternative menu that can be used in a MENU mode of operation of the electronic program guide.

FIG. 38A and 38B show, respectively, an alternative main menu screen and a listing-by-time screen accessible from the alternative main menu.

FIG. 39 is a Lockout menu that alternatively can be used for permitting or prohibiting access to certain programs.

FIG. 40 is a Setup menu that can be used to set text location and a purchase code for premium and pay-per-view programming.

FIG. 40A shows an exemplary menu for inputting a lockout code.

FIGS. 40B through 40E show, respectively, exemplary menus for entering, confirming, clearing or changing a purchase code.

FIG. 41 is a Lockout Verify menu that is used in connection with the Lockout menu of FIG. 39.

FIG. 42 is a flow chart showing the operation of the preferred embodiment of the textfit system of the invention herein.

FIGS. 43A and 43B show two representative background views that may be used in connection with the display of program schedule information.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

System Configuration

FIG. 1 is a block diagram showing various components of the electronic program schedule system generally designated as 10. Physically, these system components can be located in a user's set-top cable converter box or other signal reception or processing device, such as a satellite receiver. Alternatively, the components can be mounted in a separate housing, or included as part of a television receiver, VCR, personal computer, or multimedia player; or reside as a distributed application in a broadband network architecture.

An input signal 11 is connected to a receiver 12, which receives a transmitted data stream from a data provider. The data stream may contain, for example, information about programs or services available in a particular market, geographical or otherwise. The input signal 11 can originate, for example, as part of a standard broadcast, cablecast or satellite transmission, or other form of data transmission. The data provider is a program information provider, the satellite uplink manager, a local cable operator, or a combination of these sources, and the data stream contains program schedule information for all television programs and other services available in the operator's geographical market.

The data stream may be modulated and then transmitted on the cable line in any number of ways, including as part of a dedicated channel transmission operating at a frequency of, for example, 75 MHz. Those of skill in the art will understand that numerous other transmission schemes can be used to transmit the data stream, such as embedding it in the vertical blanking interval of a program broadcast signal. As will be discussed in greater detail below, according to the present invention, the transmitted data stream may additionally contain application software for implementing or updating the electronic program guide at the user site.

The transmitted program schedule data or application software is received by the receiver 12 on signal input line 11. The received signal is passed from the receiver to a data demodulator 13, such as a QPSK demodulator or a GI

Info-Cipher 1000R, which demodulates the transmission and passes it to a buffer 15.

A microcontroller 16, such as a M68000EC, receives data passed to the buffer 15. Bootstrap operating software, which may be used for capturing electronic program guide application software updates, is stored in a read only memory (ROM) 17. The microcontroller 16 uses the received program schedule information to build a database by storing the data in appropriately organized records in dynamic random access memory (DRAM) 18. The stored schedule information can be updated on a periodic basis, such as hourly, daily or weekly, or at any time when changes in scheduling or other factors warrant an update. The system also includes a system clock 19.

Alternatively, the program schedule information could be supplied in a ROM, disk or other non-volatile memory, or it could be downloaded to a storage disk or other data storage device. The invention herein is not directed to the particular method of transmission or reception of the schedule information.

If the microcontroller 16 recognizes the received data as application software which controls the program schedule system, as opposed to program schedule information, it stores it in non-volatile memory, such as an electrically erasable programmable ROM (EEPROM) 20 or battery-backed static RAM (SRAM). This configuration allows revised or replacement versions of the application software to be downloaded directly from the software developer to the user site through the cable or other transmission system.

In the case where an EEPROM is utilized, revised or replacement versions of the application software downloaded from the developer are first stored in DRAM 18 by the microcontroller 16, under direction of the downloading operating software stored in the ROM 17. The stored application software can then be checked for accuracy by, for example, a checksum analysis or other verification routine.

After the accuracy of the application software has been verified, the microcontroller 16 initiates a routine to re-program the EEPROM 20, where the application software is permanently stored. The microcontroller 16 will issue proper control commands to a reprogram circuit 21, which is adapted to supply the proper program voltage and logic control signals 22 required to erase and write to the EEPROM. It supplies this program voltage, V_{prog} , as well as any other required control signals, such as read or write enable, to the EEPROM 20 upon command from the microcontroller 16. After the EEPROM 20 has been electrically erased, the microcontroller 16 initiates transfer of the new application software from the DRAM 18 to the EEPROM 20 for storing.

When a battery-backed SRAM is utilized as non-volatile memory, the microcontroller stores the revised or replacement version of the application software downloaded from the developer directly in the SRAM, again under direction of the downloading operating software stored in the ROM. The stored application software can then be checked for accuracy by, for example, a checksum analysis or other verification routine.

When power is first applied to the system 10, the bootstrap operating software verifies that the program guide application software is resident in memory. If it is not resident, the bootstrap operating software waits for a download of the software. Once the application software is resident, the microcontroller 16 executes the application program software from a dedicated portion of the DRAM 18. Alternatively, the application software can be executed

directly from the non-volatile memory 20. Under control of the program guide application software, the microcontroller 16 first verifies that the program schedule information is resident in DRAM 18. If it is not resident, the microcontroller waits for a download of the program schedule information, as discussed above. Alternatively, if the application program is resident in memory, but the database records containing the program schedule information data are not yet available, the application software can be configured to carry out other tasks, such as allowing the user to carry out functions not requiring the program schedule information data, as well as displaying an appropriate message indicating the database data is not yet available.

When the schedule system is operating, as discussed in greater detail hereinbelow, the microcontroller 16 takes the program schedule information stored in the DRAM 18 and, in conjunction with other downloaded data types such as stored bit maps for the screen configuration and the graphic symbol or logo displays stored in non-volatile memory 20 or, alternatively, in DRAM 18, supplies it to a video display generator (VDG) 23, which in the present embodiment may be a commercially available VGA-type graphics card, such as a Roegen card manufactured by Roctec. The VDG includes a standard RGB video generator 24, which takes the digital program schedule information sent by the microcontroller 16 and converts it to an RGB format in accordance with the bit map for the particular screen display then being presented to the user on the television receiver 27. The configuration of each screen is shown and discussed in greater detail in the System Operation section below.

The VDG also includes a Video Overlay Device 25, which accepts the RGB video input, as well as an input from conventional television tuner 28, such as a conventional tuner manufactured by General Instrument or a Jerrold DPBB tuner, which supplies a program signal in standard NTSC video format. The overlay device 25 converts and combines the RGB signal with the signal from the tuner 28, and produces a composite NTSC output signal containing both the program signal and the program schedule information, as shown in FIG. 2. This composite video signal is supplied to a modulator 26, shown in FIG. 1, which can be a modulator such as available from Radio Shack, and then to the television receiver 27, which the user keeps tuned to the modulated channel, for example, channel 3 or 4. The composite video signal can also be supplied directly to the television receiver 27 or other receiving device from the VDG through a video port 25A on the VDG.

The system components identified in connection with FIG. 1 can all be implemented in a preferred platform by, for example, an IBM personal computer equipped with a transmission link and a video graphics card, such as those manufactured by Roctec. Other platforms, such as a cable converter box equipped with a microprocessor and memory, or a broadband network also could be used. Examples of the particular components are as follows: Microcontroller—Motorola part no. MC68331-16; ROM—Texas Instruments part no. TMS27PCS12; DRAM—Texas Instruments part no. TM4256; EEPROM—Intel part no. 28F001BX-T. In any event, those of skill in the art will appreciate that the particular details of the hardware components and data storage are a function of the particular implementation of the system, and are not the subject of the present invention.

As discussed in detail below, the user may navigate through the program schedule system with a remote controller, such as that shown in FIG. 3, which operates on conventional principles of remote control transmitter-receiver logic, such as by infrared or other signalling, or

other suitable user interface. The remote controller 31 communicates with the microcontroller 16 through the remote controller receiver 29, shown in FIG. 1, which can be a Silent Partner IR receiver and which receives signals transmitted by the remote controller 31 and supplies the microcontroller 16 with a corresponding digital signal indicating the key depressed by the user.

A remote controller suitable for the present invention, such as shown in FIG. 3, which can be a remote controller manufactured by Universal Electronics or Presentation Electronics' Silent Partner, may include a power switch 32, volume 33 and mute 34 controls, an ENTER key 35, 0-9 digit keys 36, four direction arrow keys 37A and 37B, a MODE key 38 and an information key 39 that is designated with a lower case "i." The power 32, volume 33 and mute 34 keys operate in the same manner as conventional remote controllers typically used with present-day television receivers. The numeric digit keys 36 also function in much the same manner as conventional remote controllers. A brief description of the remaining keys follows.

The MODE key 38 takes the user through various layers of the electronic program schedule system 10 and generally allows the user to return to a previous screen when he is in a submenu. The up/down direction arrow keys 37A allow a user to navigate through the different TV program channels when the program schedule system is in a FLIP or BROWSE mode, as will be fully described below, and also allow the user to navigate through highlighted bars displayed on the TV screen when in a MENU mode. The left/right direction arrow keys 37B allow the user to navigate through selected time periods when the program schedule system is in the BROWSE mode, as will also be described below. They further allow the user to navigate across subject-matter categories while in the "categories" submenu of the MENU mode, as well as to navigate across time periods when the program schedule system is in a pay-per-view ordering mode and, in general, navigate in left or right directions to select various icons and other objects. The information, or "i," key 39 allows the user to view supplemental program and other information during the various modes of the program schedule system. The ENTER 35 key fulfills and inputs a command once the user has made a selection from the remote controller keys. The function and operation of these keys will be made more apparent in the detailed discussion of the FLIP, BROWSE and MENU modes below.

A second embodiment of the remote controller 40 is shown in FIG. 4. This embodiment of the remote controller also includes a power key 41, numeric digit keys 42, direction arrow keys 43A and 43B, information key 48, ENTER or SELECT or "OK" key 44, volume control 45, lockout key 45A, mute keys 46 and help key 48A. It also includes pound sign and star keys.

This embodiment of the remote controller further includes a number of icon keys 47A and 47B, which correspond to different submenus or modes of the program schedule system. The icons 47A and 47B may also be displayed on the TV screen when the program schedule system is operating. The icon keys essentially replace the MODE key 38 used in the embodiment of the remote controller shown in FIG. 3. Using these keys, the user can move from one mode to another simply by depressing the icon key corresponding to the desired mode of operation of the program schedule system. In the embodiment of FIG. 4, the icons 47A and 47B are shown as graphic symbols situated directly above a corresponding color-coded key. Alternatively, the color-coded keys could be eliminated and keys could be formed in the image of the icon itself.

The embodiment of the remote controller shown in FIG. 4 also includes three color-coded viewer preference or favorite channel keys, 48A, 48B and 48C that are situated directly above the icon keys. Each of these keys indicates to the program schedule system a distinct user-created "Channel Preference" or "Favorite Channel" list, which is a listing of a specific subset of channels for a particular user, arranged in the sequential order that the user wishes to view during operation of the program schedule system. The creation of the Channel Preference or Favorite Channel list is discussed in the following section. Thus, the system provides for at least three individual channel subsets for three individual users.

The remote controller of FIG. 4 also may be equipped with a "HELP" key 48A, which, when depressed, causes the microcontroller 16 to retrieve previously stored instruction messages from memory and cause them to be displayed on the television receiver 27. These messages offer help to the user in the form of instructions that guide the user through the operation of the various operating modes of the electronic television program guide. They may be text messages, or instructional video images, or audio programs, depending on the storage capacity of the system, or any combination of these. Moreover, these help messages may be created so that they are context-sensitive, i.e., the messages displayed depend entirely upon the precise point in the operation of the electronic program guide that the user depresses the help key 48A. For example, information could be supplied for operation of the remote controller, for operating the FLIP or BROWSE mode (discussed below), or any other mode of operation of the guide, for impulse ordering, for setting a lockout, etc. In order to accomplish this, each point of operation of the guide could be coded so that the microprocessor could track the current operating point, for example, by temporarily storing the code reflecting the present operating point as the user operated the guide. When the user pressed the help key 48A, the microcontroller 16 would retrieve an appropriate set of messages based on the presently stored operating point code. Additionally, the key 39 could be used to carry out the function of the help key.

Additionally, each of the functions of the remote controllers can also be integrated into a keypad on the user's cable box or other hardware.

System Operation

In operation, the electronic program schedule system of the present invention functions as follows.

FLIP Mode

When the user is viewing a particular program channel on the television receiver, the program schedule system defaults to a FLIP mode, shown in FIG. 5. In this mode, a graphic overlay 51 containing programming information for the channel currently tuned on the tuner is superimposed in overlaying relationship with a received program signal 55 on the screen of the television receiver 27 whenever the viewer changes the program channel, for example, by using the up/down direction arrows on the remote controller. The video overlay device 25, such as shown in FIG. 1, combines the computer-generated RGB video-graphic overlay information with the NTSC-format program signal from the tuner 28, and supplies an NTSC-format output signal, which includes the program signal from the tuner and the program schedule overlay information for viewing on the television receiver 27.

The programming information contained in the graphic overlay 51 is supplied to the RGB video generator by the

microcontroller. In FLIP mode, the microcontroller first searches the program schedule database in, for example, the DRAM 18 to retrieve the programming information for the currently tuned channel 52 corresponding to the current time; i.e., the time at which the user just turned on the television receiver for viewing. The microcontroller 16 then supplies the current channel and program information to the RGB video generator 24 which converts the digital data information to RGB format and supplies it to the video overlay device 25.

In normal operation, the microcontroller 16 defaults to displaying all channels offered by the cable company prioritized by numeric order, which is determined by the broadcast channel position in the radio spectrum or the marketing judgments of local cable operators. Using a "Channel Preference" submenu, or an alternative "Locator" screen, both of which are discussed below, the user can revise the content and/or sequential order of the channels presented to the television receiver 27.

In general, if the user does not issue a change-channel instruction, or other command, from the remote controller 40 within a predetermined time interval while in the FLIP mode, the microcontroller 16 instructs the VDG 23 to remove the graphic overlay 51 from the television receiver, thus presenting only a program signal 55 to the television receiver 27 for viewing. The duration of the predetermined time interval is such that it allows the user sufficient time to read the programming information contained in the overlay. The duration of the predetermined time interval during which the graphic 51 overlay appears is stored in a location in non-volatile memory 20 addressable by the microcontroller 16. The user can change the duration of the time interval, by first entering a Viewer Preference mode, and then selecting an "overlay interval" entry. The microcontroller 16 then causes a user prompt to be displayed on the screen which, for example, asks the user to select an appropriate time period for displaying in the graphic overlay on the screen. Using the numeric keys, the user can input an appropriate response, for example, a period between 5 and 60 seconds, and then depress ENTER. The new interval period is then read and stored by the microcontroller 16 in the overlay time interval location in memory.

If the user issues a change-channel command from the remote controller 40 before or after the predetermined overlay period has elapsed, either by using the up/down direction arrows 43A, or by entering a desired channel number using the numeric keys 42 and then depressing the ENTER key 44, the microcontroller 16 will cause the tuner 28 to tune to the desired channel—either the channel immediately preceding or following the current 30 channel when the up or down arrow 43A is used or the specific channel entered on the numeric key pad by the user—and will also search for and immediately cause to be displayed the current program information for that channel. Thus, as the user flips through the channels, the program schedule information for any selected channel automatically appears in the graphic overlay 51 while the actual program 55 appearing on the selected channel at the particular time occupies the remainder of the screen.

The system can also be configured to issue an error message, such as an audible beep or displayed text indicating an invalid key stroke, if the user depresses either the left or right direction arrow keys while in the FLIP mode.

BROWSE Mode

To initiate the BROWSE mode, the user depresses the MODE switch once while in the FLIP mode when using the

first embodiment of the remote controller 31 shown in FIG. 3. Utilizing the second embodiment of the remote controller 40 shown in FIG. 4, the user would depress the button below the BROWSE icon 47A.

In the BROWSE mode, the user is provided with the ability to scan through program schedule information for any channel, including, but not limited to, the channel being viewed, while at the same time continuing to view the TV program previously selected. As shown in FIG. 11, in this mode the graphic overlay information that appears in the FLIP mode is replaced with programming information for the channel being browsed, which may or may not be the channel currently being viewed by the user. After the user issues the command from the remote controller 40 to enter the BROWSE mode, a graphic overlay is generated, as in the FLIP mode, with program schedule information for the currently tuned channel 112 and a textual BROWSE indicator 113 to remind the user of the currently active mode, as shown in FIG. 11.

If the user depresses either the up or down direction arrow on the remote controller 40 while in the BROWSE mode, program schedule information for either the prior or next channel is displayed in the graphic overlay portion of the television receiver screen 27, while the tuner remains tuned to the channel program that appeared on the television receiver at the time the user entered the BROWSE mode, as shown in FIG. 12, and continues to so appear. Each successive depression of the up or down direction arrow key produces corresponding program schedule information for the selected channel. The graphic overlay may also include a small video window for showing the actual video signal of a currently aired program or a clip of a future program corresponding to the schedule information then appearing in the BROWSE overlay. In this way, the user can simultaneously scan program schedule information for all channels while continuously viewing at least one selected program on the television receiver. With the advent of sophisticated television receivers, it may also be possible to simultaneously display multiple broadcast programs on a single screen for viewing, or to split the screen to show, for example, broadcast programs in combination with advertisements. The BROWSE feature could be used in any of these situations.

If, at any time during scanning of the program schedule information in the BROWSE mode, the user desires to tune the television receiver 27 from the program channel currently being viewed to the program channel indicated in the schedule information in the graphic overlay, he simply depresses the ENTER button 44 and the tuner 28 will be tuned to that channel. If the user does not want to view another channel and wishes to exit the BROWSE mode, thus removing the graphic overlay 111 with the program schedule information, he must depress the MODE key twice in the first embodiment of the remote controller 31. The first depression of the MODE key takes the user to the MENU mode, discussed below, and the second depression will take the user to the FLIP mode. Once in the FLIP mode, the graphic overlay will be removed after the duration of the time-out interval has passed. In the second embodiment of the remote controller shown in FIG. 4, the user toggles the BROWSE icon key to deactivate the BROWSE mode.

When the user first enters the BROWSE mode and begins scanning channels, the schedule information appearing in the overlay portion 111 describes the programs currently playing on any particular channel. In order to view programming information for later or earlier times, the user employs the left and right direction arrows 43B. As a consequence,

the system will display future program schedule information for the particular channel previously selected by the up and down direction arrows, whether it is the channel currently being viewed or any other available channel. The schedule information presented includes the name of the program and program start/stop time. The instant embodiment of the system, in order to conserve memory, will not allow the user to view programming information for a time prior to the current time. The system could be easily modified to provide such information if adequate memory is made available. It may be desirable, for example, to allow a user to view schedule information for an earlier time to find a particular show and then allow the user to command the microcontroller to find and display future airing dates of the show, or the microcontroller could simply do this automatically.

When viewing program schedule information for a future time in the BROWSE mode, the displayed time of airing 121 of the particular show 122 is highlighted, as well as the channel number and service indicator 123, as shown in FIG. 12A. Such highlighted information reminds the user that he is viewing program schedule information for a future time. Also, when viewing program schedule information for a future time on any particular channel in the BROWSE mode, depression of the channel up direction arrow key on the remote controller 40 causes programming schedule information for the next channel to appear, which corresponds in time to the future time that was being viewed before the up key was depressed by the user. The channel down direction arrow key 43B functions identically in this mode.

If while viewing program schedule information for a future time in BROWSE mode the user depresses the ENTER key on the remote-controller, the microcontroller 16 will instruct the VDG 23 to display a REMINDER overlay message 130 which, as shown in FIG. 13, is displayed as a second overlay 131 appearing above the BROWSE overlay 132. The REMINDER message 130 queries the user as to whether the system should remind the user, at a predetermined time before the start of the selected program, that he or she would like to view the selected program, as shown in FIG. 13. If the user responds affirmatively, the microcontroller 16 stores reminder data consisting of at least the channel, time and day of the selected program in a reminder buffer, which contains similar schedule information for all programs for which the user has set a reminder. At a pre-determined time before the selected program start time, for example, five minutes, the microcontroller 16 will retrieve schedule information, including title and service, based on the reminder data, and will instruct the VDG 23 to display a REMINDER overlay message 140 on the television receiver 27, as shown in FIG. 14, to remind the user that he or she previously set a reminder to watch the selected program. The REMINDER message 140 contains the channel, service and start time. It also displays the number of minutes before the time of airing of the particular show and updates the display every minute until the time of airing. The REMINDER message 140 also displays a "TUNE" inquiry, which asks the user if she would like to tune to the selected program. When the user sets multiple reminders, the reminder overlays are stacked, for example, in ascending order according to the time each reminder is scheduled to be displayed, and the next reminder message will appear on the television receiver after the user takes appropriate action to remove the reminder message then being displayed. The REMINDER message 140 could also be adapted to allow the user to display or modify a list of all reminders previously set by the user. As with the overlay display time period in the FLIP mode, the user can modify the time period before

a selected program that the REMINDER message appears by entering the Viewer Preference mode and revising the time entry.

MENU Mode

Using the remote controller 31 shown in FIG. 3, the user can enter the MENU mode from the BROWSE mode or from the FLIP mode by toggling the MODE button 38 once or twice, respectively. Using the remote controller 40 of FIG. 4, the user would simply depress the key 47B corresponding to the MENU icon.

Referring to FIG. 6, in the MENU mode, the system displays a plurality of menu items and icons, which correspond to and allow user selection of distinct program schedule information display formats, local cable system message boards and other online information services. The MENU screen shown in FIG. 6 is a full-screen display. In the embodiment shown in FIG. 6, there are four vertically selectable horizontal bars 61-64, which are accessed using the up and down direction arrows 43A on the remote controller 31 or 40. At the extreme left of each bar, an identifying icon 61A-64A is displayed, which identifies the information contained in that bar. In the embodiment of FIG. 6, the "TV GUIDE" icon 61A in the first bar corresponds to program schedule information from TV Guide® magazine, the "NOW SHOWING" icon 62A in the second bar corresponds to pay-per-view and premium service events, the "MSO Logo" icon 63A in the third bar corresponds to Customer Service or local cable company information messages, and the circular icon 64A in the fourth bar corresponds to other interactive services available to the user, or in the case of broadband networks, other venues, e.g., home shopping, banking or telephone use. As also shown in FIGS. 6 and 6A, each bar also contains a textual description of its contents.

When the user first enters the MENU mode, the system defaults to selection of the program schedule bar. When a particular bar is selected, the textual description is removed and a plurality of icons or identifying windows are displayed adjacent the identifying icon. In FIG. 6, the program schedule bar 61 is selected. Using the up or down direction arrow key on the remote controller 40, the user selects a vertically adjacent bar. FIGS. 15-17 show, respectively, selection of the Pay-Per-View bar 62, the Customer Service or Messages bar 63 and the Interactive TV services bar 64.

An alternative MAIN MENU screen 215 is shown in FIG. 38. Certain selection screens accessible from the menu shown in FIG. 38 are shown in FIGS. 38A and 38B. It has three horizontally selectable bars: program schedule 205, Home Theater 206 and Customer Service 207. The MAIN MENU screen 215 also contains an additional "Locator" identifier, which is described below.

Once a particular bar in the MENU screen is selected, the user can select a particular icon from the plurality of horizontally selectable displayed icons 65A-65C by using the left or right direction arrow and the ENTER key on the remote controller 40. Each icon contains a graphical symbol appearing in a background window of a particular color. When a particular icon is selected, it is offset from its background window and the color of the window changes. In FIG. 6, the grid icon 65A immediately adjacent the "TV GUIDE" icon in the first bar 61 is selected.

The function corresponding to the selectable entries in the MAIN MENU screen will now be discussed with reference to FIG. 6. It will be appreciated by those of skill in the art that the same functionality applies in the categories shown in the MAIN MENU 215 shown in FIG. 38.

In the uppermost vertically selectable horizontal bar 61, the first grid icon 65A represents an "All Listings" mode in which the program schedule information is displayed in a grid listing, such as that shown in FIG. 18. Alternatively, a single column grid-like display could be used, as that shown in FIG. 25. In this format, the vertical y-axis identifies the channel number and service while the horizontal x-axis identifies the time. The screen display of FIG. 18 also contains in the upper left-hand corner a mode identifier 180, in this case the notation "All Listings," to remind the user of the current operating mode of the system. Directly underneath the mode display is a highlighted display 181 of the channel that the user was watching before entering the MENU mode. In the upper right-hand corner, a logo icon 182 appears in a window directly above a date/time identifier 183, which alternatively displays the current date and time.

In the center of the screen display shown in FIG. 18 is a graphical Active Key Display (AKD) 184 which indicates to the user those keys on the remote controller that are active for that particular mode of the program guide display system. For example, in the screen display of FIG. 18, the cursor can only move up, down or to the right. If the user were to depress the left direction arrow key on the remote controller at that point, the system would not carry out any function since the cursor can not move to the left. Thus, the left arrow key is not active so its image is not displayed on the AKD 184. Similarly, since the system will only respond to a depression of the up, down or right direction arrow keys and the ENTER key, they are the only key images displayed on the graphical AKD 184. The MODE key, though not displayed, is always active to change from one mode to another. When the user first enters the All Listings guide, the time listing begins by default at the half-hour immediately preceding the current time unless the current time is on the hour or half-hour, in which case the display begins with the particular hour or half-hour, and the channel listing begins at the last channel being viewed by the user before entering the MENU mode. For example, in FIG. 18, the current time is displayed as 7:13 p.m., the time listing begins at 7:00 p.m. and the channel listing begins with channel 4.

In the All Listings mode, a moveable highlighted cursor 185 is used to indicate the currently selected program to the user. The user manipulates cursor movement using the direction arrow keys on the remote controller 40. Furthermore, the entire information display pages upward if the cursor is placed at the bottom of the screen and the down direction arrow is depressed, and similarly pages to the left if the cursor is at the extreme right side of the display and the right direction arrow is depressed. In this way, the user can navigate through the entire program schedule.

The folder icon 65B immediately to the right of the All Listings icon in the top horizontal bar 61 of FIG. 6 identifies a "Category Listing" mode in which program schedule information is displayed and categorized by program content, as shown in FIG. 19. The particular listing shown in FIG. 19 includes the categories of Movies, Sports, News and Children 190A-190D. The database record stored for each listing contains a content-specific identifier so the micro-controller can search the database and categorize the information by content for purposes of displaying it in the Category Listing mode. As shown in FIG. 19, the user can manipulate the cursor left or right to highlight any one of the categories which appear at the head of the listing. In FIG. 19, the "Movies" category 190A is selected. As shown, the user is given a display of all movies, prioritized by time and then alphabetically by title of show, beginning with the half-hour

immediately preceding the current time unless the current time is on the hour or half-hour, in which case the display begins with the particular hour or half-hour. The screen display shown in FIG. 19 also includes a textual description of the current operating mode of the program schedule system, as well as the graphic AKD 184, similar to that used in connection with the All Listings mode.

As with the All Listings mode, if the user highlights a show which is currently airing, he can immediately tune to that show by depressing the ENTER key on the remote controller 40. If the highlighted show is one that will appear at future time, the user is again given the option of setting a REMINDER message.

The triangular icon 65C at the far right of the TV GUIDE bar 61 in the display of FIG. 6 identifies a "Channel Listing" mode in which the program schedule information is categorized and displayed by channel, as shown in FIG. 20. The screen display shown in FIG. 20 again includes a textual mode identifier 201, the graphic AKD 184, and the window including the logo icon 182 and alternating time/date display 183. At the head of the program listing is a list of several consecutive channels 202A-202C beginning with the last channel viewed by the user before entering the Channel Listing mode. The channel in the middle window 202B is highlighted and is the channel for which schedule information is displayed. The display identifies those programs appearing on the highlighted channel beginning with the half-hour immediately preceding the current time unless the current time is on the hour or half-hour, in which case the display begins with the particular hour or half-hour. The user can display further future listings by manipulating the cursor to the bottom of the screen and paging the display, as previously described. The user can also change the selected channel by manipulating the left or right direction arrow keys on the remote controller 40. When the user issues a change-channel command in this manner, the next consecutive channel will be displayed in the highlighted window 202B in the channel string at the head of the display, and schedule information for the newly selected channel will be displayed on the television receiver 27.

As with other modes, if a user wishes to tune to a highlighted program that is currently airing, he can do so by simply depressing the ENTER key on the remote controller 40, and if the user wishes to view a program that airs at a future time, the user is again given the option of setting a REMINDER message.

In each of the FLIP, BROWSE and MENU modes, a lower case "i" icon appears at a number of occasions in connection with certain program listings, such as movies, such as the "i" 203 shown in FIG. 20. Any time this icon appears, the user can view additional programming information, generally comprising a textual description of program content and/or other information related to the program, such as the names of cast members and the like, by depressing the "i" key 48 on the remote controller 40. An example of a display of such additional information is shown in FIG. 21.

The second horizontal bar 62 appearing on the screen in the MAIN MENU mode shown in FIG. 6 is the "Home Theater" Listing. It corresponds to Pay-Per-View events or services, specialized programming, and Premium Service programs. When this category is chosen by the user, the television receiver displays information as shown in FIG. 15. The first theater-ticket icon 150 that appears in this Home Theater bar identifies a format in which the Pay-Per-View events and premium services are displayed, as shown

in FIG. 22. As with other modes, the user can manipulate the cursor to highlight and select any particular show. Also, the user can obtain additional information about the Pay-Per-View event or service by depressing the "i" key 48 on the remote controller 40. The Pay-Per-View menu screen display shown in FIG. 22 also includes a video display section 220 in which short promotional clips of current and future events and services can be shown to the user while the user is viewing the Pay-Per-View scheduling information. The display of FIG. 22 is bit mapped such that the advertising clips may be shown in the lower left quadrant of the screen. The clips may be shown randomly in the video display section 120 or, alternatively, the clip shown could correspond to the particular selected entry on the list of events, and would change automatically as the user navigated through the list.

When a user highlights a Pay-Per-View event or service by manipulating the cursor to the desired event or service using the direction arrow keys on the remote controller 40, he can order the event or service by depressing the ENTER button on the remote controller, thus linking schedule, promotional and ordering functions. If the user selects a particular Pay-Per-View event or service in this manner, the programming schedule system will next present to the user a Pay-Per-View ordering screen such as that shown in FIG. 23. The display includes a figure representing the cost of the event or service. The display also asks the user to choose from among a plurality of scheduled airing times 230A-230C, as well as whether the user would like to see a REMINDER message prior to the start of the Pay-Per-View event or service. The user responds to these inquiries by using the direction keys on the remote controller 40 to manipulate the cursor to the proper response and then depressing the ENTER key. After the user has ordered a Pay-Per-View event or service, the program schedule system will present the user with two ordering confirmation submenus, such as shown in FIGS. 24 and 24A. In either of these submenus, the user can confirm or cancel the Pay-Per-View event or service.

If the user confirms the order, the microcontroller 16 stores the Pay-Per-View ordering information in a location in memory. The ordering information can then be transmitted to the cable operator by the microcontroller 16 either by phone line or on the cable line where the system has two-way communication or other such interactive capability. Alternatively, a computer at the cable operator location can interrogate the memory where the microcontroller stored the Pay-Per-View ordering information. At the appropriate time, the cable operator supplies the Pay-Per-View event or service and it is received by all users who have ordered the program.

The second icon 151 in the Pay-Per-View bar of FIG. 15 identifies a specialized broadcast, cable or satellite programming service to which the user has access via the electronic program guide. In this mode, the electronic program guide application software acts to connect the user, through an appropriate data transmission link, to the programming service, at which point the user interacts with the service. Alternatively, the electronic program guide provides the navigation software, including the menus and scheduling information, for the particular programming service. Such a service could be, for example, Your Choice TV ("YCTV"), a service offering reruns of highly rated broadcast and cable programs, in which case the icon may take a form suitable to identify YCTV. The programming available on YCTV is then supplied to the user via the programming guide system.

The last icon 152 appearing in the Pay-Per-View bar of FIG. 15 identifies a display format which lists all Premium

Services offered by the cable operator, as shown in FIG. 26. In this mode, the user can select for impulse ordering any one of the premium services by manipulating the cursor using the direction arrow keys on the remote controller and depressing the ENTER key. Similar to Pay-Per-View ordering, the system will present the user with a series of ordering displays and, if a service is ordered by the user, it will confirm the user's request using another other submenu. If confirmed, the microcontroller 16 will store the ordering information or transmit it directly to the cable operator. Once the order has been confirmed, the microcontroller can immediately allow the user access to the ordered premium service. In this manner, the user can order premium events or services on demand.

If, during FLIP or BROWSE modes, a user views a channel or schedule information for a service not subscribed to by the user, the microcontroller 16 causes an ordering submenu to appear instead of displaying a program signal along with the graphic overlay, as shown in FIG. 9. This submenu indicates to the user that she does not currently subscribe to the selected service, and then asks the user if she would like to order the service. If the user responds affirmatively, the program schedule system takes the user to the ordering submenu discussed above. In this manner, the user can order premium events or services on impulse.

The third horizontal bar 63 in the MENU mode shown in FIG. 6 is the "Messages" or "Customer Service" listing. As shown in FIG. 16, the first envelope icon 160 represents message information available from the cable operator. When the user selects the message icon, he is presented with a screen display of currently available messages, as shown in FIG. 27. The display shown in FIG. 27 includes cable system messages 270 and billing information 271. If the user selects the cable system messages option 270, she is presented with a message pertaining to the local cable operator, such as that shown in FIG. 28. If the user selects the billing status option 271 shown in FIG. 27, she is presented with a display of current billing information, such as that shown in FIG. 29. This information may include a history of purchases charged to the user, current balance information, pending orders, and, an indication of available credit, which can be an authorized debit limit previously arranged with the cable or other operator. Thus, a user could specify only a certain pre-set spending limit. Once the amount of charges from pay-per-view events reaches the limit, the microcontroller would not permit further ordering of events. An alternative messages menu is shown in FIG. 28A.

The next icon 161 in the Customer Service information bar 63 of FIG. 16 identifies a "Viewer Preference" mode, which allows the user to create or revise a number of program schedule system operating parameters. Once selected, this display presents the user with several preference options concerning certain operating parameters of the program schedule system, as well as the viewing of certain channels and/or certain content-specific programming, for example, those shown in FIG. 7.

The first option shown in FIG. 7 is the "Parental" option 70, which can also be expressed as a "Key Lock Access" option. Once this option is initially selected by the user, the system displays a "Key Lock Access" submenu such as that shown in FIG. 30.

The Key Lock Access menu shown in FIG. 30 allows the user to control access to individual channels and programs or events by requiring the user to enter an access code "key," consisting of a user-specified four digit code in the specific embodiment discussed herein, before ordering or viewing

these pre-selected channels, programs or events. The menu display shown in FIG. 30 shows a series of subject categories that are entries in the vertical y-axis selectable by the user. A particular subject category is chosen by using the up or down direction arrow keys on the remote controller 40 to highlight the desired entry. Once the user selects a particular subject category, the left and right arrow keys are used to navigate within the chosen category.

The first subject entry shown in FIG. 30 is the "Parental Guidance" category 301. Once the user selects this category by manipulating the cursor to highlight the entry, the cursor can be then moved horizontally to an active window 302 which displays and selects one the five letter rating items in the category. The letter items represent ratings of program content as follows: "V" for violence, "N" for nudity, "L" for language, "AS" for adult situations and "PD" for parental discretion. Once the user selects a particular item, such as "L", by moving to the active window 302 using the right direction arrow key, depressing the ENTER key will indicate to the microcontroller 16 that a key lock access has been selected for programs rated with a "L" rating for violent or explicit language. The system indicates activation of a key lock access by displaying a key icon directly below the "L" category display. Once a key lock access is set, it can be deactivated by selecting the category letter and then depressing the ENTER key. This action causes the key icon to disappear. The user can change the rating category in the active window 302 by using the left or right direction arrow keys on the remote controller 40, images of which are displayed on the screen adjacent the active window as a reminder to the user. In this manner, the user can select other rating categories for setting a key lock access for any of the program content identifiers appearing in the Parental Guidance category.

The key lock access code itself consists of a four digit code, which the user can enter and modify at any time. To do so, the user highlights the fourth vertically selectable entry "Change Key Lock Access Code," 304 by manipulating the cursor to highlight it using the direction arrow keys on the remote controller. Once highlighted, the user enters a new four digit code or revises the then existing code and depresses the ENTER key. The microcontroller 16 then identifies the new four digit key lock access code and stores it in memory. The user can clear the key lock access code, as well as all other previously activated keys, by moving to the last entry in FIG. 30, "Clear Key Lock Access Code and All Keys," 305 which highlights the "OK" window, and then depressing the ENTER key. This action clears and deactivates all previously set keys, as well as the key lock access code.

The schedule information database record for each program contains a field that corresponds to the program content identifiers in the Parental Guidance category. During operation, the microcontroller checks this field in response to a user command to tune to or order a program, or to display its corresponding schedule information before carrying out the tuning, ordering or displaying function. If the parental guide identifier in the program schedule information database record matches any one of the activated parental guidance identifiers shown in FIG. 30, the user will be prompted to enter the four digit key lock access code before the system takes any further action. If the entered code matches the key lock access code previously entered and stored by the user as described above, the system will carry out the user request to tune to the program, to order it, or to display its corresponding schedule information. If the code is not recognized by the system, no further action will be taken and the user's request will be denied.

By manipulating the cursor using the direction arrow keys to highlight the second entry, "MPAA ratings," 308 the user can also set a key lock access for programs based on their MPAA rating code, as also shown in FIG. 30.

As with the Parental Guidance category, once the MPAA rating category has been selected, the user can move horizontally within the category to the active window 306 to select one of the five rating codes, i.e., "G" for general audiences, "PG" for parental guidance, "PG-13" for suggested parental guidance, no one under 13 admitted without an adult, "R" for restricted and "X" for x-rated. As with the Parental Guidance category, by selecting a particular rating—by using the left or right direction arrow keys until the particular rating code appears in the active window—and then depressing the ENTER key, the user sets a key lock access for the rating, in which case a key icon appears below the rating code. And, as with the Parental Guidance category, once a key lock access is set, the system will prompt the user to enter the four digit key lock access code anytime a request is made to tune to, order or display schedule information for a particular program having a rating code which matches a rating code for which key lock access has been activated.

The Key Lock Access mode also includes a subject category 303 for controlling access to channels, which may be entitled, for example, "Channel Block" or "Channel Lock." As with the Parental Guidance 301 and MPAA 308 categories, the user navigates to the Channel Block category 303 by manipulating the cursor using the direction arrow keys on the remote controller and depressing the ENTER key. Once the Channel Block category 303 has been entered, the user can move horizontally to an active window 307, which in FIG. 30 indicates channel 2. Once the user highlights this window by manipulating the cursor using the direction arrow keys on the remote controller 40, a key lock access can be set for the channel appearing in the active window. This is done, as with the other subject categories in the Key Lock Access mode, by depressing the ENTER key, which again causes a key icon to appear below the channel number in the active window. The user can move to the prior channel or to the next channel in sequence by depressing either the left or right direction arrow key on the remote controller 40. In this manner, the user can activate a key lock access for any available channel.

As with the Parental Guidance 301 and MPAA 308 categories, once a key lock access is set for a particular channel, the system will prompt the user to input the key lock access code prior to carrying out an instruction to tune to or order that channel. If the input key lock access code matches the previously stored access code, the user's instruction is carried out. Otherwise, the user's instruction is ignored. Thus, the user can control access to the audio and video program content of any available channel. In this instance, the microcontroller 16 will not allow audio or video program signals to pass to the VDG, but it will allow schedule information to appear for the channel.

An alternative method for effecting lockout of programs is accomplished using a "Lockout" screen, as shown in FIG. 39. In addition to limiting access to programs based on the Parental Guidance, MPAA and channel criteria, as discussed above, access may be limited on the basis of program title. FIG. 39 shows an alternative Lockout screen 250 that can be used to permit or limit access to programs based on program title, in addition to the aforementioned criteria. Other parameters also may be included, such as time of day, day of week, credit limit, and content category (e.g., talk shows).

To enter the Lockout screen 250 shown in FIG. 39, the user must enter a multi-digit lockout code using the numeric

digit keys 42 and the enter key 44 on the remote controller 40. The lockout code is set initially when the system is first used or installed. To set a lockout code in the first instance, the user accesses a Setup screen 260, such as that shown in FIG. 40. The Setup screen 260 will automatically appear the first time the electronic program guide is installed and initialized. For access during normal operation of the electronic program guide, a suitable access path to the Setup screen 260 may be provided, such as from an appropriate icon in the MAIN MENU 215.

In the Setup screen 260 of FIG. 40, the user can navigate to the Lockout Code category 265 and set a new lockout code using the appropriate navigation and selection keys on the remote controller 40. A suitable menu for inputting the lockout code is shown in FIG. 40A. Once enabled, the lockout code must be used to set or modify locks, to view a previously locked program, or to clear or change the lockout code. The memory location of the stored lockout code also should be remotely accessible, such as by the local cable company, in case the user forgets the lockout code and it must be erased.

Once the lockout code is entered and the Lockout screen 250 of FIG. 39 is displayed, navigation within the screen is controlled by the direction keys 43A and 43B on the remote controller 40. Using the up and down direction keys 43A to move the selection cursor, either the Movie Rating 251, Parental Guidance 252, Channel 253, Locked Program 254 or Lockout Code 255 category can be selected. The left and right direction keys 43B are then used to navigate inside the selected category.

Clearing a previously set lockout code is accomplished by moving the selection cursor to the "Clear" entry 256 in the Lockout Code category 255 and depressing the enter key 44 on the remote controller 40. This causes the microcontroller to clear the lockout code stored in memory, as well as all locks previously set by the user. To change the current lockout code, the user navigates to the "Change" entry 257 in the Lockout Code category 255 and depresses the enter key 44 on the remote controller 40. The user is then prompted to enter a new lockout code, which is subsequently stored in memory by the microcontroller.

To set a lock in either the Movie Rating 251 or Parental Guidance 252 category, the user navigates to the selected entry in FIG. 39 by manipulating the selection cursor using the direction keys 43A and 43B on the remote controller 40, and then depresses a lockout key on the remote controller, such as the padlock key 45A shown in FIG. 4. The microcontroller will appropriately modify the display to indicate that a lock has been set, for example, by changing the color of the text or the background in the selected entry window, or by displaying an appropriate icon next to the text in the selected entry window. In FIG. 39, a padlock icon 258 appears in the window of the "PG" entry in the Movie Rating category 251. Toggling the lockout key while the selection cursor is positioned on a selected entry will alternately enable and disable the lockout function for that entry.

Similarly, to set a lock for a particular channel, the user selects the channel using the selection cursor and then depresses the lockout key. In FIG. 39, the channel "4 KCNC" entry in the Channel category 253 has been locked, which is indicated by the inverse video and padlock icon appearing in the window.

Program locks also may be set by title, which can be effected in several ways. For example, when the above-described FLIP or BROWSE mode of the electronic program guide is enabled, thereby causing the title of a program

to be displayed along with other program schedule information in a window superimposed on the actual program signal then being received, the user can limit access to the program corresponding to the displayed program information by depressing the lockout key 45A on the remote controller 40. The user also may limit access to the currently tuned program by depressing the lockout key 45A on the remote controller 40 while viewing the program, regardless whether the FLIP or BROWSE modes are enabled. In this instance, the microcontroller first removes the program signal from the display and then accesses the schedule information database record for the program then appearing and sets an appropriate flag to indicate the program has been locked. Also, when viewing program schedule information in the grid or category listings, as discussed above and shown, for example, in FIGS. 18-20, the user also can tag a program for lockout by highlighting it with the selection cursor and then depressing the lockout key 45A on the remote controller 40.

In each of these instances, the microcontroller then stores the program title in a lockout title list stored in memory along with any other titles that previously have been locked out by the user. Individual items in the lockout title list are displayed in alphabetical order in the "Locked Program" window 259 shown in FIG. 39, and the user may scroll through the list by positioning the selection cursor on the Locked Program window 259 using the up and down direction keys 43A on the remote controller in FIG. 40 and then using the left and right direction keys 43B to scroll through the list one item at a time. In order to save memory space, alternatively, the microcontroller may be programmed to set a flag or otherwise mark the particular database record containing the program schedule information for the program that is to be locked out, and to thereafter access the database to retrieve the title information when it is to be displayed, such as when the viewer is reviewing the lockout title list in the Locked Program window 259.

Once an individual title has been locked out, the microcontroller can be programmed optionally to display an appropriate lockout icon, such as a padlock, whenever program schedule information for the locked program is to be displayed, such as in the window overlay of the FLIP or BROWSE mode, or in the various grid and category displays available in the MAIN MENU displays. The system also may display an appropriate text message if someone tries to access the program signal of a previously-locked program. Of course, once a program is locked, in all instances the microcontroller prevents access to the actual program signal (including both the audio and video portions of the program signal) until an appropriate code is entered or the lockout is removed.

Several methods can be used to block programs at their time of airing. For example, in the case of the Movie Rating, Parental Guidance and Channel categories, the schedule information database record for each program is provided with a field that corresponds to the rating, program content identifier or channel appearing, respectively, in the Movie Rating 251, Parental Guidance 256 and Channel 253 category of the Lockout screen 250 shown in FIG. 39.

During operation, the microcontroller checks the appropriate field in the database record in response to a user command to tune to or order a program before carrying out the tuning or ordering function. Additionally, the lockout code also may be used to restrict access to program schedule information. In this instance, the microcontroller also would check the appropriate field in the schedule information database record before displaying schedule information for a program.

If the movie rating, parental guidance or channel identifier in the program schedule information database record matches any one of the locked-out entries indicated in the Lockout screen 250, a Lockout Verify screen 300 is displayed in overlaying relationship with the video signal then being displayed on the television receiver, as shown in FIG. 41. The user will be prompted to enter the previously set lockout code before the system takes any further action. As an added security measure, asterisks will be displayed as the user enters the lockout code. If the entered code matches the lockout code previously entered and stored by the user as described above, the system will carry out the user request to tune to or order the program, or to display its corresponding schedule information. If the code is not recognized by the system, no further action will be taken and the user's request will be denied. In this case, the Lockout Verify screen 300 will remain displayed on the television receiver waiting for a correct code to be entered. If no action is taken by the user, the Lockout Verify screen 300 will be removed after a predetermined time-out period, such as one or two minutes.

Similarly, in the case of lockout by title, the microcontroller also could check the title field in the schedule information database record and compare it with the list of program titles for which the user previously set a lock. If, as described above, the microcontroller does not maintain a list of the actual titles of programs locked by title, a suitable identifier can be set in a field in the database record to indicate that a program has been locked by title when the user first sets the lock, and, thereafter, the microcontroller could check that field in response to a user request to tune to or order a program, or display schedule information.

An alternative method for effecting lockout involves the use of a portion of the real-time program signal being received by the television receiver. With this method, codes corresponding to a program's rating, parental guidance category, title or channel are inserted into and transmitted along with the program signal, such as in the vertical or horizontal blanking intervals, or on raster scan lines that are not visible on the television receiver. When the program signal is received, these codes are stripped from the program signal and stored in memory. Methods and apparatus for the insertion transmission and reception of digital codes carried on a program signal are known in the art.

After the transmitted codes have been separated from the program signal and stored in memory, the microcontroller can compare them with the lockout criteria set by the user in the Lockout screen and take appropriate action, as described above.

The Setup screen 260 shown in FIG. 40 also contains a Purchase Code category 270, which allows the user to set a numeric purchase code that must be entered before any premium channels or pay-per-view programs can be ordered. The Setup screen 260 shown in FIG. 40 includes entries for setting a new purchase code and for clearing or changing a previously set password. Appropriate menus for setting, confirming, clearing or changing the purchase code are shown in FIGS. 40B through 40E. Once a user sets a purchase code, the microcontroller thereafter will display a Purchase Code Verify screen in response to a user request to tune to or order a premium services channel or pay-per-view program. The Purchase Code Verify screen works in a manner similar to the Lockout Verify screen 300 in that the user is prompted to enter the previously set purchase code password before the microcontroller will tune to or order the requested program. If the correct purchase code is not entered, the microcontroller will take no further action and

the Purchase Code Verify screen will remain displayed waiting for input of the correct code. If no action is taken within a predetermined time-out period, the Purchase Code Verify screen will be removed.

The next option shown in FIG. 7 is the Channel Preference or "Favorite Channel" list option 71. By highlighting this icon and depressing the ENTER key on the remote controller 40, the user is presented with a submenu on the screen such as that shown in FIG. 8.

In normal operation, the program guide system presents channels to the user in numerical order in response to an up or down change-channel command issued by the user using one of the direction arrow keys on the remote controller. The channel number presentation sequence includes all channels offered by the cable company in the order of which they are modulated onto the channel by the operator.

The program guide system also provides the capability of selecting from among several user-defined channel presentation sequences, which are activated using one of the three "check mark" icon keys 48A, 48B or 48C on the remote controller 40 shown in FIG. 4. Each of these keys represents a preferred particular list of channels which a particular user selects and which the microcontroller stores in memory as a "Channel Preference" list, as discussed in detail below. To activate one of these preferred channel lists, the user depresses the corresponding check-mark icon key, in which case the microcontroller may display the chosen icon on the screen in the graphic overlays and full screen displays to remind the user that a particular channel preference list is being used by the system. Once a preference list is activated, the system will limit the tuning of the television receiver and the display of schedule information only to those channels that are designated in the activated viewer preference list.

To revise the content and/or sequential order of the channels in the Channel Preference list, the user enters the MENU mode of the programming guide system. To enter the MENU mode from the FLIP mode, the user twice depresses the MODE key 38 when using the remote controller 31 of FIG. 3. To enter the MENU mode when using the alternative embodiment of the remote controller 40 of FIG. 4, the user simply depresses the MENU icon key 47B.

When first entered, the MENU mode has a screen display such as shown in FIG. 6. To select the submenu for editing the Channel Preference list, the user first selects the third horizontal bar 63, which can be titled, for example, "Messages" or "Customer Service," by manipulating the cursor using the down direction arrow key, as shown in FIG. 7. The screen of FIG. 6A is thereby displayed. The user then selects the second icon 161 appearing in that bar, indicated with a check mark, which corresponds to a "Viewer Preference" mode, by highlighting the icon using the direction arrow keys and again depressing the ENTER key. This action will cause the microcontroller 16 to display a Viewer Preference submenu such as that shown in FIG. 7. By selecting the Channel Preference or "Favorite Channel" entry 71, the user enters the Channel Preference submenu, shown in FIG. 8. If the user has not already done so, he would then depress the particular check-mark icon key on the remote controller 40 of FIG. 4 to create or revise the particular channel preference list.

In the Channel Preference menu shown in FIG. 8, a list 80 of all channels available on the particular cable system is displayed on the left side of the television receiver screen, labeled "Choices" in FIG. 8, and the viewer's preferred list 81, designated "Selected" in FIG. 8, is displayed on the right side. If a particular code, such as an END or "-1" symbol

appears in the first (uppermost) position 82 of the viewer preference list 81, the system displays information for all channels in numerical order in all modes of operation. This is the default mode of the system.

By selecting channels in sequence from the available list 80 and placing them in the desired order in the preference list 81, the user can select a subset of channels and/or rearrange the default sequence in response to a channel up or channel down command from the user. This is accomplished by highlighting a channel in the available list 80 using the up and down direction arrow keys on the remote controller 40 and depressing the ENTER key 44, which stores the entry temporarily in a buffer.

The microcontroller 16 stores a list of all channels previously entered in the viewer preference list 81. As a particular channel is highlighted by the user when navigating through the available channel list 80 displayed on the left side of the television screen, a window 84 appears adjacent to the particular channel highlighted by the user. If the particular channel already appears in the viewer preference list 81, the system displays a "DELETE" message in the window 84 as a reminder that the channel was previously selected from the available channel list 80 and can only be deleted from the list 81, which is accomplished by depressing the ENTER key 44. If the particular highlighted channel in the list 80 was not previously selected, the system displays a "SELECT" message in the window 84 as a reminder that the particular channel will be selected for addition to the viewer preference list 81 if the user depresses the ENTER key 44. The microcontroller 16 inserts a selected channel at the bottom of the list 81. In this manner, the user can select or delete channels from the viewer preference list in any desired order.

The available channel list 80 may also be provided with categorical entries 83, such as movies, news, sports or children's shows. The user may also highlight any of these entries and put them into the viewer preference list 81. If the user does include a category in his viewer preference list 81, when the user issues channel up or down commands, the system will display, in sequence, first the user's selected preferred channels in numerical order and then all channels having a program whose content corresponds to the selected category or categories at the time.

Once the user has revised the channel preference list 81 in the described manner, the microcontroller 16 will follow the stored user-specified channel sequence in response to a change-channel command made by the user employing one of the direction arrow keys. To activate the viewer preference list, the user depresses one of the three check-mark icon keys 48A, 48B or 48C on the top of the remote controller shown in FIG. 4. The viewer preference list can be used to selectively limit tuning of the television receiver or display of schedule information in any of the operating modes of the electronic program guide. In the present embodiment, once a preference list is activated, the system will limit the tuning of the television receiver and the display of schedule information in the FLIP and BROWSE modes, as well as in the grid category and channel listings in the MENU mode, only to those channels designated in the activated viewer preference list. The tuner can not be tuned to, and no corresponding schedule information can be displayed for, any channel not entered in the viewer preference list when it is activated. In this regard, it should be noted that setting a key lock access in the Parental Guidance 301, MPAA 308 or Channel Block 303 categories produces a different result than when using other display criteria, such as the Channel Preference List of preferred channels discussed above. Thus, while a

key lock access will prevent audio and video program information, but not schedule information, from being displayed or ordered absent entry of an authorization code. If a particular channel is included in the Channel Preference list and also has a key lock access activated in the Channel Block category 303 of the Key Lock Access mode, that channel or its corresponding schedule information will not be displayed at any time.

To deactivate a previously selected viewer preference list, the user toggles the appropriate check-mark icon key on the remote controller 40 of FIG. 4. Once deactivated, the system defaults to displaying and tuning all available channels, as well as displaying schedule information for all available channels.

Alternatively, the viewer preference list 81, if activated, can be used to control tuning and display of schedule information only in selected modes, such as only in the FLIP mode, thus allowing the user to tune and view corresponding schedule information only for those channels entered in the preference list 81 in the FLIP mode, while viewing all channels and corresponding schedule information in all other modes.

In this latter configuration, as well as in the instance where no channel preference list is activated and the system is in default mode, if a channel appears in the viewer preference list 81 that corresponds to a service not subscribed to by the user, the microcontroller 16 causes an ordering submenu to appear instead of displaying a program signal along with the graphic overlay, as shown in FIG. 9. This submenu indicates to the user that he does not currently subscribe to the selected service, and then asks the user if he would like to order the service. If the user responds affirmatively, the program schedule system takes the user to another ordering submenu to confirm the user's request, as with impulse ordering.

The program guide also may be configured with a Locator screen 201, as shown in FIG. 37, which aids the viewer in channel selection and definition of a favorite channel list. The Locator screen 201 displays all available channel numbers grouped according to the source of the program information appearing on any particular channel at any particular time, e.g., broadcast, cablecast, pay-per-view, near video on demand, satellite, or other source of program material. Thus, the Locator screen 201 can be used to locate any particular channel or service because the groupings provide a quick and efficient method for scrolling through the list of available channels. The channel numbers also may be grouped according to other criteria, such as program category, program content, program rating or other content-based standard, time of availability, numerical order, or other logical grouping.

In the example shown in FIG. 37, the user navigates within the Locator screen 201 using the direction keys 43A and 43B on the remote controller 40. The right and left direction keys 43B move the selection cursor within the category rows, while the up and down direction keys 43A are used to select a particular category. From the Locator screen 201, any particular channel can be selected for viewing by positioning the selection cursor on the desired channel and depressing either the enter key 44 or an optional tune key (not shown) on the remote controller 40.

In addition to aiding in channel selection, the Locator screen 201 also provides the user with the ability to conveniently define favorite channel lists. To do so, the user first moves the selection cursor to the desired channel by using the direction keys 43A and 43B or numeric digit keys 42 on

the remote controller 40, and then depresses a favorite channel key 46A provided on the remote controller 40, which causes the display to change in some manner or characteristic as an indication that the channel has been selected as a favorite channel, such as by changing the color of the channel identification text or the text background, by displaying an appropriate icon or by some other appropriate identification scheme. In the remote controller 40 shown in FIG. 4, the pound key "#" can function as the favorite channel key.

Also, if multiple favorite channel lists are being used, the user would depress the appropriate favorite channel key on the remote controller to select a particular list before depressing the favorite channel key. For example, as discussed above, the remote controller 40 shown in FIG. 4, has three color-coded check-mark favorite channel keys 48A, 48B and 48C, which provide for at least three individual favorite channel lists for three individual users. Different identification characteristics could be displayed on the Locator screen 201 to indicate that a particular favorite channel list is selected. For example, the icon or image used to enable a favorite channel list on the remote controller, such as the check mark key 48A used on the remote controller 40 shown in FIG. 4, could be displayed on the Locator screen 201, as well as other screens of the program guide, when a favorite channel list is enabled. Alternatively, the color of the displayed text or background could be changed to match the color of the selected favorite channel key.

The Locator screen 201 may be accessed via several paths. For example, it may be included as a virtual channel that is conveniently positioned in the channel-tuning sequence, such as between the highest and lowest available channel numbers—for example, a virtual channel 0. To the user, such a virtual channel appears to be a conventional channel. However, it requires no additional bandwidth as a carrier. For example, it can be digitally produced at the subscriber station or included in an appropriate blanking interval in existing bandwidth frequencies. In this manner, the virtual channel is accessible either by entering the corresponding channel number using the numeric digit keys 42 on the remote controller, or by using the up and down direction keys 43A to wrap around from the highest to the lowest channel number, or vice versa. As shown in FIG. 38, it also may be desirable to provide a suitable identifier, such as an icon or text message 210, in the MAIN MENU display 215, from which the user could access the Locator screen 201 simply by highlighting the identifier 210 with the selection cursor and depressing the enter key 44 on the remote controller 40. Alternatively, the remote controller may be provided with a key corresponding to the Locator screen 201 which would cause the microcontroller to display the Locator screen 201 when the user depressed it.

In addition to Channel Preference or Favorite Channel keys, the remote controller 40 can also be supplied with a number of user-activated category preference icon keys, e.g., movies, sports, or children's programming. The system can be adapted to present to the user only those programs meeting particular preference category when it is activated by the user. As with the Channel Preference icons, the microcontroller may display the icon corresponding to the activated preference category to remind the user of the currently activated mode of system operation.

The question mark icon 162 at the far right of the third horizontal bar in the menu of FIG. 16 identifies a program guide system "Help" mode in which information explaining the operation of the system is displayed for the user. Again, by manipulating the cursor using the appropriate keys on the

remote controller, the user can select this mode. Once selected, the next submenu appearing in the Help mode asks the user to identify the particular portion of the system about which the user would like to view Help information.

The icons appearing in the last horizontal bar of the MENU mode identify certain interactive and/or other types of information services which the programming system, acting as a gateway, makes available to the user as shown in FIG. 17. By manipulating the cursor, the user can select any one of the identified services, as shown in FIGS. 31-35.

For example, if the user initially selects the "X*PRESS" icon appearing in the last horizontal bar, he is presented with a submenu such as that shown in FIG. 31. Using the direction arrow and enter keys on the remote controller, the user selects one of the three entries appearing in the display of FIG. 31. Once a particular entry is selected, the electronic program guide connects the user to the selected service and passes control to the particular service application software, as shown in FIGS. 32-35.

Alternatively, the remote controller 40 can be supplied with a plurality of content-specific keys corresponding to a plurality of content-specific categories of programming, e.g., a Sports key, News key, Movie key, etc. When the user depresses a content-specific key, a content-specific mode is initiated. In FIG. 4, the remote controller is equipped with a Sports key 49. If the user depresses the Sports key 49, the microcontroller will limit the display of programs and/or program schedule information to those that are sports-related. The microcontroller will block all other programming or schedule information from appearing on the television receiver. The microcontroller can be adapted to distinguish programs and schedule information that are sports-related by examining an appropriate code associated with the program or schedule information.

As discussed above, coding can be accomplished using any number of methods, such as by including an appropriate code in the vertical blanking interval of the program signal, or in an appropriate memory location in the database record of the program schedule information, or if the schedule information is being received on a broadband network, by including it in an appropriate blanking interval. The user activates a content-specific mode by depressing the appropriate content-specific key in any mode of operation of the electronic programming guide, including the aforesaid FLIP, BROWSE or MAIN MENU modes, as well as when no schedule information is being displayed and only a program signal is visible on the television receiver. Once a content-specific mode is requested by the user, the microcontroller immediately and directly enables the content-specific programming criteria, and maintains it for all operating modes of the guide until disabled, which can be accomplished, for example, by toggling the Sports key 49.

Instead of a dedicated content-specific key, such as Sports key 49, the system may be configured with a single, generic content-specific key, which, when activated, would cause the microcontroller to display a content-specific menu containing a list of all content-specific categories available to the user. The user then could highlight a particular category by manipulating the selection cursor using the direction arrow keys on the remote controller and select it by depressing the ENTER or OK key 44. As an alternative to using a content-specific key on the remote controller, access to the content-specific menu can be effected by providing an appropriate identifier in another menu screen of the electronic guide, such as in the LOCATOR, SETUP or MAIN MENU screens.

In addition to blocking all non-selected content-specific programming when a particular content-specific category has been selected, the microcontroller can be programmed to enable all added-value programming or services that are specially related to the selected content-specific category. For example, if the user activates a Sports content-specific mode, the microcontroller, in addition to allowing only sports programming or schedule information related to sports programming to be displayed, will proactively seek out and enable all sports related added-value services, such as related trivia or video games, up-to-date scores while a game is in progress, team schedules, replays of prior games of the selected teams or players, ticket or souvenir purchasing, etc. Thus, the information available from the programming or service can be integrated into the environment of the electronic program guide. Rather than simply passing control to another service as described above, in this manner the electronic program guide would function as a system integrator or interface to combine the available added-value information into a package within the electronic guide environment, thus essentially creating a series of modular electronic program applications corresponding to a variety of available content-specific categories.

The Setup screen shown in FIG. 40 also includes a Text Location category 275, which contains the textual entries "Bottom of Screen" and "Top of Screen." By navigating to the Text Location category 275 using the up and down direction keys 43A on the remote controller 40, and to either the "Top" or "Bottom" entries in that category using the left and right direction keys 43B on the remote controller, and then depressing the enter or select key 44, the user can control the position of the overlay windows used to display information in various operating modes of the electronic program guide. The Setup screen of FIG. 40 provides the user with two positional choices: the top or bottom of the screen. Depending on the modes of operation of the program guide, it may be desirable to provide the user with more positional choices in viewing area of the television receiver, or to provide the user with the ability to choose a different position for information displayed different operating modes.

One of the novel features of the disclosed invention is the textfit system. The preferred embodiment of the text fit system includes an interactive computer program used to edit the program listings data before it is transmitted to the user and stored in memory. The interactive system operates as follows: unedited (or partially edited) program listings information is loaded into data a processor. The data includes program titles, program schedule times, duration, category, as well as additional descriptive information dependent on the type of program. For example, for movies the data includes the MPAA rating, year of the movie, whether it is in black and white, and a list of starring actors and actresses.

The data processor extracts only the program title data which includes television program titles as well as movie titles, sporting events and titles for other special events. Based on the duration of the program, the data processor first analyzes the listings data to determine what grid size listings are needed for each title. Thus, a two hour movie could require four different edited titles to fit into each of the four different size grid cells (30, 60, 90, 120 minutes). The data processor then determines how much space is required to display the title based on its character length. If the title is to be displayed in the program schedule grid using a proportional font and character to character kerning, the data processor may also account for these factors in determining

the space required to display a title. The determination would than be based on the number of pixels required for the particular combination of characters in the title. The amount of space available for display of a title depends on the size of the grid cell and the space required for display of icons, when activated.

If the data processor determines that a full title requires too much space to fit into one or more grid cells, the title is then presented to the editor using a suitable display device connected to the data processor, such as a CRT. The editor is then queried to alter the title so that it will fit in the allotted space. If the title must be edited for more than one cell size, the editor is queried to edit each of these separately. In the preferred embodiment of the interactive program, the editor is shown in real time whether the edited title will fit in the designated grid cell.

In the preferred embodiment, two lines of text are displayed in each grid cell of the program listings. The title, as edited, appears on the first line, and if necessary, continues onto the second line. The decision to wrap-around to the second line is based on whether natural breaks exist in the title such as spaces between words, commas, periods, hyphens, etc. These are standard techniques used in word processing software routines. The editor may also be queried to edit a title in the situation where the full title will fit on the allotted two lines, but a hyphen is required because there are no natural breaks in the title.

Prior to querying the editor to shorten a title, the data processor compares the title with a stored library of shortened titles to determine if the title had previously been shortened while editing another listings database. Each time changes are made by the editor to a title, the shortened title is added to the library. It is apparent that this process of building a library of shortened titles greatly reduces the manual input required.

A flow chart illustrating the process by which the text fit system operates is shown in FIG. 42. The chart illustrates the operation of editing a listing for display in a program grid for a single platform, but operation is the same for all platforms.

Text editing may be necessary in other situations besides that where multiple size grid cells are used for display of the same title. For example, the disclosed program guide may run on several different platforms, with each one having different constraints and grid cell space availability. Some may not display the text in proportional fonts and some may have other limitations reducing the available space. Thus, in the preferred embodiment the interactive program would request edits for all platforms for which they required at the same time. In addition, editing of text may be required for display modes other than a grid of program listings. For example, in the "Listings by Channel" display of FIG. 20, programs are listed on an entire, fixed-length line, but the length of the line may vary from platform to platform, so that the text fit system may be employed for the purpose of editing listings for the different platforms in this display mode as well. The space available for the display of text will also depend on how much space is reserved for icon display. The same process as that shown in FIG. 42 would apply, except that there would be no need to determine what grid sizes are needed because a fixed length line is used for display rather than multiple sized grid cells.

It will be apparent to those of skill in the art that the disclosed text fit system has applications beyond that of title editing alone. The system may be easily modified to provide editing of messages, "I" screen storylines, pay-per-view promotional copy, and similar text messages so that they will

fit into the designated space available for display of the text. In fact, the system may be used to edit any text for display in the disclosed program schedule system.

The computer program for the microcontroller 16 may also include a schedule for the display of varying background views upon which the program schedule information is overlaid either partially or in a full screen display. The background views may be stored as bit maps in memory or in another storage medium, such as an optical storage device. For example, the microcontroller 16 may be programmed to issue a command to the VDG every morning at 6:00 AM to display a sunrise in the background. The background may then be changed accordingly throughout the day to, for example, a blue sky or a nighttime view as shown in FIG. 43A. It also may vary, e.g., by time of day, day of week, month, year or season as in the autumn scene shown in FIG. 43B. The mood background also could change depending on the particular category of programming that the user is watching or to which selected schedule information pertains. The mood background also may be adapted to display scenes that reflect the particular viewing area in which the user is situated, like the Rocky Mountains, or Mt. Rainier, etc. It also may be possible to display standard scenes, such as an ocean or forest scene. Moreover, the audio background also could be adjusted to relate to the particular mood background then being displayed. In addition, different background views may be used for holidays and special events, such as Christmas, Fourth of July, Superbowl Sunday, etc. The purpose of the background views is to help ease the monotony of viewing program listings. The microcontroller 16 could be adapted automatically to coordinate the display of the mood background. The user also could be given the ability to choose from among various mood background displays by adapting the microcontroller to display an appropriate mood option menu that lists the mood background options available to the user and allows the user to select one or more by manipulating the selection cursor. Access to such a mood option menu could be achieved by supplying an appropriate identifier, textual or visual, in an appropriate menu of the system, such as the LOCATOR or SETUP screen.

Additionally, the electronic program guide could be configured to store a unique digital identifier for each program along with its schedule information and later use the identifier—e.g., by transmitting it—to indicate to a recording or storage device, such as a video recorder, that the user wishes to record the program. The program guide could also use the identifier to automatically control operation of the video recorder. The electronic program guide could also be configured to use other stored schedule information for this purpose.

The form and content of a particular computer program to implement the invention disclosed herein will be readily apparent to those skilled in the art of video system programming and graphic display. A flow chart showing the operation logic of the system is shown in FIGS. 36A-D. It will also be appreciated by those skilled in the art that there can be departure from the specific embodiment of the invention described herein without departing from the true scope of the claims appended hereto.

We claim:

1. An electronic programming guide for use with a receiver for displaying programs on a plurality of user-selectable channels comprising:

user control means for issuing control commands, including channel-control commands;

data processing means for receiving said control commands and for generating video control commands;

a video display generator adapted to receive video control commands from said data processing means for generating and displaying a location menu on said receiver, said location menu identifying for a user a program source or subject matter category associated with each of said plurality of channels; and

a virtual channel accessible in the tuning sequence of said plurality of channels; said data processing means causing said location menu to be displayed in response to a user control command to tune to said virtual channel.

2. The programming guide according to claim 1 wherein said virtual channel is located between the highest and lowest channels.

3. The programming guide according to claims 1 or 2 wherein said virtual channel is channel zero.

4. A process for use with a receiver having a plurality of user-selectable channels for displaying programs comprising:

providing user control means for issuing control commands, including channel-control commands;

inputting to a data processor said control commands;

controlling a video display generator with the data processor for generating and displaying a location menu on said receiver, said location menu identifying for a user a program source or subject matter category associated with each of said plurality of channels;

providing a virtual channel accessible in the tuning sequence of said plurality of channels; and

configuring said data processor to cause said location menu to be displayed in response to a user control command to tune to said virtual channel.

5. The process according to claim 4 further comprising the step of generating selection means for allowing said user to select in said selection menu any one of said identified channels; said data processor being responsive to said selection means and adapted to tune said receiver to the channel selected by the user in said location menu.

6. The process according to claims 4 or 5 further comprising positioning said virtual channel between the highest and lowest channels.

7. The process according to claims 4 or 5 further comprising positioning said virtual channel as channel zero.

8. The process according to claims 4 or 5 further comprising the step of also identifying said virtual channel in said location menu.

9. The programming guide according to claims 1 or 2 wherein said virtual channel is also identified in said location menu.

10. A system for providing an interactive electronic programming guide comprising:

means for electronically storing program schedule information for a plurality of programs;

means for receiving background views including graphical portions;

user control means for issuing control commands;

a data processor for generating display control commands in response to said user control commands;

selection means for selecting one of said background views comprising the data processor and wherein the data processor automatically selects the background view based on predetermined selection criteria; and

a video display generator for receiving said program schedule information, said display control commands from said data processor and said selected background view and for displaying portions of said schedule

information in partial overlaying relationship with said selected background view in response to a user control command to display schedule information.

11. A system for providing an interactive electronic programming guide comprising:

means for electronically storing program schedule information for a plurality of programs;

means for receiving background views including graphical portions;

user control means for issuing control commands;

a data processor for generating display control commands in response to said user control commands;

selection means for selecting one of said background views comprising a background selection menu including a selector for allowing a user to select said one background view using said user control means; and

a video display generator for receiving said program schedule information, said display control commands from said data processor and said selected background view and for displaying portions of said schedule information in partial overlaying relationship with said selected background view in response to a user control command to display schedule information.

12. The system of claim 11 wherein said selector comprises a moveable cursor controllable with said user control means.

13. The system of claim 10 wherein said data processor periodically alters said background view.

14. The system of claim 10 wherein said data processor alters said background view on a time selected basis.

15. The system of claim 10 further comprising a clock for maintaining the current time and wherein said data processor alters said background view in response to the current time.

16. The system of claim 10 wherein said data processor alters said background view on a seasonal basis.

17. The system of claim 10 wherein said data processor selects said background view based on the geographic location of said system.

18. The system of claim 10 wherein said data processor selects said background view based on a holiday or special event.

19. The system of claims 10, 11 or 12 wherein said background views comprise bit maps.

20. A process for providing an interactive electronic programming guide comprising:

storing in a memory program schedule information for a plurality of programs;

receiving background views including graphical portions;

controlling a video display generator using control commands from a data processor;

selecting one of said received background views for display automatically with the data processor; and

displaying, in response to a user control command to display program schedule information, a portion of said program schedule information in partial overlaying relationship with said selected background view.

21. A process for providing an interactive electronic programming guide comprising:

storing in a memory program schedule information for a plurality of programs;

receiving background views including graphical portions;

controlling a video display generator using control commands from a data processor;

displaying selection means comprising a background selection menu including a selector for allowing a user

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to select one of said background views using said user control means; and

displaying, in response to a user control command to display program schedule information, a portion of said program schedule information in partial overlaying relationship with said selected background view.

22. The process of claim 21 wherein said selector comprises a moveable cursor controllable with said user control means.

23. The process of claim 20 further comprising the step of periodically altering said background view.

24. The process of claim 20 further comprising the step of altering said background view on a time selected basis.

25. The process of claim 20 further comprising the steps of maintaining the current time using a clock and altering said background view in response to the current time.

26. The process of claim 20 further comprising the step of altering said background view on a seasonal basis.

27. The process of claim 20 further comprising the step of selecting said background view based on the geographic location of said system.

28. The process of claim 20 further comprising the step of selecting said background view based on a holiday or special event.

29. The electronic programming guide according to claims 9 or 10 wherein said program source is chosen from the group consisting of a broadcast program, cablecast program, satellite program or premium service program.

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30. A system for providing an interactive electronic programming guide comprising:

means for electronically storing program schedule information for a plurality of programs, said program schedule information comprising program title information, said program title information comprising abbreviated titles and complete titles;

user control means for issuing control commands;

a data processor for generating display control commands in response to said user control commands;

a video display generator for receiving said program schedule information and said control commands from said data processor and generating, in response to said display control commands, a viewable display of program schedule information comprising display cells, at least one display cell having an available space for displaying said program title information;

said data processor selecting for display in said display cells either said abbreviated title or said complete title in accordance with the available display space in each said display cell in which program title information is to be displayed and in response to a user control command to display program schedule information.

31. The system of claim 30 wherein said program schedule information comprises program titles for time slots of about 30, 60, 90 and 120 minutes.

* * * * *

- [54] **PROCESSOR CIRCUIT FOR VIDEO DATA TERMINAL**
[75] Inventor: Jean Gastinel, Paris, France
[73] Assignee: Thomson-CSF, Paris, France
[21] Appl. No.: 152,888
[22] Filed: May 23, 1980

Related U.S. Application Data

- [63] Continuation of Ser. No. 879,974, Feb. 22, 1978, abandoned.

Foreign Application Priority Data

- Feb. 23, 1977 [FR] France 77 05254

- [51] Int. Cl.³ G06F 3/153

- [52] U.S. Cl. 364/900; 340/750;
340/799

- [58] Field of Search ... 364/200 MS File, 908 MS File;
358/85, 903; 340/720, 724, 725, 748, 799; 179/2
TV

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Primary Examiner—Gareth D. Shaw
Assistant Examiner—Thomas M. Heckler
Attorney, Agent, or Firm—Edwin E. Greigg

[57] ABSTRACT

An electronic data processor, for use with a keyboard, a telephone set and a standard television receiver, for permitting the exchange of data with an information system. The electronic processor includes circuitry for displaying pages of alphanumeric text on the television screen, either block by block or in continuous manner, circuitry for generating and displaying a writing cursor which indicates the position of the letter which is to be written or changed, circuitry for erasing parts or all of the screen and all of these circuits being so connected as to operate in time-shared manner with the line scan frequency of the television receiver.

15 Claims, 33 Drawing Figures

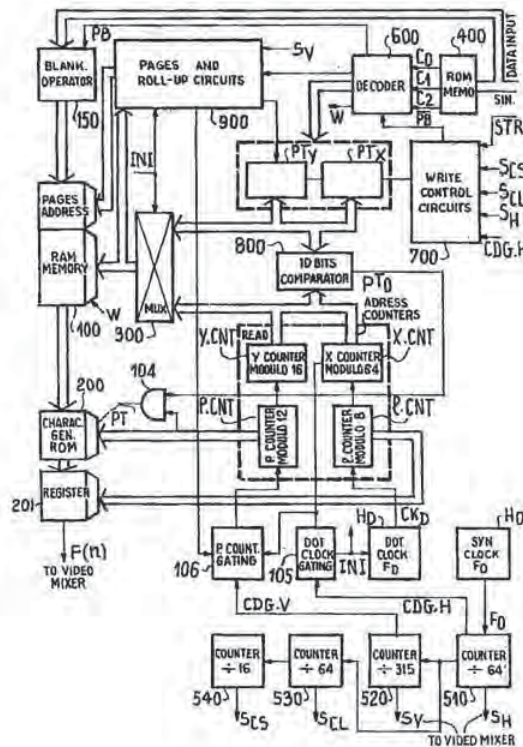


Fig. 1

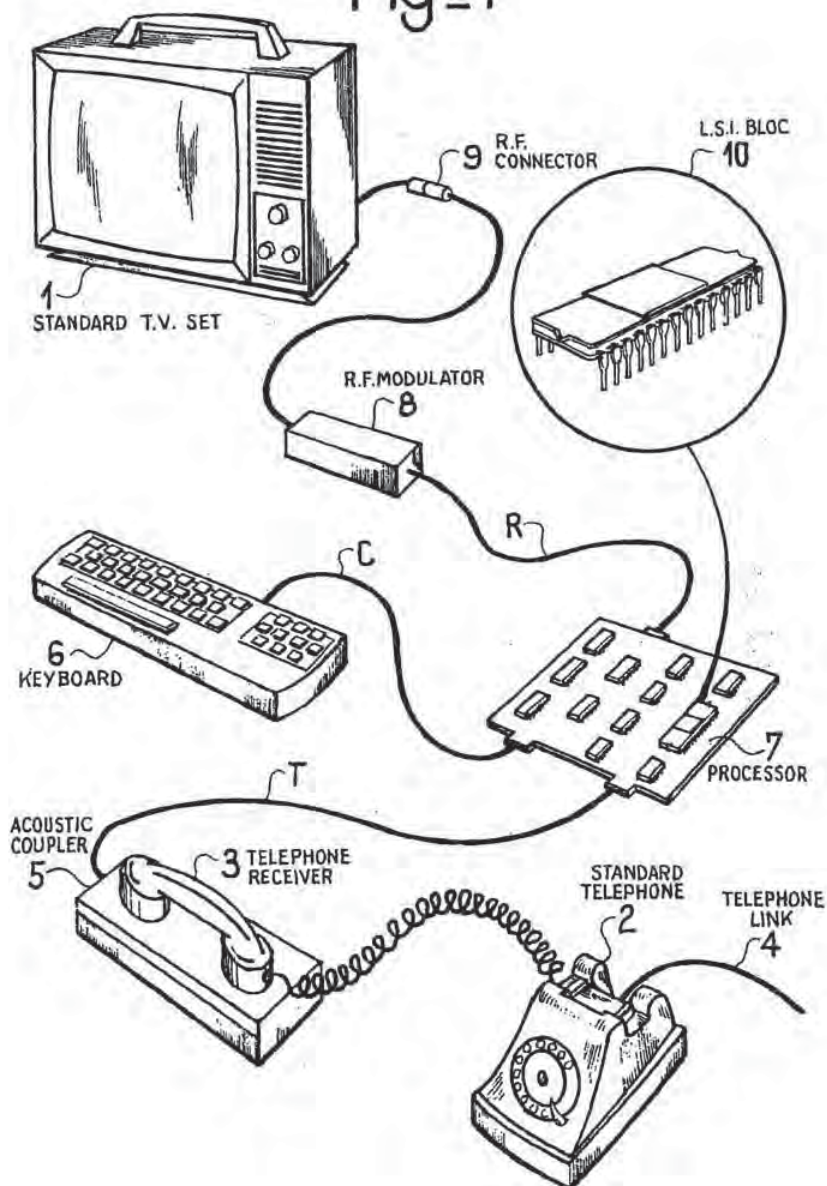
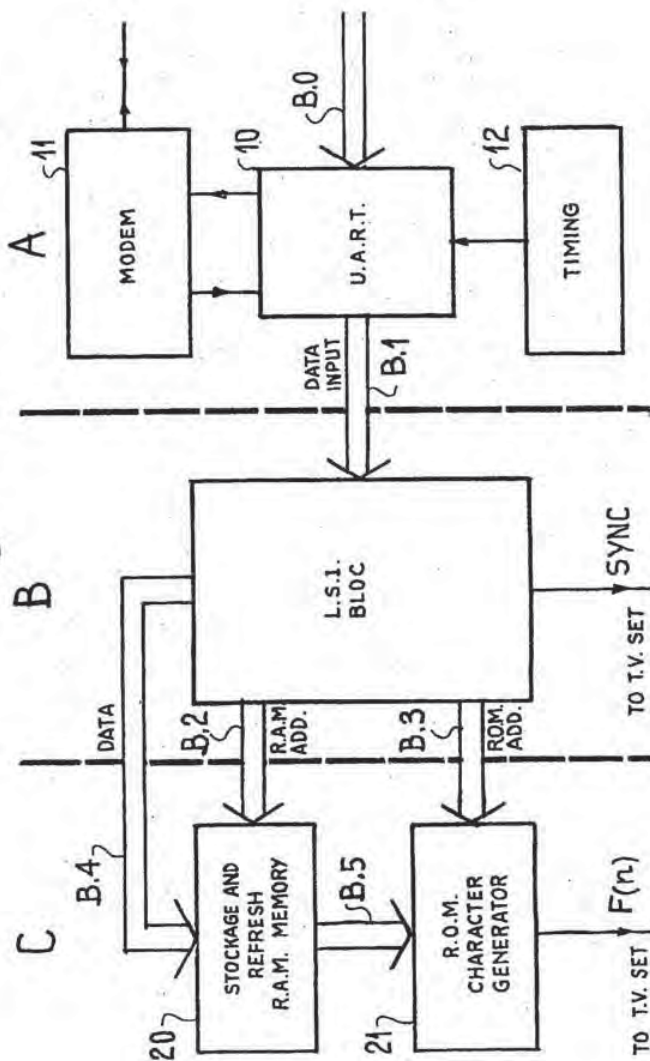


Fig-2



Fig_3a

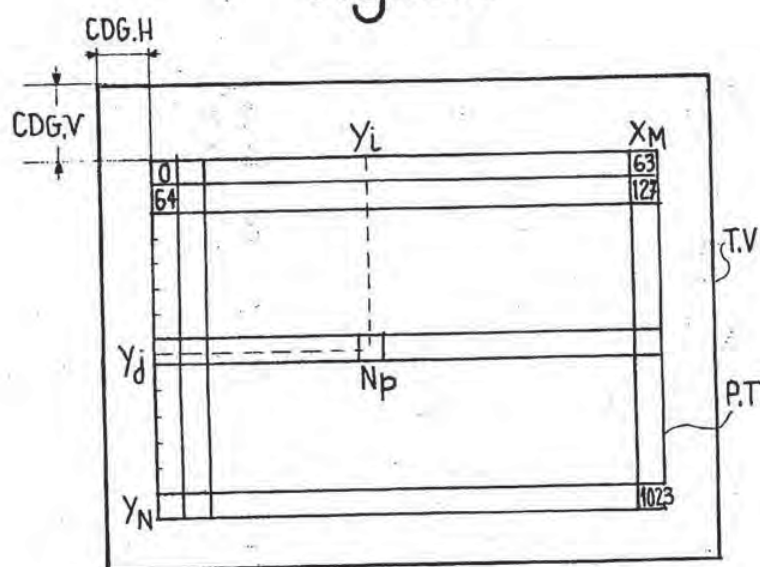
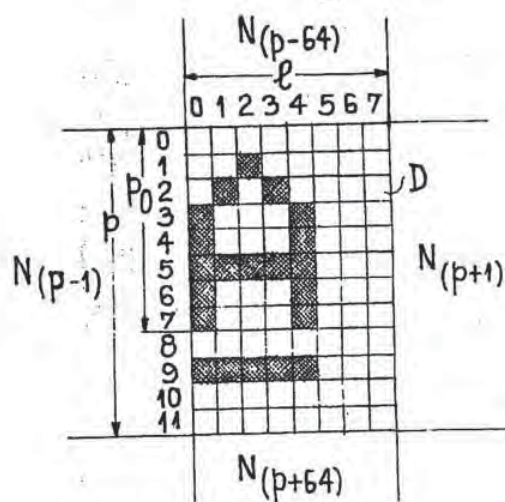
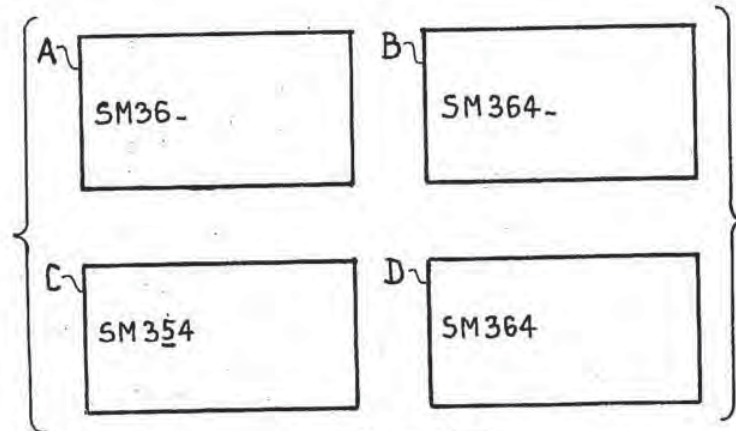


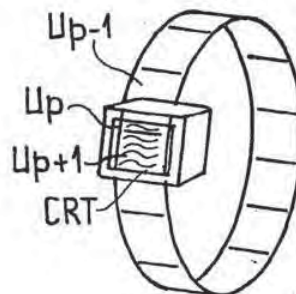
Fig. 3b



Fig_4



Fig_5



Fig_6

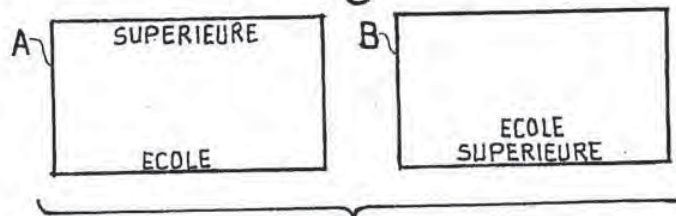
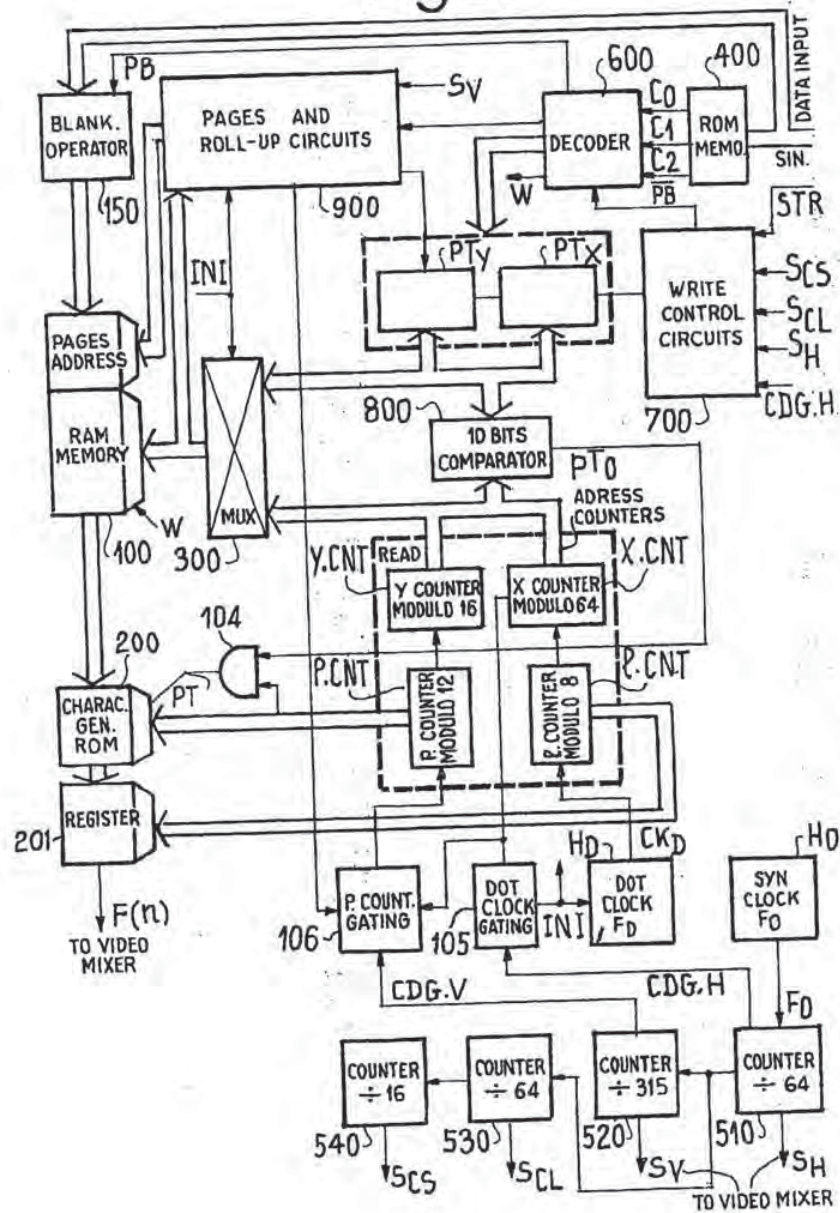


Fig. 7



Fig_8a

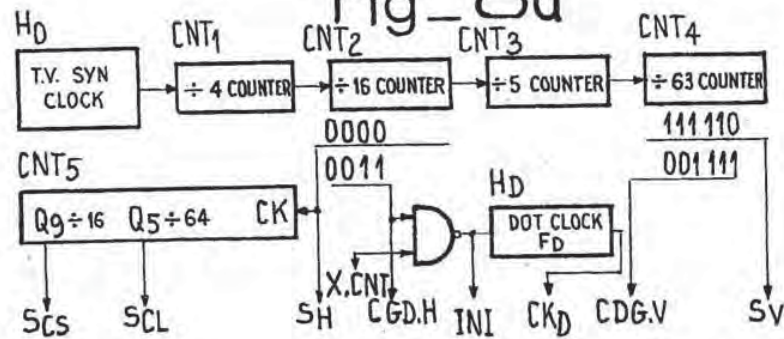


Fig.8b

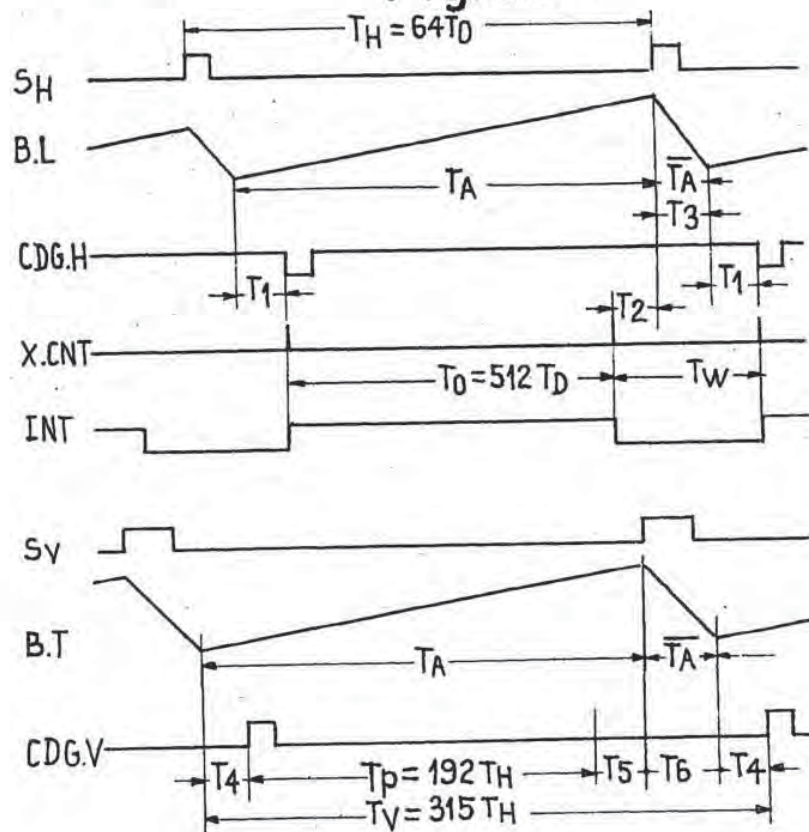
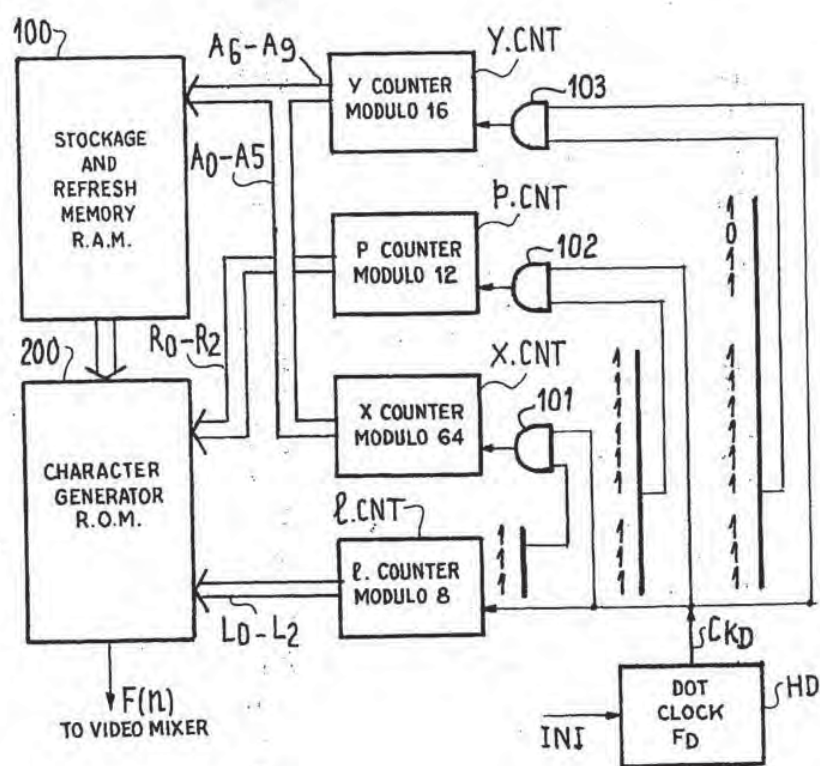


Fig. 9a



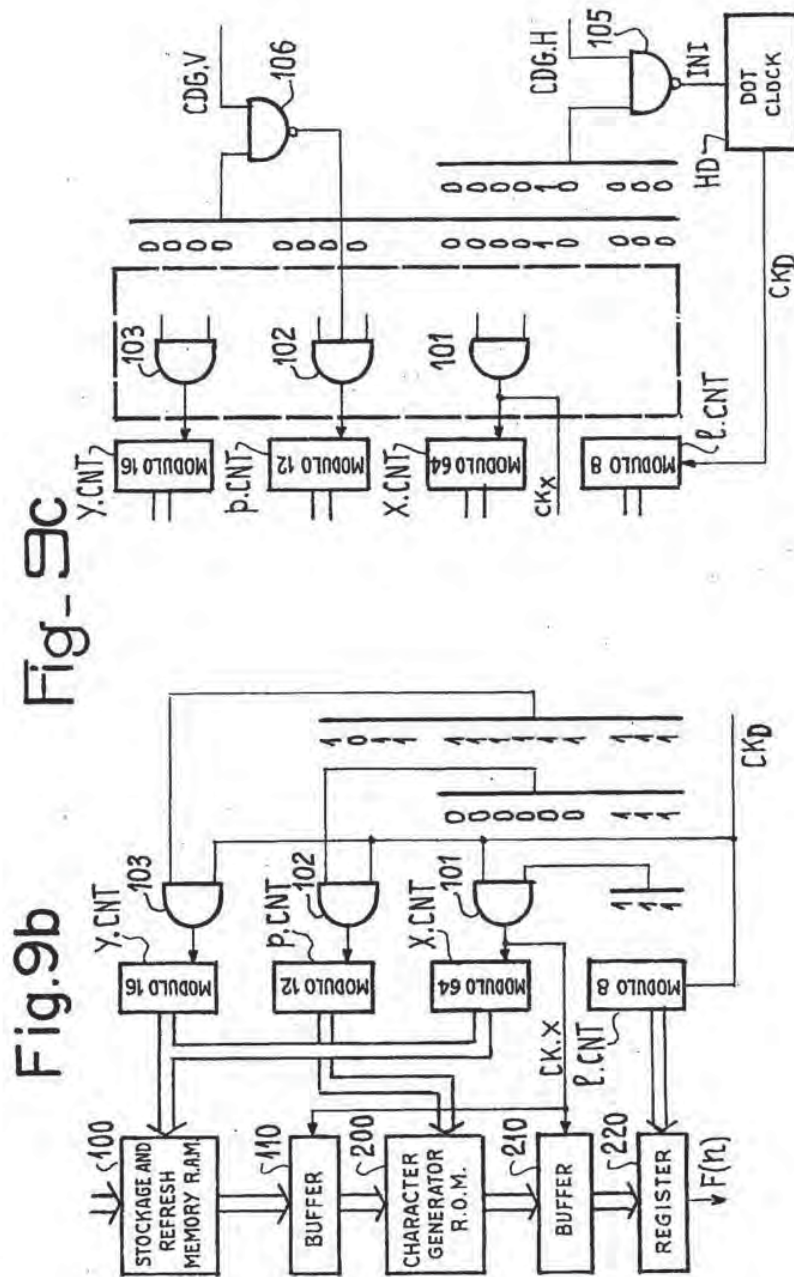


Fig. 9d

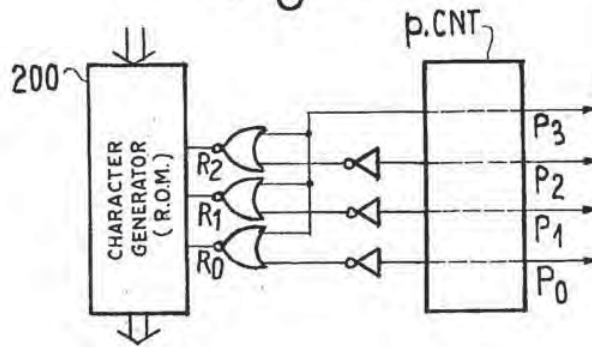


Fig. 9e

P _i	P ₃	P ₂	P ₁	P ₀	R ₂	R ₁	R ₀
0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	1
2	0	0	1	0	0	1	0
3	0	0	1	1	0	1	1
4	0	1	1	0	1	1	0
5	0	1	0	1	1	0	1
6	0	1	0	0	1	0	0
7	0	1	1	1	1	1	1
8	1	0	1	0	0	0	0
9	1	0	0	1	0	0	0
10	1	0	0	0	0	0	0
11	1	0	1	1	0	0	0
0	0	0	0	0	0	0	0

Fig. 10

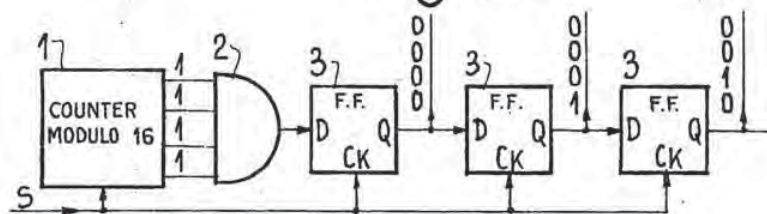


Fig. 11a

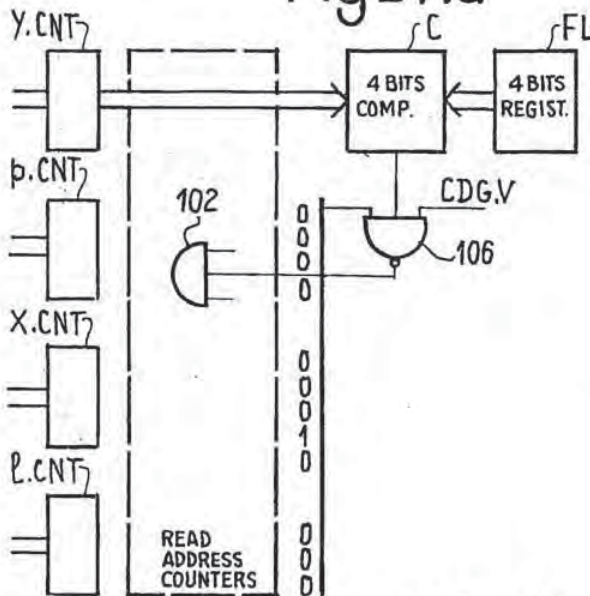
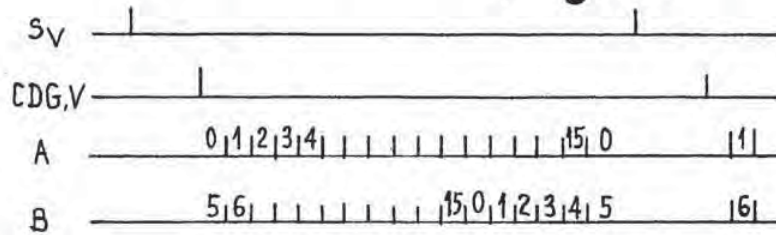


Fig. 11b



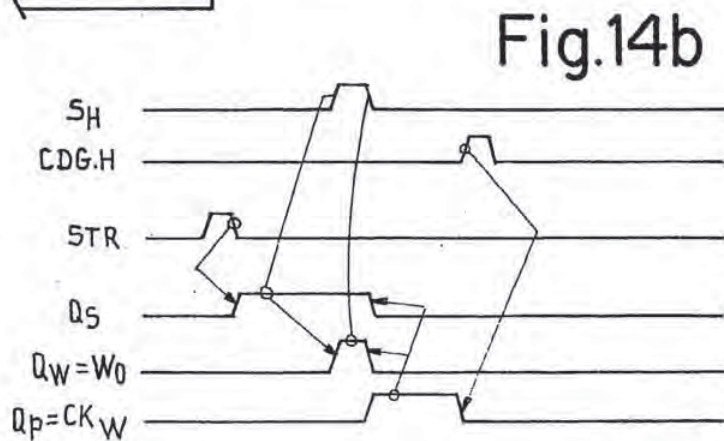
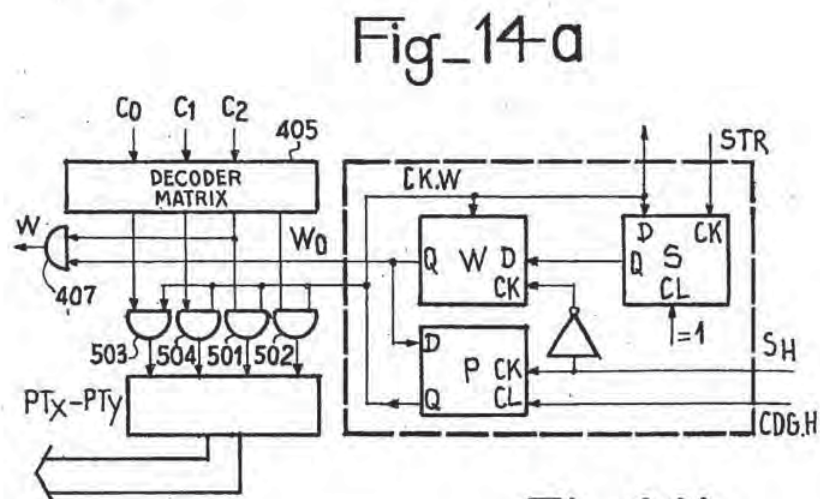
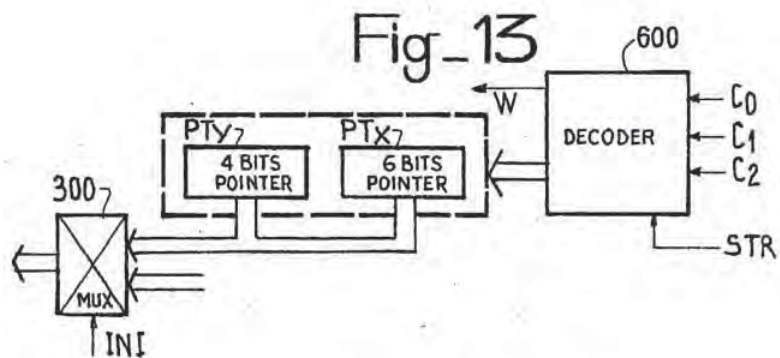
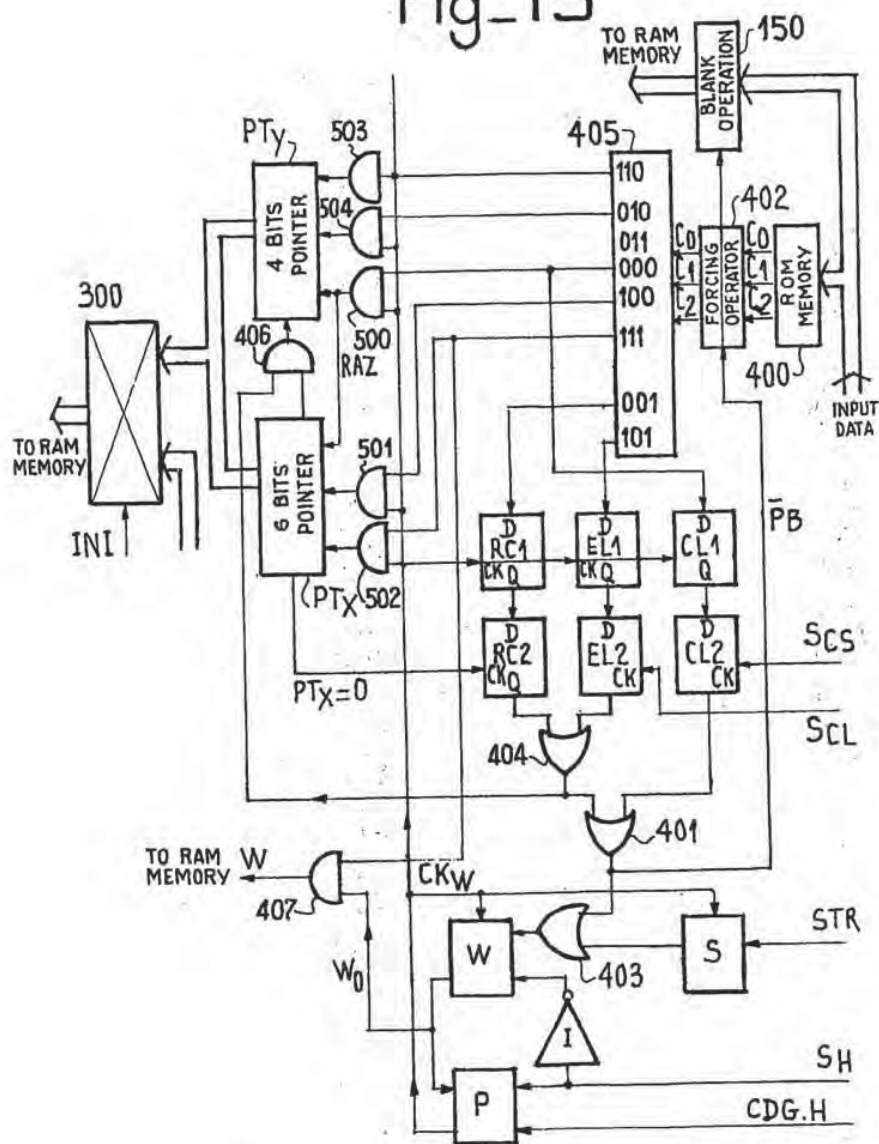


Fig. 15



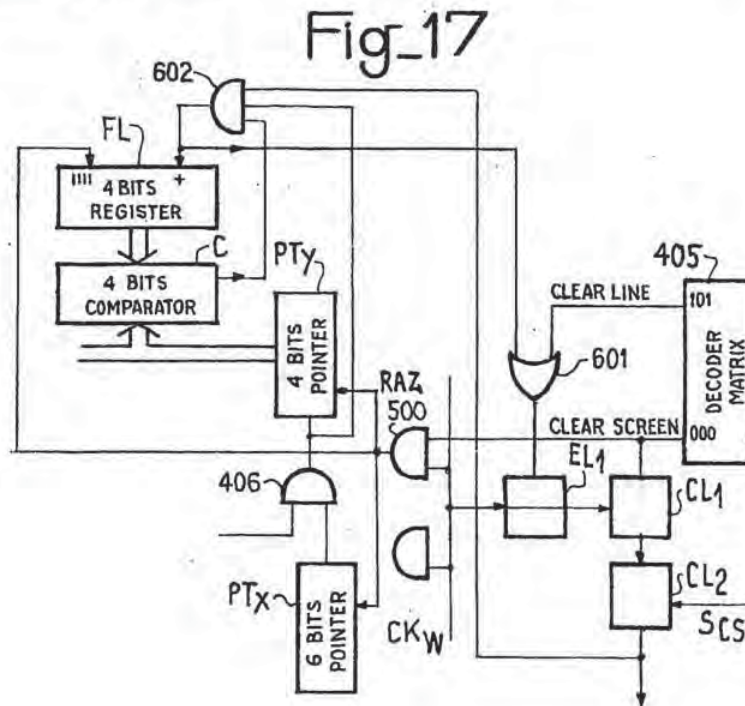
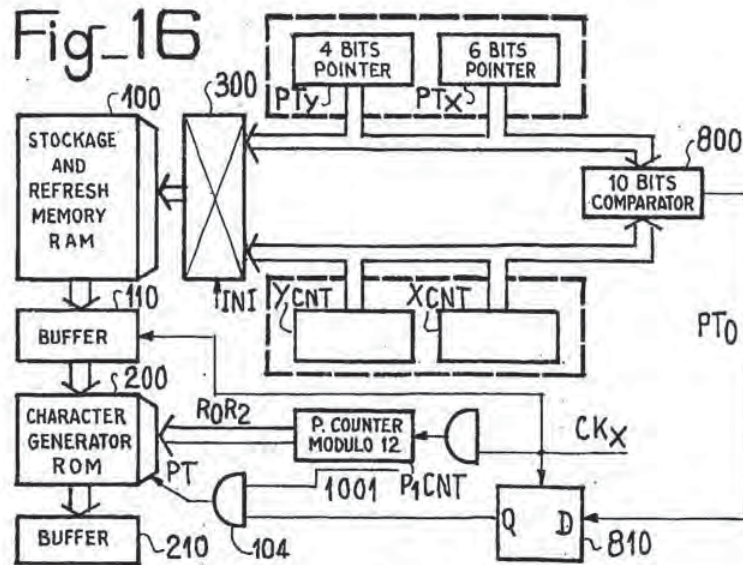


Fig. 18a

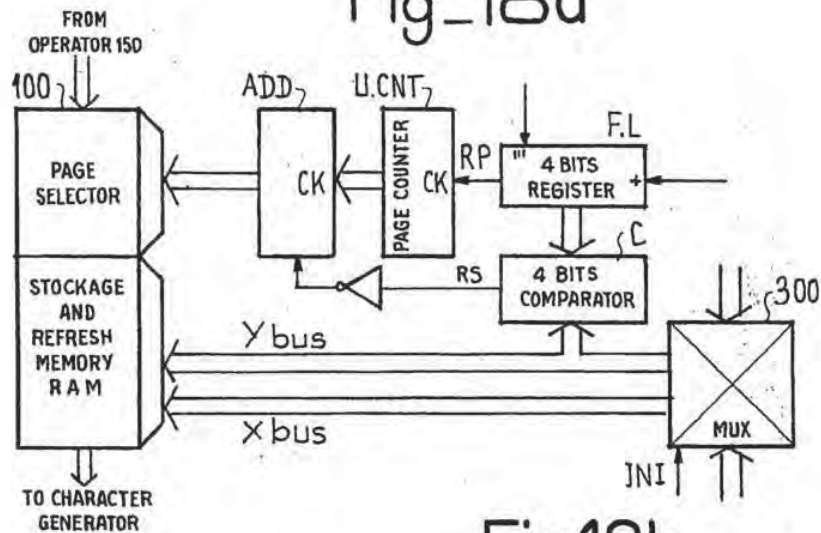


Fig. 18b

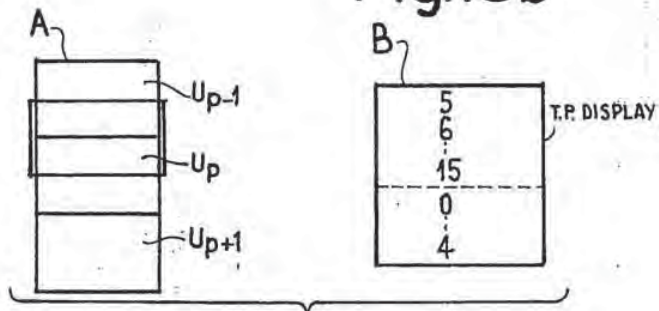
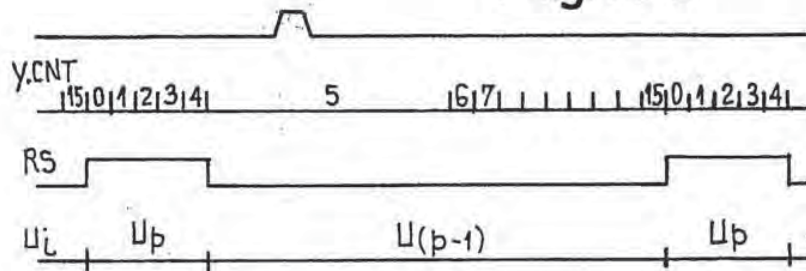
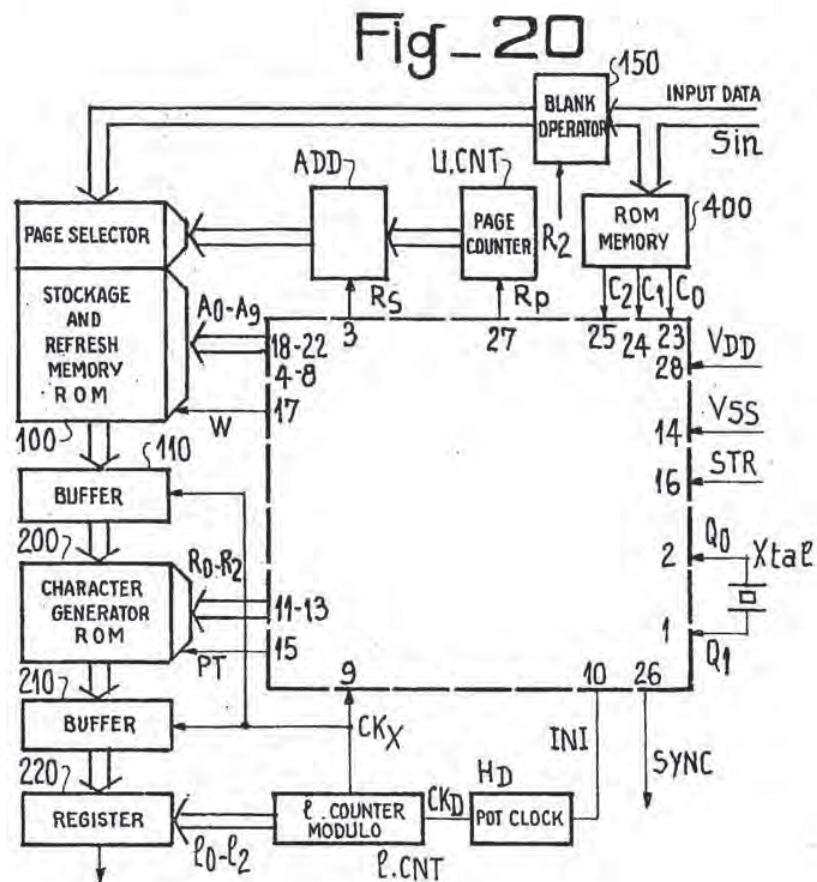
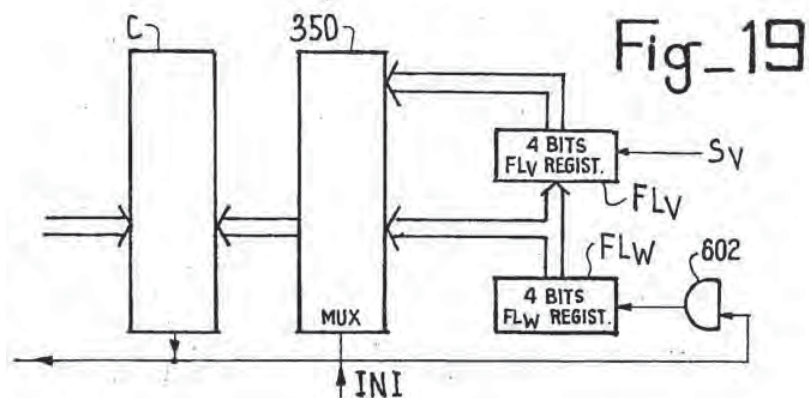


Fig. 18c





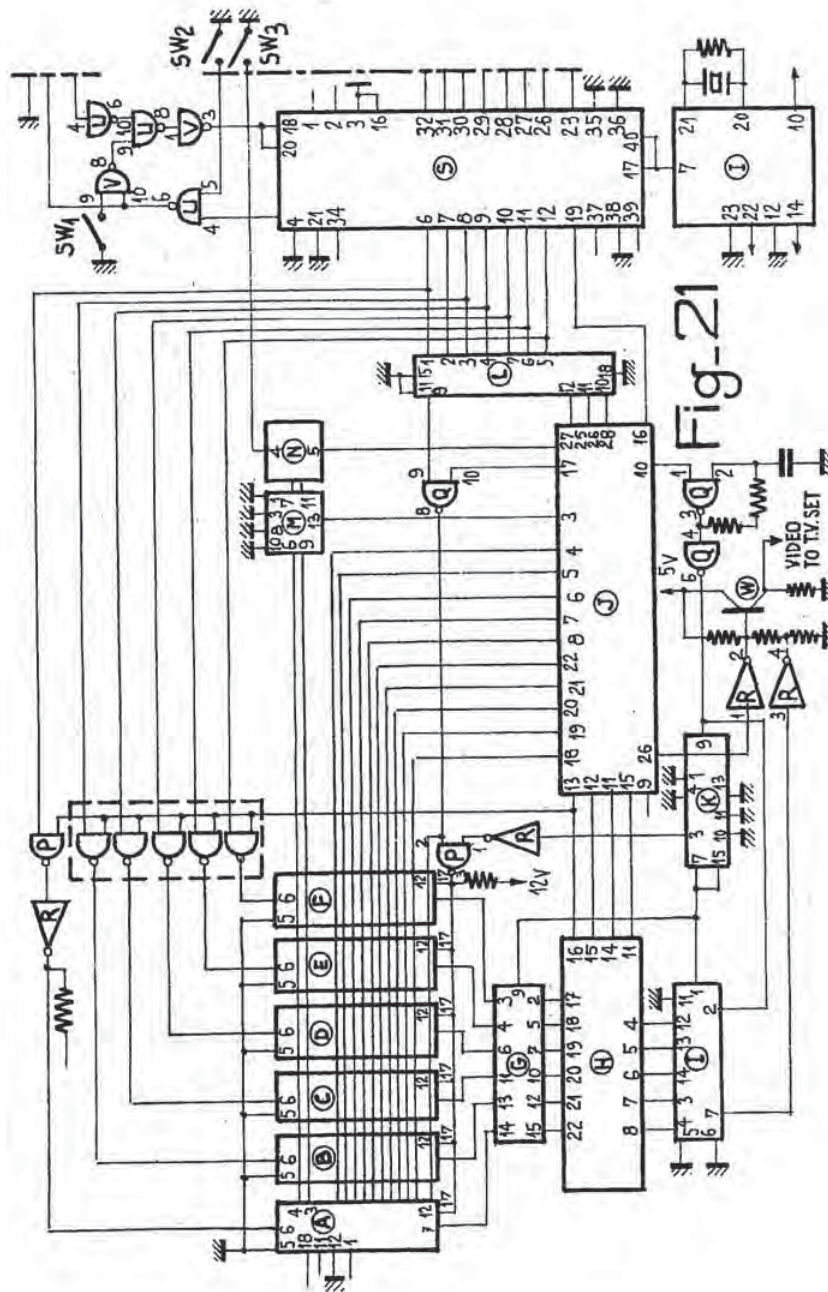


Fig-21

PROCESSOR CIRCUIT FOR VIDEO DATA TERMINAL

This is a continuation of application Ser. No. 879,974; 5
filed Feb. 22, 1978, abandoned.

BACKGROUND OF THE INVENTION

The invention relates to data display terminals, in particular video terminals for the visual display of information on a cathode ray tube. Video terminals of the type to which this invention relates may be used by a person to communicate, for example with a computer located at some distance via data communication lines, for example commercial telephone lines. The invention relates particularly to a video terminal which employs as its display device a television receiver.

Known data terminals usually include a console with some type of cathode ray screen, a keyboard for writing various messages, commands and other control information and may have an acoustical coupler which permits the transfer of information to and from the data terminal via commercial telephone lines. The acoustic coupler normally accepts the handset portion of a standard telephone set permitting the acoustical exchange of signals with the telephone set. The type of data terminal referred to above has a large number of applications, among which are the interrogation of an interaction with data banks, the transmission and exchange of communication, the dialogue with a computer, process control and numerous others. Generally, it is desirable if these data terminals are easily transported but they may also be permanently installed.

While there appears to be a universal utility for these data terminals, their general use in public is still limited because of the relatively high cost of acquisition. In order to lower the overall cost of this type of equipment, it has been proposed to employ as the visual display device a commercial television receiver for displaying written text and graphical symbols. Ordinary television receivers are produced in vast numbers and are generally accessible to any potential user of data terminals.

Inasmuch as the majority of potential users thus has access or possession of a television set and normally can make use of a standard telephone set and because the keyboard itself is not a very high-priced item, it would be possible to considerably lower the cost of a data terminal if an electronic processor were designed which would appropriately combine the functions of these various elements to produce a data video terminal which has high flexibility for handling various types of data. Two principal concepts stand out for use in the general area of performing the required processing tasks on a data terminal. The first of these makes use of universal microprocessors, generally known under the acronyms M.P.U., C.P.U., etc. Such microprocessors may be coupled with standard components and can be programmed, thereby giving the system in which they are used a great deal of flexibility but incurring a substantial cost. The second concept aims at providing a specialized processor for a particular application. Such a processor is constructed by judicious combination of circuit elements which may include those of medium scale integration (M.S.I.) so that the overall flexibility and performance of the processor is limited but the attendant cost is reduced. The present invention differs from these two concepts in that it describes a method

and means for producing a specialized processor of high flexibility and capability associated with a limited number of standard M.S.I. components and capable of performing the required functions to permit a very flexible system for communication by means of a video screen. Furthermore, the circuitry according to the invention is capable of being included in a large scale integration processor in a single integrated circuit block.

OBJECT AND SUMMARY OF THE INVENTION

It is thus a principal object of the present invention to describe an electronic processor suitable for large scale integration and capable of association with a commercial television receiver and a standard electronic keyboard as well as a telephone set. It is a second object of the present invention to provide an electronic processor of the above-described type which coordinates the functions of the video display, the keyboard and the telephone set in a general manner, permitting the receipt and sending of coded messages such as in codes commonly known as ASCII, EBDIC, BAUDOT, etc. It is a further object of the invention to thus provide a video data terminal which has high performance but whose acquisition cost and usage costs are relatively low. Furthermore it is an object of the invention to provide a data terminal which can be easily transported and has a large number of optional features which permit its use by a very general segment of the populace.

The processing circuit according to the present invention accomplishes the following principal tasks:

1. Coding and decoding of signals from an external source of coded messages,
2. Classification of coded messages according to their nature, i.e. characters, control signals, and commands,
3. Storage of messages,
4. Display of characters on a cathode ray tube (CRT) to form a readable text.

The display functions of the data terminal include the following:

- 40 Displaying a relatively high number of characters for each line of text and a relatively large number of lines of text per page;
- To display texts at a high refreshment rate without flickering;
- 45 To display a blinking writing cursor which can be displaced to any part of the screen;
- To handle a large number of text pages, either singly or catenated in continuous manner;
- Automatic scrolling, i.e. roll-up of the next page of text;
- 50 Partial or complete erasure of rows of characters displayed on the screen.

A particular feature of the present invention is that its principal functions, i.e. the writing in memory and the reading/display are performed in time-share with the line sweep cycle of the television receiver, thereby permitting a high rate of information flow.

It is another characteristic feature of the invention that the time base which controls the television sweep rate and the display time rate for the text characters are pseudosynchronous, making it possible to arbitrarily alter the size of the displayed characters.

A still further feature of the invention is that the processor can include random access memories (RAM), of either static or dynamic type. When dynamic memories are used, the processor permits the refreshing of the characters stored in memory.

Yet another characteristic of the invention is that the architecture of the processor is such as to permit large

scale integration (LSI), due especially to the choice of the logical circuits and the small number of input/output lines.

The invention will be better understood as well as further objects and advantages thereof become more apparent from the ensuing detailed description of a preferred exemplary embodiment of the invention taken in conjunction with the drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an illustration showing the various elements associated with the processor of the invention to provide a video terminal;

FIG. 2A-C are block diagrams illustrating the major sub-assemblies of the processor portion of the invention;

FIGS. 3a and 3b are diagrams illustrating the formatting of the text displayed on the cathode ray tube;

FIG. 4 illustrates the manner in which the writing cursor operates;

FIG. 5 is an illustration to aid the description of page concatenation;

FIG. 6 is a diagram illustrating page scrolling;

FIG. 7 is a detailed block diagram illustrating the processor architecture in terms of functional blocks;

FIGS. 8a and 8b are illustrations of the time base generators and of the timing diagrams associated therewith;

FIGS. 9a through 9e illustrate the memory address circuits in the read/display mode;

FIG. 10 is a logical circuit diagram of a temporal detection circuit;

FIG. 11, consisting of a and b, is an illustration of the part of the processor producing page movement;

FIG. 12 is an illustration of circuitry providing address generation;

FIG. 13 is a simplified illustration of address circuits for the writing means;

FIG. 14a illustrates circuitry which generates a simple writing cycle; FIG. 14b is an associated timing diagram;

FIG. 15 illustrates circuit elements for generating complex writing cycles;

FIG. 16 illustrates circuit elements for generating and displaying the writing cursor;

FIG. 17 is an illustration of elements for moving the text on the screen;

FIGS. 18a and 18b are illustrations of circuitry for joining pages of text indicating the manner of concatenation; FIG. 18c is a timing diagram of associated signals;

FIG. 19 is a variant embodiment of the manner of moving a page of text;

FIG. 20 is an illustrative description of the architecture of the integrated processor; and

FIG. 21 is an overall diagram illustrating an example of the application of a processor according to the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to FIG. 1, there will be seen an overall illustration of the various elements which cooperate to form a data display terminal according to the present invention. The terminal includes or is associated with the following major components:

A standard television receiver 1 of any commercial design, either black-and white or color. The TV set serves for the display on its screen of various characters,

letters, numerals, punctuation signs and other symbols. The size of the cathode ray tube is entirely determined by the convenience of the user, i.e. by the distance at which the TV screen is normally placed from the keyboard. Further considerations may be whether the terminal is fixed or mobile and if it is to be supplied by battery power or by line power.

A standard subscriber telephone set 2 having a handset 3 with a speaker and a microphone connected by a cable 4 to the telephone network.

An acoustic coupler 5 permitting communication between the telephone set 3 and the electronic processor 7. The presence of the coupler 5 is optional if the processor is directly connected to the telephone or to the system with which the user wishes to communicate.

A standard keyboard 6 having, for example 52 keys and including coding electronics. The keyboard serves to edit the text and to provide commands to the processor.

A processor 7, shown here as a single circuit board which is connected to the other elements of the terminal by a cable R which leads to the television receiver 1. The cable includes a UHF modulator 8 and a coaxial antenna coupling 9. A cable C connects the keyboard to the processor, while a cable T connects the processor to the telephone assembly. If the television receiver 1 is of the type which has a direct video input or if its place is taken by a standard display terminal, such as a professional video monitor operating at commercial television norms, the UHF modulator 8 may be omitted.

The terminal according to the present invention may have other configurations, in particular it may include several cathode ray tubes, the addition of a luminous writing wand, a printing mechanism, etc.

FIG. 2 is an overall block diagram of the major sub-assemblies of the processor 7 in FIG. 1. It will be seen that the processor comprises three major parts:

The first part A includes a UART for placing in parallel or in series data received on the entry/exit buses. The UART may be of the type AY-5-1013, marketed by the firm General Instruments Company and it receives, for example, messages produced by the keyboard and is associated with a sending and receiving modem 11, for example an integrated circuit of the type MC 14412 marketed by the firm Motorola as well as with a clock circuit 12, for example an integrated circuit of the type MC 14411 marketed by the firm Motorola. The second major subassembly of the processor is the part B which includes processing circuits for various signals and which will be described in greater detail below.

The third major sub-assembly of the processor 7 is the part C which includes a memory 20 for storing character codes in binary form and a character generator 21.

With the exception of a small number of standard components, the part B of the processor is a single package such as that labeled 10 in FIG. 1.

The major connections between the sub-assemblies are the following:

The output bus B₀ from the keyboard, the input bus B₁ for coded messages into the processor, the address bus B₂ for the character memory 20, the address B₃ for the character generator 21, the data input bus B₄ for the character memory 20, the connection B₅ between the memory 20 and the character generator.

The major output signals from the processor are these:

The video signal $F(n)$ for displaying characters on the CRT,

The synchronization signal (SYNC) for the sweep of the CRT.

Before proceeding to the complete and detailed description of the apparatus of the invention, the nature and characteristics of the text displayed on the CRT will be explained with a definition of the various terms used in the following description. Turning therefore to FIG. 3, there will be seen a diagram illustrating the format of the text displayed on the screen. The outer boundary of the FIG. 3a shows the limit of the screen as defined by the raster-scan or sweep of the electron beam on the screen. The swept image has "m" horizontal lines minus the number of lines occurring during the return of the beam and a frame rate of "s" frames per second. The outline labeled P.T. is the format of a page of text as displayed on the screen and includes X_M columns of character boxes as well as Y_N rows of character boxes. The text page may be moved electronically within the TV scan frame by an appropriate horizontal and vertical adjustment through a distance CDG.H and CDG.V respectively, by means to be explained below.

FIG. 3b is an enlarged diagram of a single character cell or box of order N_p which is that occurring in the column X_i and the row Y_j . As can be seen from FIG. 3, there are Y rows of character cells, each row having X cells. Each character box has 1 column of dots D and p rows of dots. In other words, each character cell is comprised of $1 \cdot p$ dots. The dots are formed by the presence of the focused electron beam on the cathode ray tube. The various indices obey the following relations:

$$0 \leq i \leq X_M, 0 \leq j \leq Y_N$$

$$0 \leq X \leq X_M, 0 \leq Y \leq Y_N$$

The number N_p is given by

$$N_p = (X_M + 1) Y_j + X_i$$

The value of the last character box $N(X_M, Y_N)$ is

$$N(X_M, Y_N) = (X_M + 1) Y_N + X_M$$

In the example chosen,

$$X_M = 7, Y_N = 11, X_M = 63, Y_N = 15$$

which corresponds to a page of displayed text having 1024 character boxes, each of the character boxes having 96 addressable dots, which can be inscribed at will by the cathode ray beam.

The format of each character is a 5×7 dot matrix having a total of 35 dots. The character boxes adjoin one another so that, in the chosen example, the horizontal distance between each character is equal to 3 dots and vertical separation is equal to 5 dots. FIG. 3b shows an illustration of the letter A which is seen to occur between rows 1 and 7 while a writing cursor is a bar occurring on row 9 and having a length of 5 dots.

The total number of dots along the abscissa of each page of text is thus:

$$n_X = 8(X_M + 1) = 512 \text{ dots.}$$

The total number of dots along the ordinate of a page of text is:

$$n_Y = 12(Y_N + 1) = 192 \text{ dots.}$$

The total number n of dots in a page is:

$$n = 1M + 8X_M + 512pN + 6144Y_N = 98,304 \text{ dots.}$$

In the example shown, the number of horizontal lines on the television screen is $m = 315$ while the number of images or frames per second $s = 50$ Hz. In this type of application of the television sweep, it is unnecessary to interlace images of even and odd rows.

The intensity modulation of the cathode ray beam is binary, i.e. it is either on or off, and which level is chosen depends on whether the characters are to be black-on-white or white-on-black. The choice of modulation may also depend on whether a European or non-European TV standard is used.

FIG. 4 is an illustration of the manner in which the writing cursor appears. In the block A, the writing cursor is shown in place to write a new character. Normally, the cursor is positioned at the character box adjacent to the last letter written. In part B of the diagram, the cursor is shown at a later time. In this mode, the cursor alone blinks at some low frequency, for example 2 Hz. In part C, the cursor is shown in position for modifying or changing the character above. In that case, both the cursor and the character above it blink in opposite phase. In part D of the diagram, the writing cursor is shown at a later moment after the indicated character has been modified.

FIG. 5 illustrates the joining or concatenation of pages. In this diagram, the cathode ray tube is shown in the manner of a window which is continually moved over a roll of contiguous pages.

FIG. 6 illustrates the automatic scrolling of text at the end of a line (roll-up mode). When the end of a page is reached in this mode, the cursor is not returned to the top of the page but is maintained in block position on the last row of characters. In order to prevent that the new text is merely written on top of the old, the text rises progressively and the new rows of characters arrive from below while the upper rows of characters are normally erased. The upper rows of characters may be saved in memory if memory space is made available for them.

FIG. 6a illustrates the placement of information on the screen without scrolling while FIG. 6b indicates the appearance of information with scrolling.

The apparatus of the invention permits the partial or total erasure of characters in a page of text. When a row of characters is written on top of a row of characters already present, the new characters merely take the place of the old. However, if the length of the new row is shorter than that of the old, the remaining characters would be inappropriate. They may thus be blanked out either as a complete row or only as the end of the row. Furthermore, the entire page may be erased completely.

The detailed architecture and electronic components of the processor 7 and the various aspects of the invention will now be explained with the aid, firstly, of FIG. 7. The architecture of the processor includes two major parts. The portion generally at the lower part of FIG. 7 includes circuits for reading character codes into the character memory 100 and the circuits for displaying these characters on the cathode ray tube by means of the character generator 200.

The upper portion of FIG. 7 includes the circuits which inscribe the character codes in the storage mem-

ory and control circuits for executing commands specified by writing and erasure codes as well as codes for moving the writing cursor.

These two portions of the circuit function in time-shared mode at the TV line sweep rate, and are multiplexed by a multiplexing circuit 300 controlled by a signal INI.

The input data for the processor, furnished either by the keyboard or transmitted via the telephone line, are numerical signals corresponding to the character code or the control code. These signals (Sin) appear in parallel on 7 lines accompanied by a timing or "Strobe" signal STR which indicates the presence of a code word as either standard ASCII or EBDIC. These 7-bit code words are fed to a ROM-type memory which produces a 3-bit word (C_0, C_1, C_2) that specifies the writing mode. The input data is also directed to the character code memory; in the example shown, only 6 of 7 bits are retained for specifying the character code, thereby making available 64 different characters.

The character code memory 100 is a random access memory (RAM) of U pages each including 1024 6-bit words. The character code memory can be addressed at random and may be static or preferentially dynamic. The data entry to the character code memory is indicated by the reference letter W. Connected to the memory 100 is a blank operator circuit 150 which makes it possible to erase characters by inscribing blanks in their place.

The character generator 200 is a read-only memory (ROM) which generates 64 different characters each occupying a 5×7 dot frame in a 5×8 dot matrix, the first row of rank 000 being blank. The character codes are transferred from the memory in parallel, while the output of points $F(n)$ to the video circuit takes place in series via a parallel-to-series converting register. This is accomplished by serializer register 201.

The processor operates on two time bases. The first time base is the dot display rate and the second time base is the TV sweep rate. The dot time base is generated by a clock H_D which is pseudo-synchronous with the TV sweep rate. The clock H_D has an oscillation frequency F_D which can be adjusted so as to permit a change of the size of the displayed characters as well as the change of the right margin of text. The clock H_D is pseudo-synchronized to the TV sweep rate by stopping the clock with the signal INI and releasing it by the horizontal framing pulse CDG.H.

The TV sweep rate is generated by a clock H_Q with continuous oscillation. The output frequency F_Q of the clock H_Q is divided in a set of coupled counters; the counter 510 generates synchronization pulses S_H for the line sweep rate of the television receiver and the horizontal framing pulses CDG.H; the counter 520 generates the synchronization pulses S_V for the frame rate of the television receiver as well as the vertical framing pulses CDG.V; the counter 530 generates the control signals S_{CL} for erasing a row of characters and the counter 540 generates the control signals S_{CS} for erasing the entire screen.

The address circuits for the character memory 100 and the character generator 200 are constituted by 4 counters: Y.CNT, X.CNT, p.CNT and l.CNT. These circuits are coupled so that their total content permits addressing 98,304 dots. The counters l.CNT and X.CNT correspond to the abscissa of a page of text and have a counting capacity of 512 units, i.e. they count modulo 512. They are incremented for each line of

television display so that dynamic RAM memories may be used. The counters labeled p.CNT and Y.CNT correspond to the ordinate of a page of text and have a counting capacity of 192 units (they count modulo 192) and are incremented for each new TV frame. The circuits which generate the display address or the writing pointers which are used for addressing the character code memory 100 are made up by registers PT_x and PT_y which are incremented by writing commands.

The writing circuits include a decoder circuit 600 which processes the writing command specified by the code word C_0, C_1, C_2 . This circuit makes it possible to increment the writing pointer. The write control circuit 700 includes writing cycle generators which are under the control of the signal STR. This circuit generates simple codes such as writing a character into the code memory 100, incrementing the writing pointer so as to cause a movement of the writing cursor, and it also is capable of generating complex writing cycles such as those corresponding to the partial or total erasure of the screen either by command or automatically in the scrolling mode when the last row of displayed characters is erased.

A circuit which controls the operation of the writing cursor includes a 10-bit comparator 800 which generates a signal PT_O whenever the contents of the display address circuit and the write address circuit are identical. The display signal PT of the writing cursor is subject to the contents of the counter p.CNT.

The processor further includes circuits 900 which permit generating the scrolling mode and the chaining together of pages of text.

FIG. 8 is an illustration of the time base generators, namely the television sweep rate and the rate at which displayed dots are positioned.

The television sweep rate clock H_Q includes an oscillator, preferably quartz-controlled, having an output frequency F_Q which is divided by counters CNT1, CNT2, CNT3 and CNT4 whose respective dividing ratios are 4, 16, 5 and 63. They are followed by a further counter CNT5 whose function will be explained later. The counter CNT2 has two outputs one of which carries the synchronization pulses S_H of the television line frequency while the other carries the horizontal framing pulses CDG.H. The counter CNT4 also has two outputs, one of which generates the vertical synchronization pulses S_V for the television framing frequency while the other carries the vertical positioning pulses CDG.V for a page of text. The synchronization pulses S_H are applied to a previously mentioned counter CNT5 which is used to process the control signals for erasing displayed characters. The counter CNT5 has two outputs, an output Q_5 permitting a division of the S_H pulses by a factor of 64 and an output Q_6 which performs a division of the pulses S_H by a factor of 1,024.

The time base for writing the character dots includes a clock H_D including an oscillator having an output frequency F_D which is adjustable and can be made pseudo-synchronous with the TV sweep frequency F_Q by triggering the oscillation of the F_D frequency by means of the horizontal framing pulses CDG.H. The F_D oscillator is stopped by the end-of-row signal X.CNT. The framing pulses CDG.H and the end-of-line pulses are combined in a logical operator to form a signal INI which inhibits the dot clock H_D . At the same time, the signal INI is used for time multiplexing the read/display periods of the characters and the writing times for characters into the character memory. The duration of the

signal INI is approximately a third of the period of the television line and the presence of this signal governs the character writing mode in the character memory.

FIG. 8b is an illustration of the waveform associated with the time base circuits. The horizontal synchronization pulses S_H have a period equal to $64 T_O$, T_O being the period of the clock H_O . The vertical synchronization pulses S_V have the period $T_V = m T_H$, where m is the number of television lines per frame, in this example being equal to 315. In a standard television receiver operating with a framing frequency of 50 Hz, the period T_V is equal to 20 milliseconds.

The sawtooth sweep signals B.L and B.T (line and frame) of the cathode ray tube comprise an active period T_A and a return period T_R . The horizontal framing signals are delayed by a time T_1 with respect to the horizontal synchronization pulses S_H . The end-of-row signals X.CNT are produced after a period $T_c = 512 T_D$, where T_D is the period of the dot clock H_D and the period T_c corresponds to the read/display mode. The period T_w corresponds to the time available for writing in the character code memory and is equal to $T_1 + T_2 + T_3$; it is controlled by the inhibit signal INI from the dot clock H_D . By studying the timing diagrams of FIG. 8b, it may be deduced that:

The time T_p for displaying one page of characters equals $192 T_H = 12, 228 T_O$.

The duration of a frame of a television image equals $20,160 T_O = 20$ ms.

The television sweep rate $F_O = 1/T_O = 1.008$ MHz while the television line period T_H is approximately equal to $64 \mu s$. The duration T_c of the display of a row of characters equals

$$T_c = T_H - (T_1 + T_2 + T_3)$$

where $T_3 = T_A$ times the sweep return, i.e. approximately $12 \mu s$. T_1 is approximately equal to T_2 and equal to approximately $5 \mu s$ so that the dot frequency F_D is approximately equal to 12 MHz. The repetition rates of the signals S_{CS} and S_{CL} from the counter CNT5 are respectively equal to 64 and 4 milliseconds.

There will now be described the method for addressing the RAM memory in which the character codes are stored and the ROM memory for generating characters in the read/display mode.

Illustrated in FIG. 9 is a block diagram of the address circuits for the RAM memory 100 and the ROM memory 200. During a display cycle, the cathode ray sequentially traverses all n dots in a page of text, i.e. n goes from 0 to 98,303. To perform this sweep, there are disposed 4 sequential counters of the following characteristics:

A 3-bit modulo 8 counter ICNT whose address outputs are L_0 , L_1 and L_2 ;

A 6-bit modulo 64 counter C.CNT whose address outputs are A_0 to A_5 ;

A 4-bit modulo 12 counter p.CNT whose address outputs are R_0 , R_1 , R_2 ; and

A 4-bit modulo 16 counter Y.CNT whose address outputs are A_6 through A_9 .

These counters are clocked at the rate of the pulses CK_D delivered by the dot clock H_D . These counters are chained together in such a way that the maximum count in a counter triggers the incrementation of the following counter.

The organization of the various memories and address circuits such as shown in FIG. 9a is based on a consideration of different time delays in transmission or

execution, for example the access time of the RAM memory 100, the signal traversal time in the ROM memory 200 and the time for selecting the 5×12 matrix of a character box. When presently available circuit components are used, these delays are greater than $0.8 \mu s$. In order to overcome this limitation, there are inserted two buffer or latch registers 110 and 210 as shown in FIG. 9b. The buffer 110 is placed between the RAM 100 and the ROM 200 while the buffer register 210 is placed between the character generator ROM and the parallel-to-series converting register 220 which is addressed by the counter 1.CNT. The two buffer registers 110 and 210 are addressed by the incrementation pulses for the counter X.CNT. These registers are filled a short time prior to the modification of the data, i.e. prior to the incrementation of the X.CNT counter.

The coupling together of the display counters as shown in FIG. 9b eliminates the effect of the various time delays.

The counter block is incremented in synchronism with the TV time base. When dealing with the horizontal display of character dots, the counter block must be incremented by 512 units for each line of dots. For this purpose, the dot clock H_D is started in synchronism with the synchronization pulses S_H or, more exactly, with the horizontal framing pulses CDG.H which indicate the beginning of a new row of characters in a page of text. The clock H_D is stopped when the counters have been incremented by 512 units and the circuit for controlling the dot clock H_D is illustrated in FIG. 9c. A logical operator, for example a flip-flop or a gate, is triggered by the pulses CDG.H and reset when the counters 1.CNT and X.CNT have received 512 incrementations corresponding to a content of $(512 + 16) = 16$ units due to the effect of transfer delays in the memories as indicated previously. The output of the gate delivers a signal INI which inhibits the clock H_D and will also be used at the same time for initiating the writing mode.

The vertical synchronization may be generated in a similar manner to the horizontal one, however it is preferable to proceed differently so as to permit the use of a character storage memory of the dynamic RAM type. If the dot clock H_D is inhibited, the RAM memory could not be addressed during approximately 8 milliseconds which would be an excessive amount of time for a dynamic RAM memory which requires a refreshment of the 64 columns every two milliseconds. The addressing of rows in the RAM memory may be stopped by inhibiting the input incrementation of the counter p.CNT at the end of a page of text until the moment when the vertical framing pulse CDG.V arrives as shown in FIG. 9c. The output signals of the counter p.CNT which are used to address the character generator ROM 200 must be adapted to the particular type of memory. If, for example, the ROM has 5 columns of dots and 8 rows of dots, with the first row of rank 0 not being used, and if it is desired to obtain a vertical separation of 5 dots between characters, a logical interface circuit must be inserted between the p.CNT counter and the ROM memory 200. A circuit of this type is shown in FIG. 9d. The input signals P_0 - P_2 from the counter p.CNT are inverted and applied to one of the input lines of NOR gates whereas the other input of these gates receives the signal p_3 . The output signals R_0 - R_2 of these gates are then applied to the address inputs of the ROM 200 while the signals p_0 - p_2 are applied to the status input of the p.CNT counter. A table

as illustrated in FIG. 9e shows the diagram of the sequence of addresses.

It has been seen that the state of the display address counters must be recognized and for this purpose there must be deployed recognition elements. These status recognition elements may be gates which use the Boolean sum of the counter outputs. A different method based on temporal recognition is shown in FIG. 10. In order to produce a circuit that recognizes the value K of a counter which counts modulo N , with $0 \leq K \leq N$, one may use a Boolean recognition circuit for the value K' and reduce that value by a quantity $(K - K')$ modulo N . By way of example, the outputs of a modulo 16 counter are shown incremented by a signal S and supply the inputs of an AND gate 2 feeding a sequence of flip-flops 3 which are clocked by the same signal S which sequentially retards the output of the gate 2.

There will now be described the circuits which permit the upward shift of a page of text, i.e. to produce the function of the terminal in the scrolling or roll-up mode. In the previous configurations of chaining together the display address counters, each character box of rank N_p is stored in the address code memory. In order to operate in the roll-up mode, the rows of characters must be able to be displaced upwardly on the cathode ray screen.

One method for obtaining this upward movement is to submit the incrementation of the p.CNT counter and the Y.CNT counter to a register whose content is equal to the number of the last row of characters to be inscribed.

FIG. 11a illustrates an exemplary circuit for thus incrementing the counters p.CNT and Y.CNT. The output of a register FL whose content K ($0 \leq K \leq Y_N$) is compared in a comparator C with the content of the counter Y.CNT. It will be noted that, when the content of the register FL is all ones (1111), the previous configuration is restored.

FIG. 11b is a timing diagram of the sequences associated with the roll-up mode; the diagram A illustrating conditions when the contents of the register FL are 15 units, and in B when the contents of the register FL are 4 units.

The contents of the register FL are modified in connection with the writing mode which will be developed ultimately. The partial description of the elements which constitute the processing block for the addresses of writing/display of characters makes it possible to establish the complete block diagram for this circuit as represented in FIG. 12.

There will now be described the means for writing characters and first of all the means for addressing the character code RAM memory 100. The addressing circuits are shown in simplified manner in FIG. 13 and are constituted by a writing pointer consisting of two chained registers, PT_X and PT_Y with a total capacity of 10 bits, whose content shows the address of the next character to be written in the RAM memory to be displayed consecutively. A writing operation thus involves an inscription or a writing into the character code memory 100 and thereafter the modification of the contents of the writing pointer. A writing operation depends on the presence of the STROBE signal STR which is a service signal that validates the character code received, the nature of the operation being specified by the 3-bit word C_0, C_1, C_2 or by the writing code. These writing circuits are active only during a time period when the inhibit signal INI for the dot clock H_D

is present. The address words coming from the registers PT_X and PT_Y are multiplexed in time by the multiplexer 300 which is controlled by the inhibit signal INI. The writing operation specified by the writing code C_0, C_1, C_2 may be divided into two classes: one class which has only a simple cycle and which is executed during the presence of the inhibit signal INI and another class which includes complex cycles executed during several periods of the presence of the inhibit signal INI.

A writing operation in a simple cycle will involve: The eventual inscription of a word of character code in the RAM memory.

And/or a displacement of the writing cursor (+1, -1, +64, -64) corresponding respectively to a displacement to the right, to the left or up or down by one row of characters.

In FIG. 14a are illustrated the elements which are necessary for executing a simple cycle; they include, for example, three flip-flops S, W, P of the master-slave type, wherein the slave portion of the flip-flop copies the status of the master flip-flop if the clock input is low. With the aid of the flip-flop W, the horizontal synchronization sweep signal S_H samples the output signal Q_S of a flip-flop S which is set by the signal STR. The output signal W_0 of the flip-flop W authorizes a write operation as specified by the writing code C_0, C_1, C_2 . The output Q_W of the flip-flop P is sampled by the signal S_H thereby generating a signal CK.W which increments the writing pointer PT_X, PT_Y and resets the flip-flops W and S. The flip-flop P is reset by the horizontal framing signal CDG.H which thus completes a simple cycle. Depending on the writing code C_0, C_1, C_2 , either the character to be displayed is written in the RAM memory or the writing pointer is incremented.

FIG. 14b is a timing diagram of the signals generated by the circuits of FIG. 14a. The leading edge of the signal S_H clocks the flip-flop W while the trailing edge clocks the flip-flop P. The leading edge of the signal CDG.H clears the flip-flop P and thus concludes a simple write cycle.

The complex cycles are also conditioned by the presence of the strobe signal STR, and they include:

Resetting the writing pointer to 0, writing in the character code memory RAM 1,024 blank characters so as to erase all of the characters in that memory and thus to generate a blank page of characters on the cathode ray screen;

Writing 64 blanks in the RAM memory without changing the content of the writing address register PT_Y so as to erase one whole row of characters;

Incrementing the contents of the writing address register PT_X and writing blanks in the RAM memory until the instant when the contents of the PT_X register correspond to the return of the writing cursor to the beginning of a row of characters.

The elements for performing complex writing cycles are illustrated in FIG. 15. It has previously been shown that the input D_W of the flip-flop W, if at high level, permits generating a write cycle at the rate of the line sweep signal S_H of the TV screen. If the high level of the D input of the flip-flop W is maintained during a predetermined time which is a function of the number of characters or of blanks to be inscribed, it is possible to produce complex cycles. For this purpose, the signals SC_S and SC_L generated by the time base of the television sweep synchronization are used, the duration of the signals SC_S and SC_L being, respectively, 1,024 and 64 times as long as the repetition period T_H of the horizon-

tal synchronization signal S_H . It should be noted that for complex cycles, it is necessary to inscribe blank characters in the RAM memory and that the inscription of each character requires generating a simple writing cycle. It may also be noted that during the erasure of one row of characters and the erasure of the end of a row of characters, it is necessary to inhibit the effect of the register PT_X on the register PT_Y so as to prevent any change of the row of the writing cursor.

The foregoing considerations are related to the circuit diagram for a complex cycle as represented in FIG. 15. During a complex cycle, a high level signal should be present at one of the D entries of the flip-flops RC_1 , CL_1 , and CL_2 . The arrival of a strobe signal STR then starts a simple write cycle and the signal CK_W memorizes the corresponding command in one of the flip-flops. If the operation specified by the writing code C_0 , C_1 , C_2 is an erasure of the remaining part of a row of characters, then the flip-flop RC_2 is forced high until the time when the content of the register PT_X of the writing pointer is 0. For this purpose, the content of the writing register PT_X is detected and applied to the input CK of the flip-flop RC_2 . During the entire cycle, the output signal PB of the OR gate 401 is applied to an operator 402 which forces the code C_0 , C_1 , C_2 to the normal character writing code and at the same time it is also applied to an operator 150 placed above the character code memory 100 and forces the character code to be a blank.

The two other complex cycles function in the same way with the exception that the flip-flops CL_2 and EL_2 which correspond to the writing codes of erasure of a page and erasure of a row of characters are maintained at a high level until the appearance of the second increasing, i.e. leading, edge of the signals S_{CS} and S_{CL} . It will also be noted that the insertion of an AND gate between the PT_X and PT_Y registers makes it possible to inhibit the communication of the PT_X register with the PT_Y register during the duration of the complex cycles "erasure of a row of characters" and "erasure of the remainder of a row of characters".

The element 405 is a decoder matrix which translates the code word for the various operational orders in the manner tabulated in the following table:

$C_2 C_1 C_0$	Operations Code
0 0 0	Erase page
0 0 1	Erase end of row of characters
0 1 0	Lower by one line
0 1 1	Inhibit character sent
1 0 0	Return cursor
1 0 1	Erase or transfer row
1 1 0	Raise by one line
1 1 1	Normal character

There will now follow a description of those elements which serve to display the writing cursor and these elements are illustrated in a schematic diagram in FIG. 16. The circuit for generating the writing cursor includes a 10-bit comparator 800 which compares the contents of the writing pointer constituted by the registers PT_X and PT_Y with the contents of the display address counters $X.CNT$ and $Y.CNT$, it being kept in mind that the contents of the writing pointer correspond to the address of the next character to be inscribed and that the writing cursor is represented on the cathode ray screen by a horizontal bar of a length of 5 dots which appears on the line of 9th rank in the dot

matrix of a character box. The write cursor is displayed during the display phase by forcing the input to the buffer register to a logical 1. The output signal PT_0 of the comparator 800 is retarded by one incremental period of the counter $C.CNT$ because of the presence of the buffer register 210, and this operation is performed by a flip-flop 810 which is controlled by the pulses CK_X which increment the counter $p.CNT$.

Next to be described are the elements for insuring the operating mode in which text is scrolled or rolled up on the screen and these elements are presented in FIG. 17. The roll-up mode requires the FL register and this register contains the number of the last line below the page of text, the content of the register FL being between 0 and 15. Thus, in order to obtain the roll-up mode, it is sufficient to increment the FL register at the same time as the upper part PT_Y of the writing pointer. The comparison between the contents of the FL register and the upper part PT_Y of the writing pointer is performed by the comparator C which has a capacity of 4 bits. Subsequent to the incrementation of the FL register, the new last line displayed corresponds to the oldest previous line of text. This line is generally composed of character codes so that it must be erased or blanked out so that the lines which appear from the bottom of the cathode ray screen are continuously free of characters as if they came from a roll of paper. To achieve this effect, a line erasure cycle is automatically started when the FL register is incremented. For this purpose, the flip-flop EL_1 which registers a line erasure command is interfaced with an OR gate 601. When the control code "screen erasure" arrives, this order is registered in the flip-flop CL_1 and subsequently by the flip-flop CL_2 , at the same time as the contents of the writing pointer are annulled (RAZ) and the register FL is forced to assume the code "1111" which corresponds to the row of characters of the 15th rank.

It will now be described how several pages are chained together in the character code memory.

When the processor functions in the scrolling or roll-up mode, it may be desirable to save those parts of the text which have been written. This may be done by installing a storage memory having a capacity of $U \times 1,024$ words of 6-bits, organized in $U=2^n$ pages. Thus, means must be provided for writing and reading a page of rank U_p . One way to perform the chaining together of pages is shown in FIG. 18a. A page counter $U.CNT$ which shows the rank of a page being processed is incremented by the output RP of the register FL. The address of the actual page will be deduced from its value diminished by one unit or not, depending on whether one is located at the bottom of the preceding page, i.e. the top of the screen, or the top of the new page, i.e. the bottom of the screen, the deduction being made by comparing the address "row of the character box" with the value of the contents of the register FL. An adder ADD is inserted in the page address bus of the character code memory 100; this adder is controlled by the signal RS coming from the comparator C. The signal RS is at a low logical level when the displayed part of the page of text belongs to the preceding page and the signal RS is at a high logical level if the part of the page of text being displayed belongs to the top of the current page.

In the illustration of FIG. 18b, the diagram A represents the position of the cathode ray screen on the linked pages of text and in diagram B there is shown the

corresponding position of the rows of character boxes on the screen. The manner of chaining or linking together the pages of text is shown in FIG. 18c in a timing diagram for the rows of character boxes with respect, on one hand, to the vertical synchronization pulses of the television scan and, on the other hand, with respect to the sequence of pages U_h of rank U_p and U_{p-1} . The capacity of the text-linking circuit described above is limited only by the size and cost of the character code memory 100.

It has previously been shown that the operation of the roll-up mode required two address comparators: a first comparator between the register FL and the address of the rows of displayed characters which permits stopping the display when the last row of characters is being displayed on the screen and a second comparator between the register FL and the writing address so as to know when it is proper to increment the register FL. It is possible to join these two comparators in a single comparator by time-multiplexing the display and writing addresses. However, when the writing causes an incrementation of the FL register, it is possible that a parasitic line can appear at the bottom of the TV screen although only during the first scan. In order to eliminate this phenomenon, one must double the size of the register FL; the first register FL ν is used for display while the second is used for writing as shown in FIG. 19. The contents of the register FL ν are modified only at the beginning of the vertical sweep which is the phase during which the display means are inhibited and to this effect the vertical synchronization pulses S ν for the television scan are applied to the register FL ν . The registers FL and FL ν are multiplexed by the multiplexer 350 whose output is compared in the comparator C which also receives the address bus for the character

code memory 100. The manner of integrating the above-described processor in an LSI configuration (large scale integration) will now be discussed. Any large scale integration of a circuit is subject to various constraints: The maximum number of input/output lines of a circuit, the maximum capacity of the integrable components on the silicon wafer, the upper operational frequency, various non-integrable components, the flexibility of usage of the device, the number of power supply sources, etc. In the present case, it appears reasonable to limit the number of input/output lines to a standard 28 lines, the next higher standard value being 40 lines for commercially made circuits. If it is desired to keep the processor as flexible as possible in its application, the character code memory, the character generator and the control generators cannot be integrated into the single circuit. Furthermore, the memory circuits are easily available in the commercial market. For this reason, the input data bus connected to the character code memory and to the identification memory for control codes leads to the placement of the blanking operator for character codes on the outside of the integrated circuit. Given that the operational frequency of the dot clock H $_D$ of the display counter 1.CNT is higher than 10 MHz, these elements are also advantageously disposed externally of the integrated circuit. The page-linking circuit whose capacity depends on the desired application should also be placed outside of the integrated circuit as should the quartz crystal which controls the frequency stability of the TV sweep clock H $_0$.

In order to permit limiting the number of lines of the integrated circuit to 28, it is suitable to multiplex certain

ones of the input/output signals which are temporally orthogonal, for example the signal PB which is used to force the character codes to be blank during an erasure of the characters in a write cycle may be multiplexed with the address signal R $_2$ of the ROM character generator which is used only during the display period and the inhibition signal INI may be used for this purpose.

FIG. 20 illustrates the manner of interconnecting the processor module and the associated elements which together constitute the processor assembly. The assignment of the various input/output buses is recapitulated hereinafter.

Signal	Number of bus	
A $_0$ -A $_4$	18 to 22	Addresses for the character code memory.
A $_5$ -A $_9$	8 to 4	Addresses delivered by the X.CNT counter which counts continuously so as to permit the possible refreshment of the dynamic RAM memory. The memory cycle should be lower than 500 ns.
R $_0$ -R $_2$	11 to 13	Addresses of the "line" portion of the character generator ROM 200. The line 000 must be blank for all characters and the access time of the ROM must be less than 600 ns. The address signal R $_2$ is multiplexed with the control signal PB.
PT	15	The writing cursor signal furnished to the character generator ROM.
C $_0$ -C $_2$	23 to 25	Input lines for the writing code, the character write code, the displacement of the cursor, and erasure (see table page 36).
STR	16	Validation signal for writing codes.
W	17	Signal for writing in the character code memory 100.
CK.1	9	Incrementation signal for the counters X.CNT, p.CNT and Y.CNT.
INI		Inhibition output signal for the dot clock H $_D$, duration approximately 20 μ s, repetition period 64 μ s.
Q $_1$ -Q $_0$	1 to 2	Connections to the quartz crystal of the television sweep clock H $_0$.
SYNC	26	Multiplex synchronization TV signals S $_H$ and S $_V$.
R.P	27	Incrementation signal for the page counter.
R.S	3	Identification of the displayed page whether preceding or current page.
VSS	14	+5 V power supply.
VDD	28	Ground.

For example, a processor of this type may be integrated in N-MOS technology in a silicon matrix.

The description of the invention will now be concluded by giving an example of an application in which a processor is integrated on a silicon wafer encapsulated in an integrated circuit having 28 lines similar to that described above. The processor and its associated components are shown in a functional block diagram in FIG. 21. This processor permits a display of four pages of text of 1024 characters of 6-bits each, and using a dynamic RAM storage memory and a character generator ROM capable of generating an alphabet of 64 characters. The integrated circuit portion J is connected to

a number of associated circuits which may for example be of the following general commercially available type:

A-B-C-D-E-F, dynamic RAM memories of type 2107 B marketed by the firm INTEL.

G, a buffer stage, for example the integrated circuit 74174 marketed by THOMSON-CSF, Division SESCOSEM.

H, a ROM character generator of the type RO-3-2513 marketed by GENERAL INSTRUMENTS.

I, a parallel-to-series converter of the type 74165 marketed by THOMSON-CSF, Division SESCOSEM.

K, a counter of the type DM 8556 marketed by NATIONAL SEMICONDUCTORS.

L, a ROM of type 71301 marketed by THOMSON-CSF, Division SESCOSEM.

M, an adder of the type 7483 marketed by THOMSON-CSF, Division SESCOSEM.

N, a register of the type 74193 marketed by THOMSON-CSF, Division SESCOSEM.

O, a NAND gate of the type 7400 marketed by THOMSON-CSF, Division SESCOSEM.

P, an operating circuit of the type SFC.5452 marketed by THOMSON-CSF, Division SESCOSEM.

Q, an integrated circuit of the type 74132 marketed by THOMSON-CSF, Division SESCOSEM.

R, an inverter of the type 7404 marketed by THOMSON-CSF, Division SESCOSEM.

S, a UART of the type AY-5-1013 marketed by A.M.I.

T, a clock of type MC 14411 marketed by MOTOROLA.

U, gates of the type MC 1488 marketed by MOTOROLA.

V, gates of the type MC 1489 marketed by MOTOROLA.

W, an NPN transistor of type 2 N 2222 used as the multiplexing stage for the character dots and the synchronization pulses S_V and S_H for the television scan.

It will be appreciated that the list of particular integrated circuit elements given above is entirely exemplary and that similar circuits produced by other commercial firms would be entirely satisfactory.

Similarly, the various examples of the circuits shown to accomplish the functions described, the numerical values of principal parameters and the general nomenclature of elements within the description are entirely exemplary. In particular, the format of the text pages could be altered, both with respect to the number of rows of character boxes as with respect to the number of columns of characters. The scan characteristics of the television receiver may be adapted to various standards. The capacity of the character code RAM memory is entirely dictated by the intended operational conditions. The prior programming of the operational decoder ROM may be altered to either increase or decrease the facilities that use the system.

One of the principal applications of the processor according to the present invention is in constituting a video communication terminal which may be used to conduct a dialogue between a computer and a person. If the computer itself is located near the video terminal, the telephone and associated components may be eliminated, for example in local control applications in control consoles and the like, i.e. wherever a person communicates directly with a computer. A video terminal of the type described in the present invention may advantageously take the place of a teletypewriter.

The particular advantages provided by the present invention which are of considerable significance with respect to the prior art are, among others, the cadence with which characters are written into memory, the manner in which the size of the characters displayed is controllable, the capability of using a character code memory of several pages with the employment of linked dynamic RAMS, and the architecture of the various circuits in such a way as to permit large scale integration. The processor according to the present invention and the video terminal which it controls have a great flexibility of use, permitting their adaptation to only that level required by the intended tasks.

The foregoing relates to preferred exemplary embodiments of the invention, it being understood that other embodiments and variants thereof are possible within the spirit and scope of the invention.

What is claimed and desired to be secured by Letters Patent of the United States is:

1. A digital processor connected between a data bus and a conventional TV set having a CRT screen and a scanning means, said TV set operating according to a raster-scan system of m lines per frame and s frames per second, said digital processor permitting the display, in the form of discrete dots having a time base for writing, on the CRT screen, a page of alphanumeric characters having an alphabet of 2^N characters, a page of characters being composed of Y rows of character cells, each row being composed of X character cells, each character cell being composed of a matrix of 1 by p dots, and a writing cursor indicating the position of the next character which is to be inscribed, said digital processor including,

a ROM for decoding input instruction codes which enters said ROM, said ROM having: inputs connected to the data bus which carries said input instruction codes, and outputs;

an N-bits blanking operator, said blanking operator having: N inputs connected to the data bus, N outputs and one blank command input connection;

a REFRESH RAM connected for storing data representing said alphanumeric characters, said REFRESH RAM having a capacity of at least one page of X by Y words of N bits and having N data inputs connected to the N outputs of said blanking operator, and an input means for addressing said character cells, a Read/Write command input and N outputs;

an N-bits latch register, said register having N inputs connected to said N outputs of said REFRESH RAM, N outputs and a load command input connection;

a character ROM for generating 2^N distinct characters, said character ROM having data inputs connected to said latch register, a scanning means for scanning said character cells; the character ROM also having outputs equal in number to or less than the value L ;

a serializer register having inputs connected to said character ROM, a second load command input connection, a shift command input and an output connected to the TV set;

a package containing a semiconductor microchip comprising the following LSI circuits:

a timing generator which permits the synchronization of the TV set scanning means and of the other LSI circuits of said semiconductor microchip, this generator comprising: a clock signal source of fixed

frequency which increments a first counter including a decoder which provides TV line SYNC top-signals and pulse signals for horizontal centering of the page of displayed characters and a second counter including a decoder which provides TV frame SYNC top-signals and pulse signals for vertical centering of the page of displayed characters; an address signal generator comprising: a command circuit which generates a command signal; a clock signals source which generates clock signals at a frequency equal to the time base of the dots, said clock signals source connected to the command circuit to be disabled by the command signal, the address signal generator also comprising four linked counters including decoders which are incremented by the clock signals source; these connectors being: one modulo-L counter, one modulo-X counter, one modulo-P counter, one modulo-Y counter, an output of said counter modulo-L also being connected to the shift command input of said serializer register, the output of said modulo-L counter being connected to the first load command input of said latch register and the second load command of said serializer register, the outputs of the modulo-P counter being connected to the character ROM inputs means for scanning said character cells; the command circuit of the dot clock circuit including: a first input which receives said signals for horizontal centering and a second input connected to the output of said modulo-X counter decoder, the incrementation of the modulo-P counter being enabled by said pulse signals for vertical centering;

a writing address pointer with outputs connected to said REFRESH RAM, comprising an X-bits register linked through an inhibiting gate to a Y-bits register;

a first multiplexer comprising a first input connected to the outputs of said writing address pointer and a second input connected to outputs of the modulo-X and modulo-Y counters and also comprising (X+Y) outputs connected to the addressing means of said REFRESH RAM, and a command input connected to receive said command signal;

a decoding operator connected to said character ROM for decoding via a forcing operator means, said forcing operator means including a command input, said decoding operator being connected to generate command inputs to said writing address pointer;

a writing generator connected to operate in synchronism with the TV line SYNC top-signals, said writing generator connected to the Read/Write command input of said REFRESH RAM and connected to provide an input to the writing address pointer;

an erase generator for clearing an end of a row, a row, or a page of characters, said erase generator including inputs connected to said decoding operator, an output connected to the inhibiting gate of said writing address pointer, an output connected to the blank command input of said blanking operator and the command input of said forcing operators;

a writing cursor generator including: a comparator of (X+Y) bits with inputs connected respectively to the outputs of said writing pointer and the outputs of said modulo-X and modulo-Y counter; and an

inhibiting gate connected to receive the output of the writing cursor generator and to receive the outputs of said modulo-P counter and to generate a signal indicative thereof to the writing cursor.

2. A digital processor in accordance with claim 1, wherein the clock signals source of said address signal generator includes means for permitting the modification of its frequency.

3. A digital processor in accordance with claim 1, wherein said REFRESH RAM data is of the dynamic type.

4. A digital processor in accordance with claim 1, wherein said TV set is a "home TV receiver" type having an RF modulator.

5. A digital processor in accordance with claim 1, wherein said TV set is of the TV monitor type having a video input.

6. A digital processor in accordance with claim 1, wherein said timing generator for synchronization is a quartz-stabilized oscillator.

7. A digital processor in accordance with claim 1, including a modulo-XY counter connected to be incremented by the TV line SYNC top-signals, said XY counter furnishing a first signal for synchronization of the erase generator for erasing a row of characters and a second signal for erasing a page of text.

8. A digital processor in accordance with claim 1, wherein said clock signal source and the modulo-L counter of said address signal generator are disposed on the exterior of said LSI case.

9. A digital processor in accordance claim 1, including a decoding operator between the outputs of said modulo-P counter and the inputs of the scanning means of said character ROM.

10. A digital processor in accordance with claim 1, wherein the decoder of said modulo-Y counter is a programmable decoder controlled by the output signals of the Y bits register of the said writing address pointer in order to provide a roll-up function.

11. A digital processor in accordance with claim 1, wherein said erase generator includes a first circuit for erasing an end of a row of characters, a second circuit for erasing a complete row of characters and a third circuit for erasing a complete page of text, wherein the output of the first, second, and third erasing circuits are connected to an OR gate whose output is connected to the blank command input of said blanking operator and the command input of said forcing operators.

12. A digital processor in accordance with claim 11, wherein the output of the first and second erasing circuits are connected to a logic gate of the OR type whose output is connected to the input of the inhibiting gate included in said writing address pointer.

13. A digital processor in accordance with claim 1, wherein said modulo-Y counter of said address signal generator includes a programmable decoder including a further register for ranking the character rows, said further register being incremented by the output signal of a comparator which is connected between said further register and the Y bits register of said writing address pointer.

14. A digital processor in accordance with claim 13, wherein said character RAM comprises U pages of memory of X by Y words of N bits, said pages being linked by a means of linkage including, connected in series, a page counter indicating the page actually at hand, said page counter being incremented by a report output of said further register for the rows of charac-

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ters, and a subtractor controlled by the output of said comparator.

15. A digital processor in accordance with claim 1 including roll-up means for the page of alphanumeric characters, said roll-up means connected to the Y outputs of said first multiplexer and connected to the output of a further multiplexer including a control input connected to receive the command signal of the command circuit, a first register including an incrementa-

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tion input connected to the output of said comparator and a second register including a load command input which receives the TV frame SYNC top-signals, the output of the first register being connected to an input of said first multiplexer and to the input of the second register, the output of the second register being connected to the other input of said first multiplexer.

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United States Patent

Young et al.

[11] Patent Number: 5,808,608
[45] Date of Patent: Sep. 15, 1998

[54] BACKGROUND TELEVISION SCHEDULE SYSTEM

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[73] Assignee: StarNight Telecast, Inc., Fremont, Calif.

[21] Appl. No.: 627,804

[22] Filed: Apr. 10, 1996

Related U.S. Application Data

[60] Continuation of Ser. No. 400,064, Mar. 7, 1995, abandoned, which is a division of Ser. No. 79,503, Jun. 18, 1993, Pat. No. 5,358,156, which is a continuation-in-part of Ser. No. 33,773, Mar. 19, 1993, Pat. No. 5,353,121, which is a continuation-in-part of Ser. No. 579,555, Sep. 10, 1990, abandoned, and Ser. No. 916,043, Jul. 17, 1992, abandoned, which is a continuation of Ser. No. 778,404, Oct. 17, 1991, Pat. No. 5,151,789, which is a continuation-in-part of Ser. No. 428,620, Oct. 30, 1990, abandoned.

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[52] U.S. Cl. 345/327; 348/13; 348/563; 348/734; 348/906

[58] Field of Search 348/460, 461, 348/468, 473, 478, 552, 563, 564, 569, 570, 906, 754, 6, 12, 13; 386/1, 46; 345/326, 327; H04N 7/10, 7/14, 7/173, 5/44, 5/445

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Primary Examiner—Mark R. Powell

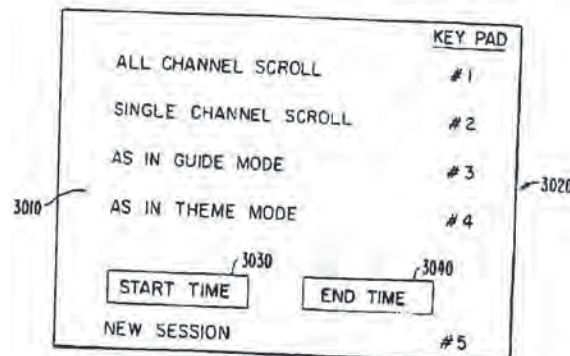
Assistant Examiner—John W. Miller

Attorney, Agent, or Firm—Christie, Parker & Hale, LLP

[57] ABSTRACT

Screen (10) for a user interface of a television schedule system and process consists of an array (24) of irregular cells (26), which vary in length, corresponding to different television program lengths of one half hour to one-and-one half hours or more. The array is arranged as three columns (28) of one-half hour in duration, and twelve rows (30) of program listings. Some of the program listings overlap two or more of the columns (28) because of their length. Because of the widely varying length of the cells (26), if a conventional cursor used to select a cell location were to simply step from one cell to another, the result would be abrupt changes in the screen (10) as the cursor moved from a cell (26) of several hours length to an adjacent cell in the same row. An effective way of taming the motion is to assume that behind every array (24) is an underlying array of regular cells. By restricting cursor movements to the regular cells, abrupt screen changes will be avoided. With the cursor (32), the entire cell (26) is 3-D highlighted, using a conventional offset shadow (34). The offset shadow (34) is a black bar that underlines the entire cell and wraps around the right edge of the cell. To tag the underlying position—which defines where the cursor (32) is and thus, where it will move next—portions (36) of the black bar outside the current underlying position are segmented, while the current position is painted solid.

6 Claims, 28 Drawing Sheets



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	11:00 AM	11:30 AM	12:00 PM
2	JUDGE(PART 1)	JUDGE(PART 2)	AT NOON
4	GOLDEN GIRLS	NEWS	INSIDE EDITION
5	YOUNG & RESTLESS	NEWS	NEWS
7	PERFECT STRA	LOVING	ALL MY CHILD
9	SESAME STREET		
13	ALL MY CHILDREN		NEWS
44	EVERYDAY		MOVIE
A&E	LORNE GREEN'S WORLD OF S		FUGITIVE
CNN	NEWS		NEWS
DIS	WALT DISNEY PRESENTS		LUNCH BOX
LIF	JANE WALLACE		FRUGAL GOURM
TNT	MOVIE		
CH 2	KNTV-FOX	CBL 2	11:25A
			TUE APR 3

FIG. 1.

32	40	48	11:00 AM	11:30 AM	12:00 PM
			JUDGE(PART 1)	JUDGE(PART 2)	AT NOON
[2]	[4]		GOLDEN GIRLS	NEWS	INSIDE EDITION
	[5]		YOUNG & RESTLESS ²⁶		NEWS ²⁶
	[7]		PERFECT STRA	LOVING	ALL MY CHILD
	[9]		SESAME STREET ²⁶		
	[13]		ALL MY CHILDREN		NEWS
	[44]		EVERYDAY ²⁶		MOVIE
[A&E]			LORNE GREEN'S WORLD OF S		FUGITIVE
[CNN]			NEWS		NEWS
[DIS]			WALT DISNEY PRESENTS		LUNCH BOX
[LIF]			JANE WALLACE		FRUGAL GOURM
[TNT]			MOVIE ²⁶		
[CH 2]	[KNTV-FOX]	[CBL 2]	[11:25A]	[TUE APR 3]	

FIG. 2.

	11:00 AM	11:30 AM	12:00 PM
[2]	JUDGE (PART 1)	JUDGE (PART 2)	AT NOON ³²
[4]	GOLDEN GIRLS	NEWS ²⁶	INSIDE EDITION
[5]	YOUNG & RESTLESS		NEWS ²⁶
[7]	PERFECT STRA	LOVING	ALL MY CHILD
[9]	SESAME STREET		
[13]	ALL MY CHILDREN		NEWS ²⁶
[44]	EVERYDAY ²⁶		MOVIE
[A&E]	LORNE GREEN'S WORLD OF S		FUGITIVE
[CNN]	NEWS		NEWS
[DIS]	WALT DISNEY PRESENTS		LUNCH BOX
[LIF]	JANE WALLACE		FRUGAL GOURM
[TNT]	MOVIE ²⁶		
[CH 2]	[KNTV-FOX]	[CBL 2]	

FIG. 3.

16

PENDING RECORDINGS	RECORDED PROGRAMS	LINKED TITLES	ON GRID PROG
NEWS	CH 4	4/3 11:30A	:30
ROSEANNE	CH 13	4/3 9:00P	:30
ALL MY CHILDREN	CH 7	4/4 12:00P	1:00
MACNEIL, LEHRER	CH 9	4/4 6:30P	1:00
QUANTUM LEAP	CH 4	4/5 10:00P	1:00
NOVA	CH 9	4/5 8:00P	1:00
MOVIE: ALIEN NATION	HBO	4/5 9:00P	2:00
ALL MY CHILDREN	CH 7	4/6 12:00P	1:00
CHEERS	CH 5	4/6 7:00P	:30
MOVIE: SUMMER JOB	SHO	4/6 9:00P	2:00
NBA BASKETBALL	CH 5	4/7 4:00P	?
		SP	EP

FIG. 4.

	11:00 AM	11:30 AM	12:00 PM
[2]	JUDGE(PART 1)	JUDGE(PART 2)	AT NOON
[4]	GOLDEN GIRLS	NEWS ²⁶	INSIDE EDITION
[5]	YOUNG & RESTLESS	⁴⁶	NEWS ²⁶
[7]	PERFECT STRA	LOVING	ALL MY CHILD
[9]	SESAME STREET ²⁶		
[13]	ALL MY CHILDREN		NEWS ²⁶
[44]	EVERYDAY		MOVIE
[A&E]	LORNE GREEN'S WORLD OF S		FUGITIVE
[CNN]	NEWS ²⁶		NEWS ¹⁸
[DIS]	WALT DISNEY PRESENTS		LUNCH BOX
[LIF]	JANE WALLACE		FRUGAL GOURM
[TNT]	MOVIE ²⁶		
[CH 2]	[KNTV-FOX]	[CBL 2]	[11:25A] [TUE APR 3]

FIG. 5.

	11:00 AM	11:30 AM	12:00 PM
[2]	JUDGE(PART 1)	JUDGE(PART 2)	AT NOON
[4]	GOLDEN GIRLS	NEWS ²⁶	INSIDE EDITION
[5]	YOUNG & RESTLESS		NEWS ²⁶
[7]	PERFECT STRA	LOVING	ALL MY CHILD
[9]	SESAME STREET ²⁶		
[13]	ALL MY CHILDREN		NEWS ²⁶
[44]	EVERYDAY ²⁶		MOVIE
[A&E]	LORNE GREEN'S WORLD OF S		FUGITIVE
[CNN]	NEWS		NEWS
[DIS]	DOROTHY BRINGS SOPHIA'S SISTER (NANCY WALKER) OVER FROM SICILY AS A BIRTHDAY SURPRISE		
[LIF]			
[TNT]			
[CH 2]	[KNTV-FOX]	[CBL 2]	[11:25A] [TUE APR 3]

FIG. 6.

WHAT'S NEXT ON CHANNEL 2		
11:00 A	JUDGE (PART 1)	60
11:30 A	JUDGE (PART 2)	
12:00 P	AT NOON	58
1:00 P	MOVIE: ANATOMY OF A SEDUCTION	
3:00 P	ALVIN AND THE CHIPMUNKS	22
3:30 P	SUPER MARIO BROS. SUPER SHOW	
4:00 P	CHIP'N DALES RESCUE RANGERS	58
4:30 P	DUCKTALES	
5:00 P	SILVER SPOONS	22
5:30 P	THREE'S COMPANY	
6:00 P	WHO'S THE BOSS	58
6:30 P	MAMA'S FAMILY	
7:00 P	CHEERS	22
CH 2	KNTV-FOX	
CBL 2	11:25A	

FIG. 7.

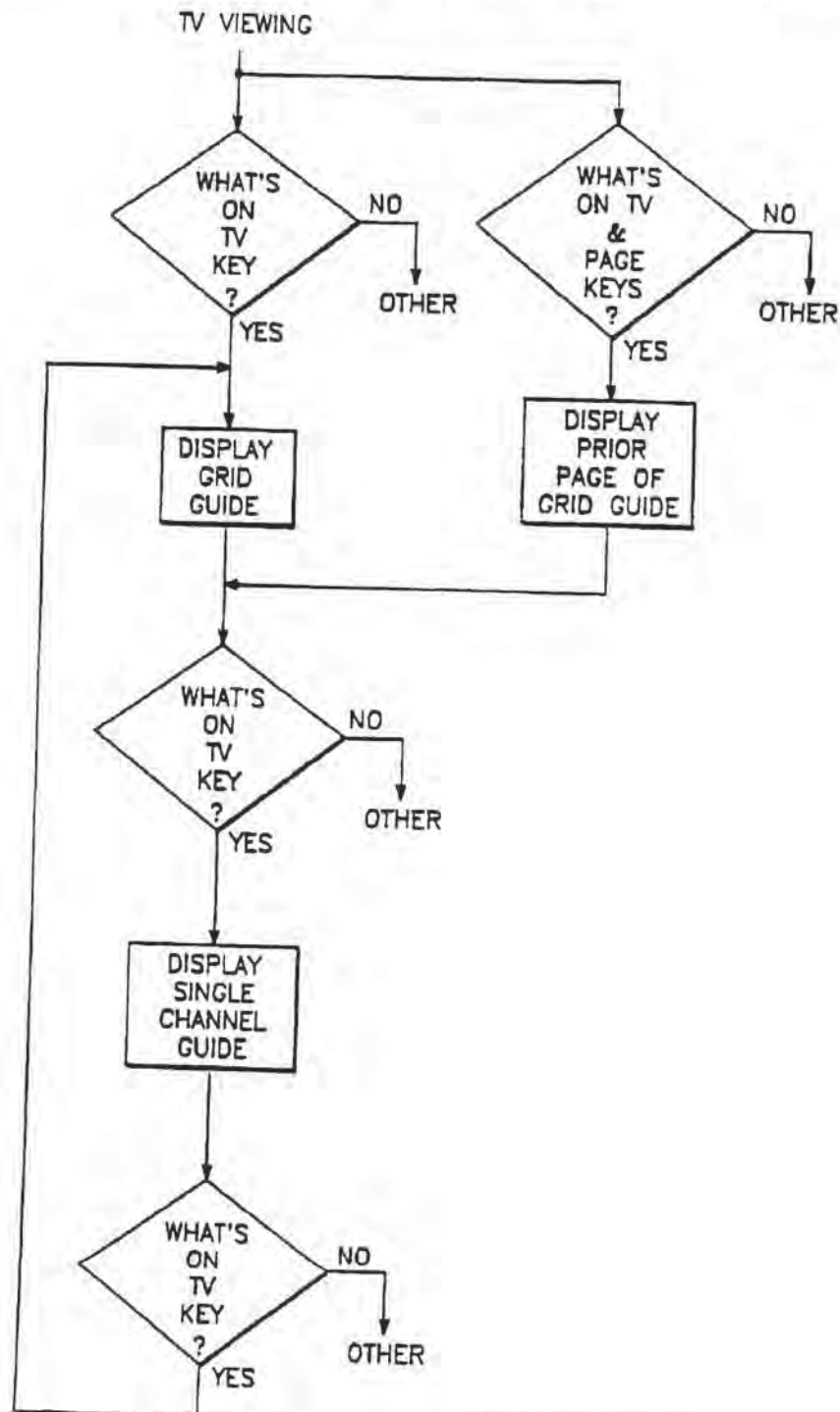
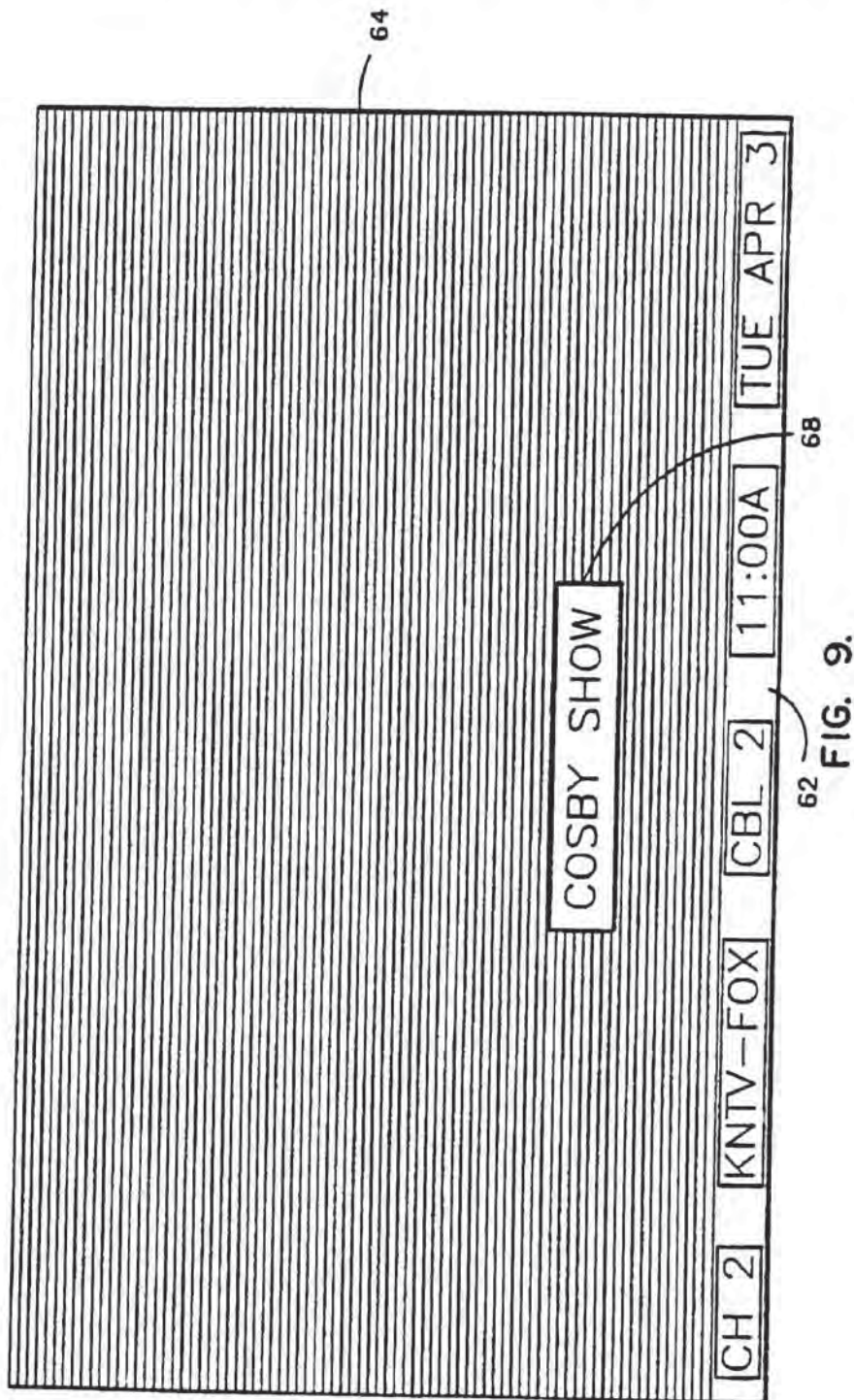


FIG.-8



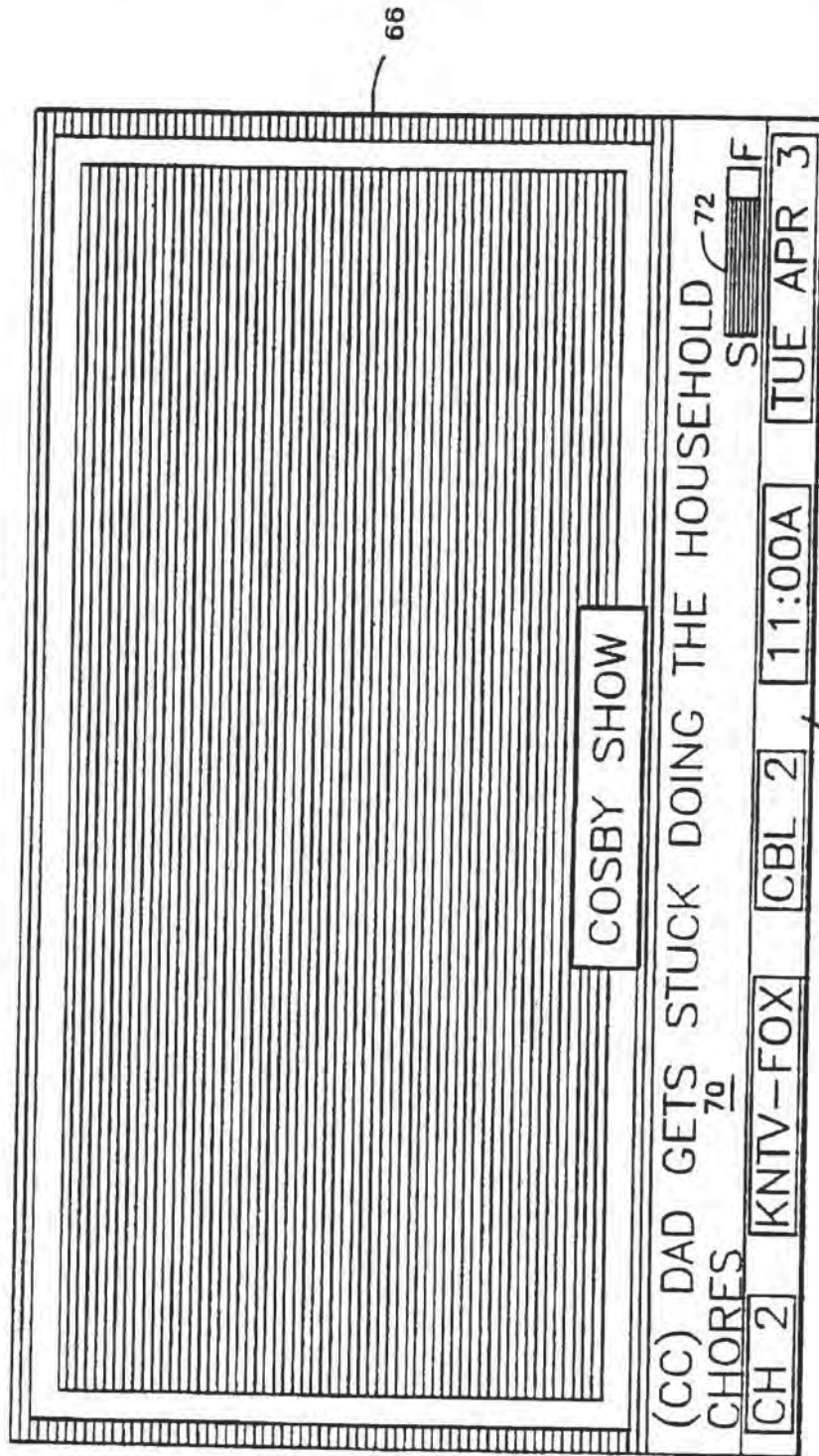


FIG. 10.

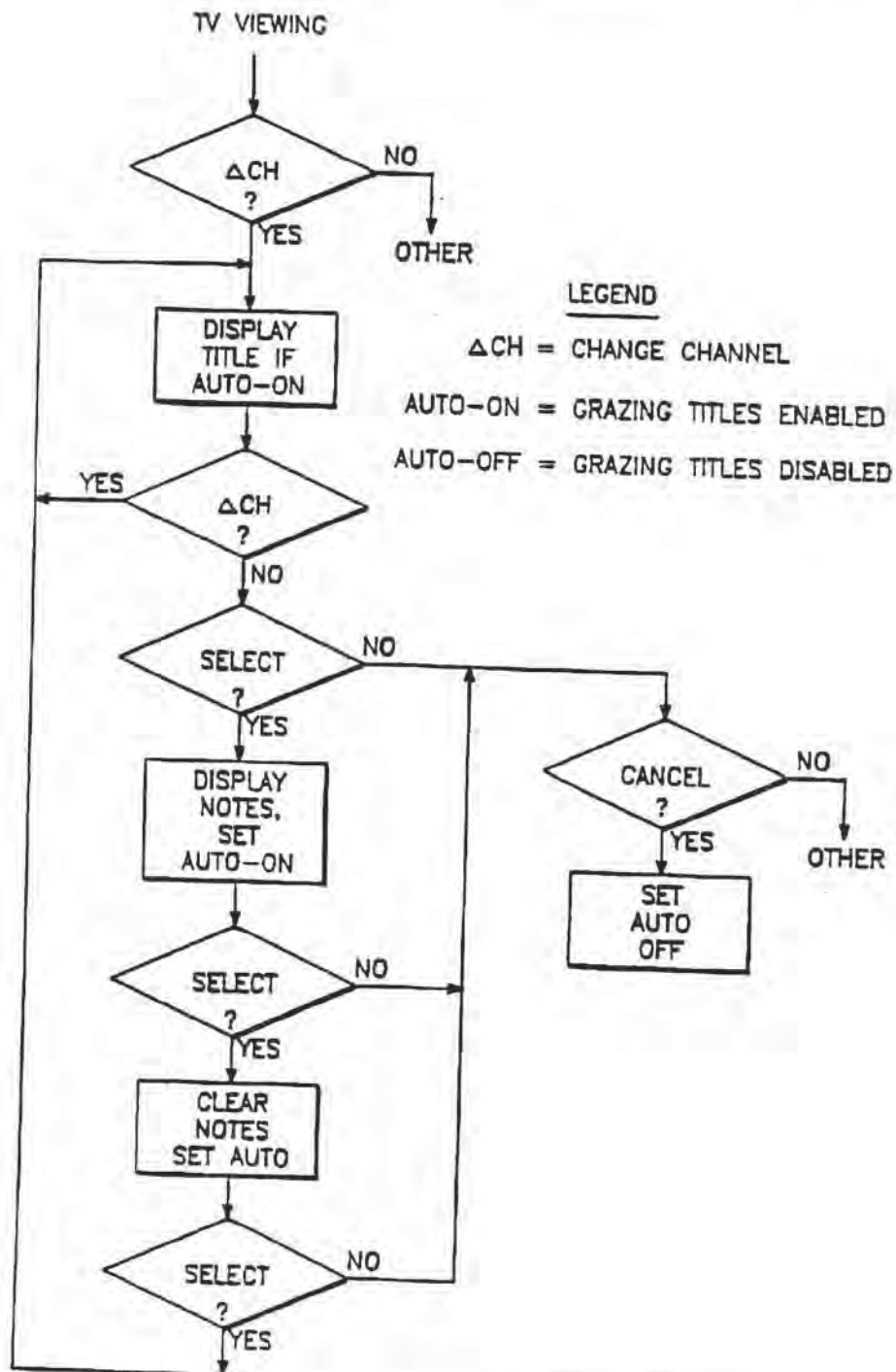


FIG.-11

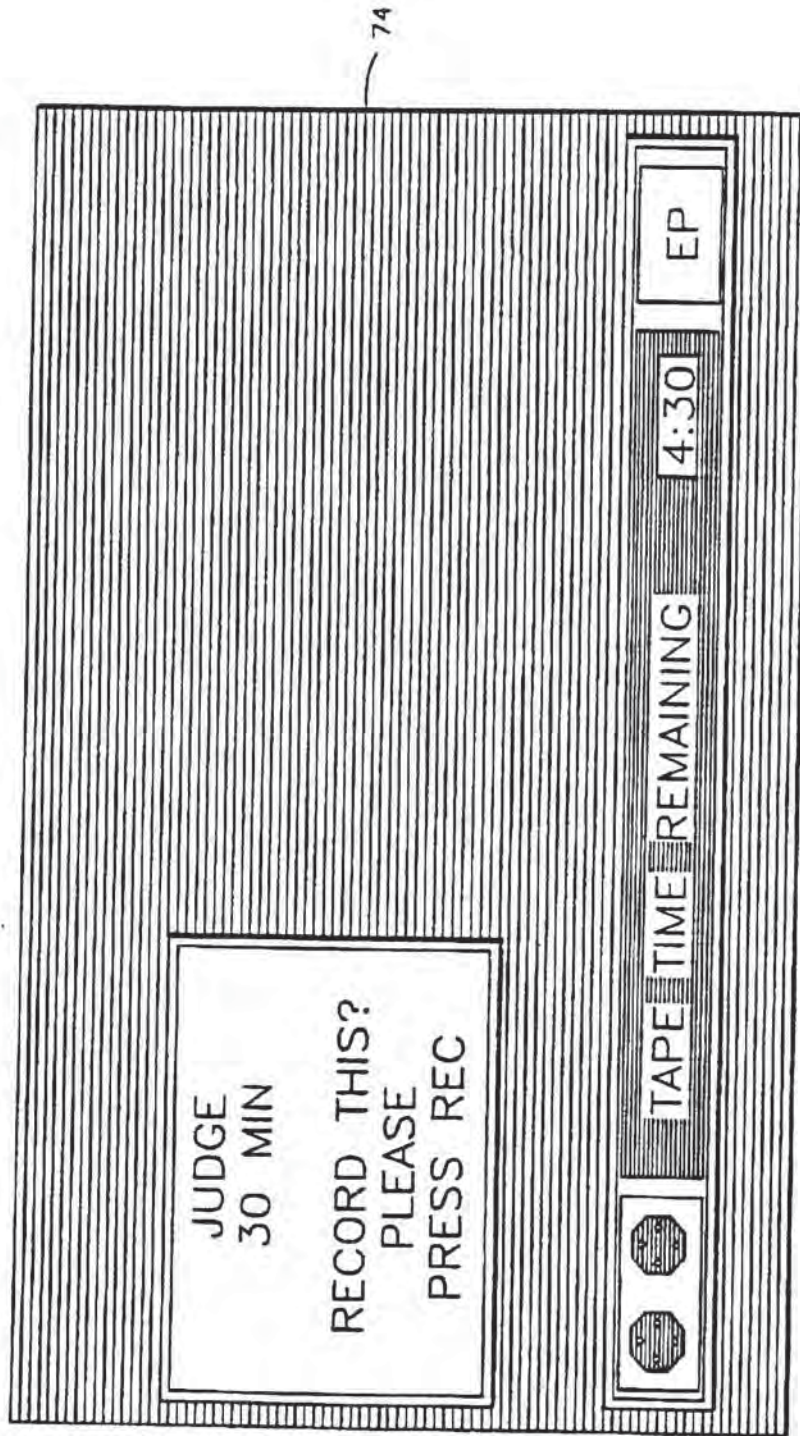


FIG. 12.

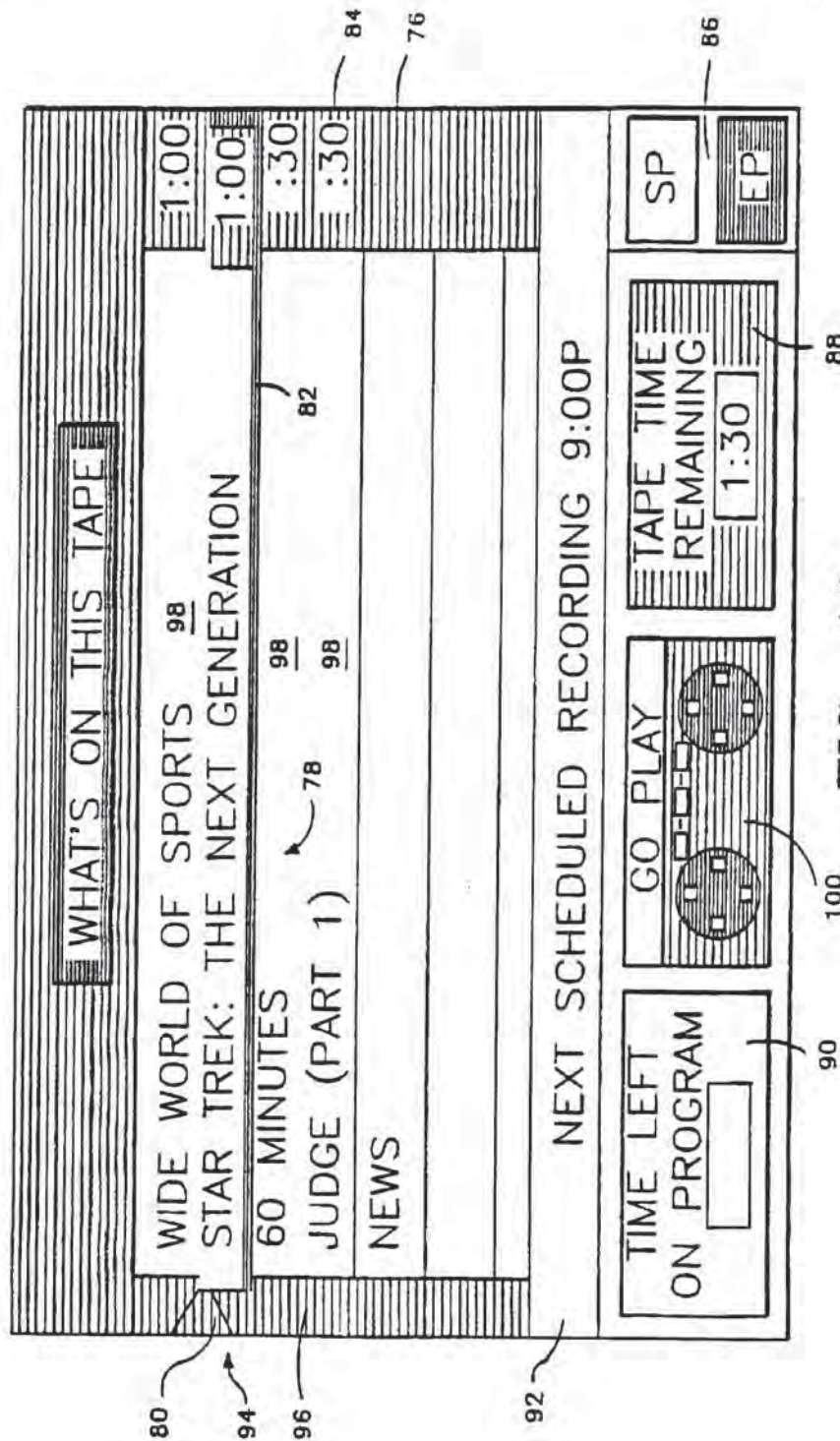


FIG. - 13

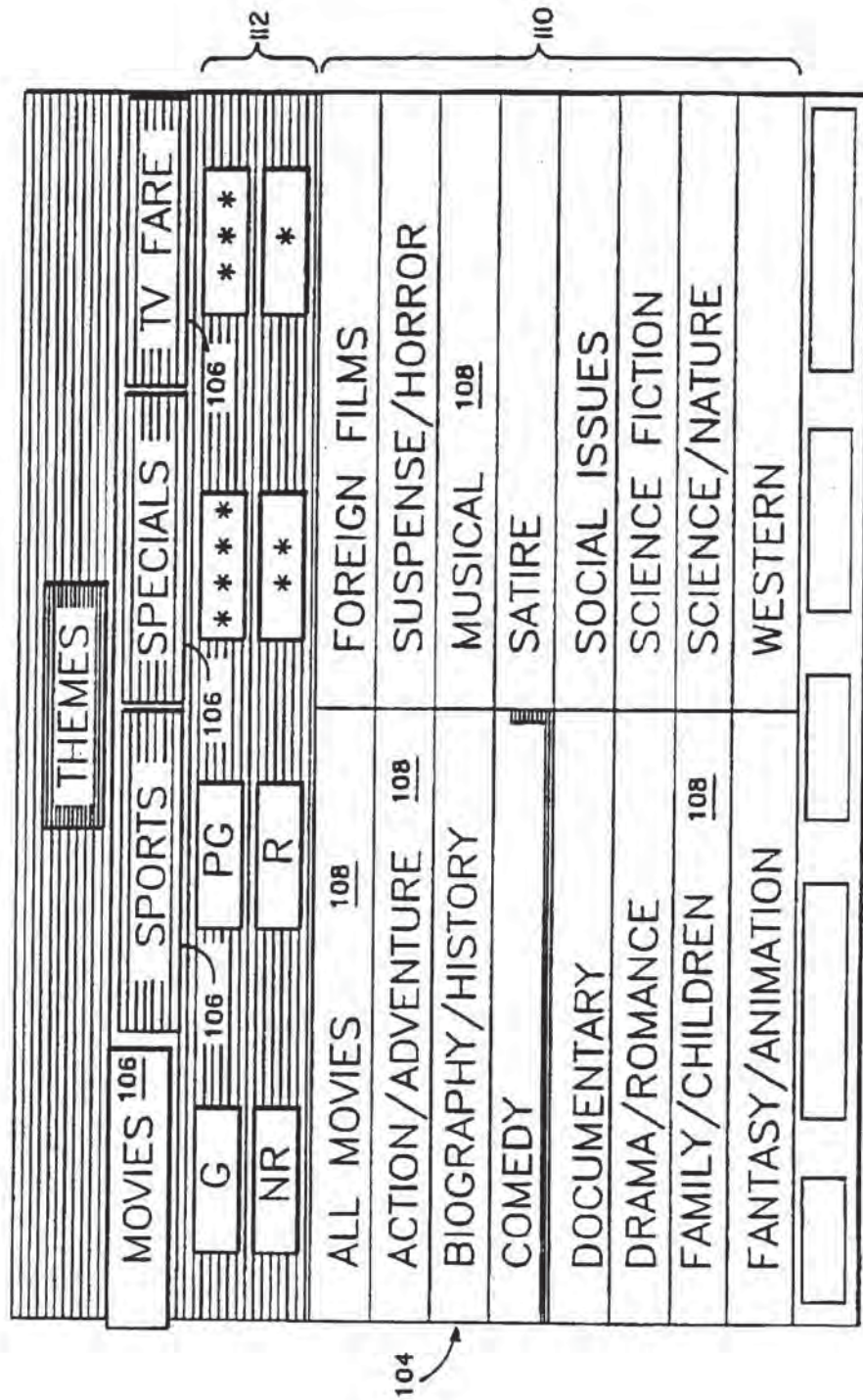


FIG. 14.

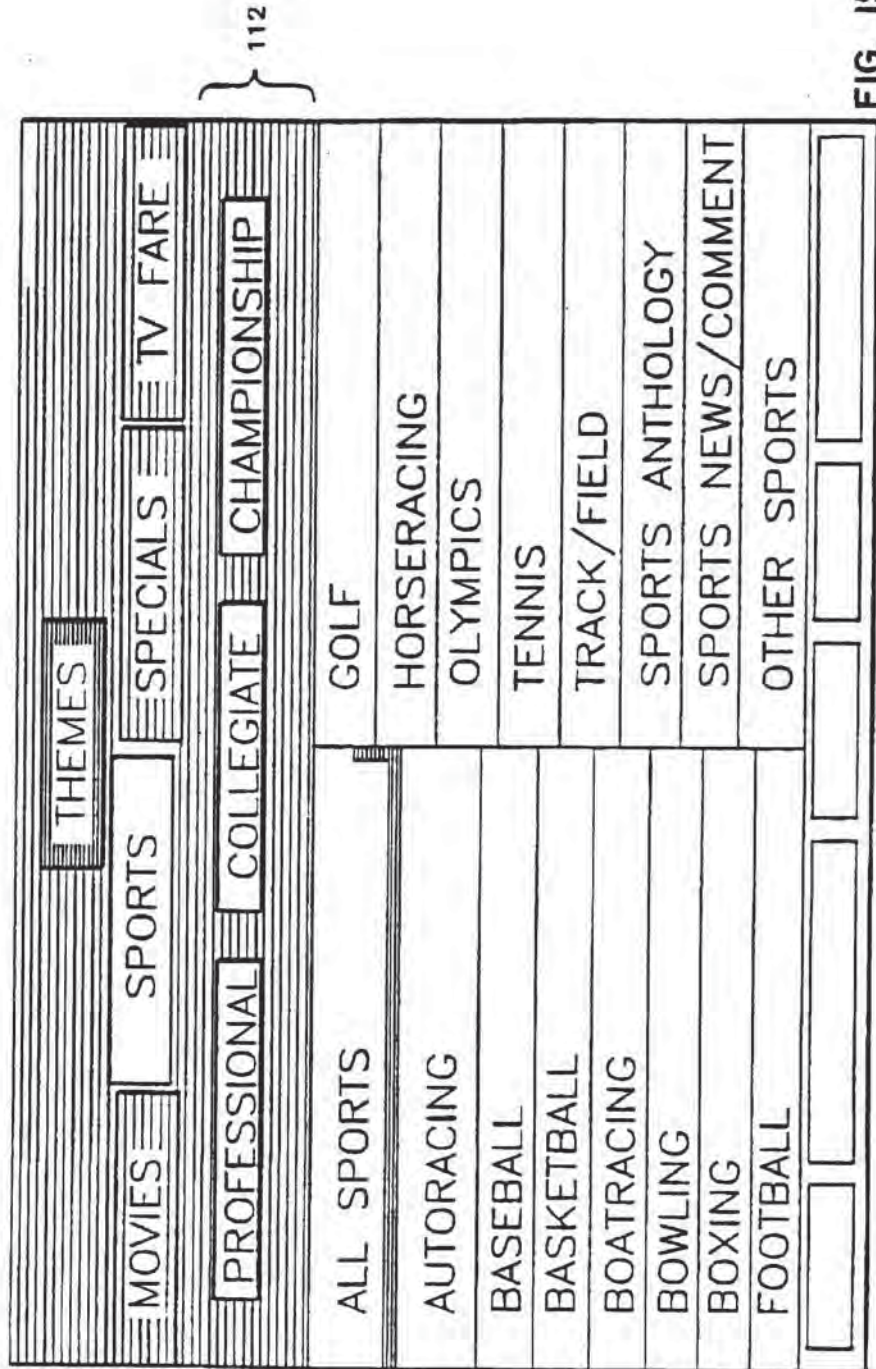


FIG. 15.

112

THEMES	
MOVIES	SPORTS
LIVE	SPECIALS
FIRST RUN	TV FARE
RERUN	
ALL SPECIALS	NEWS
AWARD/PAGEANTS	PICK OF THE WEEK
COMEDY	PIPELINE PROGRAMS
DRAMA	BULLETIN BOARD
ENTERTAINMENT	
FAMILY/CHILD	
HOLIDAY	
MINI-SERIES	
[]	[] [] [] [] []

FIG. 16.

112

THEMES	
MOVIES	TV FARE
SPORTS	SPECIALS
LIVE	RERUN
FIRST RUN	

ALL TV FARE	ETHNIC/DEVOTIONAL
ACTION/ADVENTURE	GAME SHOWS
ANIMATION/CARTOON	HEALTH/EXERCISE
BUSINESS/FINANCE	NEWS/INFORMATION
CHILDREN	MUSIC
COMEDY/VARIETY	SCI FI/HORROR
DRAMA/SUSPENSE	SCIENCE/NATURE
EDUCATIONAL	TALK SHOWS

FIG. 17.

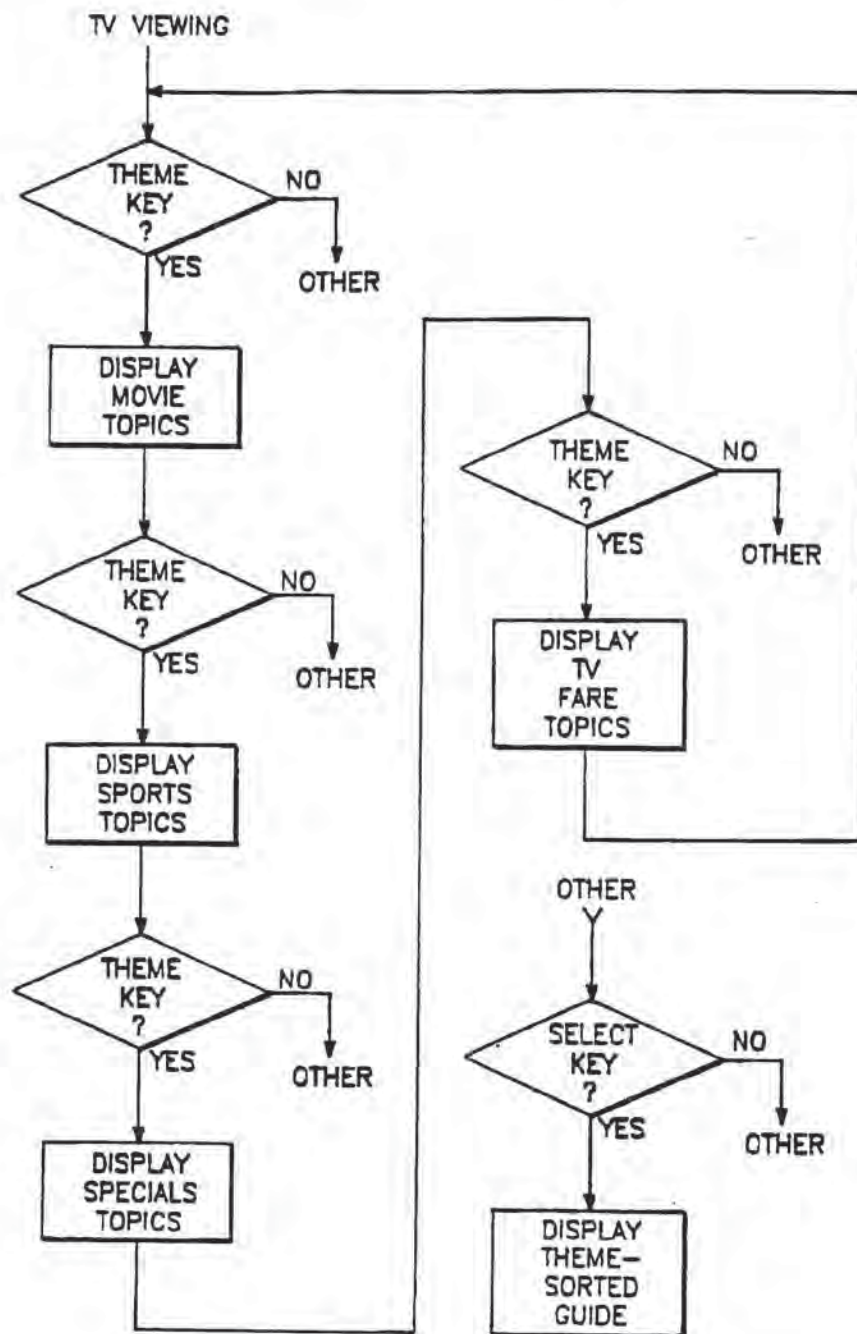


FIG.-18

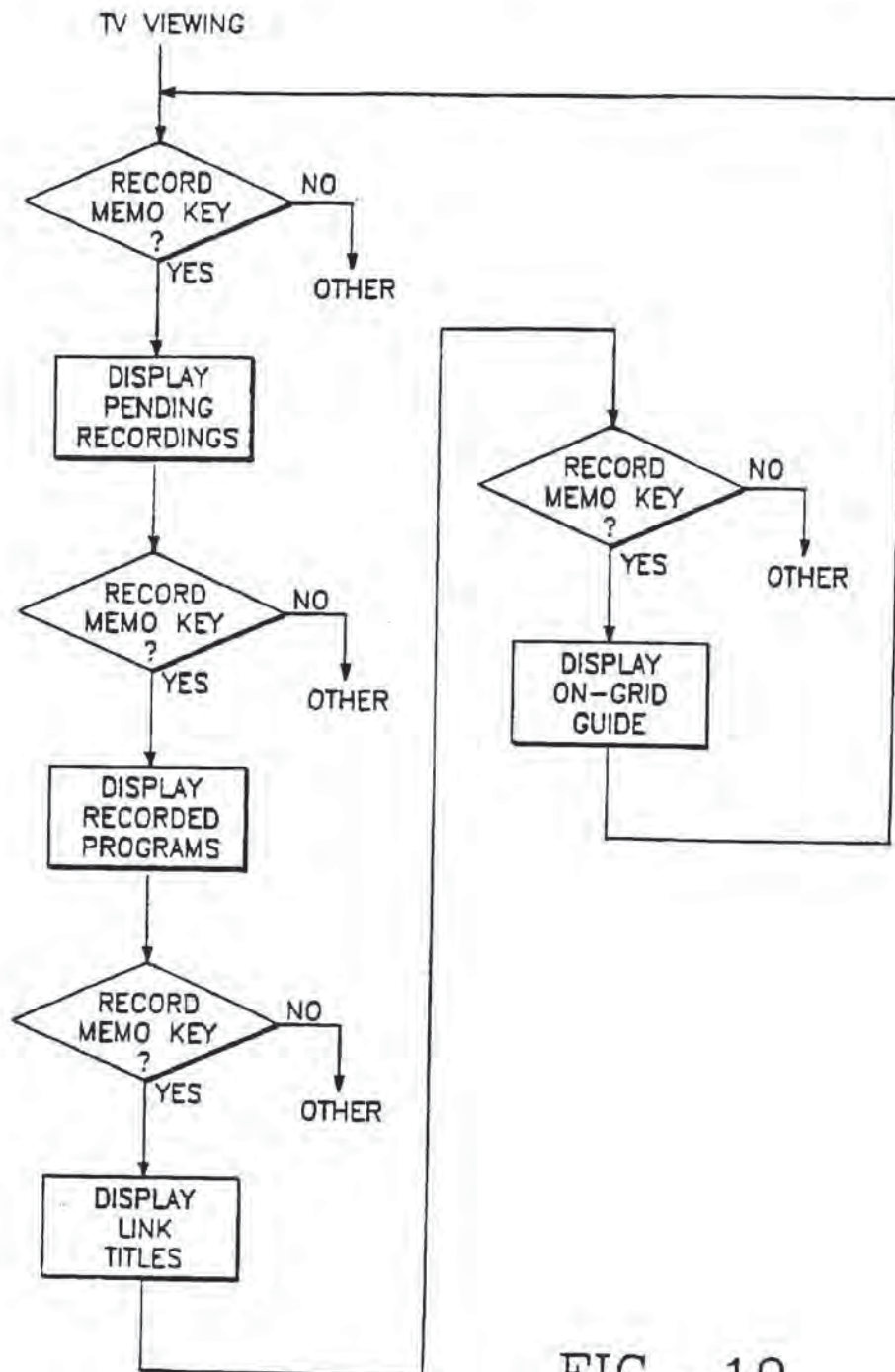


FIG.—19

CHANNEL CUSTOMIZATION										PAGE 1		
MY	2	KTVU-2	14	WGN	26	CSPAN						
	3	KICU-36	15	PPVW	27	MAX						
	4	KRON-4	16	KVOF-38	28	CSPAN						
	5	KPIX-5	17	WTBS	29	EDUC						
	6	KSTS-48	18	KCSM-60	30	DIS						
	7	KGO-7	19	KTSF-26	31	VH-1						
	8	KTEH-54	20	KOFY-20	32	SHO						
	9	KQED-9	21	TRVL	33	CNN						
	10	KDTV-14	22	CBN	34	ESPN						
	11	KNTV-11	23	CBB	35	LIF						
	12	KBHK-44	24	BDSS	36	HBO						
	13	KQEC-32	25	BARC	37	GALA						
USE SELECT TO CHANGE STATUS:										MY	OFF	ON

120

124

118

116

FIG. 20.

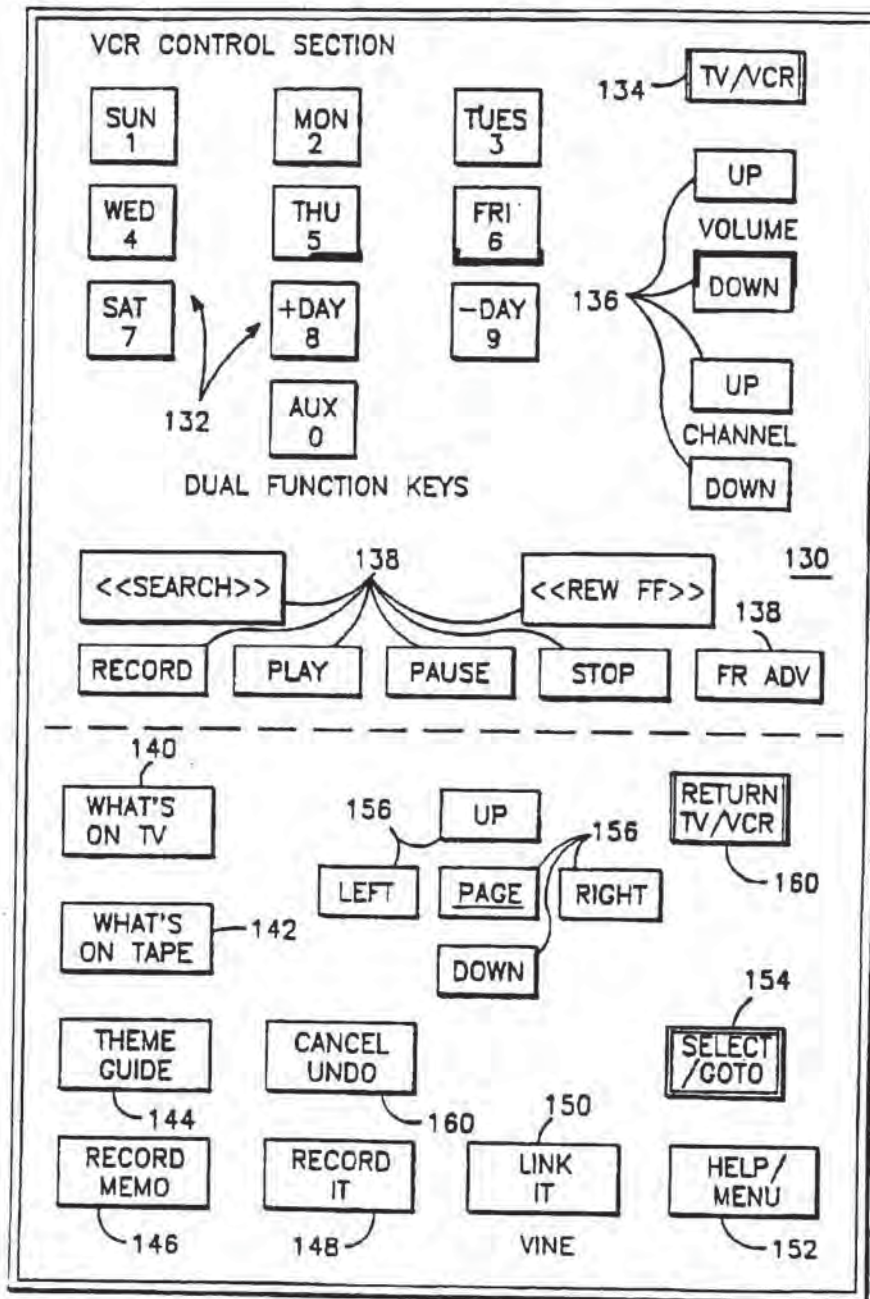


FIG.-21

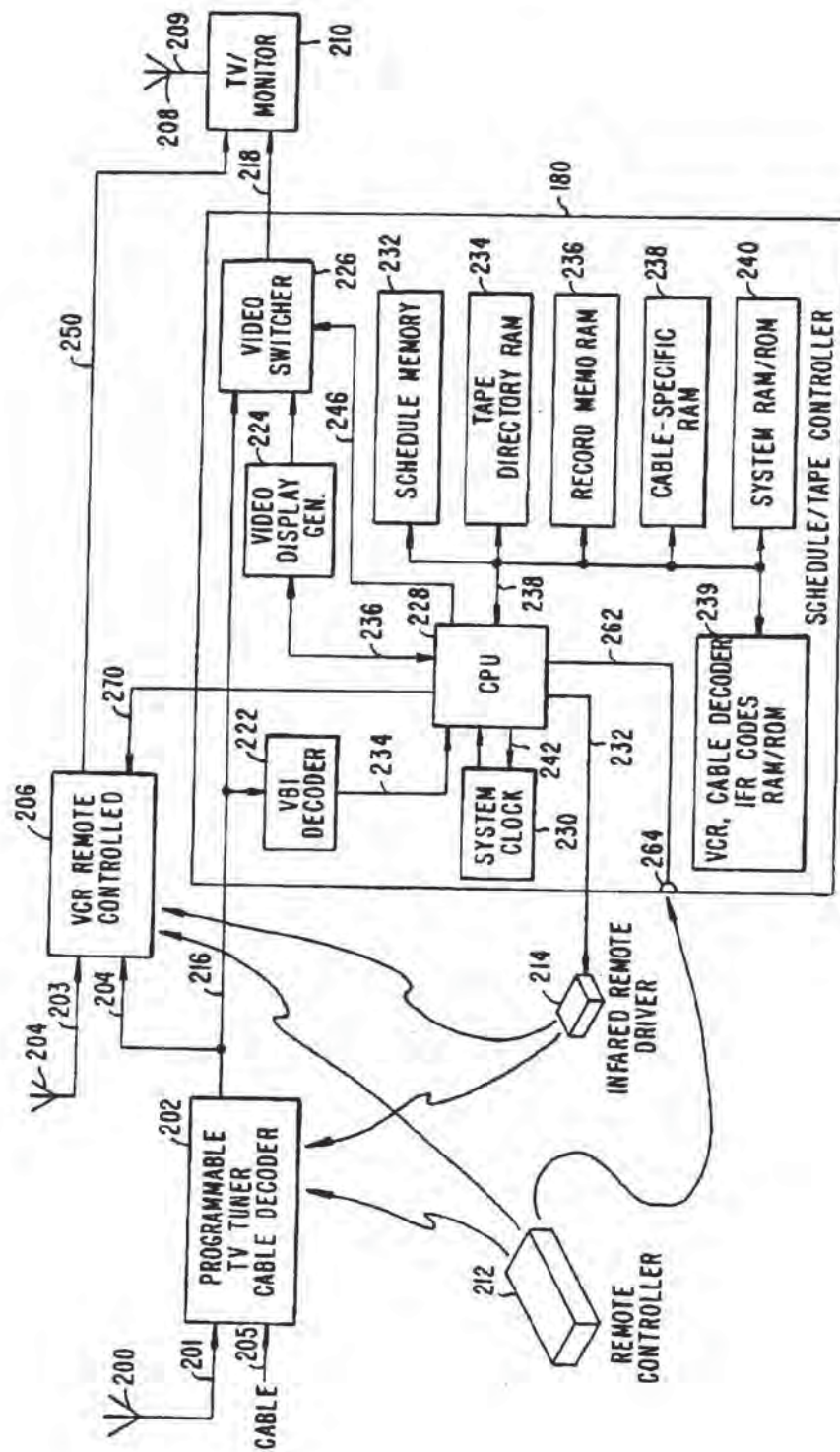


FIG. 22A.

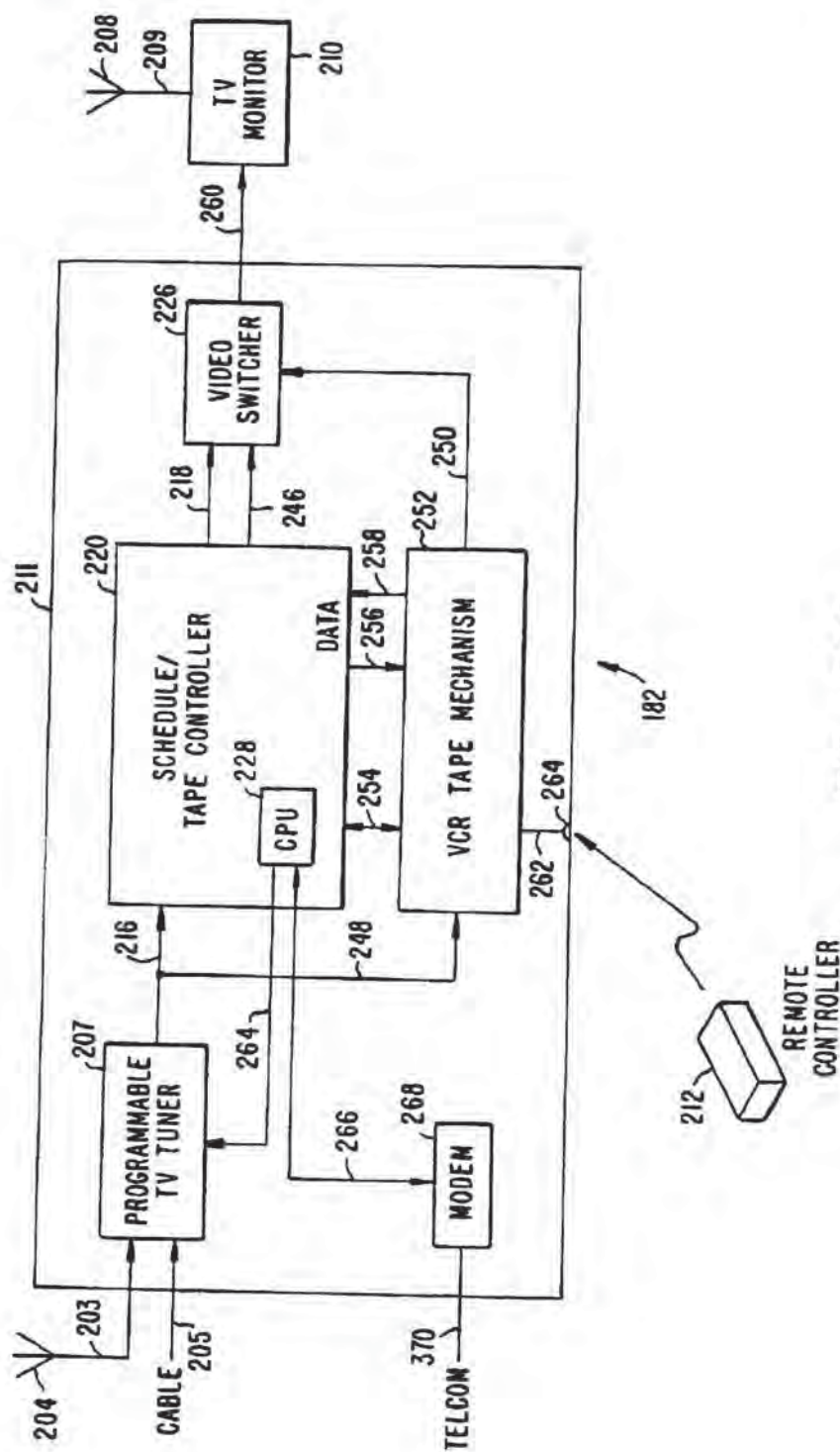


FIG. 22B.

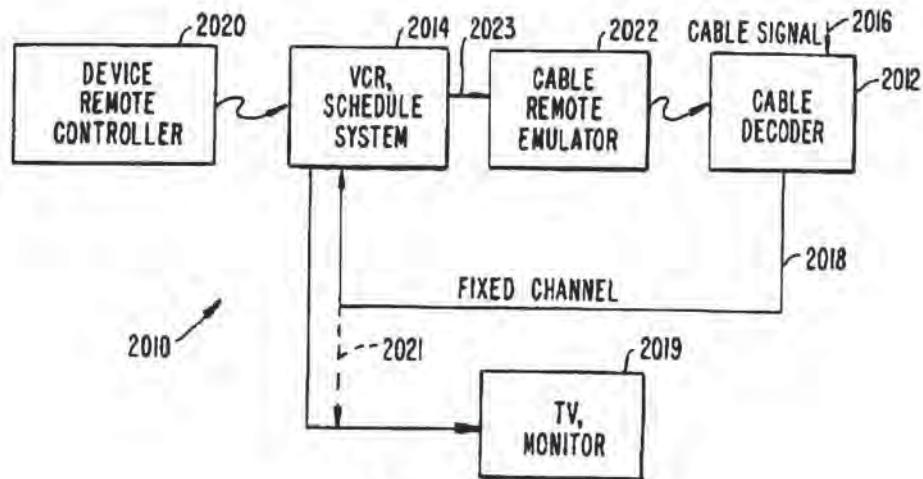


FIG. 23.

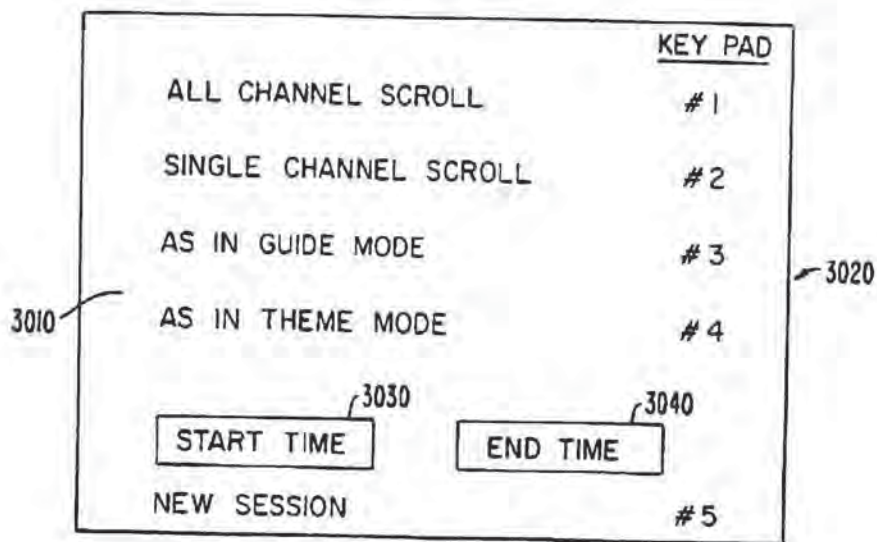


FIG. 25.

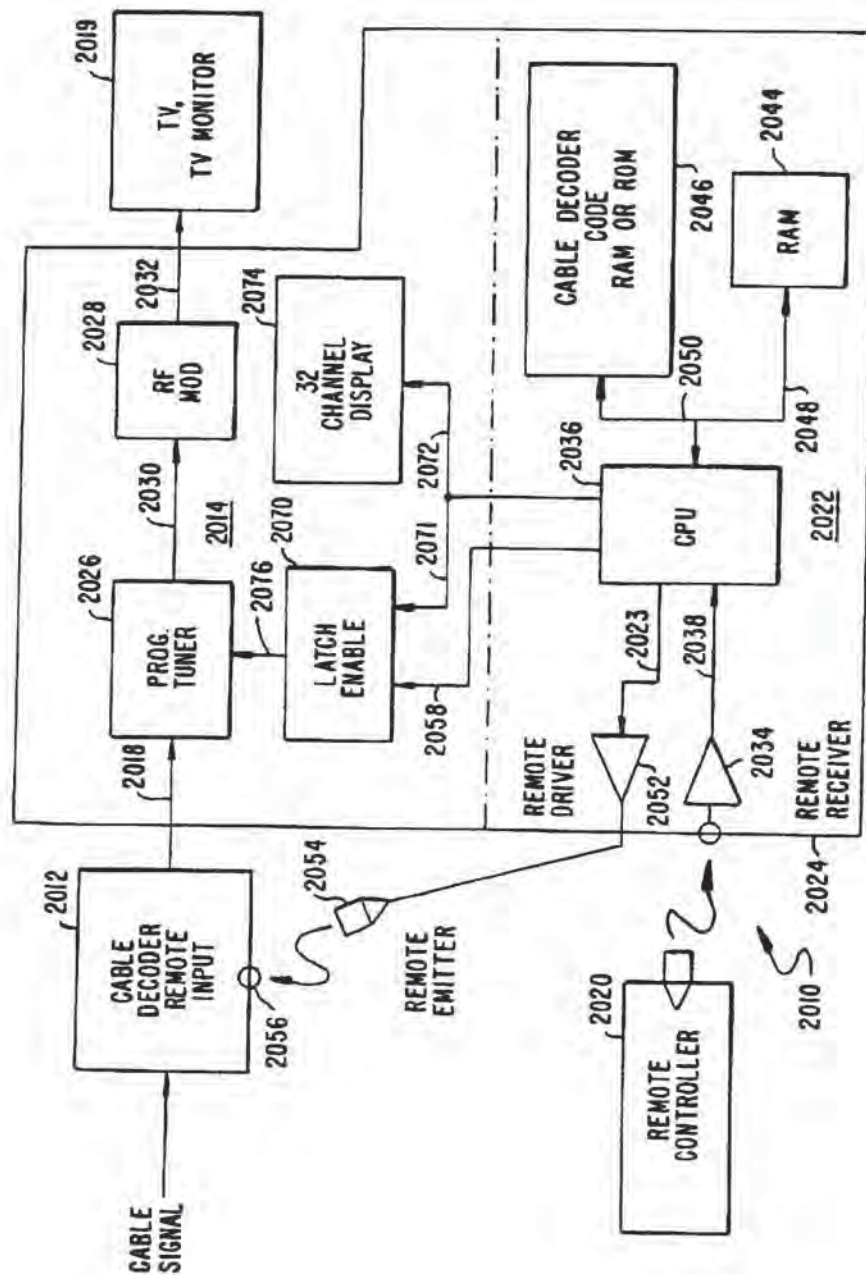
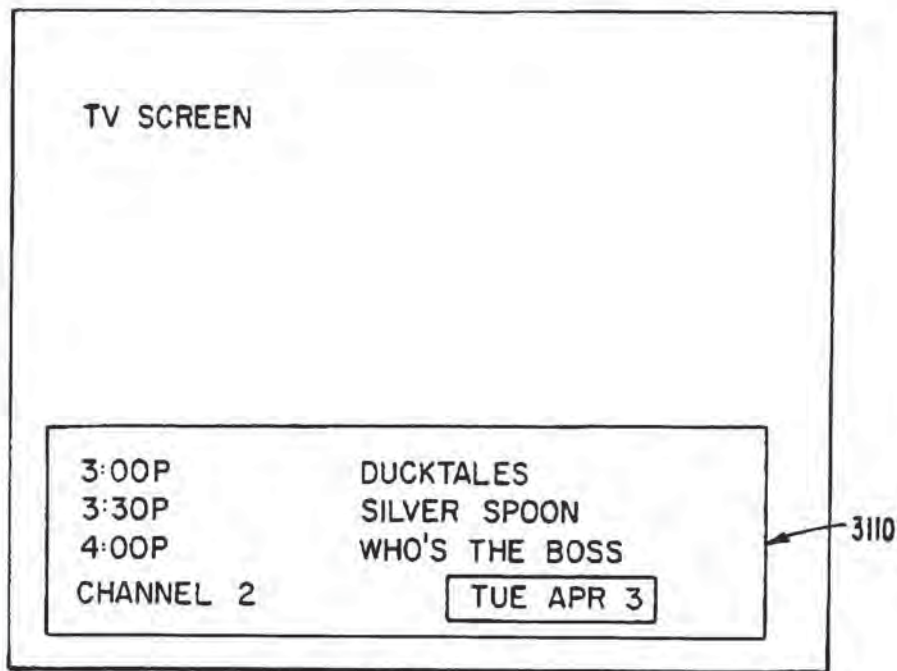
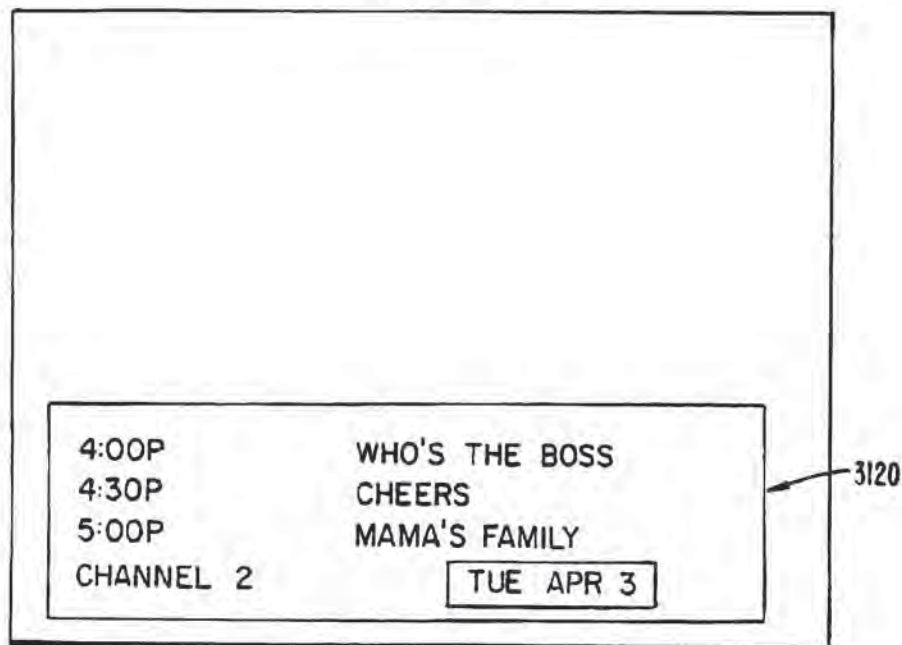
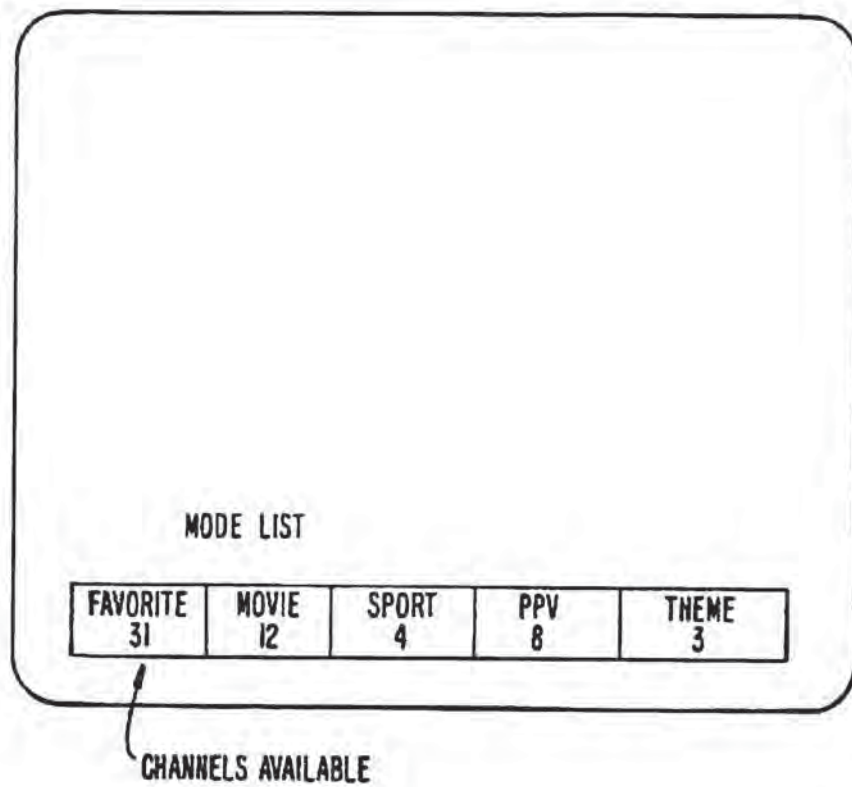


FIG. 24.

**FIG. 26A.****FIG. 26B.**

*FIG. 27.*

KEY	GRAZING TITLES POP UP FOR CURRENT CHANNEL	GRAZING TITLES POP UP FOR OTHER THAN CURRENT CHANNEL
INFO	DISPLAY GRAZING INFO POP UP FOR THE PROGRAM ON THE CURRENTLY TUNED CHANNEL.	DISPLAY GRAZING INFO POP UP FOR THE PROGRAM WHOSE GRAZING TITLES POP UP IS CURRENTLY DISPLAYED.
TUNE	DISPLAY "?" POP UP.	TUNE TO THE CHANNEL AIRING THE PROGRAM WHOSE GRAZING TITLES POP UP IS CURRENTLY DISPLAYED AND DISPLAY GRAZING TITLES POP UP.
RECORD	DISPLAY RECORD CONFIRMATION POP UP FOR THE PROGRAM ON THE CURRENTLY TUNED CHANNEL.	DISPLAY RECORD CONFIRMATION POP UP FOR THE PROGRAM WHOSE GRAZING TITLES POP UP IS CURRENTLY DISPLAYED.

FIG. 28A.

IF A GRAZING INFO POP UP IS OPEN:

KEY	ACTION
UP/DOWN	LEAVE GRAZING INFO POP UP OPEN.
INFO	REMOVE GRAZING INFO POP UP.
TUNE	TUNE TO THE CHANNEL DISPLAYED IN THE CURRENT GRAZING INFO POP UP, CLOSE THE POP UP, AND DISPLAY THE GRAZING TITLES POP UP. THIS FUNCTIONALITY IS CONSISTENT WITH TUNING FROM A GUIDE OR WITH THE NUMBER PAD.
RECORD	REMOVE GRAZING INFO POP UP, DISPLAY RECORD CONFIRMATION POP UP. THIS FUNCTIONALITY IS CONSISTENT WITH STARTING A RECORDING FROM TV STATE.

FIG. 28B.

BACKGROUND TELEVISION SCHEDULE SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation of Ser. No. 08/400,064, filed Mar. 7, 1995, now abandoned, which is herein incorporated by reference in its entirety, and which is a division of Ser. No. 08/079,503, filed Jun. 18, 1993, now U.S. Pat. No. 5,358,156, which is herein incorporated by reference in its entirety, and which is a continuation-in-part of application No. 08/033,773 filed Mar. 19, 1993, now U.S. Pat. No. 5,353,121, which is herein incorporated by reference in its entirety, and which is a continuation-in-part both of Ser. No. 07/579,555 filed Sep. 10, 1990, now abandoned, which is herein incorporated by reference in its entirety, and of Ser. No. 07/916,043, filed Jul. 17, 1992, now abandoned, which is herein incorporated by reference in its entirety, and which is a continuation of Ser. No. 07/778,404, filed Oct. 17, 1991, now U.S. Pat. No. 5,151,789, which is herein incorporated by reference in its entirety, and which is a continuation-in-part of Ser. No. 07/428,620, filed Oct. 30, 1990, now abandoned, which is herein incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

One aspect of the present invention relates generally to a system and process that allows a television viewer to access on screen television program listings and use the program listings in an easy and convenient way to control operation of a video cassette recorder (VCR) or other recording device. In particular, it relates to a system and process that displays on a television screen, overlaying a primary television display or program, a small background schedule guide that can be easily accessed by a user during lulls in the primary television display or program.

Another aspect of the present invention relates to such a system and process that creates a directory of recorded programs by title for easy retrieval and program playback. More particularly, it relates to such a system and process in which the VCR or other recording device is controlled by a simple selection of program title and a record command, even for recording at a future date and time. Most especially, it relates to such a system and process incorporating an intuitive user interface.

Yet another aspect of the present invention relates generally to a cable television (CATV) decoder interface. More particularly, it relates to such an interface for connecting the cable television decoder to a television accessory, such as a video cassette recorder (VCR). Most especially, it relates to such an interface which maintains full functionality of the television accessory while connected to the decoder.

The difficulty of setting a VCR for automatic recording at a future date is notorious. Even users who are technically sophisticated will often make mistakes in the VCR programming procedure that cause them to record the wrong program or not to record anything at all. This difficulty has even resulted in a substantial body of humor dedicated to the subject of programming VCRs.

The difficulty of VCR programming has been alleviated somewhat by the development of VCRs that use a television set as a display for user prompts and feedback to the user during the programming process. U.S. Pat. No. 4,908,713, issued Mar. 13, 1990 to Michael R. Levine, discloses such a VCR using the television set as a display for VCR programming with an interactive user interface for directing

the user on a step-by-step basis. Such a user interface removes a great deal of the mystery from VCR programming, but users still have difficulty with such a command-based interface and encounter problems carrying out the programming without making mistakes that cause them to miss recording programs they would like to watch at a different time than when they are broadcast.

Commonly assigned U.S. Pat. No. 4,706,121, issued Nov. 10, 1987 to Patrick Young, discloses a system and process in which user selections from television schedule information are used for automatic control of a VCR. That patent also contains a description of a proposed user interface for such a system and process. However, the provision of a highly intuitive user interface that makes such a system and process easy and convenient to operate is a difficult task. Further development of this system and process has produced considerable change in the user interface as originally proposed.

In addition to simplifying VCR programming, users who do a substantial amount of program taping also need an improved system and process for keeping track of their recorded programs. Commonly assigned application Ser. No. 07/219,971, filed Jul. 15, 1988, in the name of Patrick Young, discloses a system and process that provides indexing capability for taped material. A user interface for a television schedule system and process should also handle this capability on an intuitive basis.

Thus, while the art pertaining to the control of VCRs and to television schedule systems is a well-developed one, a need still remains for a television schedule system and process incorporating an improved user interface. In particular, unlike most computer menus, a grid TV guide is an array of irregular cells, where the cell size can vary from a fraction of an hour to many hours—extending well beyond the current screen. If this array is navigated by a cursor that goes from cell to cell, a single cursor command can produce violent screen changes. For example, a cursor right command may cause an abrupt jump to a cell situated several hours from the current page. Not only is this unsettling, but may take considerable effort to recover. Clearly, a gentler cursor motion is needed for the irregular cells found in a grid TV guide.

Printed grid television schedule guides often include additional information besides the program title and broadcast names. Such grids are also typically provided in combination with a more detailed printed schedule that contains a synopsis of each program, whether the program is a repeat, ratings for movies, and other information. When using a television set as a display for a schedule system, the size and resolution of the television display limit the amount of text that can be displayed with the grid. Improved techniques are required for conveying the most amount of information to the user in an easily understood manner within the limitations of the television display. When a large number of channels are available for viewing, there is also a need to order the display of information most conveniently for the user.

Programming a VCR for unattended recording becomes even more problematic when it is desired to record cable programs. Cable television decoders typically operate by requiring a television set and a VCR connected to the decoder to be set to a predetermined channel, such as channel 2, 3 or 4, and all channel selection is accomplished by the decoder. This presents problems for unattended recording, in that not all of the advanced features available on state-of-the-art VCRs can be used while the VCR is under control of the decoder.

Two Zenith Electronics Corporation technical papers disclose systems which attempt to deal with this problem. Merrell, "Tie-Timer," 1986 NCTA Technical Papers, pp. 203-206, discloses a smart remote controller to solve the unattended programming problem when a cable decoder precedes a VCR. The smart controller is programmed to turn on the cable decoder at specific times, but the VCR must be programmed independently to match the programming of the smart controller. However, this remote controller does not coordinate channel selection for such devices as television schedule systems, such as disclosed in my U.S. Pat. No. 4,706,121, issued Nov. 10, 1987, nor does it support unique features of more advanced VCRs. For example, this controller does not support on-screen VCR programming, even if that feature is otherwise available on a VCR. The controller does not include any capability for conveying information about a channel selected on the cable decoder unit to a television schedule system or a VCR in any useful way.

Long, "The VCR Interface," 1986 NCTA Technical Papers, pp. 197-202, discloses two solutions for the unattended programming problem when a cable decoder precedes a VCR. The first of these is a VCR baseband decoder, also called BASE-TAC, and currently marketed by Zenith as MultiPort or MP. MPs allow the core functions (descrambling and addressing) of a cable decoder to be added to TVs and VCRs. The decoder accepts the baseband output of the TV or VCR tuner, eliminating the need for a separate decoder tuner and attendant need to coordinate two tuners. This method is effective for supporting television schedule systems and allows full functionality of advanced VCR features. However, the MP alternative requires new TV or VCR equipment and is not compatible with the existing installed base of cable decoders. This method has not been well-received at this time. The second is the VCR Interface, which uses RF switching and a centralized approach for all TVs and VCRs in the home. It descrambles incoming CATV channels and, after modulation, combines them back onto the CATV cable at unused upper channels. The result is that any TV set on the cable can receive premium channels without a separate decoder. This method eliminates the need for redundant decoders at every TV set or VCR. As described, the system was conceived for only one premium channel. To support a television schedule system, all premium channels must be descrambled together and be available simultaneously. If not, it would be necessary to provide a way of tuning the centralized descrambler from any TV set or VCR attached to the cable. Such a scheme would be awkward when more than one TV or VCR competes for control of the single descrambler. The VCR interface may be implemented using retrofitted decoders, but the overall cost may be prohibitive for the average home.

A somewhat similar system for use with the German television networks is described in Sommerhauser, "Video Program system: flexibel programmierten mit VPS," Funkschau, No. 25, December 1985, pp. 47-51.

Other prior art relating to CATV, its decoders, and programmable remote devices includes west German Published Application 2,338,380, published Feb. 13, 1975; U.K. Patent 1,554,411, published Oct. 17, 1979; U.S. Pat. No. 4,375,651, issued Mar. 1, 1983 to Templin et al.; U.S. Pat. No. 4,394,691, issued Jul. 19, 1983 to Amano et al.; U.S. Pat. No. 4,802,114, issued Jan. 31, 1989 to Sogame. While the prior art relating to cable decoder interfaces and similar devices is a well-developed one, a need remains for further development of such devices. None of the existing interfaces both provides a complete solution to the problem of unattended recording and is compatible with already installed equipment.

SUMMARY OF THE INVENTION

The above problems and difficulties present in the prior art are overcome through the use of the novel system and method of the present invention. One aspect of the present invention is directed to a system and method to allow automatic, unattended recording of cable television programs supplied on a cable system as herein disclosed. A video recording system to allow automatic, unattended recording of at least two cable television programs supplied sequentially at different times on different channels of a cable system includes a television receiver, a remote controllable cable decoder and a remote controllable video recorder with unattended programming capability connected between the television receiver and the cable decoder. A remote controller for the video recorder includes a means for user input of program selections from a television schedule. The remote controller is coupled to the video recorder. A channel selection coordinator includes a memory means for storing channel tuning conversion information and program selections input by the user with the means for user input of program selections. A means converts channels of the at least two program selections to channel tuning commands recognizable by the cable decoder using the channel tuning conversion information and the program selections. A means automatically transmits the channel tuning commands to the cable decoder at desired activation times of the at least two program selections (typically the broadcast times, with a guard time at the beginning and end of each program). A means automatically supplies recording commands to the video recorder at the desired activation times of the at least two program selections.

The method of this aspect of the invention automatically records cable television programs supplied sequentially at different times on a cable system unattended, even with channel changes between the programs. A remote controllable video recorder having unattended programming capability is connected between a television receiver and a remote controllable cable decoder. Channel tuning conversion information is stored in a memory. Program selections for at least two programs on different channels is input from a television schedule with a remote controller for the video recorder. The program selections are stored in the memory. Channels of the program selections are converted to channel tuning commands recognizable by the cable decoder using the channel tuning conversion information and the program selections. The channel tuning commands are automatically transmitted to the cable decoder at broadcast times of the program selections. Recording commands are automatically transmitted to the video recorder at the broadcast times of the program selections.

Another aspect of the present invention is directed to a novel television schedule system and process user interface herein disclosed. A television schedule system including a user interface in accordance with this aspect of the invention has a display and a means connected to the display for displaying the television schedule on the display as an array of irregular cells which vary dimensionally in length, corresponding to different television program time lengths. A means is connected to the display for providing a cursor with the television schedule on the display. The cursor has a variable length corresponding to the length of a selected one of the irregular cells in which the cursor is located. A means is connected to the means for providing the cursor for moving the cursor in the array in a series of equal length steps. At least some of the irregular cells have a length which is greater than the length of the steps.

In the process of operating a television schedule system with the user interface of this aspect of the invention, the television schedule is displayed as an array of irregular cells which vary dimensionally in length, corresponding to different television program time lengths. A cursor is provided with the television schedule on the display, the cursor has a variable length corresponding to the length of a selected one of the irregular cells in which the cursor is located. The cursor is moved in the array in a series of equal length steps, with at least some of the irregular cells having a length which is greater than the length of the steps.

In another aspect of the invention, a control system for a video recording machine has a controller for starting and stopping the video recording machine, for recording video information on recording media, and for playing recorded video information on recording media. A display generator provides display image generation signals. A means supplies information to the display generator for generation of display images relating to operation of the video recording machine. The means for supplying information includes means for generating a recording media position indicator graduated as segments corresponding to programs recorded on the recording media.

In a process for controlling a video recording machine according to this aspect of the invention, a recording media position indicator is graduated as segments corresponding to programs recorded on the recording media. The recording media position indicator is displayed as position of a selected one of the recording media in the video recording machine is changed.

In a further aspect of the invention, a television schedule system includes a display and means connected to the display for displaying the television schedule on the display. The means for displaying a schedule is configured to allow selection by a user of a first number of desired channels for display of schedule information which is less than a second number of available channels. A programmable tuner is connected to the means for displaying a schedule. The programmable tuner is configured to follow the first number of desired channels when the television schedule is shown on the display in response to a channel up or channel down command. The programmable tuner is configured to follow the second number of available channels in the absence of the television schedule on the display in response to a channel up or channel down command.

In a process for operating a television schedule system according to this further aspect of the invention, a first number of desired channels is selected for display of schedule information, which is less than a second number of available channels. The schedule information is displayed on a display. The first number of desired channels is followed when the schedule information is shown on the display in response to a channel up or channel down command. The second number of available channels is followed in the absence of the television schedule on the display in response to a channel up or channel down command.

According to yet another aspect of the present invention, user control of a television is simplified by a system and process that displays on a television screen, overlaying a primary television display or program, a small background schedule guide that can be easily accessed by a user during holls in the primary television display or program.

The attainment of the foregoing and related objects, advantages and features of the invention should be more readily apparent to those skilled in the art, after review of the

following more detailed description of the invention, taken together with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1-3 are diagrammatic representations of a television schedule grid incorporating the user interface for the system and process of this invention.

FIG. 4 is a diagrammatic representation of a screen display used in the system and process of the invention.

FIGS. 5-7 are additional diagrammatic representations of the television schedule grid incorporating the user interface for the system and process of the invention.

FIG. 8 is a flow chart for understanding the operation of the FIG. 7 diagram.

FIGS. 9-10 are additional diagrammatic representations of screen displays of the user interface for the system and process of the invention.

FIG. 11 is a flow chart for understanding the operation of the FIGS. 9-10 diagrams.

FIGS. 12-13 are diagrammatic representations of taping and tape index screen displays of the user interface for the system and process of the invention.

FIG. 14-17 are diagrammatic representations of program selection by category screen displays of the user interface for the system and process of the invention.

FIG. 18 is a flow chart for understanding operation of the FIGS. 14-18 diagrams.

FIG. 19 is a flow chart for understanding operation of the FIG. 20 diagram.

FIG. 20 is a diagrammatic representation of a channel customization screen display of the user interface for the system and process of the invention.

FIG. 21 is a diagrammatic plan view of a control panel for the system of the invention.

FIGS. 22a and 22b are block diagrams of television schedule systems in accordance with the invention.

FIG. 23 is a block diagram of a system for interfacing a cable television decoder to a television accessory in accordance with one aspect of the invention.

FIG. 24 is a more detailed block diagram of the system shown in FIG. 23.

FIG. 25 shows a setup screen for a background guide according to one aspect of the present invention.

FIGS. 26a and 26b show background guide presentations according to one aspect of the present invention.

FIG. 27 shows a screen presentation according to another aspect of the present invention.

FIGS. 28A and B illustrate grazing functions according to a particular aspect of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

1. User Interface

Turning now to the drawings, more particularly to FIGS. 1-7, there are shown a series of menu screens 10, 12, 14, 16, 18, 20 and 22 used in operation of the system and carrying out the process of the invention. Screens 10, 12, 14, 18 and 20 each consists of an array 24 of irregular cells 26, which vary in length, corresponding to different television program lengths of one half hour to one-and-one half hours or more. The array is arranged as three columns 28 of one-half hour in duration, and twelve rows 30 of program listings. Some of the program listings overlap two or more of the columns

28 because of their length. Because of the widely varying length of the cells 26, if a conventional cursor used to select a cell location were to simply step from one cell to another, the result would be abrupt changes in the screens 10, 12, 14, 18 and 20 as the cursor moved from a cell 26 of several hours length to an adjacent cell in the same row. Such abrupt changes disorient a user of the system.

An effective way of taming the motion is to assume that behind every array 24 is an underlying array of regular cells. By restricting cursor movements to the regular cells, abrupt screen changes will be avoided. However, there is now a potential ambiguity between the underlying cell which governs cursor movement and a visible cell 26 which holds the program title.

Viz.: if the cursor moves in half hour steps, and the cell length is, say four hours, should the cursor be $\frac{1}{2}$ hour long or four hours long? If the cursor only spans the interval of the underlying cell ($\frac{1}{2}$ hour), the cursor appears to be highlighting a segment of the cell, which is misleading. On the other hand, if the cursor spans the entire four hours of the TV listing, the cursor underlying position will be obscure. In this case, cursor right/left commands will appear inoperative while traversing a long cell. The absence of feedback following a cursor command is befuddling to users. Therefore, an innovative cursor 32 (FIG. 1) for the irregular array 24 is required which satisfies several conflicting requirements.

With the cursor 32, the entire cell 26 is 3-D highlighted, using a conventional offset shadow 34. The offset shadow 34 is a black bar that underlines the entire cell and wraps around the right edge of the cell. To tag the underlying position—which defines where the cursor 32 is and thus, where it will move next—portions 36 of the black bar outside the current underlying position are segmented, while the current position is painted solid.

For an half hour cell 26, the offset shadow's underline bar will always be solid black. FIGS. 2 and 3 show the cursor 32 as it appears for a half-hour program. For programs that go beyond $\frac{1}{2}$ hour, only the current $\frac{1}{2}$ hour position will be solid black. All remaining positions will be striped. If the cursor is moved left or right, the solid section will move accordingly, providing complete visual feedback. Thus, this modified 3D offset shadow cursor 32 satisfies the demands stated above: it spans the entire cell, yet clearly highlights the current underlying position. Movement of the cursor 32 will always be visible even for cells 26 that are much longer than the underlying cell.

A grid continuity icon 38 is shown in FIG. 1. Printed grid television schedule guides often include parenthetical comments, (such as "cont'd") to indicate program continuity. In an electronic guide displayed on a TV screen, limited text space precludes parenthetical comments. To conserve space, an icon 38 will be used to indicate cell 26 continuity. At the border of a cell 26 that is continued to the next screen, an arrow icon 38 pointing to the right will be overlaid. The arrow direction always points to right, which is the direction of program elapse.

FIGS. 2 and 3 show recording status representations. When a program has been selected for recording, its listing cell 26 will be outlined or highlighted in red, as indicated at 40. If guard time has been added or deleted, the cell will be stretched or shrunk to reflect the change. Cell 26 continuity will be treated the same as above. There are four other record status representations:

If the cell is actively being recorded, the outline 40 will blink off and on.

A recorded cell will be displayed with a solid red background 42 (Note: Not shown in drawing).

A mis-recorded cell will be indicated by red hash-marks 44 over the title. A mis-recording can be the result of insufficient tape, VCR loss of power, stopped before completion, etc.

A program linking icon 46 is shown in FIG. 5. After each schedule update, the schedule system examines the new listings for the occurrence of any titles that match a title in Linked Titles (FIG. 23).

If a title matches, it will automatically be tagged for recording. When a linked program is displayed in the guide, it will have two identifiers: a red outline 40 indicating that the title has been selected for recording, and a link icon 46 appended to the title to indicate that this title was link-selected. After a linked program has been recorded, it will be treated like any recorded program with the title shaded in red. To differentiate this recording from others, the link icon will remain appended to the title.

Further details on the linking feature are given in screen 19 of FIG. 23. 1) A linked program 47 may be suspended by the user (perhaps to avoid conflict with a pending recording), by de-selecting the link title in the Link List screen, under the Record Memo command. A suspended link program will still be identified by a link icon, but the red-outline will be suppressed since the program will not be recorded. 2) A smart link process is used to tame the matching of titles when there is a likelihood of excessive candidates for recording. The Lucy show, for example, is often syndicated on several channels, each running a different vintage series of Lucy. Untamed linking may result in a plethora of recording, mixing segments from one vintage with segments from another vintage. To differentiate vintages of a series, each Lucy vintage can be given a distinct title. For example, one may be entitled "The Lucy Hour", while another may be "The Lucy Sho", etc. However, due to syndication right overlaps, it is possible for two or more television or cable TV stations to carry the same vintage of a series, but still be running different segments of the same vintage. For such series, the link list will include the channel and time as well as the link title. For the avid Lucy-phile, the user can locate each series individually for linking. If there is more than one link title of the same name, the series will be numbered, in the order of acquisition. Thus, the second Lucy will be identified as Lucy (Two), at 47.

FIGS. 1-3 show the columns 28 headed by half-hour header status indicators. The $\frac{1}{2}$ hour header strip across the top of the grid TV guide has two auxiliary functions: 1) as an indicator 48 of pending or in-progress recording scheduled at that time, and 2) as a time-bar 50 to delineate the past from the future. The past is darkened, while the future is lightly shaded. If there is an in-progress recording, the $\frac{1}{2}$ hour header will be red-outlined at 48 in the same manner as a pending recording title cell 26.

FIG. 6 shows a television schedule grid screen 20 with a program note overlay 52. With limited text capacity on TV displays, it is preferable to display as many lines of TV listings as feasible. To handle program notes, which are text intensive, on-demand overlays 52 are used. Program note overlays 52 may include any or all of the following information:

- A program genre
- Program description
- Stars and personalities
- Year of release
- Episodic subtitles
- Run-time of program
- Elapse time of the program

Critique (Star Ratings)
Rating (PG, G, etc.)
Call letter, channel markers
Closed caption, stereo.
Pay Per View Program

Program notes for a selected program are overlaid over the grid guide upon request. The program note can be toggled off/on using a SELECT command. The program note 52 overlays and hides 3 or 4 listings of a guide. To minimize concealment of the guide, an auto-rolling note is used. The program note will overlay either the top half or bottom half of the screen, as necessary to avoid masking the title of the selected listing. If the cursor 32 is in the upper half of the screen, the note will appear in the bottom half, and vice versa. If the cursor 32 is moved to the lower half of the screen, the note will automatically position itself in the upper half of the screen.

FIGS. 1-3 and 5-6 show a channel column 54 in the television schedule grid 24. Favorite stations and cable channels may be listed together to create a personalized grid guide. The channel column 54, unlike most printed TV guides, has a mix of over-the-air station names and cable services names.

The grid 24 guide lists channels by favorite combinations of station number and cable names, and not in the usual numerical order. Note that the order of channels can be arranged in any sequence, and need not be the numeric grouping followed by alphabetical grouping, as shown in the figures. For example, the first channel of column 54 may be DIS, followed next by channel 44, next by A&E, next channel 4, etc. The method of rearranging the channels is described in detail below. When viewing the grid 24 guide, a Tuner Up/Down channel command will be mapped according to the channels and order listed on the screen. When not viewing the guide, the tuner sequence will revert back to the usual numerical order. When the last channel on a page is reached, the next Tuner command will change the channel to the channel listed at the beginning of the following page.

When a channel to which the tuner is tuned is displayed on the grid 24, it is highlighted, as shown at 56. A grid 24 page may be changed by either a page command or by entering a channel Up/Dn command as described above. If a page is turned using the page command, the current channel is now located in the previous page, and will not be seen in the new page. Therefore, the new page must suppress the highlighting of a channel, since that indicates the current channel. Note that information about the current channel will still be presented in the channel information boxes 58 at the bottom of the screen.

When is the highlighting re-enabled? Once into the new page, the first channel up/down command will cause the tuner to automatically change to the channel listed in the last or first row 30 respectively of the new page. Since the tuner channel is now located on the new page, the current channel will be highlighted again.

If the channel highlighting is not suppressed after a page is selected, by definition, the tuner must be changed to track the highlighted channel. This is undesirable since casual paging should not cause the channel to change.

When a guide is first opened, as shown in FIG. 2, both the cursor 32 and the current channel 56 are situated on the same row 30 of the grid 24. When the channel 56 is changed, it is desirable to drag the cursor 32 along with the channel in unison. In doing so, the cursor 32 will be ready for a Select command (to retrieve the program note) or for a Record It command. Cursor dragging by the channel command takes place whenever the channel 56 and cursor 32 are united on

the same row. If they are not united, the cursor 32 is disengaged from the channel command. Note that dragging is not reciprocal; moving the cursor 32 does not affect channel selection.

FIG. 7 shows a screen 22, showing a program list 58 for a single channel, generated by toggling a user What's On TV command, which switches between the grid 24 and the list 58. The list 58 consists of rows 60 of sequential program listings on the channel and a channel information field 62. Program notes are overlaid on the list 58 in the same manner as shown in FIG. 6 for the grid 24.

Each What's On TV command alternates between the grid guide 24 and the What's Next on Channel row guide 58. While viewing the grid guide 24, the next What's On TV command will replace the grid guide 24 with a single-channel row guide 58. FIG. 8 is the flow diagram for the What's On TV command.

The page relationship between the two guides 24 and 58 are tightly coupled. The single channel guide will open to the channel and schedule time that was selected by the cursor 32 on the grid 24. While viewing the single channel guide 58, the Up/Down channel command may be used to change the channel to be listed. When exiting the single channel guide 58 and returning to the grid guide 24, the grid cursor 32 will be pointed to the channel and schedule time last selected on the single channel guide 58.

FIGS. 9 and 10 show channel grazing overlays 64 and 66 that provide information on current programs when switching channels while watching television. In the overlay 64, when scanning channels, the title of each program is overlaid at 68, along with the name of the TV service (HBO, ABC etc.), the cable channel number, and the current date, day of week, and time in the channel information field 62. The overlay 66 is the same as the overlay 64 except that this overlay includes a program note 70, which is similar to the program note 52 in FIG. 6, but contains information pertinent to a program currently being broadcast on the selected channel. To access program notes, press the Select key. In addition to the program note 70, elapsed time is indicated by a percentage calibrated time bar 72. The bar is bracketed by S for start, and F for finish. By default, titles will appear automatically when channels are scanned. Grazing Titles may be de-activated using the CANCEL key. To restore auto-titles, press Select while viewing TV. The flow diagram governing titles/program notes, while viewing TV, is shown in FIG. 11.

An express recording screen 74 is shown in FIG. 12. The express recording screen includes the following information:

Title of Program
Length of Program
Tape Time Remaining
Recording Speed.

FIG. 13 shows a tape index screen 76. Locating a recorded segment is often an arduous task when several programs have been recorded on the tape. Without a table of contents, the VCR users muddle through stretches of recording trying to find what's recorded on the tape, where the beginning of the desired program is, and where the tape is now. Some premium VCRs provide tape indexing that automatically finds the start of each recording. However, while the viewer can find the start of a recording, the indexing VCRs do not record titles. The net result is about as useful as a having a table of contents without chapter titles. Considerable searching is still required to find what is recorded at each index. The tape index screen 76 provides a virtual tape directory, giving the equivalent function of a table of contents for a

tape recording. There is a list 78 of titles of recorded programs, a pointer 80 to the start of the program, and a current position indicator cursor 82 showing the "chapter" location on the tape. The virtual directory is automatically compiled, revised and stored in off-tape memory as the user records over the tape.

The What's on Tape command will display a list of titles of programs recorded on the tape. The title of the selected program (the segment of tape that is positioned over tape head) is highlighted by the cursor 82. The tape position pointer 80 dynamically tracks the current tape position. All searching is done simply by title, bypassing the need for index numbers. To play back a program, the up/down cursor command is used to select the program. For example, to play back Judge, the down cursor is pressed until it highlights the program Judge. As seen in FIG. 13, the tape head is currently positioned over Star Trek with the cursor on Star Trek. When the cursor is moved to Judge, the tape will immediately begin going forward to the start of Judge. Although the cursor immediately underscores the Judge listing, the tape lags behind as shown by tape position indicator 80, which will be gradually moving down. To graphically portray tape movement, a tape motion indicator field, block 100, is provided, as explained below.

The tape directory is equivalent to a table of contents showing titles, but not page number. It automatically opens to the starting page by simply pointing to the title of the program. In addition to the tape directory 78 of recorded programs, the screen 76 includes a program duration field 84, a recorded speed of each title field 86, a remaining time left on tape field 88, a remaining time left on program field 90 and a next scheduled recording time field 92.

The virtual tape directory is generated as follows. It is difficult to implement a competent self-contained tape directory for a non-random access storage such as a video tape. No matter where the directory is stored on the tape, the latent access time to locate the directory and return to current position (for a standard six hour tape) is excruciating slow, in the order of 5 to 10 minutes.

If redundant directories are recorded uniformly across the tape to minimize latency time, the problem of sluggishness is merely shifted from playback to updating the multiple directories. After each video program is recorded, the entire tape must be scanned to update each directory. Even if this update process is automated, there is a question of excessive wear on tapes and the VCR itself. Viz.: each recording, no matter how short, results in high-speed scanning of the entire tape in order to revise all directories.

Even more troubling is the question of when to perform the update, since there is no "safe" period for the VCR to take control. For example, the user may have stopped the tape momentarily, perhaps to skip commercials, only to find that the VCR has commandeered control and place the tape in a high speed update mode. The safest update is one that is user-initiated. Unfortunately, few VCR users will follow a regimented procedure of updating after each recording session. Clearly, an on-tape directory based on existing technology is not satisfactory.

The following innovative solution, the "virtual tape directory", stores directory information in off-tape memory and does not require an on-tape directory or any augmentation of the video cassette. Since the directory is held in external memory instead of the tape, it is best suited for tapes that have recently been played and recorded, the "working tapes".

When a program is recorded, the title of the program is written to the data (control) track of the tape and, at

the same time stored in a non-volatile (NV) memory. Other information about the recorded program, such as length of program, theme category, date recorded, and tape identifier code may be written to the data channel, as well as stored in the NV memory. The NV memory is adequate to support a number of working tapes.

When a tape is first loaded, the tape data channel will be scanned for a few seconds to identify the recorded program under the tape head. This data will be matched against the directories stored in NV memory. If there is a match, the directory of the working tape will be displayed immediately when the What's On Tape key is pressed. The "virtual" tape directory appears to have been read from the tape, but is actually obtained from NV memory.

If there is no match, a new directory for the tape will be created. During playback and recording of this tape, a virtual directory will be generated for that tape. Directories of inactive tapes will be automatically purged from memory as new working tapes are introduced.

The foregoing off-tape realization of the virtual tape directory is an approach that can be implemented without any alterations to existing video cassettes. However, with minor augmentation of the video tape cassette and video recorder mechanism, a true random-access permanent directory for each tape can be realized.

In a preferred implementation, a digitally encodable read/write planar magnetic strip is located on a surface of the video cassette. Ideally, the strip will be located on one of the four planes which are orthogonal to the direction of video cassette insertion, for a front loading VCR. A most preferred location is on the face of the video cassette, which is usually reserved for a 1½" by 2" label. In the video recorder, a read/write magnetic head is located to be aligned with the magnetic strip as the cassette is inserted. The head comes into contact with the magnetic strip when the cassette is loaded or removed from the recorder. As the cassette is inserted, the stored data from the strip will be read and transferred to the tape directory buffer of the electronic guide. When programs are recorded on or erased from the tape, the content of the tape directory buffer will be updated to reflect the program content and index location of the program on the video tape. As the video cassette is ejected from the recorder, the content of the tape directory will be transferred to the magnetic strip on the video cassette. By augmenting the video cassette with a random access rewrite permanent memory, directory information for the tape is retained long after a video record session. This method is a significant improvement over using the tape media itself to record directory information.

In the above method, the movement of the video cassette magnetic strip during cassette insertion and ejection over a stationary magnetic head allows the magnetic flux changes to be sensed. Alternatively, a moving or rotating read/write magnetic head mounted on the video recorder can be used to scan a stationary magnetic strip after the video cassette is loaded. In this variation, data from the magnetic strip can be read and updated immediately from the tape directory buffer. Such magnetic strip encoding is similar to that commonly used in credit cards, personnel identification tags, security entrance cards, etc. As another alternative, optical read/write methods may be used instead of magnetic encoding.

It is relatively easy to estimate remaining time of a scheduled televised program with the assist of a clock and a TV schedule. In contrast, there are few clues as to current location during playback of a recorded program, particularly when there are several recorded segments on a tape. Tape index counters or running-time clocks require diligent book-

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keeping before the start of a recorded segment. Few consumers will tinker with 5 or 6 digit numbers when a "ballpark" indicator is adequate, such as, "is the program about over?", or "about when does the next segment start?". Clearly, there is need to provide a location indicator without the burden of bookkeeping.

To provide an at-a-glance indicator of relative tape location, an on-screen tape position gauge 94 has been devised. The tape position gauge 94 consists of a vertical bar 96 with the arrow pointer 80 located on the left edge of the screen 76. The arrow 80 dynamically tracks the current tape position as the tape is advanced or rewound.

The gauge 94 is graduated, not in linear units, but in units of recorded segments 98 with each segment labelled with its program title. Thus, a 10 minute program or a 6 hour program is represented as one vertical unit corresponding to the height of the left vertical edge of a title line. Since the left vertical edge of a title is the same for all programs (independent of program duration), the position indicator is only a rough approximation of actual tape position. If the arrow is pointing at the upper 25% of the left vertical edge of a title line, it indicates that the tape head is positioned approximately into the first 25% of the program. If a conventional linear gauge were displayed, a far more complicated gauge would be required, that would likely confuse rather than clarify.

As noted by the tape position indicator 80 in FIG. 13, the tape head is positioned to the start of Star Trek. If the viewer wishes to play back another program, the cursor is simply moved until it highlights the desired program. As soon as the cursor is moved to another program, the tape will immediately go forward or backward to the selected program. Tape position pointer 80 will move very slowly if it is scanning past a long program. This motion may not be readily apparent. To provide an unequivocal graphic representation, a tape motion indicator field, block 100, indicates direction of scanning and whether the tape is being prepared for playback or for recording.

Thus, this tape gauge 94 provides a quick capsule indication of where the tape head is currently positioned, relative to the current program, and relative to other programs on the tape, and the title of other programs.

The tape index screen 76 includes a tape motion indicator field 100. When the tape is undergoing high speed repositioning, the What's On This Tape (WOT) screen 76 will be displayed. During high speed search of a long program, the tape gauge 94 will appear to be dormant, since the gauge is relatively coarse for programs of long duration. To supplement the tape gauge 94, the tape indicator 100 is included. During high speed positioning, one of these messages will be displayed in the space above twin-hub tape icon 102: GO PLAY, GO RECORD, FORWARDING, REVERSING, PAUSE, and STOP.

GO PLAY is displayed while the tape is repositioning to the selected title. When the title is reached, the WOT screen 76 will be displaced by the playback video. GO RECORD is displayed while the tape is positioning to the selected program segment 98, where the new recording will be written.

FIGS. 14-17 show Theme function screens 104. The Theme function allows the viewer to quickly sort the downloaded schedule and display a subset schedule based on a subject of interest. The user has the freedom to select listings sorted first by major themes, second by topic(s) within a theme, and/or by topic qualifiers. All guides sorted by theme, topic and qualifier will be displayed in a row-tabulated format and begins by listing programs nearest to the current

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half-hour. The theme function screens 104 have the following attributes: Rotating Themes. There are four theme categories, with each theme title enclosed in horizontally-arranged selection boxes 106. From left to right, the themes are:

[Movies]

[Sports]

[Specials]

[TVFare]

FIG. 18 is a flow diagram defining the Theme command. Topic Selection. There are up to 16 topics 108 for each theme arranged in an 8 row by two column field 110. Any number of topics may be selected under a selected theme. Topics is a logical OR function, meaning that each listing that meets the definition of the topic will be displayed. For example under the theme of Movies, if the topic titles Comedy and Satire are selected, a subset schedule of both comedy movies and satire movies will be displayed. Other qualifiers may include a Pay Per View selection box in addition to the Live selection box of FIGS. 16 and 17.

Default All Selection: when the Theme screen 104 is first opened, the first slot (upper left most topic 108) will be highlighted. This is the ALL function, which is the sum of all topics 108 for the selected theme. The ALL function was created to minimize key stroking.

Without an all topic category, the user must enable all 16 topics 108 individually. Conversely, if the user wishes to go from an all topics to an individual topic, the user must cursor to and deselect each of the other 15 topics.

Qualifiers: each theme includes a group of search attributes or qualifiers 112. The qualifiers for each theme 106 are shown in the respective one of FIGS. 14-17 for each theme 106. Any number of qualifiers can be enabled at one time. These qualifiers perform a logical OR functions; they will select for display all listings (sorted first by theme and topic) that satisfy the qualifiers.

The qualifiers 112 are positioned for easy selection. The selection of qualifiers is made using the usual cursor commands. When a theme 106 is initially opened, by default, the cursor is located near the top of the screen. To minimize cursor commands, the qualifiers are also located near the top of the screen. In contrast, placing the qualifiers at the bottom of the screen would require a round trip of up to 16 key strokes.

The complete theme sorting strategy is defined as follows:

Listings = (Topic A + Topic B + etc.) * (Qualifier A + Qualifier B + etc.)

This may be read as listing all Topic A that also meets Qualifier A or Qualifier B, plus all Topic B that also meets Qualifier A or Qualifier B, etc. For example, the qualifier field of FIG. 14 includes four star ****, three star ***, two star ** and one star * rated TV programs, based on the auxiliary schedule information described above. By selecting both the **** and *** boxes, only programs that have at least a three star rating will be listed. Other criteria, such as year of release, may also be included as a qualifier field. In this case, the guide will restrict listings to movies or TV shows released during a specified year period. The year period may be implemented with two selection boxes: the first box indicating the start year and the next box indicating the end year. To change the year window, the year values may be incremented or decremented with the page up/down keys when a year box is selected.

Qualifiers, topics and themes are rooted in relational database operations and allow logical sorting of the schedule. To support these higher order of sorting, auxiliary data

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must be delivered to the VCR. In contrast, simple sorting operations, such as sorting by time and by channel are inherent in the fundamental information of a TV guide, and do not require auxiliary search data.

The keystroke sequence for using the themes screens 104 are as follows. While watching TV, the first Theme key command will summon the opening theme screen with the left most theme, Movies, highlighted. Further theme commands will rotate the theme selection from left to right. Each theme screen will be initialized to the ALL (topics) selection. If no topic selection is made, an all topics guide for the selected theme will be displayed upon depressing the Select/Goto command.

To additionally sort the theme by a single topic, position the cursor key to the desired topic and depress the Select/Goto key. Use the cursor to return to a topic.

To sort by more than one topic, position the cursor over each desired topic and depress the Select key. When finished, press Select/Goto to display a multiple-topic guide.

To sort by one or more attributes, position the cursor over each desired attribute and press the Select key. When finished, move the cursor to a topic and press Select/Goto to retrieve the theme/attribute-sorted TV guide.

Other than express recording, all recording activities are controlled with the Record Memo screen 16 of FIG. 4. The Record Memo screen 16 is accessed with a Record Memo key. When the Record Menu key is depressed, the following titles enclosed in horizontally-arranged selection boxes 114 will appear at the top of the opening screen. From left to right:

[Pending Recordings]

[Recorded Programs]

[Linked Titles]

[On-Grid Prog.]

Each Record Memo key command will highlight a new selection, rotating from left to right, and wrapping around to Pending Recordings after the right most position. FIG. 19 is a flow diagram defining the Record Memo command.

FIG. 20 shows a Channel Customization screen 116, which is an example of one embodiment of a channel selection menu. The screen 116 allows the user to customize channels to match viewing interest, providing a compact listing as well as eliminating undesired channels during up down scanning. During schedule update, a list of all cable channels available at the subscriber's cable system (or broadcast stations for over-the-air subscribers) is also delivered to the VCR. This unabridged set of channels may be customized using screen 116.

The channel customization screen 116 has two fields, a 3 column field 118 listing up to 36 unabridged channels and a single column field 120 listing 12 favorite MY channels. The latter is a replica of the channel descriptor column 122 (FIG. 1) of the opening grid guide. Additional pages are available (using the page key to swap between the pages) to accommodate systems with more than 36 channels. Each cell 124 in the 3 column field 118 contains the following information:

Channel number and program service name (such as HBO or station KTVU, 2). The cell 124 is color-coded to indicate the following states:

ON, default state before any customization, with the cell 124 in light green background.

MY, favorite channels listed in the single column field 120, also shown in the three column field 118 with a blue background.

OFF, a channel deleted from all guides, as well as during (Channel Up/Down) scanning (still accessible

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using the ten key channel keypad). OFF cells have a gray background.

When first installed, the system assigns the first 12 (listed in numerical order) channels as MY favorites. The channel status may be changed by selecting a channel and picking a state, MY, ON, or OFF using the SELECT key. Since only 12 favorites are allowed, the user must first remove a favorite channel by changing the status of an existing favorite channel to OFF or ON. When that is done, the first column will automatically open up a space for the next MY selection. When a new MY is selected, the MY column 120 will automatically insert the new selection in the prescribed order. The order of listing in the MY favorite channel column 120 is as follows:

All favorite broadcast stations will be listed first in numerical order. Next, all cable services will be listed in alphabetical order.

A new cable service, which displaces a previous service, will be inserted under the previous status. Example: If the channel was MY, the new service will be MY. However, a new cable service that appears on a new channel will be initialized ON.

In another embodiment of the channel customization method, any number of channels may be arranged to suit the preference of the viewer. In this approach, column 34 is not required and is not displayed. Instead, any channel listed in the three-column field may be re-ordered in any sequence desired. In this method, a channel whose order is desired to be changed is selected using a cursor. A destination slot is then selected and the transfer is made, with intervening channels being adjusted in position towards the source slot. For example, to move channel 30 DIS to the number one slot (shown occupied by channel 2, KTVU), the source channel (DIS) is first highlighted by positioning the cursor and pressing the SEL/GOTO key. The selected channel will then appear as slightly offset from its normal position (not shown in the drawing). The Up/Down cursor commands are then used to move the cursor to the destination slot (KTVU), and the SEL/GOTO key is then pressed again. Channel 30 (DIS) will then appear in the first slot, and all channels that were previously from the destination slot to just above the source slot will be moved down one slot. If a channel is moved to a lower position rather than a higher position, all channels previously from the destination slot to just after the source slot will be moved up one slot.

In yet another embodiment of the channel customization method, the viewer can re-order channels using a drag and drop method. Again, the cursor is used to select a channel in a source slot. An image representing the channel symbol is then dragged into the desired destination slot for the channel and dropped, and intervening channels are adjusted as discussed above.

Another embodiment employs channel customization prompt menus to re-arrange channels. In this approach, each channel label is sequentially displayed over time in a default sequence (such as numeric/alphabetic sequence, or according to the previously selected user-sequence). The channels are preferably displayed one at a time. The viewer can select a priority for each channel as it is displayed, or can skip to the next channel label. If a priority is given, the channel will be moved into the channel slot corresponding to the entered priority, as if it were selected and moved into that slot as discussed above. The priorities that may be assigned range from 1 to 9, the highest number on the numeric keypad (in some embodiments 0 is used to represent 10). Note that the total number of channels that can be re-arranged is not limited to the number of priorities (9). For example, the user

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could assign the same priority (such as number 1) to as many channel labels as desired. The last selected channel label would then appear in the number 1 slot, with the remainder immediately following below, according to the order in which they were selected.

FIG. 21 shows a front panel 130 for a remote controller of the schedule system. The top half of the front panel 130 corresponds to a conventional remote controller for a television set and a VCR. Included are a dual function ten key keypad 132, with the alternate functions of each key and its digit shown, a TV/VCR toggle key 134, volume and channel up/down keys 136, and VCR control keys 138. The lower half of the front panel 130 contains control keys that are specific to the schedule system. Included are a What's On Tape key 140, a What's On TV key 142, a Home key 144, a Record Memo key 146, a Record It key 148, a Link It key 150, a Help/Menu key 152, a Select/Go to key 154, Left, Right, Up, Down and Page Cursor keys 156, a Return TV/VCR key 158 and a Cancel/Undo key 160. The use of these keys has either been explained above or is apparent from their labels.

FIGS. 22A and 22B are block diagrams of television schedule systems/tape controllers 180 and 182 in which the user interface is used. The schedule system/controller 180 is applicable to existing television equipment, where the schedule system is separate from the basic television equipment. Programmable tuner 202 is shown as part of a cable decoder. The schedule system/controller 182 is shown as integrated into a VCR 211. In this version, a cable decoder is not required, and tuner 207 is part of the VCR 211. It should be clear from these two systems 180 and 182 that the schedule/tape controller may be integrated into other television equipment, such as a cable decoder or a TV/Monitor receiver. It is also practical to implement the entire schedule/tape controller in a remote controller by adding a text display, such as an LCD screen, on remote controller 212.

In the system 180, programmable tuner 202, which may be part of a cable decoder unit, receives a TV signal from antenna 200 and/or from cable input 205. Tuner output 216 goes to a vertical blanking interval (VBI) decoder 222, which may be a closed caption decoder or a high speed teletext decoder. Listing information and other support information, such as cable channel assignment data, will be transmitted over the VBI by one or more local stations or cable channels several times a day or continuously.

When update is required, programmable tuner 202 will be tuned automatically to the station or cable channel carrying the data. After the VBI signal is processed by CPU 228, the listing data is stored in schedule memory 232, while the cable channel assignment data is stored in cable-specific RAM memory 238. This data is used to convert generic TV source names, such as HBO, to channel assignments for the specific cable system.

Other information transmitted to the schedule/tape controller 180 and stored in the system RAM memory 240 includes clock update data to set system clock 230 automatically, schedule update time, which may vary from once a day to a continuously transmitted format, new theme categories, and last minute schedule change data.

For a What's on TV request, the listing stored in schedule memory 232 is retrieved, processed by CPU 228, and outputted to video display generator 224. Video switcher 226 is enabled by CPU output 246 to select the video display generator 224 output whenever schedule data is to be presented to the TV/monitor 210.

When a request to time-shift record a program is made, the title of the program and its record parameters (channel,

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start time and length) is copied from the schedule memory 232 to the Record Memo RAM memory 236. When the system clock 230 matches the schedule time, the CPU 228 will issue a channel command to the programmable tuner of the cable decoder 202 (tuning it to the selected channel), and a power on and record command to VCR 206 by means of an infrared remote driver 214 directed at infrared input ports of these two devices. In the VCR integrated version 182, the command to the tuner 207 is made on a wired bus 264.

In addition to programming by selecting a title from the on-screen schedule, it is also possible to program the VCR 206 or 211 and the cable decoder 202 or 207 with remote controller 212. In this mode, programming information is entered into the remote controller 212, and at the desired activation time, the remote controller 212 will issue programming commands to the proper TV device. While there are universal remote controllers that offer programming capability, none allow the user to enter generic names, such as station and cable channel names, and have the CPU convert the names to specific channels for tuning the VCR or the cable decoder. This is implemented by incorporating CPU 228 and the cable-specific RAM 238 in the remote controller 212.

Remote controller 212 and infrared remote driver 214 are capable of emulating the infrared command instructions required by the cable decoder 202 and VCR 206. The command emulation codes for the remote driver 214 are stored in cable decoder IFR code RAM/ROM memory 239. Commands for popular cable decoders and VCRs are pre-programmed in ROM. Alternatively, the infrared commands of the original remote controller may be learned by aiming the controllers at the IFR input receiver 264 and storing the command codes in RAM memory 239 after processing by CPU 228. This process is well known in the art of universal remote controllers and need not be detailed here.

As shown in FIG. 22A, the VCR 206 and cable decoder 202 may be manually controlled by remote controller 212, or it may be automatically controlled by infrared remote driver 214.

During recording, the tape index location of the VCR 206 will be transmitted over control/data bus 270 to the CPU 228. This start address information is stored in tape directory RAM memory 234, together with the program title. The bus 270 also carries VCR control commands for recording, playback, tuner selection, and other functions, including power on/off.

Once a program is recorded, its title and other program information is stored in a section of the Record Memo RAM memory 236. To play back a recorded program, the What's on Tape request will cause a directory of recorded programs on the tape to be displayed. When a program is selected for playback from this directory, the tape will fast forward or reverse to the tape index location specified in the Tape Directory RAM memory 234.

In the system 182, schedule/tape controller 220 is embedded in the VCR 211. The VCR tape mechanism 252 contains all the record and playback electronics of the video recorder, less the programmable tuner 207. Data recorded on the control track of a tape is coupled to the CPU 228 over input bus 258 and output bus 256. The art of recording data on the control track is well known, for example, in recent VCRs with indexing capability. CPU 228 commands to the VCR 211 are carried over bus 254. When schedule information is to be displayed, video switcher control input 246 selects the display generator on line 218. At other times, video switcher 226 selects the output of the VCR mechanism 252 on line 250. Schedule information may be downloaded from the

VBI. Alternatively or supplementally, it may be downloaded from a telecommunication line 370 to modem 268 and to CPU 228 via line 266. Other means of delivering schedule information can be employed, including the use of a sub-carrier channel on the cable service.

It should now be readily apparent to those skilled in the art that a system and method incorporating a novel user interface capable of achieving the stated objects of the invention has been provided. The user interface that is configured to compensate for the particular nature of the television schedule information. The user interface has a cursor operation that compensates for an irregular grid format of the television schedule information. The user interface presents the schedule information in a format that compensates for limited resolution of the television display. The user interface presents supplemental schedule information in overlays that obscure a minimum amount of useful other information. Order of presentation of the schedule information in the interface is customizable by user preference.

II. Cable Decoder Controller

Turning now to FIG. 23, there is shown a system 2010 for interfacing a cable television decoder 2012 to a VCR 2014 incorporating a television scheduling system of the type disclosed in my above-referenced issued U.S. Pat. No. 4,706,121, which is hereby incorporated by reference in its entirety. As is conventional, the cable signal is supplied to the cable decoder 2012 on cable 2016, and the decoded output of the decoder 2012 is supplied to the VCR 2014 through cable 2018 on a fixed channel. The decoded output on the fixed channel is also selectively supplied to a television set 2019, as indicated at 2021. The VCR 2014 receives commands from its remote controller 2020. A cable decoder remote control emulator 2022 is connected at 2023 between the VCR 2014 and the cable decoder 2012. All channel selection codes supplied to the VCR 2014 by its remote controller 2020 are converted by the remote control emulator 2022 to command codes recognized by the cable decoder 2012. The remote control emulator 2022 also suppresses execution of the channel selection codes supplied to the VCR 2014, in order to keep the VCR 2014 tuned to the fixed channel on which the decoded cable signal is supplied.

When the cable decoder mode is selected, channel indicator 2074 (FIG. 24) of the VCR will show the channel selected by the cable decoder unit. There are two reasons for using the VCR 2014 to display the channel number instead of the cable decoder 2012: The cable unit may now be hidden from sight, which is desired by most users, and it provides improved infrared isolation of the VCR remote controller 2020 signal from unwanted pickup by the cable decoder remote input 2056 (FIG. 24). The benefit of using the VCR 2014 for channel display is that the cable decoder unit 2012 can be made transparent to the user.

One aspect of making the cable decoder unit 2012 transparent to the user relates to the time of control of the cable decoder. Just as the schedule system controls the VCR to begin recording at a desired activation time, the cable decoder is also controlled and set to the desired channel at that time. The desired activation time is stored in memory, along with the channel of the selected program, and these stored values are later used to control the cable decoder. The desired activation time is typically the broadcast time of the selected program. It should also be noted that in order to allow for possible inaccuracies in the local system clock time and for variations in the actual broadcast times, the effective broadcast time employed by the schedule system and remote control emulator will typically include a guard

time on the order of a few minutes to either end of the scheduled program time period. Controlling the cable decoder at the time of broadcast is critical to making the cable decoder transparent to the user, because if the cable decoder were not controlled at that time, one schedule request could interfere with another schedule request or with a user manual channel selection. This storing in memory of both channels and desired activation times for program selections is performed whether or not the program selections are being entered through an interactive electronic schedule system or are simply being entered manually from a printed television schedule guide.

The remote control emulator 2022 drives an infrared emitter, which is positioned in front of an infrared input on the cable decoder 2012. Thus, the remote control emulator 2022 replaces the conventional cable decoder remote controller. The user communicates with the system using the VCR remote controller 2020. For the user, the system 2010 appears to function in the same manner as would the VCR 2014 connected to the TV 2019 with no cable decoder 2012 present. This means that all functions, including on screen programming and the TV schedule system, provided with the VCR 2014 are fully functional and are operated uniformly by the user and interact with the user uniformly.

Further details of portions of the VCR 2014 and the cable remote emulator 2022 are provided in FIG. 24. As indicated at 2024, the remote emulator 2022 is supplied together with the VCR 2014. The VCR 2014 includes a programmable tuner 2026 connected to an RF modulator 2028 by cable 30. The cable decoder 12 is connected to the programmable tuner 2026 by the cable 2018, and the RF modulator 2028 is connected to the TV 2019 by cable 2032. The remote controller 20 supplies its inputs to a remote receiver 2034 in the cable remote emulator 2022. The remote receiver 2034 is connected to a central processing unit (CPU) 2036 by line 2038. The CPU 2036 is implemented with a commercially available microprocessor integrated circuit, such as those available from Intel Corporation, Santa Clara, Calif., or Motorola, Inc., Phoenix, Ariz. The CPU 2036 is connected to a random access memory 2044 and to cable decoder code memory 2046, which may be either a random access or a read only memory, by busses 2048 and 2050. The CPU 2036 is connected to a remote driver circuit 2052 by the line 2023. The remote driver circuit 2052 is connected to an infrared emitter 2054, which is positioned in front of remote input 2056 of the cable decoder 2012. The CPU 2036 is connected to the programmable tuner 2026 through a latch 2070 by lines 2071 and 2076 and to a channel display 2074 by line 2072. The latch 2070 is also connected to the CPU 2036 by line 2058. The latch 2070 allows the channel data to be shown on the display 2074 to be separated from data which is supplied to the programmable tuner 2026. Data is supplied to the programmable tuner 2026 only when the latch is enabled on line 2058.

In operation, the cable remote emulator 2022 is either programmed to learn the cable decoder 2012 remote controller codes in the conventional manner for teaching a remote controller to learn the commands of a foreign controller, which are then stored in the cable decoder code memory 2046, or the memory 2046 contains conversion codes stored in ROM for the more popular cable decoder 2012 models. The TV schedule system, which also utilizes the CPU 2036, is set to the cable mode by a command from the remote controller 2020. This causes the programmable tuner 2026, also forming part of the TV schedule system, to be non-responsive to the remote controller 2020 channel commands, as a result of a suitable control signal on line

2058, so that the tuner will remain tuned to the fixed channel for the cable decoder 2012, typically channel 3 or 4. However, the channel commands are stored in memory 2044. Whenever the TV schedule system requires channel information, it will refer to the stored channel information. For example, when the TV schedule system is opened, it will point to the channel currently being viewed/recorded. When a program is selected from the TV schedule system, the system will automatically generate codes recognizable by the cable decoder 2012 to change the channel on the cable decoder 2012. When a cable input is not being used, the latch 2070 is enabled on line 2058, so that channel commands on line 2071 are supplied to the programmable tuner 2026.

Remote controller 2020 commands are infrared coupled to the CPU 2036 and stored in memory 2044. When the system 2010 includes a cable decoder 2012, all channel tuning commands from the remote controller 2020 are inhibited in favor of cable decoder channel commands recognized by the cable decoder and produced by the CPU 2036 through conversion from the channel tuning commands. The conversion code is contained in a ROM, or a RAM if the system 2010 has a "learn" mode. After a delay to prevent potential conflict of two infrared signals, the converted code is coupled to the cable decoder remote input 2056 by the infrared emitter 2054. The process of emulating codes recognizable by the cable decoder 2012 is done in a conventional manner known in the art. All other commands from the remote controller 2020 are acted upon in the system 2010 unchanged.

Thus, as discussed above, in one embodiment a system for interfacing a cable television decoder having an input for receiving television signals including a plurality of channels and an output for directing a selected channel from the television signals to a television or television accessory includes a programmable tuning means for selecting a desired television channel signal (connected to the output of the cable television decoder to receive the selected channel on a fixed channel from the cable television decoder), means (connected to the programmable tuning means) for inhibiting the programmable tuning means from tuning to the selected television channel when the cable television decoder is operational, means for emulating the channel selecting commands of the cable television decoder, means (connected to the emulating means) for transmitting emulated channel selecting commands from the emulating means to the cable television decoder, and means (coupled to the emulating means) for making television channel selections. The means for making television channel selections also includes means for setting a desired activation time for a channel selection, and the system includes a memory (connected to the emulating means) for storing television channel selections and desired activation times for the television channel selections.

While the preferred embodiment is directed to controlling the tuner of a cable decoder, the teachings of the present invention are equally applicable to the control of a tuner of a satellite receiver, a telecommunication fiber optic tuner/receiver used to receive TV programming, or any TV tuner apparatus with a tuner that preselects television programs for recording by a VCR. By controlling the preselection TV tuner, the VCR on-screen unattended recording programming functions need not be duplicated by the preselection TV tuner apparatus. Moreover, the viewer is not burdened with the task of programming more than one TV apparatus.

It should now be apparent to those skilled in the art that a novel system for interfacing a cable television decoder to

a television accessory capable of achieving the stated objects of the invention has been provided. The system and method provides a single tuning arrangement which will coordinate channel selection information between a cable decoder and a television schedule system, a VCR or any television device. The tuning arrangement is compatible with already installed equipment. The single tuning arrangement eliminates duplicative programming effort and preserves the advanced features of television devices, such as on-screen programming of unattended recording, even when operating behind cable decoders and other TV apparatus with preselection tuners.

III. Background Guide.

This aspect of the invention is directed to a convenient background mode for the electronic guide which presents several lines of guide information, typically occupying the bottom quarter of the screen, overlaying the current television program. The background mode enables the viewer to manually or automatically scroll through preselected portions of the schedule information. This preselected information is not just limited to information about a single current (or otherwise selected) program. This background scrolling guide is particularly convenient during a lull in television programming, such as a commercial break. As a supplement to the full-screen foreground guide, the background mode eliminates the need to master the advance navigation commands of the full-screen guides.

Due to the limited amount of listing information that can be displayed in the background guide, preselection of the listing is essential. An indiscriminate scrolling of every listing in a typical one week guide would require 8 hours, even if each listing is scrolled at a rate of one per three seconds. Limiting the listings to a fixed time period, such as the current day, current hour, or primetime is a first step toward implementing a useful background guide. Other selection criteria, such as channel or theme, can be logically combined to further filter the listings down to a total that can be read in a fraction of an hour.

In existing non-interactive scrolling guides available on some cable systems, the listing cannot be controlled by the viewer. Each time the viewer switches the tuner to the guide channel, the listings is at some random point in the one week guide. Listings are grouped chronologically, by day and start time. Under each group are channel identifiers arranged numerically or by cable source name if it is a listing for cable-TV programming. Without user interaction, there is little chance that the viewer will randomly tune to the guide channel and see desired listings at the desired time and channels without a tedious wait. For an interactive background guide, the ability to resume and continue forward from the last listing is highly desirable.

In the present invention, there is a concept of a guide session which allows the user to open the background guide repeatedly, interleaved with non-background guide activities, such as watching TV or using the foreground guide. During a session, specific setup criteria for the background is persistent and stored in electronic memory. This may include the time-period over which the listings are scrolled, whether the scrolling is manual or automatic, the channel of the last listing, whether sorting by theme has been setup, whether sorting by favorite channels has been setup. One or all criterion may be manually changed without terminating a session. Some criteria may be automatically changed if the cursor or setup of the foreground guide is changed. A session is completed if the background guide has not been accessed for a certain period of time, or the user manually selects a new session. A typical setup screen for

the background schedule guide is shown in FIG. 25, in which setup screen 3010 occupies all of television screen 3020.

During a session, each time the viewer opens the background guide, the initial listing will continue from (or repeat) the last listing displayed in the previous background guide access. The pointer to the current listing within a set of schedule information is known as a tab. The tab can be advanced by manual or automatic scrolling. Additionally, if the current system clock time catches up to a tab in a time-indexed set of schedule information, the tab can be pushed forward from then on in step with the system clock until overridden by a user. The tab is pushed forward as broadcasts end. If the system clock surpasses the tab, once all programs at the tab time setting are over, the tab setting will be advanced.

The default setting for the tab when the guide is first opened is the earliest start time of any program that is still being broadcast at the time the guide is opened. The tab is then advanced, and listings printed, repeatedly, until the guide screen space is filled. From that point on the tab can be advanced by either manual scrolling or automatic scrolling. Automatic scrolling can be at a fixed number of listings per time period, or can simply be from the tab being pushed forward by program broadcasts ending, as described above.

A session does not end when scrolled to the end of the time period window, but repeats itself when all listings in a time-period have been scrolled. By providing persistent storage of the last time-period, the last listing, or tab, within the time period, the last channel, and the setup criteria for the foreground guide, the viewer is freed from the chore of remembering and reentering a host of background setup criteria each time the background guide is opened. This is illustrated in FIGS. 26a and 26b. FIG. 26a shows the display of a background guide 3110. If at three o'clock the user suspends the background guide for an hour, and then reactivates it within the same session, the display upon reactivation would be as shown in FIG. 26b. Background guide display 3120 of FIG. 26b is determined by the same stored operating characteristics such as theme, time period, manually scrolling, automatically scrolling, etc., as were used for the display of FIG. 26a. Note that the tab, or the pointer to the current listing, has been pushed forward from three o'clock to four o'clock by the advancing time on the system clock. The status of displays 3110 and 3120 are substantially the same, except that the passage of time causes the displayed schedule information to only partially overlap.

In the preferred implementation, pressing the background guide command once will start display of a background guide. It will list programs according to previous criteria selected by the setup menus for the background guide and the foreground guide. Depending on the prior setup, the background guide may automatically scroll, or may be manually stepped using the Page Up/Dn keys. The channel of the background listings may be sequenced by pressing the Channel Up/Dn key. Depending on the background mode selected, pressing a Channel key will cause the listing to jump to the next channel that is defined either by the Channel Up/Dn keys, or according to the sequence defined under the foreground guide. Pressing the TV, Guide, or Theme key will terminate the background guide display, but not the session.

To change the mode of the background guide, the background guide command is entered again while a background guide is displayed. A background guide setup menu will be displayed displacing the background listings. One such setup screen 3010 is shown in FIG. 25, in which setup screen

3010 is shown to cover the entire television screen 3020. In alternative embodiments, the setup screen occupies only the same portion of the television screen as the background guide. From the setup menu, the viewer may select another background mode:

Scroll current listings for all channels. This is the default mode when a new session is started.

Scroll listings for current channel.

Scroll listings according to the selection criteria when the foreground guide mode was last exited.

Scroll according to the theme criteria when the theme guide was last exited.

The setup menu also allows the viewer to change the time period from the default period. The default time period is the current time to programs starting in the next 3 hours. The time period is shown by start time block 3030 and end time block 3040. At the end of the time-period, the listing will loop back to the start of the time-period. If there is a Primetime command, actuating this command will cause the time-period to be automatically set to the designated primetime. The viewer can also select a new session, in which all the default selections (including the default time-period) will be reinstated.

The following is a detailed description of each mode:

1) All selected channel scroll. This is the default mode when a new session is started. The first listing of the background guide is for the program on the current tuner channel. Pressing the page up/down key momentarily will manually advance the listings starting with the listing group for the current time. When all channels with the current start time is displayed, the next group of listings for the next start time will be displayed. Pressing the page key for 3 seconds, or longer, will start automatic scrolling of the guide. The guide will scroll through all channels which have been declared favorites in the foreground grid guide. If the favorite channel menu has not been setup, by default, all channels will be considered favorites. Typically, all channels listed in the opening few pages of the grid guide are favorite channels.

a) Pressing a channel key will cause the listing to jump to the next channel listed in the grid guide. The Up channel key will cause listing to advance to the next higher listed channel, and to the previous listed channel for the Down channel key. Pressing the page key momentarily will cause scrolling to stop. The next page key command will resume manual scrolling of the background guide.

b) Pressing the primetime command will change the time-period to match the primetime period. The latter has a default time of 7PM to 11PM, but may be defined by the user when setting up the foreground guide.

c) The viewer can immediately change tuner channel to one that is displayed in the background guide by pressing the Enter key. The background mode is not exited, and the viewer may continue scrolling the background guide.

d) To exit, press TV or any other mode command.

e) To resume the background mode last selected, press the background guide key. If the session is not over, the guide will continue from the last listing displayed.

While a background guide is displayed, pressing the background guide command key will toggle presentation of the setup menu. Another mode can be selected without

ending the current session. For example, a single channel mode can be selected and scrolled over the current time-period. Pressing the background guide command again will toggle back to TV viewing with a background guide.

2) single channel scroll. This mode may be selected by pointing to the Single Channel mode in the setup menu, or by entering the number #2 key. The single channel background guide is almost identical to the single channel foreground guide, except that only one or two programs is displayed.

a) Pressing the page up/down command will manually display listing for the selected channel. If the page key is held down for three seconds, or longer, the guide will scroll at a predetermined rate automatically in the direction of the selected channel key (up or down). To return to manual scrolling, press the page key momentarily and release.

b) Pressing either the up/down channel key will cause the listing to jump to the listing for the next channel.

c) The viewer can immediately change tuner channel to one that is displayed in the background guide by pressing the Enter key. The background mode is not exited, and the viewer may continue scrolling the background guide.

d) To exit, press TV or any other mode command.

e) Press the background guide command to resume listing. If a new session is not started, the first displayed listing will continue from the last listing scrolled before exiting the background mode.

Pressing the background command will open the setup menu. A different time-period can be selected if desired. Alternatively, the user can select New Session, to reset to the default time-period. Or the viewer can select another background mode. After the setup menu selection is completed, pressing the background guide command will restart display of the background guide.

3) Scroll according to the criteria setup for the guide. This background mode preselects display listing according to the guide mode that was last active. It can be the grid guide, or the theme guide. This mode provides an alternative way of viewing the listings normally seen on the grid guide or the theme guide, whichever was last viewed. Specifically, the start time is indicated by the leading edge of the grid guide cursor. The default time-period is 3 hours. This background guide will scroll through the listings of channels that are defined in the grid guide.

A typical application for this mode is as follows: assume that the viewer has started browsing the grid guide and decides to return to TV viewing. During the next commercial break, the viewer can open the background guide to resume displaying listings of programs starting at the cursor position in the grid guide. This eliminates the need to specify favorite channels in the background guide duplicating the setup effort of the grid guide. Likewise, if the viewer was browsing the theme guide, the background guide will resume listings of programs at the cursor position in the theme guide. This eliminates the need for the reviewer to setup theme and subtheme criteria in the background mode.

a) Pressing the Enter key will cause the tuner channel to change immediately to the listed channel in the background guide.

b) Pressing the page key will manually advance the listings. Momentarily holding the page key down for several seconds will cause the display to automatically scroll. Pressing any page key again will cause the scrolling to stop and to resume manual advancing of the listings.

c) To exit, press TV or any other mode command. Channel presentation on the grid guide.

It is desirable to list programs in the order of most favorite channels instead of sequentially by channel number or alphabetically as in a printed television guide. A channel menu is provided to allow the viewer to arrange channel listings in the preferred order. In this way, the most favorite channels will be grouped together, on one or two pages, greatly reducing the need to perform channel paging. This is usually a one-time installation menu that allows the user to define channels that are favorites, and to be listed in the grid guide in a preferred order.

The channel select menu provides a list of all channels that can be received by a viewer. From this list, channels can be designated as favorites. Favorite channels are automatically given certain priorities. For example, in the event that the schedule memory is insufficient to store all the listing information downloaded from broadcast, program notes and other descriptive information for non-favorite channels will be discarded before discarding such information for favorite channels. In case of severe shortage of memory space, listings for non-favorite channels will be discarded first.

The channel select menu also allows the viewer to decide on the listing priority of favorite channels on the grid guide. In one implementation, the channel select menu is a list of all channels, arranged in columns. The first column on the left, from top to bottom, will be the order in which channel listings will appear in the grid guide. Once favorite channels are designated, they will automatically be grouped together in the left-most columns. For example, if there are four favorite channels, such as CNN, DISN, HBO and SHO, it is possible to position SHO as the first channel in the grid guide. To do this, highlight the location where the new channel is to be moved. In this case, CNN is first highlighted. Next select the preferred channel, SHO. When this is done, CNN, DISN, and HBO will shift down one slot, and SHO will be entered into the first slot.

The channel select menu is maintained in a persistent (a non-volatile) memory and is used by foreground and background guides and serves as user input selection criteria when listing program in the grid guide, or to determine the order and which channels are to be listed in the background guide.

Grazing

Additional grazing features are illustrated in FIGS. 27, and 28A-B.

The following is a description of a more comprehensive grazing function that allows a viewer to retrieve guide information for other channels, without leaving the current channel and without significantly obstructing viewing of the current program. This grazing guide, consisting of a few lines of text, is displayed momentarily at the bottom of the screen. The following implementation provides a consistent user interface for the various modes.

0. While viewing TV, pressing INFO will pop-up a Grazing Title for the currently viewed program.

1. To see grazing titles for other channels, without leaving the current channel, press the UP or Down arrow keys to change the channel of the displayed information. The Up or Down key will shift through a set of channels determined by the selected grazing mode, as explained below.

2. While the Grazing Info Pop up is open, pressing the Left or Right arrow keys will open up a list of grazing modes (displayed horizontally across the bottom of the screen). The last established mode will be highlighted when the Right or Left key is pressed first pressed. This mode list will momentarily displayed (hiding the Grazing Title) each time the Left

or Right arrow is pressed. After about two seconds, the mode list will disappear and the Grazing Title will re-appear.

While the mode list is displayed, pressing the Right key will select the mode to the right of the current mode, and pressing the Left key will select the mode to the left. The newly selected mode will be highlighted and the previous selected mode will be de-highlighted. Repeated pressing of either will toggle through the following Grazing Title modes:

- a. By Favorite channels (channels selected using the favorite channel menu).
- b. By movies channels (channels now showing movies).
- c. By sports (channels now carrying sports programming).
- d. By Pay Per View (all channels carrying PSV programming).
- e. By Theme. These are the channels that currently meet the Theme criteria that was last established in the Theme menu.

3. Two seconds after a new mode is selected, the mode list vanishes and the Grazing Title for the newly selected mode will be displayed. In another two or three seconds, the Info Pop up will also vanish, restoring the screen to full TV display.

4. Channel Count for each mode.

Some modes, particularly certain submodes of theme, may be so narrow that no channels meet the selection criteria. To inform the viewer in advance, a channel count for each mode will be displayed alongside the mode label. This count is a tally of all channels that are broadcasting shows meeting the mode criteria. If the viewer selects a mode with no (0) channels, a "No channels are available" message will be displayed.

Grazing Titles on Channels Other Than the Current Channel

The user may wish to find out what programs are airing on channels other than the current channel without returning and without obstructing the view of the current program. This can be accomplished by pressing the UP or DOWN arrow keys while viewing TV.

When the user presses UP, the Grazing Titles pop up for the next channel in the user's favorites order is displayed. In the same way, when the user presses DOWN, the Grazing Titles pop up for the previous channel in the user's favorites order is displayed. The Grazing Titles pop up remains on the screen for two seconds, the same amount of time Grazing Titles pop ups remain on the screen during normal channel grazing.

While a Grazing Titles pop up for a channel other than the current channel is on the screen, most of the keys have the same functionality they have in normal TV state with Grazing Titles; however, there are three whose functions are altered.

It should further be apparent to those skilled in the art that various changes in form and details of the invention as shown and described may be made. It is intended that such changes be included within the spirit and scope of the claims appended hereto.

What is claimed is:

1. A television schedule system for displaying television schedule information, said television schedule information including listings, said television schedule system comprising:

an input device for inputting user selections, said user selections including limiting said listings and selecting a mode of operation, said listings including information on multiple available television programs, said mode of operation determining an order in which said listings are displayed on a screen;

a memory, coupled to said input device, for storing said user selections and for storing at least one of (1) a time period over which said listings are scrolled, (2) whether scrolling is manual or automatic, (3) a channel of a last viewed listing, (4) a sort by theme command, and (5) a sort by channel command;

a controller, coupled to said memory, for activating and suspending operation of said television schedule system; and

a display, coupled to said controller, for displaying schedule information on said screen in response to inputs from a user, wherein said user can cause said listings in said display to scroll automatically or manually.

2. A background television schedule system for displaying television schedule information on a television including a television screen on which is displayed a primary display, said television schedule information including listings, said background television schedule system comprising:

an input device for inputting user selections, said user selections including limiting said listings displayed on said television screen and selecting a mode of operation, said listings including information on multiple available television programs, said mode of operation determining an order in which said listings are displayed on said television screen;

a memory, coupled to said input device, for storing said user selections and for storing at least one of (1) a time period over which said listings are scrolled, (2) whether scrolling is manual or automatic, (3) a channel of a last viewed listing, (4) a sort by theme command, and (5) a sort by channel command;

a controller, coupled to said memory, for activating and suspending operation of said background television schedule system; and

a background display, coupled to said controller, for displaying background schedule information on said television screen in response to inputs from a user; wherein said user can cause said listings in said background display to scroll automatically or manually.

3. The background television schedule system of claim 2, wherein said user can select and prioritize a plurality of favorite channels.

4. The background television schedule system of claim 2, wherein said mode of operation further includes at least one of (1) all selected channels scroll, (2) single channel scroll, (3) scroll according to the criteria set up for said background guide, and (4) grazing.

5. The background television schedule system of claim 4, wherein said grazing allows the user to display listings of a certain type, said certain type selected from the group consisting of (1) desired channels, (2) movies, (3) sports, (4) pay-per-view, and (5) desired theme.

6. The background television schedule system of claim 2, further comprising a tab, coupled to said controller, for pointing to a current listing within said background schedule information displayed on said background display, said tab capable of being advanced automatically and manually.



IW 7572045



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APPLICATION NUMBER: 08/119,367

FILING DATE: September 09, 1993

PATENT NUMBER: 6,418,556

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By Authority of the
Under Secretary of Commerce for Intellectual Property
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P. R. GRANT
Certifying Officer

PART (2) OF (7) PART(S)



US006418556B1

(12) **United States Patent**
Bennington et al.

(10) **Patent No.:** **US 6,418,556 B1**
(45) **Date of Patent:** **Jul. 9, 2002**

(54) **ELECTRONIC TELEVISION PROGRAM
GUIDE SCHEDULE SYSTEM AND METHOD**

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OK (US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) Appl. No.: **08/119,367**

(22) Filed: **Sep. 9, 1993**

(51) Int. Cl.⁷ **H04N 7/14; H04N 5/50**

(52) U.S. Cl. **725/40; 725/39; 348/569;
348/906**

(58) Field of Search 348/906, 460,
348/461, 463, 464, 465, 466, 467, 468,
731, 732, 734, 6, 7, 8, 10, 12, 13, 563,
569, 570, 473, 474; 455/186.1, 186.2; 725/39,
40, 43; H04N 7/087, 7/04, 7/08, 5/50, 5/44,
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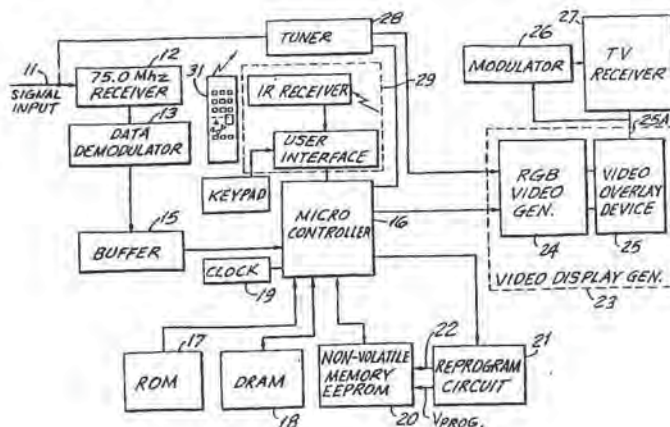
Primary Examiner—Michael Lee

(74) Attorney, Agent, or Firm—Fish & Neave; James M.
Glass

(57) **ABSTRACT**

An electronic program schedule system which includes a
receiver for receiving broadcast, satellite or cablecast tele-
vision programs for a plurality of television channels and a
tuner for tuning a television receiver to a selected one of the
plurality of channels. A data processor receives and stores in
a memory television program schedule information for a
plurality of television programs to appear on the plurality of
television channels. A user control apparatus, such as a
remote controller, is utilized by a viewer to choose user
control commands and transmit signals in response to the
data processor which receives the signals in response to user
control commands. A television receiver is used to display
the television programs and television program schedule
information. A video display generator receives video con-
trol commands from the data processor and program sched-
ule information from the memory and displays a portion of
the program schedule information in overlaying relationship
with a television program appearing on a television channel
in at least one mode of operation of the television program-
ming guide. The data processor controls the video display
generator with video control commands, issued in response
to the user control commands, to display program schedule
information for any chosen one of the plurality of television
programs in overlaying relationship with at least one tele-
vision program then appearing on any chosen one of the
plurality of channels on the television receiver.

48 Claims, 42 Drawing Sheets



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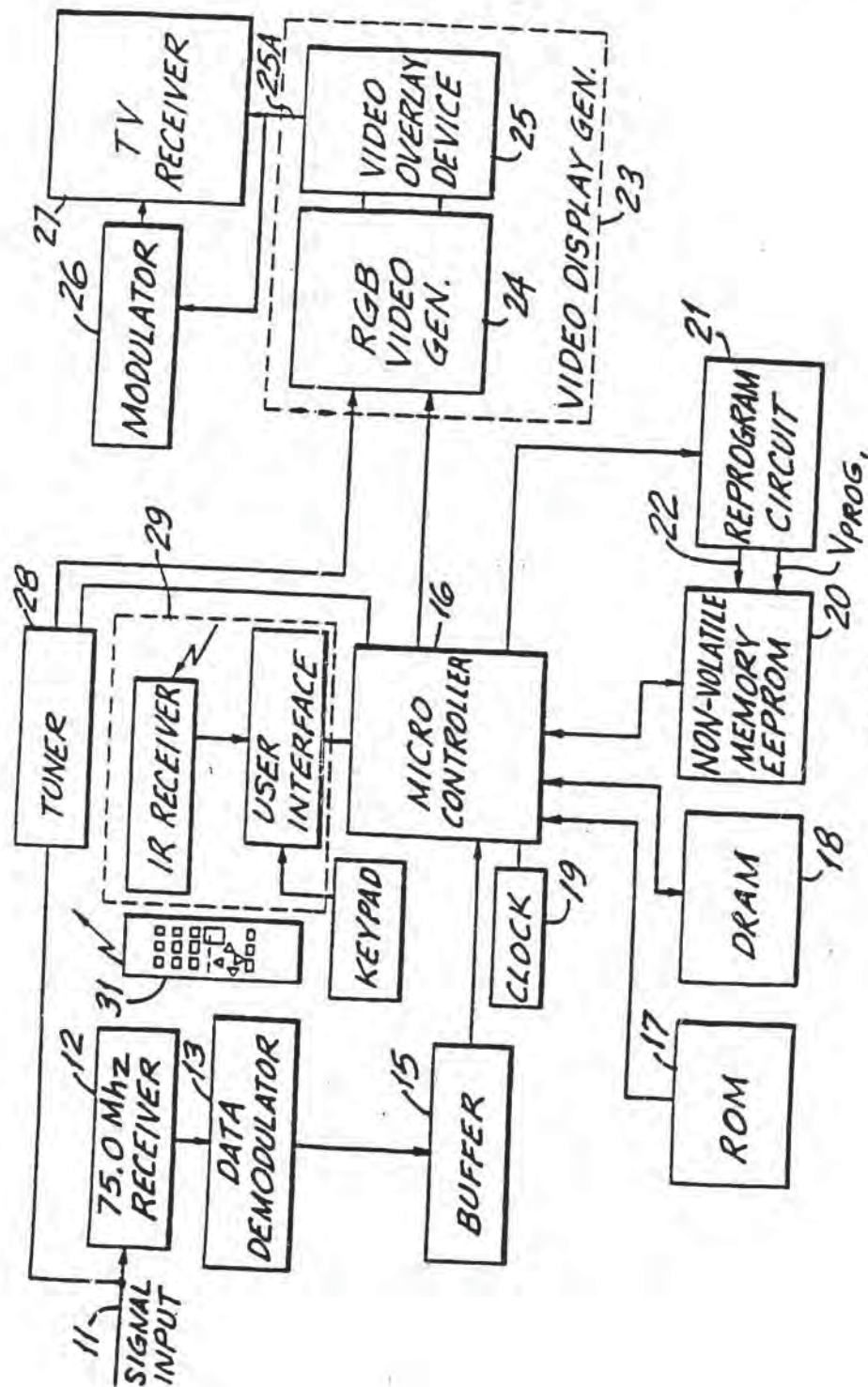


FIG. 1

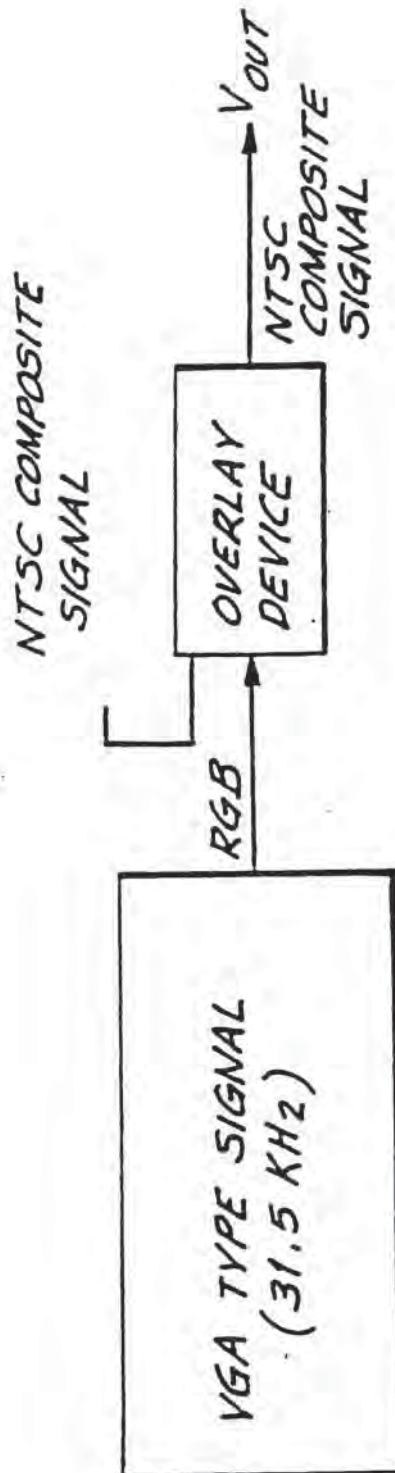


FIG. 2

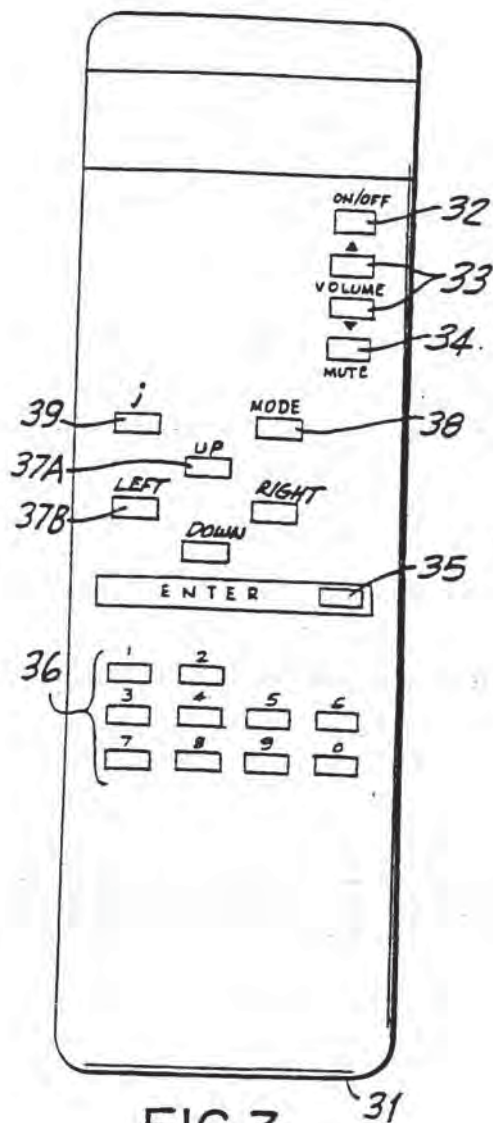


FIG. 3

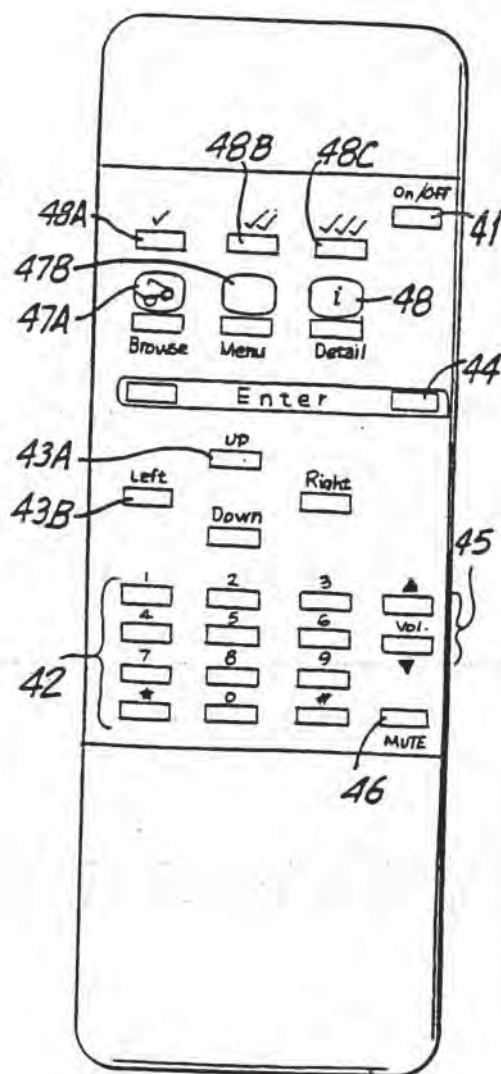


FIG. 4

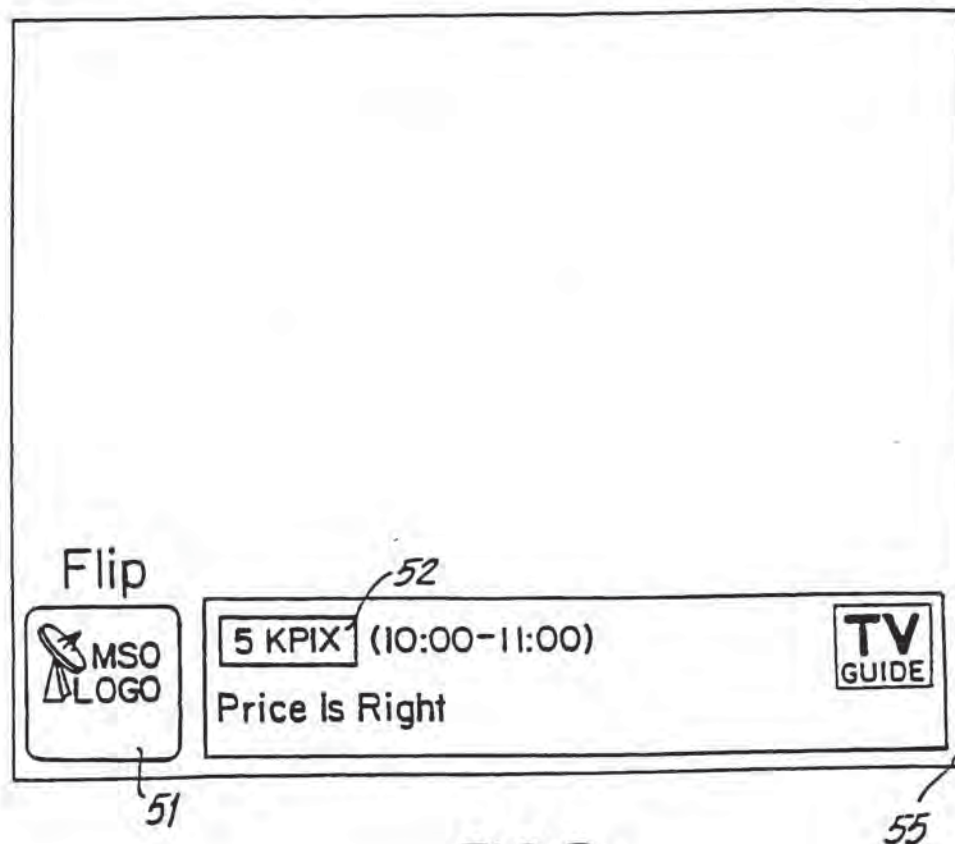


FIG. 5

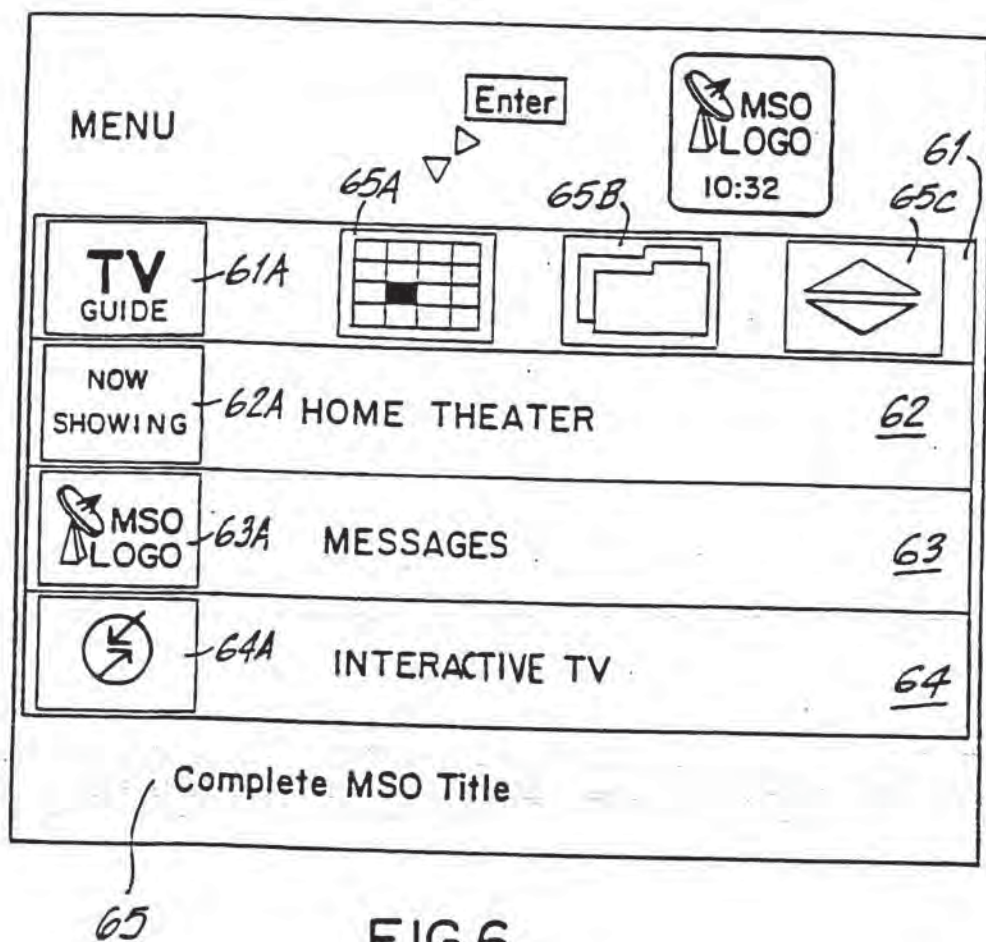


FIG. 6

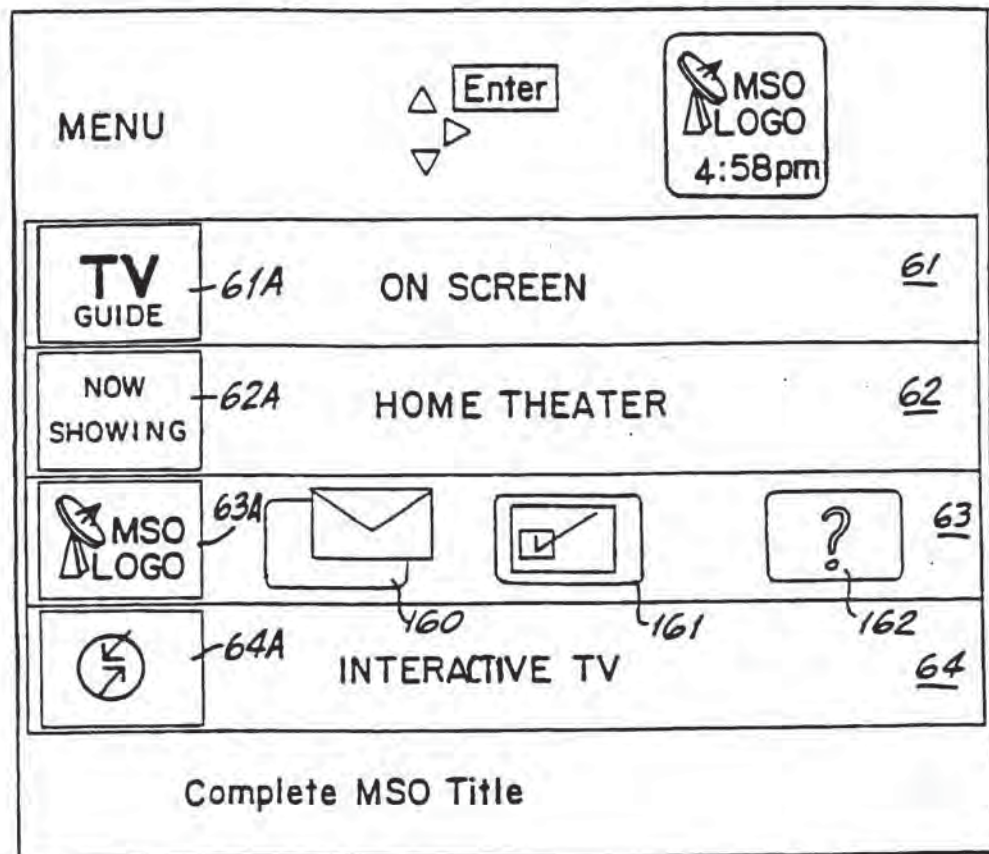


FIG. 6A

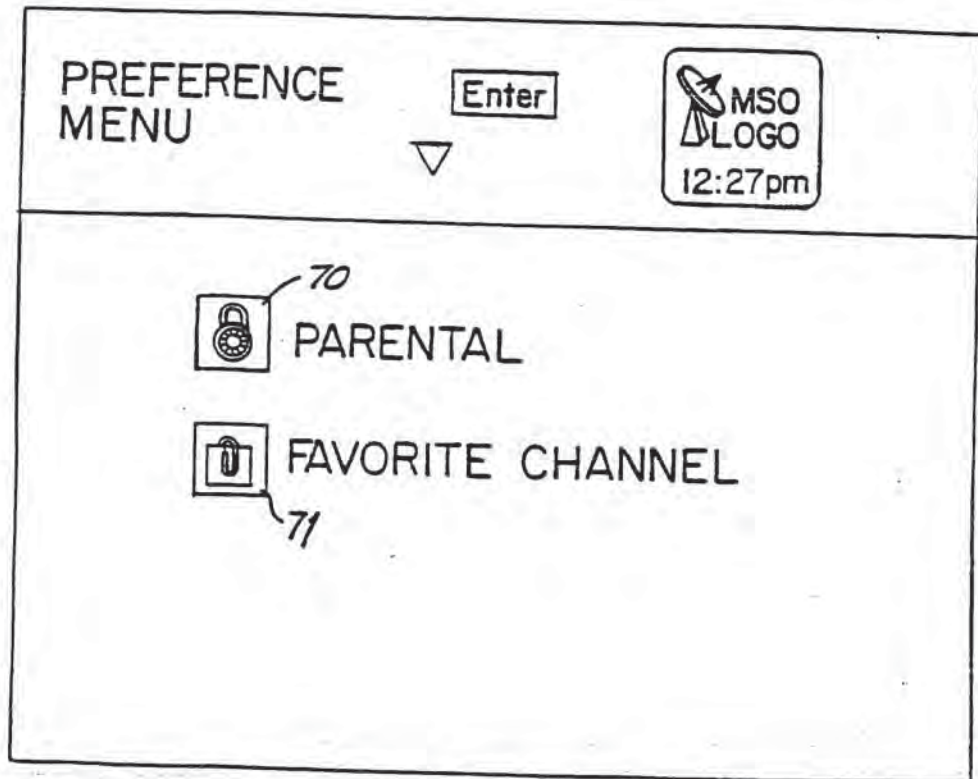


FIG.7

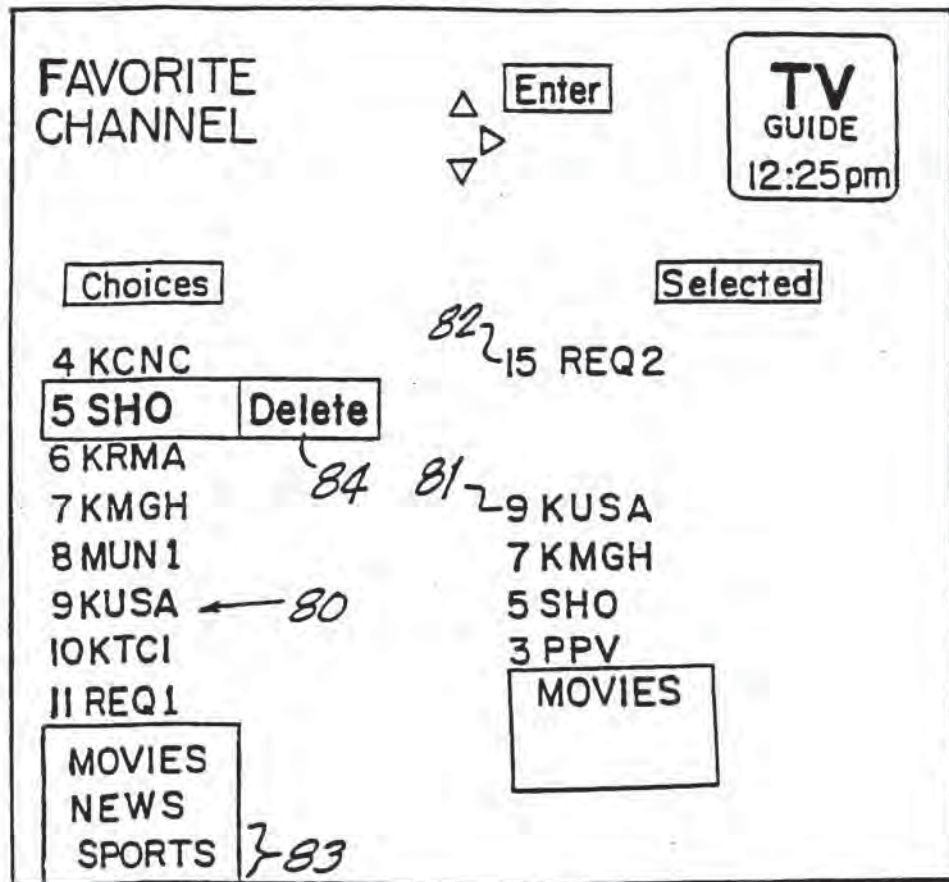


FIG. 8

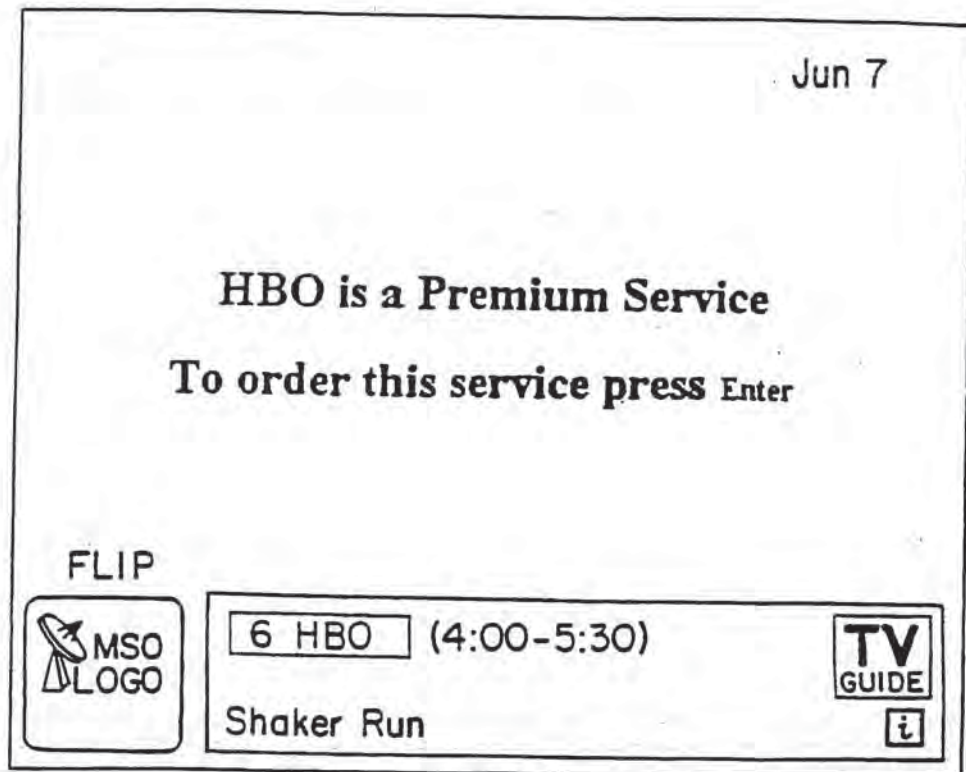


FIG.9

Premium Services	Enter	 5:03pm
HBO	Home Box Office \$10.40/Month	
SHO	Showtime \$9.95/Month	
DIS	The Disney Channel \$9.95/Month	
TMC	The Movie Channel \$1.50/Month	
MAX	Cinemax \$9.95/Month	
PLA	Playboy at Night \$4.95/Evening(5:00pm to 3:00am)	
ACT	Action \$5.95/Day(11:00pm to 3:00pm)	
Movie, special events and family programming!		
You are not a Subscriber. Press Enter to Subscribe!		

FIG. 10

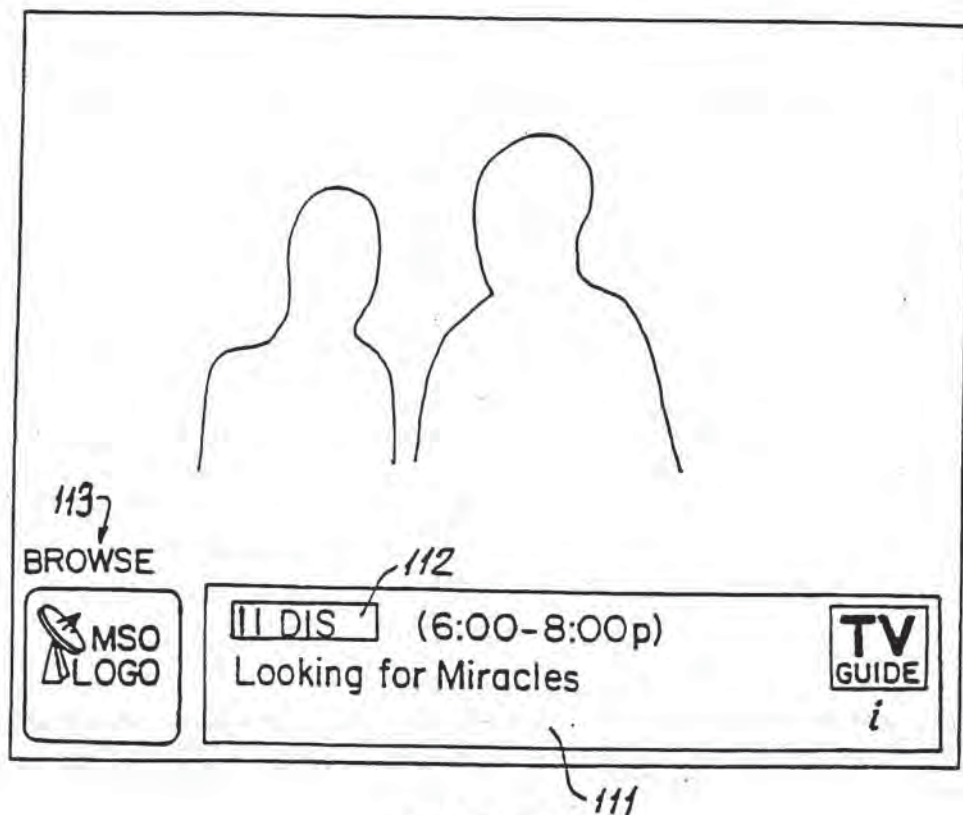


FIG. II

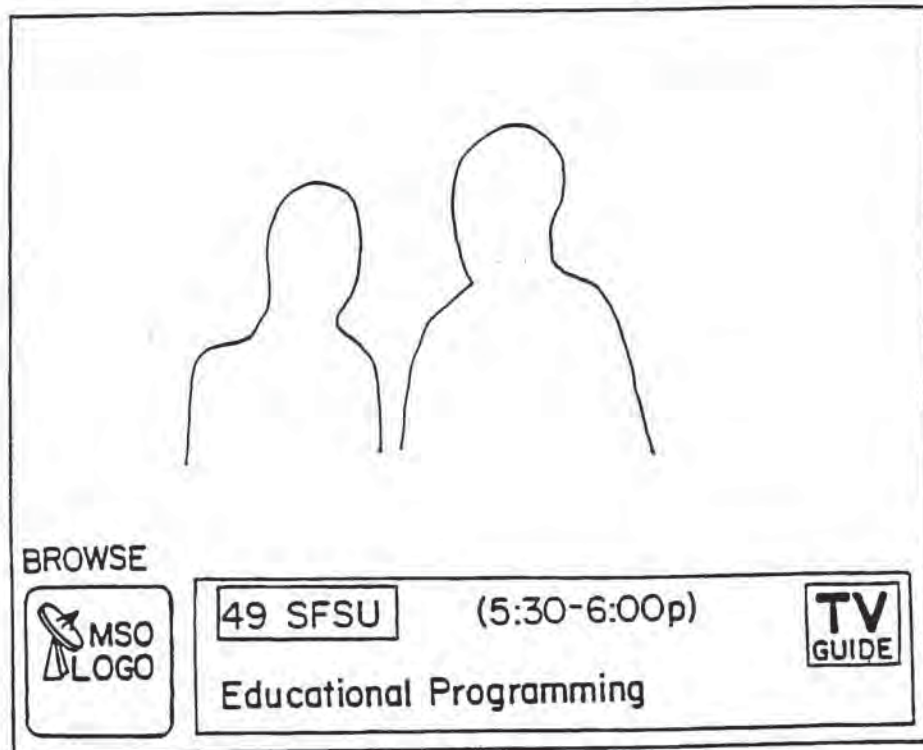


FIG. 12

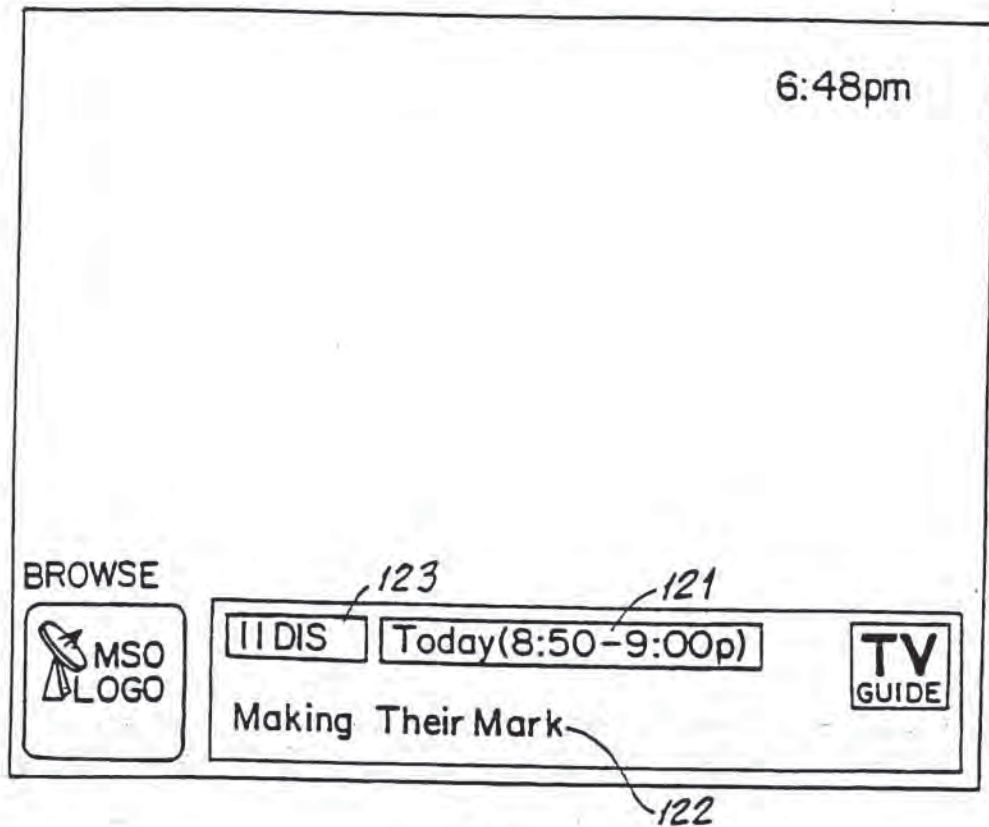


FIG. 12A

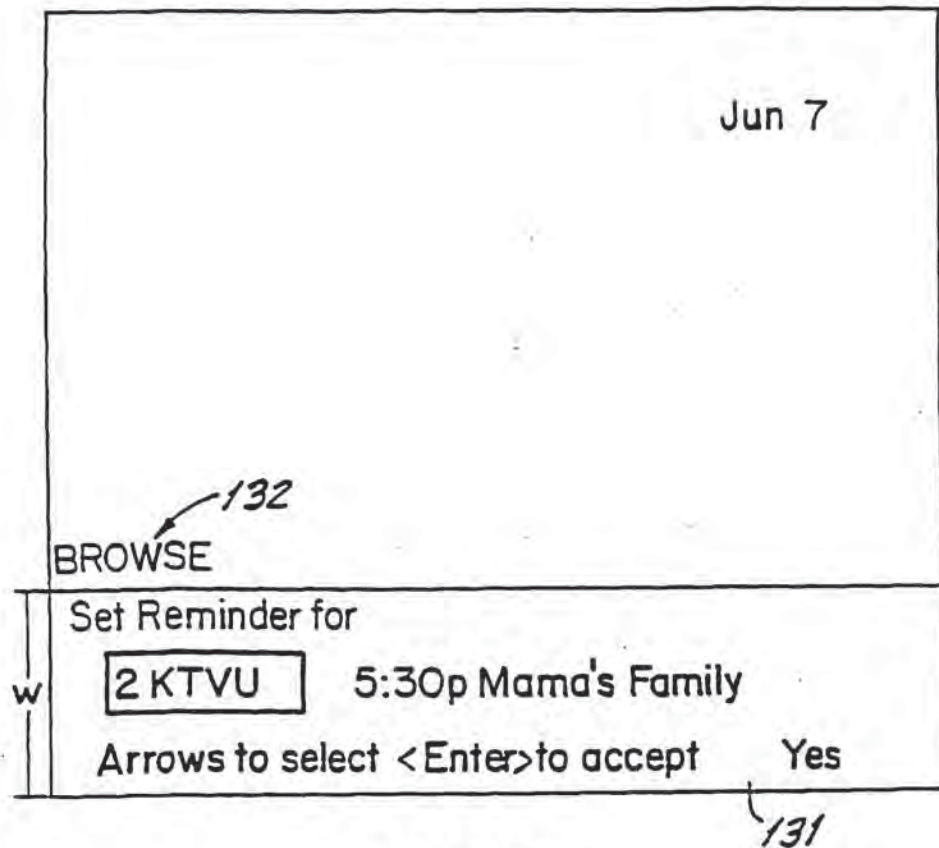


FIG.13

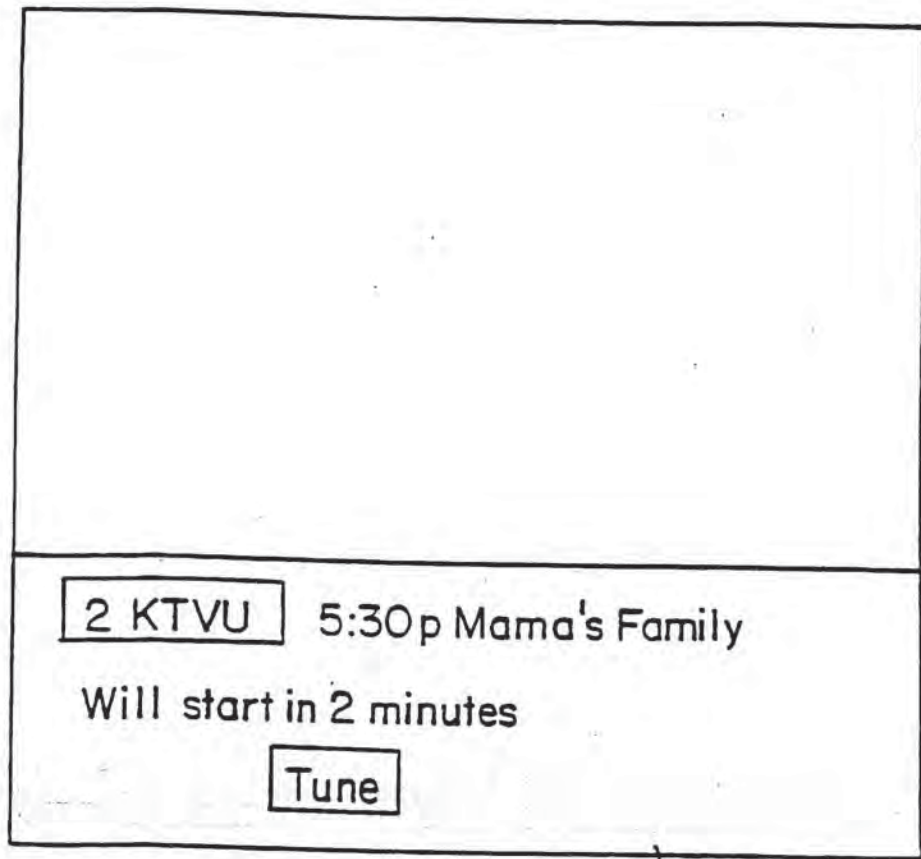


FIG.14

140

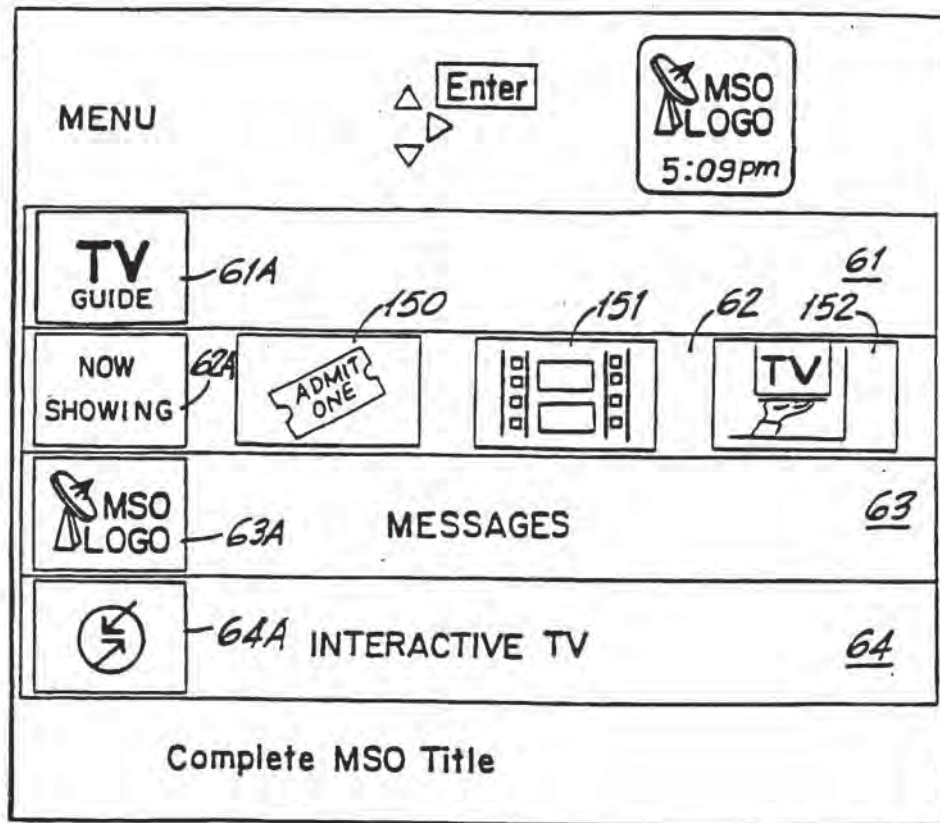


FIG.15

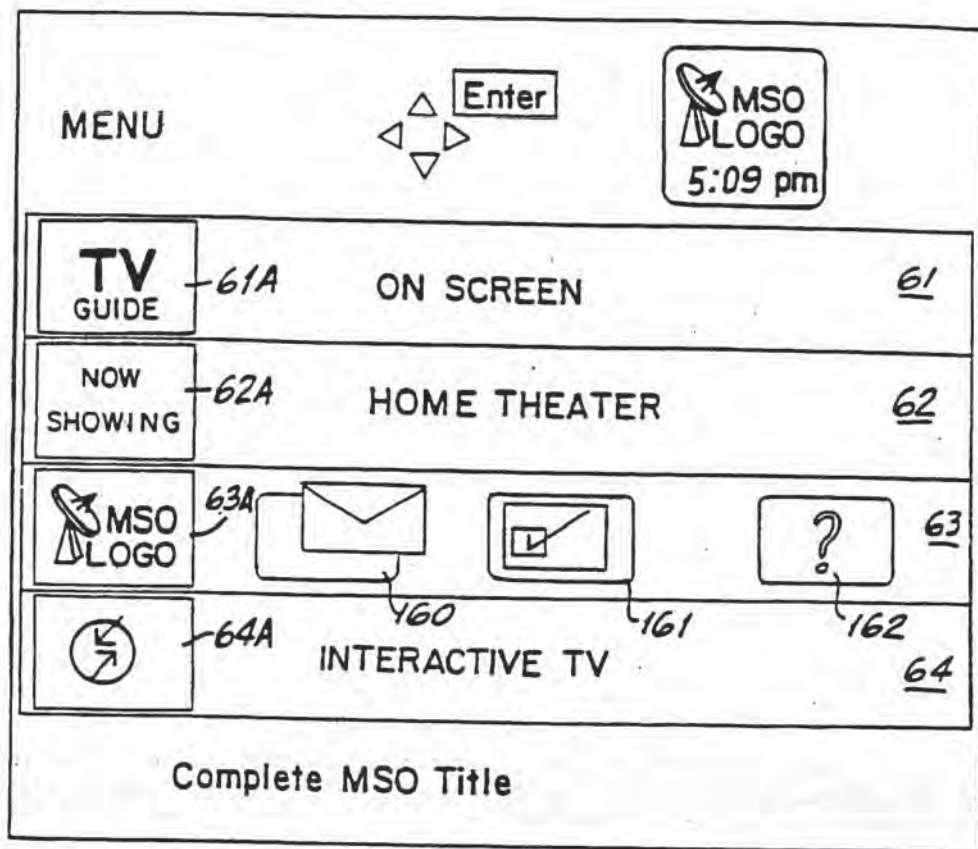


FIG. 16

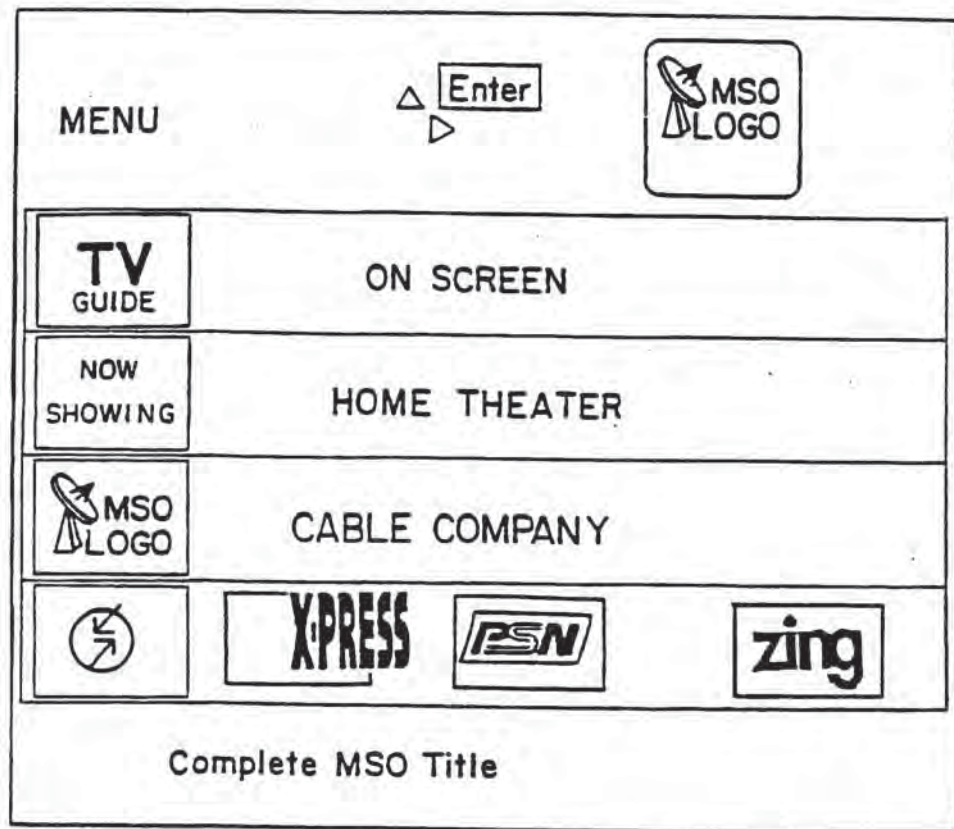


FIG. 17

All-180 Listings

4 KRON

Today

4 KRON

5 KPIX

6 HBO

7 KGO

Baseball (4:30 - 7:30p)

7:00p

7:30p

8:00p

8:30p

Baseball

Ent. Tonight

Fresh Prince

Blossom

Evening Shade

Major Dad

Murphy Brown

JFK: In His Own Words

JFK

Jeopardy!

Wheel of Fortune

Day One

TV GUIDE

7:13 pm

182

183

Enter

i

184

185

FIG. 18

FIG. 19

Listings By ²⁰¹

Today ²⁰³

4:30p Baseball	i
7:30p Entertainment Tonight	
8:00p Fresh Prince	
8:30p Blossom	
9:00p Perry Mason: Notorious Nun	i
11:00p News	
11:30 Tonight	
12:30a David Letterman	

FIG. 20

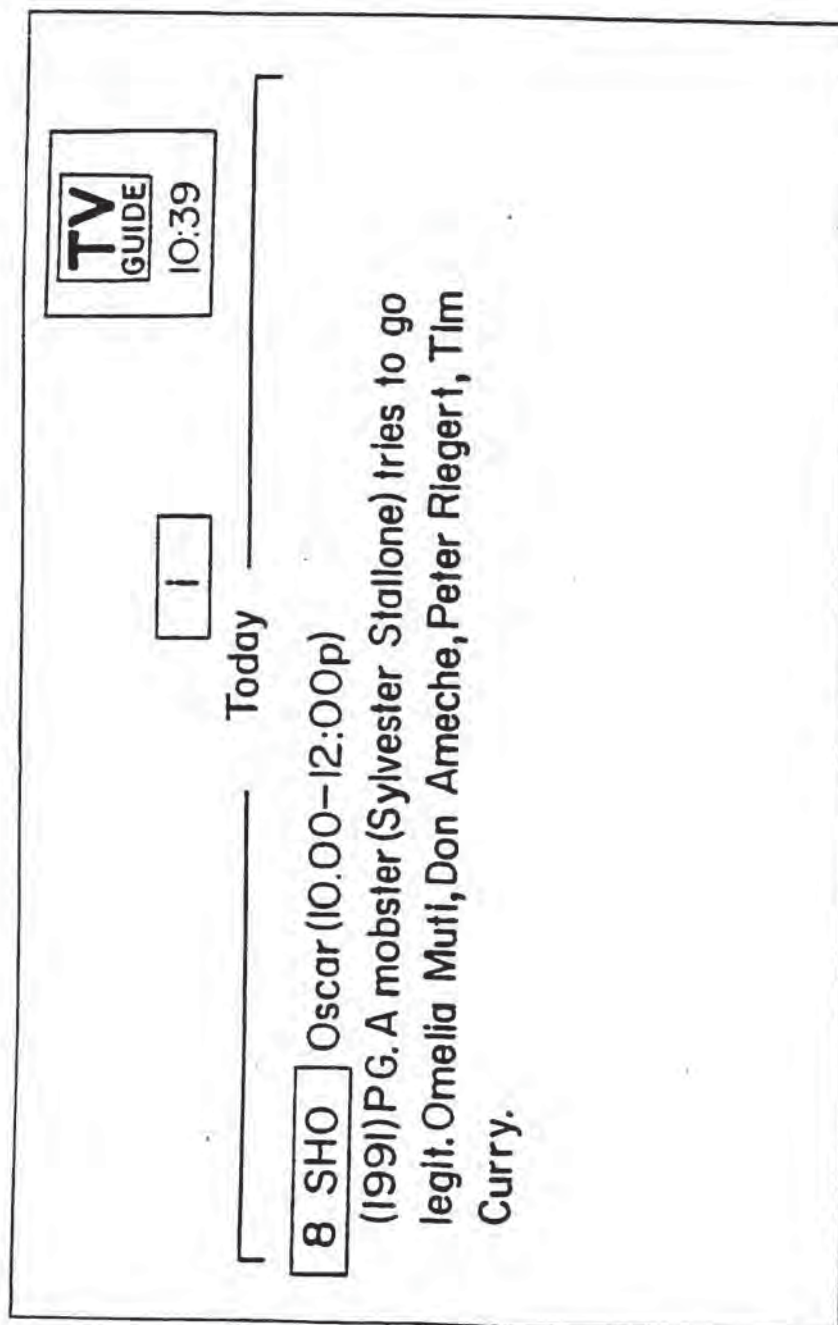
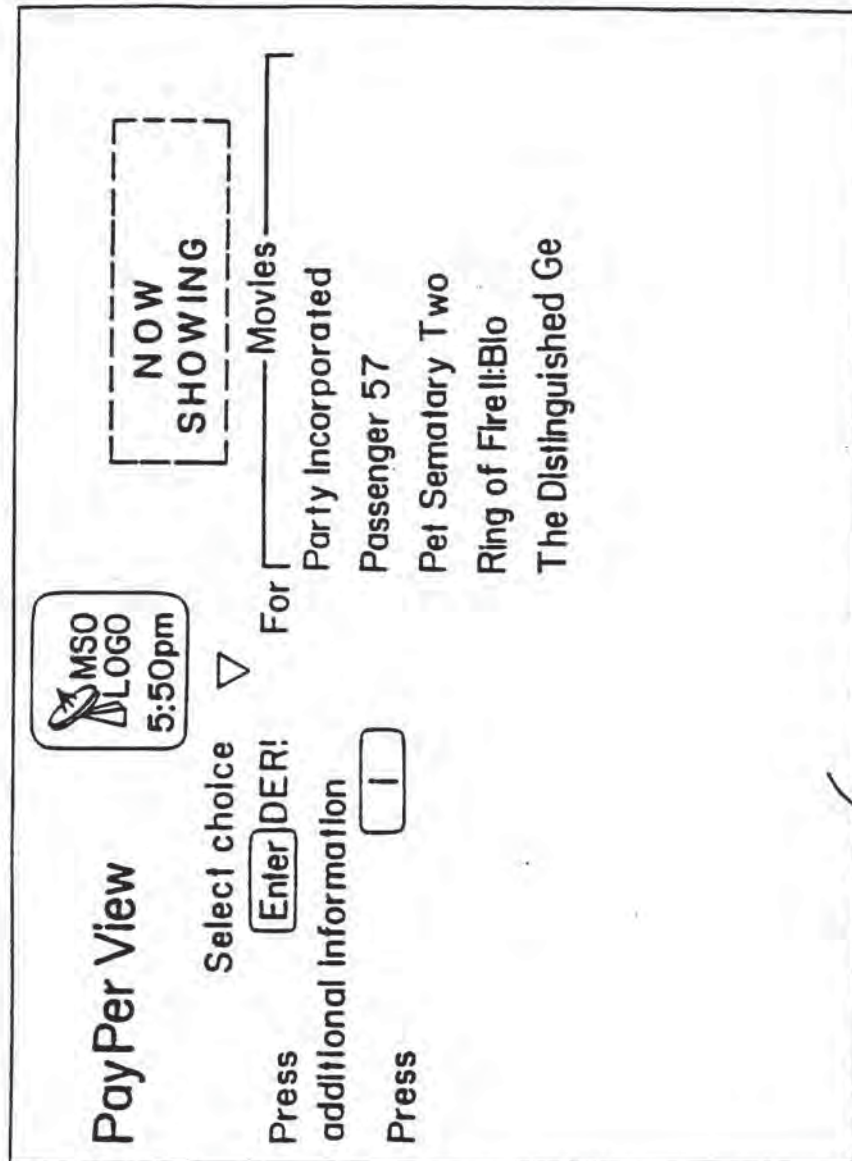


FIG. 21



220 FIG. 22

Pay Per View
Ordering

Enter

MSO
LOGO
5:49 PM

\$ 3.99

Passenger 57

What time would you like this show to start?

Today 9:00p Tomw 12:00p Tomw 6:00p

Would you like to see a countdown onscreen
just before the show start

Yes No

PPV /
Source

FIG.23

Pay Per View Confirmation	◀	Enter	 5:49 pm						
You have requested to order :									
Passenger 57		\$ 3.99							
NO, I DO NOT WANT TO ORDER.									
<table border="1"><tr><td>PPV</td><td>/</td><td></td></tr><tr><td>/</td><td>Source</td><td></td></tr></table>				PPV	/		/	Source	
PPV	/								
/	Source								

FIG.24

Pay Per View Confirmation					
You have requested to order:					
Passenger 57	\$ 3.99				
Yes, I would like to order					
Passenger 57 has been Ordered!					
Tune to Channel 1 Today at 9:00pm.					
<table border="1"><tr><td>PPV /</td><td></td></tr><tr><td>/</td><td>Source</td></tr></table>		PPV /		/	Source
PPV /					
/	Source				

FIG.24A

LISTINGS		 Listing 		6:06P AUG 16		
5:00	5:30	6:00	6:30	7:00	7:30	8:00
NBC	4	News				
ABC	6	News				
CBS	10	CBS News				
Fox	28	Club Paradise (5:00)				
PBS	29	Mystery!				
COM	30	Tribute to Carson				
HBO	33	Gremlins 2: The New Batch				
ESN	34	Tennis (4:30)				
AMC	35	Arise my Love (5:00)				
DSC	37	Natural World				
NIK	38	I Love Lucy				

FIG.25

Premium Services	Enter	 5:03pm
▽		
HBO	Home Box Office \$10.40/Month	
SHO	Showtime \$9.95/Month	
DIS	The Disney Channel \$9.95/Month	
TMC	The Movie Channel \$1.50/Month	
MAX	Cinemax \$9.95/Month	
PLA	Playboy at Night \$4.95/Evening(5:00pm to 3:00am)	
ACT	Action \$5.95/Day(11:00pm to 3:00pm)	
Movie, special events, and family programming!		
You are not a Subscriber. Press Enter to Subscribe!		

FIG. 26

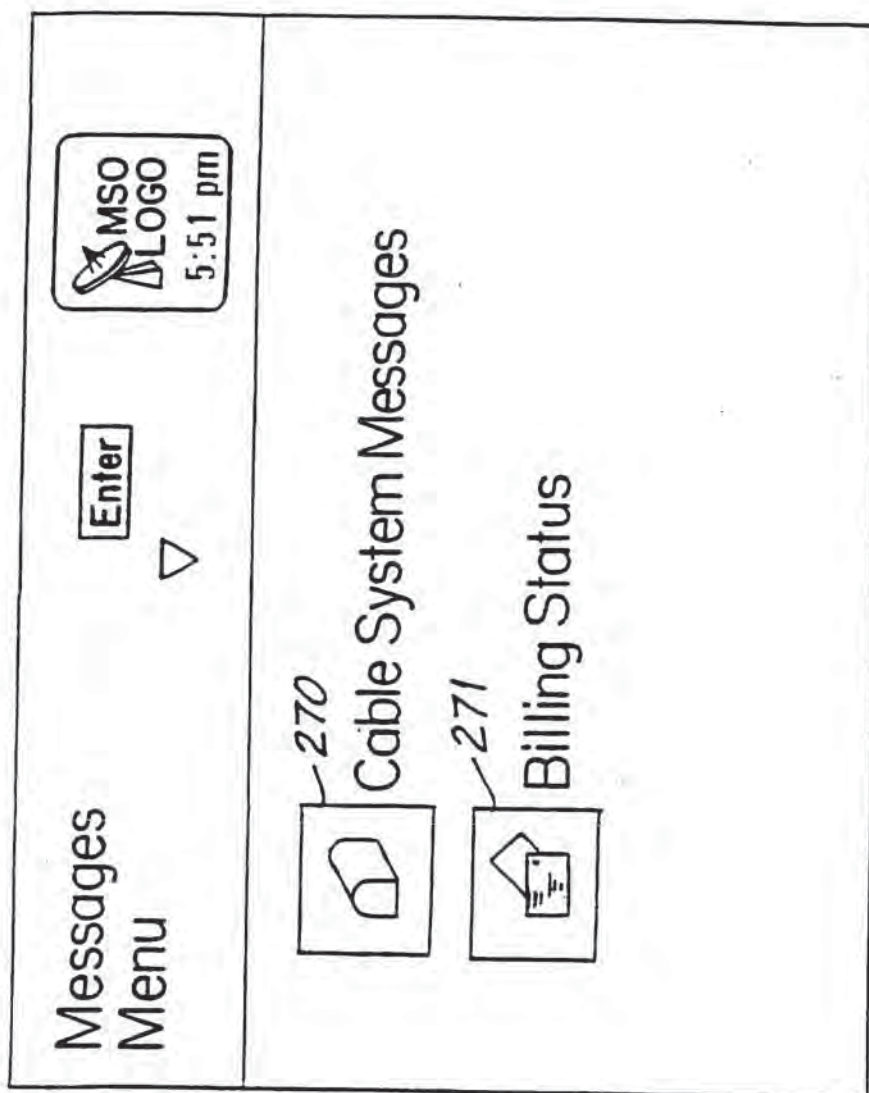


FIG. 27

Cable System Messages	 MSO LOGO 5:52 pm Pay Per View is featuring "Batman Returns" this month. Get a free sneak peek of HBO this weekend.	Complete MSO Title
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FIG.28

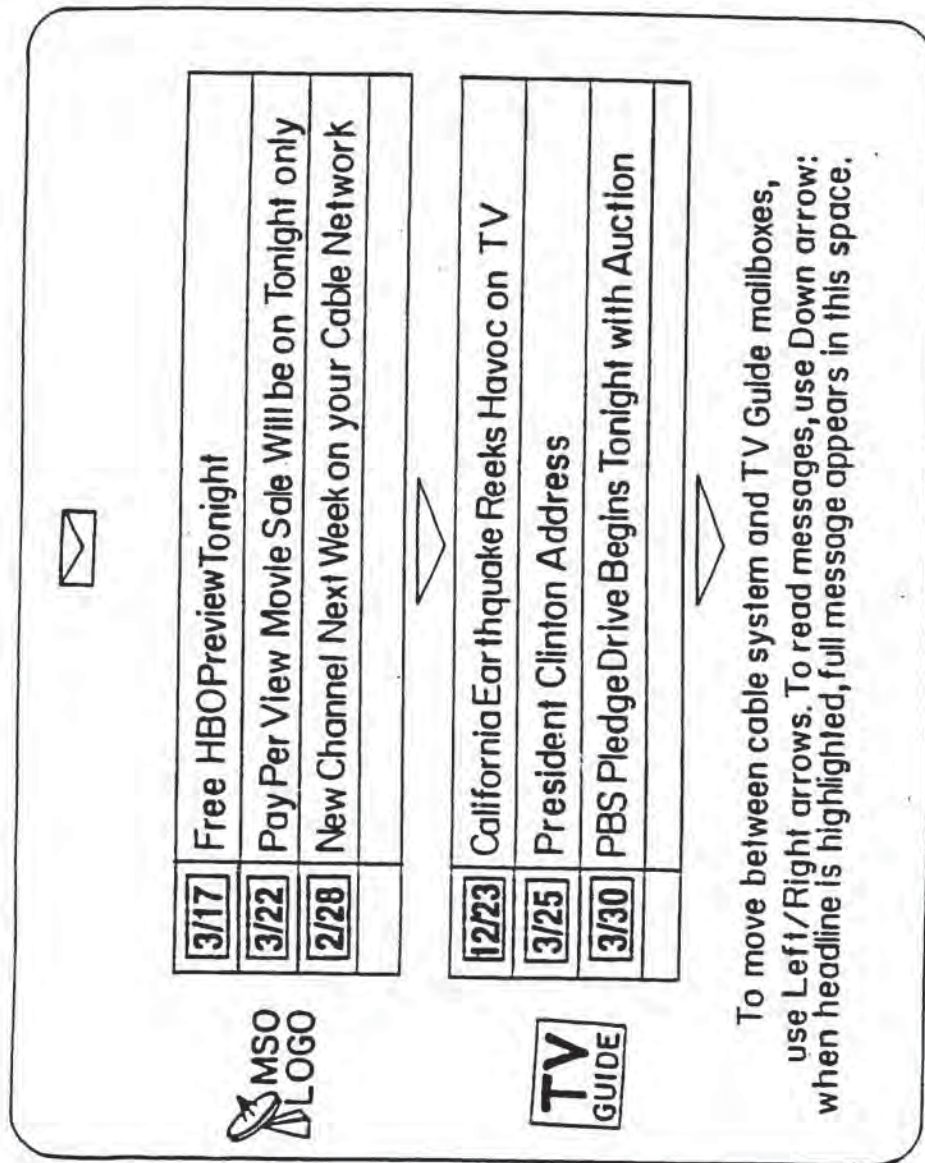


FIG. 28A

 5:52 pm			
Billing			
Name: TV Guide Onscreen	Acct. #: 12345-098765-08-9		
Billed From: 05/25/93	Billed To: 06/25/93 Total: \$3.99		
FOR CUSTOMER SERVICE CALL: 790-0900			
Date	Time	Service / PPV Event	Cost
06/07/93	9:00 p	PASSENGER 57	\$3.99

FIG. 29

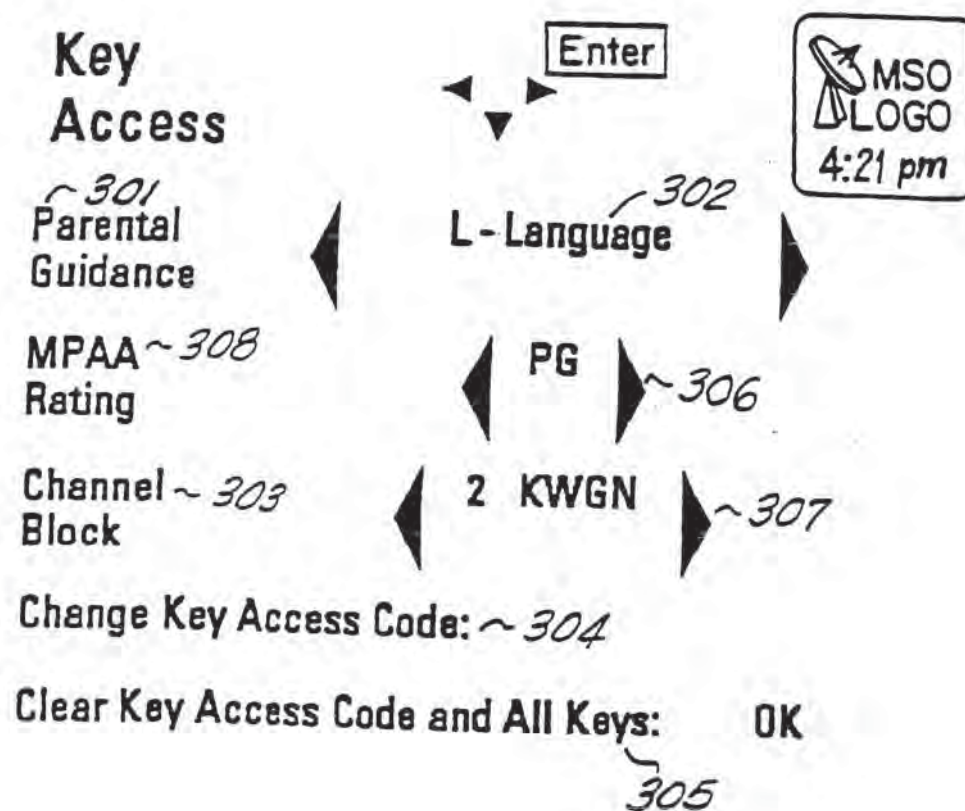


FIG.30

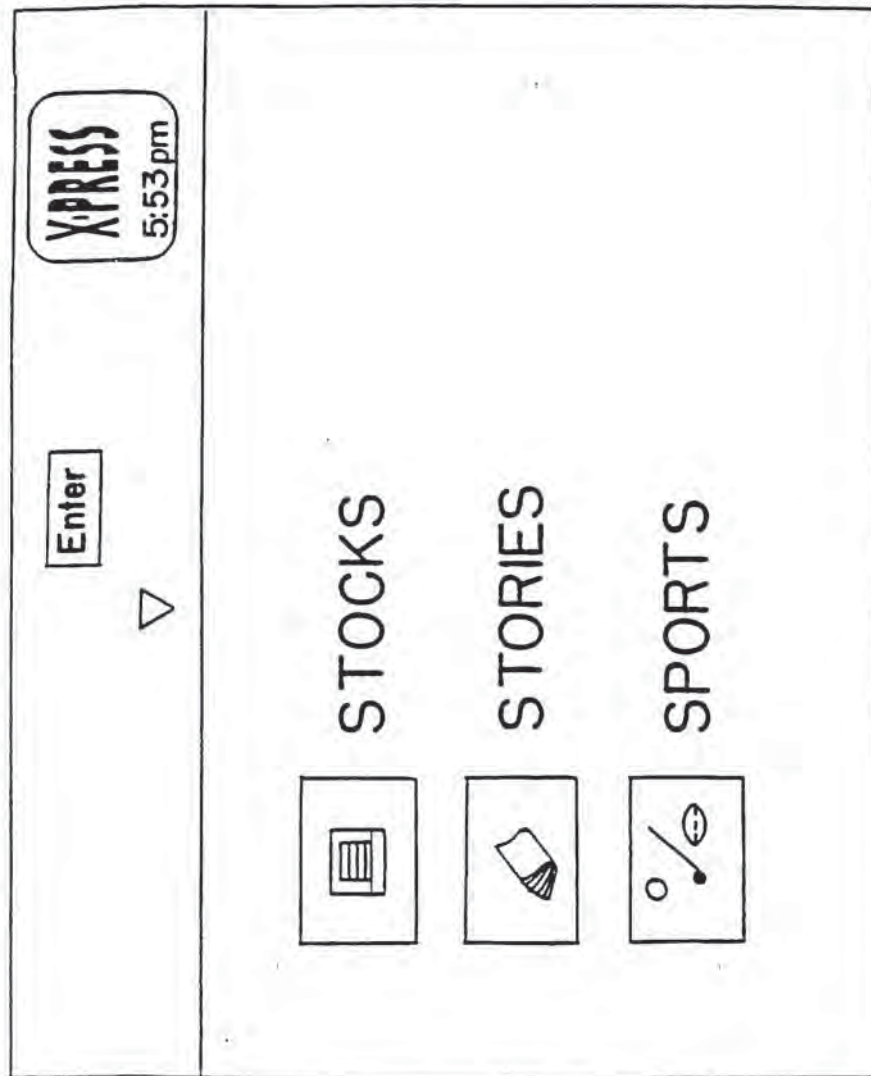


FIG. 31

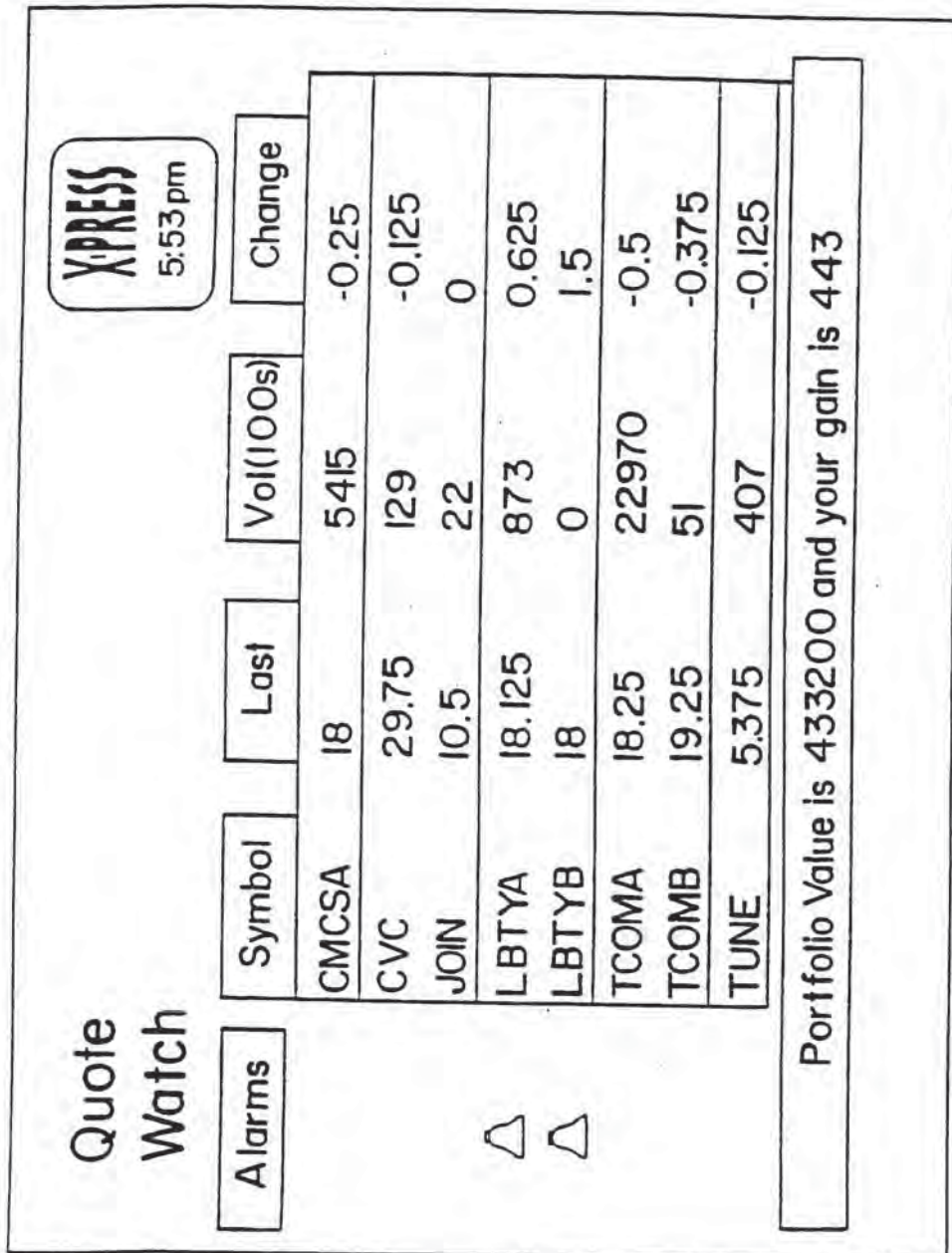


FIG. 32

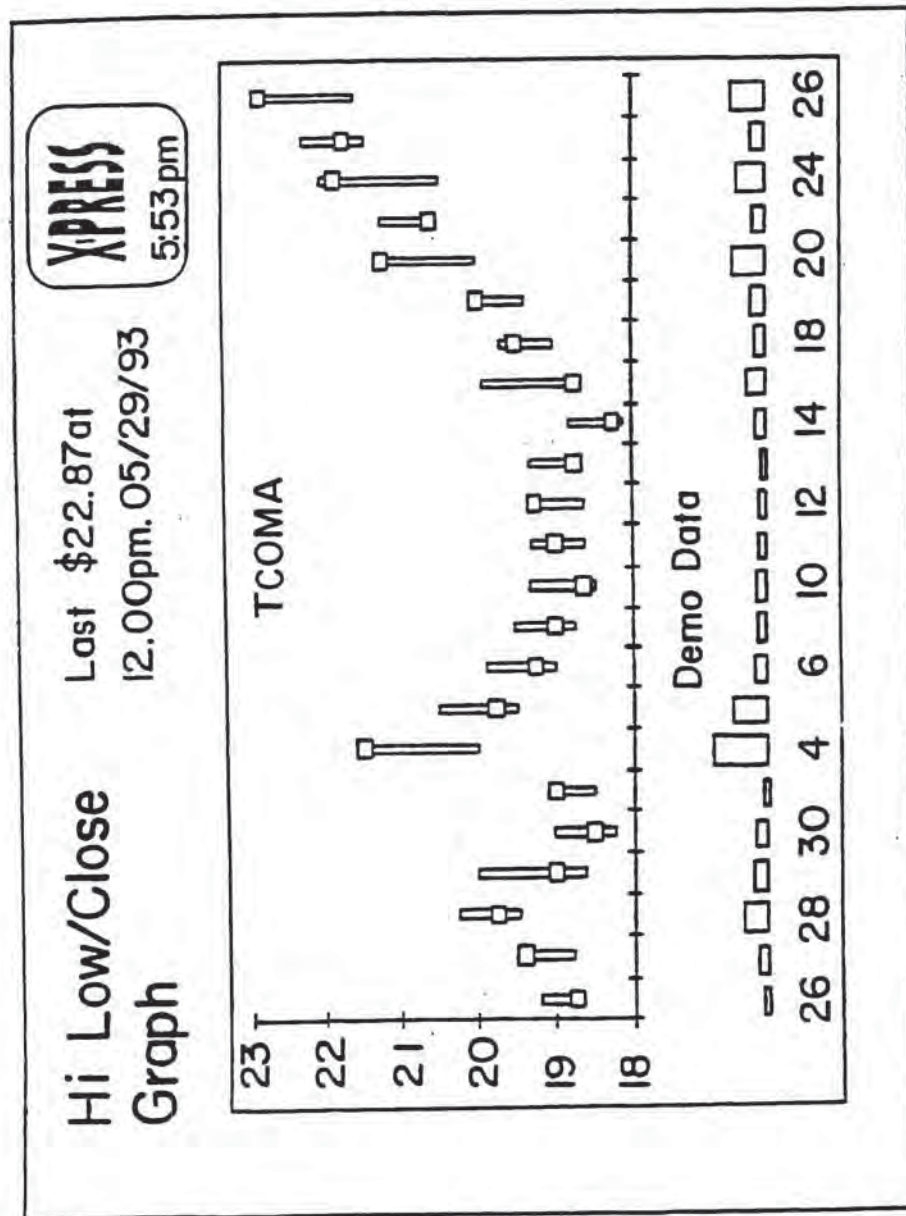


FIG. 33

STORIES**US World News****Cubans use Vitamins to combat epidemic**

Geneva - A costly campaign to provide vitamins to all Cubans has helped curb a mysterious epidemic that has afflicted thousands with vision problems, a World Health Organization official said yesterday.

The outbreak of optical neuritis has dimmed the vision of about 20,000 Cubans and a related malady has affected 6,000 other people, mostly women.

FIG.34

SPORTS



Major League Baseball

Yesterday in National League Action

Colorado 7, Houston 5

San Francisco 5, Chicago 4

Yesterday in American League Action

Detroit 4, Boston 1

Toronto 4, Milwaukee 2

FIG.35

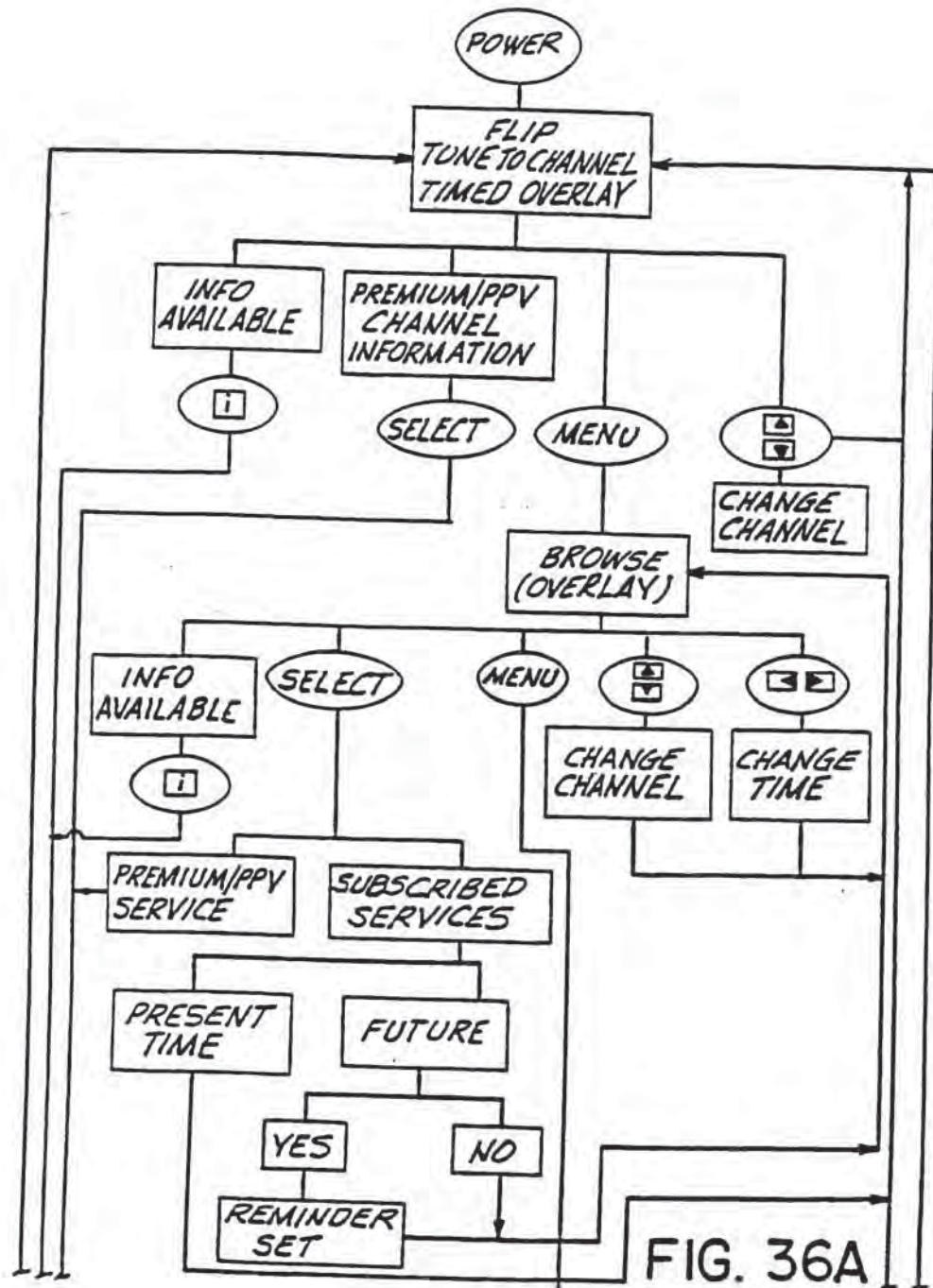


FIG. 36A

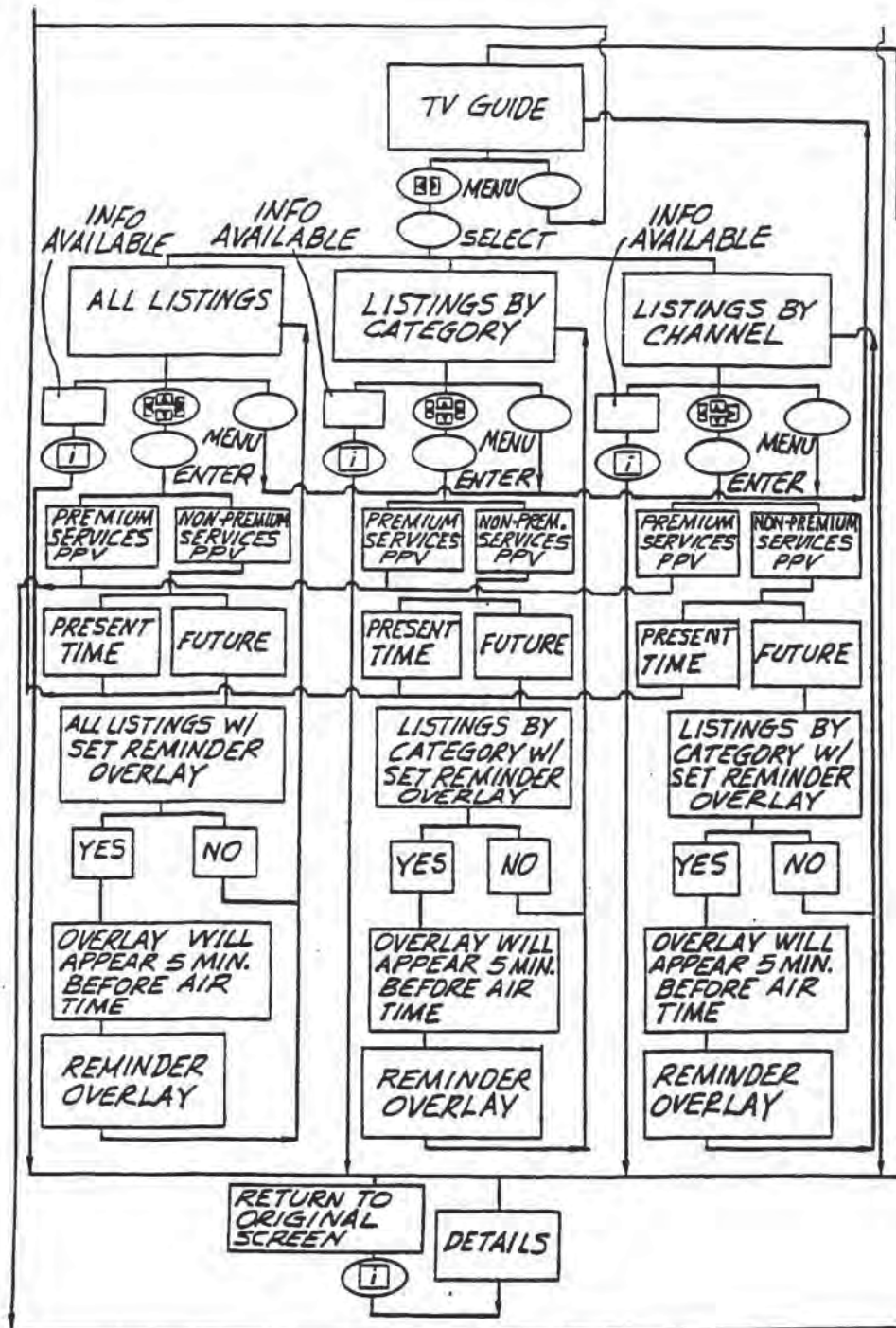


FIG. 36B

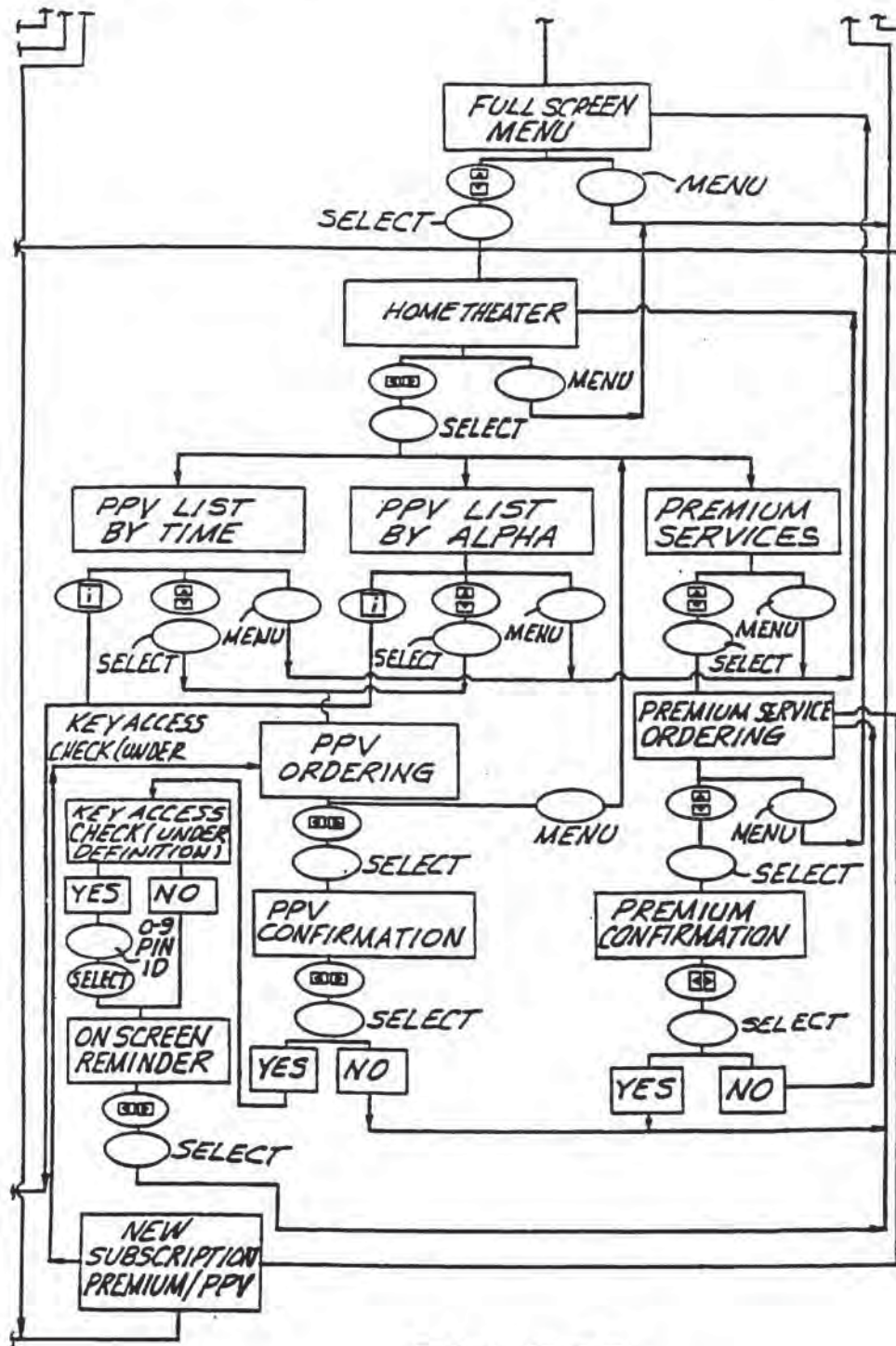


FIG. 36C

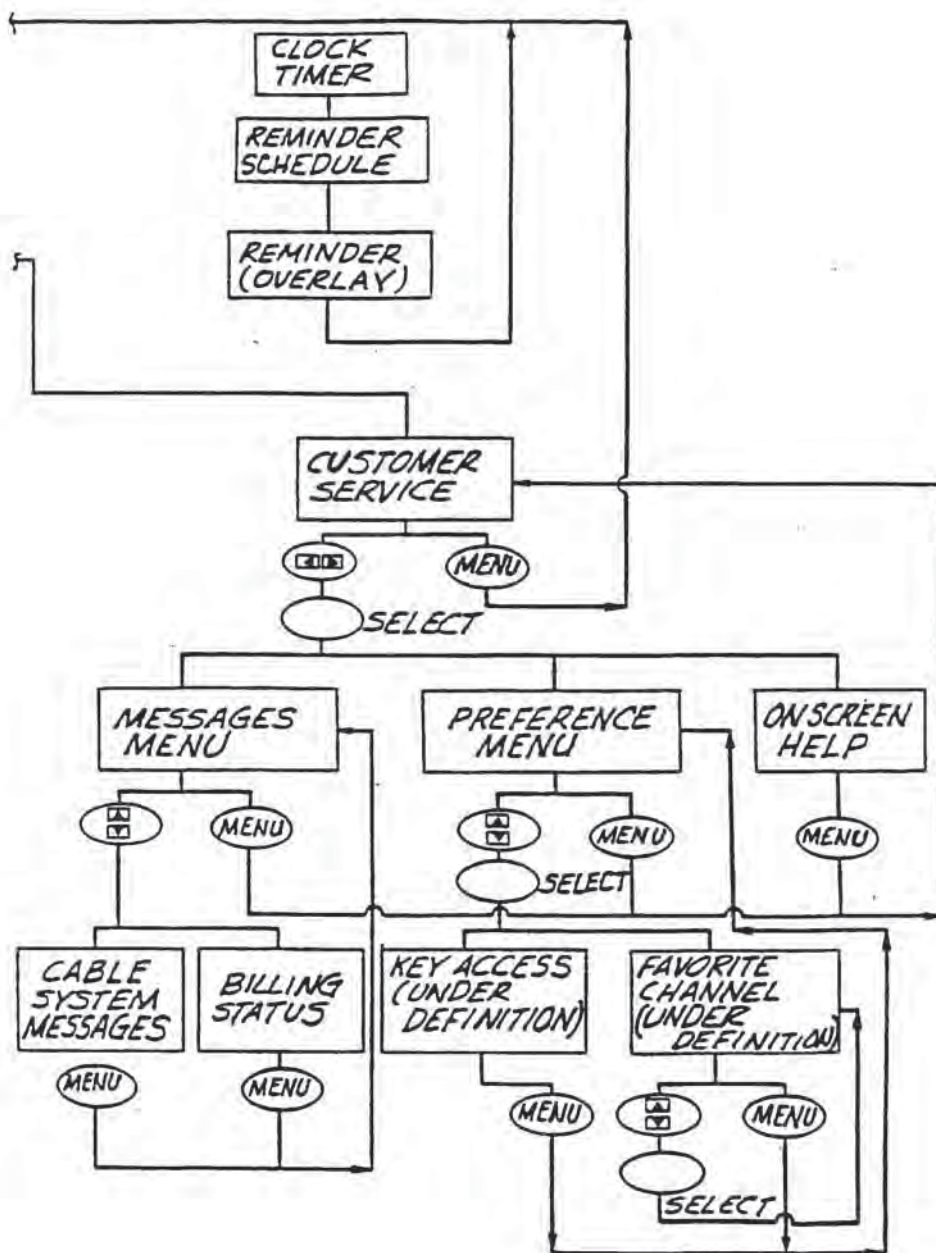


FIG. 36D

ELECTRONIC TELEVISION PROGRAM GUIDE SCHEDULE SYSTEM AND METHOD

BACKGROUND OF THE INVENTION

This invention relates to an electronic program schedule system, which provides a user with schedule information for broadcast or cablecast programs viewed by the user on a television receiver. More particularly, it relates to an improved electronic program guide that provides the user with a more powerful and convenient operating environment, while, at the same time, increasing the efficiency of navigation by the user through the guide.

Electronic program guides for television systems are known in the art. For example, one prior system used an electronic character generator to display textual schedule information on the full screen of a television receiver. Other prior systems presented electronically stored program schedule information to a user for viewing while allowing the user to select display formats. Still other systems employed a data processor to input user-selection criteria, then stored only the program schedule information meeting these criteria, and subsequently used the stored information to automatically tune a programmable tuner or activate a recording device at the time of broadcast of the selected television programs. Such prior systems are generally discussed in "Stay Tuned for Smart TV," published in the November 1990 issue of *Popular Science*.

Collectively, the prior electronic program systems may be difficult to implement and cumbersome to use. They also fail to provide viewing capabilities that address in a more realistic manner the viewing habits of the users of these electronic program systems. Moreover, many of these systems are complex in their design and are expensive to implement. Ease of use and economy are primary concerns of television program distributors and viewers as they contemplate dramatic increases in the number and nature of program networks and other television-based services. And, as the number of television channels available to a user increases dramatically with the advent of new satellite and cable-based technologies, the utility of these prior systems substantially diminishes.

These prior-art systems also fail to provide the user with sufficient information, for example pricing and the like, about pay-per-view events, premium services or other packaged programming to which the user does not subscribe, nor do they provide the user with the capability to automatically purchase such programming on demand or impulse. Moreover, these prior-art systems are deficient in that they fail to provide an efficient and automatic method of updating or replacing the application software programs that implement the electronic guide at the user sites, relying instead on manual or other cumbersome forms of revision or replacement or hardware-based systems that can not be updated without physical replacement of integrated circuits and/or other parts.

Nor do these prior electronic guide systems have the capability of linking the user to other applications or information systems which are not part of the electronic program guide application or data.

Nor do these prior electronic guide systems provide video promotion of television programs and services that are functionally linked and visually displayed in an integrated fashion. Program promotion is an important element of the effective marketing of television programming. The promotion of pay-per-view pay (i.e., "a la carte") programs and other unregulated program services is particularly important

to cable television operators in the wake of re-regulation by the federal government. The current method of promoting such programming using video is through dedicated "barker" channels that use full screen continuous trailers (i.e., previews) which may or may not be accompanied by prices and ordering information. Recently, such promotional videos have been shown in split screens where part of the screen shows general schedule information for a time period roughly corresponding to the time period during which the general program being promoted is shown. Accordingly, there exists a need for an electronic program guide which can provide improved display and linking of video promotions with program schedule information and order processing functions.

The prior electronic program guides also fail to provide the user with a simple and efficient method of controlling access to individual channels and individual programs. The amount of adult situations involving sex and violence has steadily increased during the last 40 years. The issue of how this affects children or other viewers has gained national attention. Providing a parent with the ability to lock-out a channel is a well known and widespread feature of certain television receivers and cable converter boxes. Despite this availability, the feature is seldom used by parents. The main impediments to its effective use are the cumbersome ways in which it is generally implemented, as well as the requirement that entire channels be blocked in order to block access to any objectional programming. A channel-oriented parental lock is unfair to other programmers on the blocked channel—who, for example, offer adult-oriented programming in the evening and youth-oriented programming the following morning—and inconvenient for viewers who want access to such programs. Thus, there is a particular need for a system which provides password control to individual programs and channels using a flexible and uncomplicated on-screen user interface.

The prior electronic program guides are also deficient in that they do not provide the user with the ability to view on demand current billing status and, thus, a need exists for a system which can provide the user with current billing information on the user's demand.

The prior electronic program guides also lack a method for creating a viewing itinerary electronically while still viewing a program currently appearing on the television receiver. Moreover, these prior program guides leave much guess work for the user as he navigates through a sequence of channels. When skimming through channels to ascertain the program then being displayed on any channel, commonly known as "channel surfing," the user needs to guess which program is currently being aired from the video encountered as the user surfs through the channels. Since much—in some cases, up to 30%—of the programming appearing on any given channel at any given time is advertising or other commercial programming, the user is not provided with any clues as to what program is appearing on a selected channel at a given time and must therefore wait until the advertisement or commercial is over before ascertaining the program then appearing on the selected channel. Thus a need exists for a program guide which displays current program schedule information for each channel as the user surfs through the available channels.

Accordingly, there is a need in the art for a simplified electronic program schedule system that may be more easily implemented, and which is appealing and efficient in operation. There is also a need to provide the user with an electronic program schedule system that displays both broadcast programs and electronic schedule information in a

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manner not previously available with other electronic program schedule systems, particularly those using a remote controller.

For example, there is a particular need for a flexible program schedule system that allows a user to view selected broadcast programs on a portion of the screen of the television receiver while simultaneously viewing program schedule information for other channels and/or services on another portion of the screen. There is also a need for such a program schedule system that permits the user to select from a plurality of selectable display formats for viewing the program schedule information. It is also preferred to have a system that indicates to the user those keys on the remote controller that are active in any particular mode of operation. There also exists a need for such a system that will give a user the capability to set a programmable reminder for viewing a program scheduled to air at a future time.

There is also a need for an electronic guide system providing the user with comprehensive information about pay-per-view events, premium services or other packaged programming to which the user does not ordinarily subscribe, and which provides the user with the capability to automatically purchase such programming on demand or impulse. There is also a need for an electronic guide system providing a reliable and efficient method of updating or replacing the application software that implements the electronic guide at the user sites.

There also exists a need for an electronic program guide that operates as a shell or window to provide the user with the capability to access other applications or information systems that are not part of the electronic program guide application or data.

It is accordingly an object of the present invention to provide a system that will allow the user to view a broadcast program while, at the same time, interactively viewing program schedule information for other programs.

It is another object of the present invention to provide the user with the ability to select from among a plurality of display formats for the program schedule information.

It is yet another object of the present invention to indicate to the user of the program schedule system those keys on the remote controller active in the particular mode of operation of the system at the time of use.

It is a still further object of the present invention to provide the user of the electronic program schedule system with the capability of setting programmable reminder messages for any future program.

It is yet a further object of this invention to provide the system user with comprehensive information about pay-per-view events, premium services or other packaged programming to which the user does not subscribe and the capability to automatically purchase such programming on demand or impulse.

It is another object of the present invention to provide an electronic guide system that provides a reliable and efficient method of updating or replacing the application software programs that implement the electronic guide at the user sites.

It is still another object of the electronic program guide to operate as a shell or window to provide the user with the capability to access other applications or information systems which are not part of the electronic program guide application or data.

It is yet another object of the electronic program guide to provide a system whereby video promotion of television

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programs and services are functionally linked and visually displayed in an integrated fashion to facilitate the marketing and sale of such programs and services.

It is still a further object of the present invention to provide password control for access to individual programs, as well as channels, using a protected interactive flexible and uncomplicated on-screen interface.

The disclosed system is also adapted to provide the user with current programming information for all programs as the user surfs through the available channels.

It is yet a further object of the present invention to provide a system in which the user can access his current billing information on demand.

These and other objects of the invention are achieved by an electronic program schedule system which includes a receiver for receiving broadcast, satellite or cablecast television programs for a plurality of television channels and a tuner for tuning a television receiver to a selected one of the plurality of channels. A data processor receives and stores in a memory television program schedule information for a plurality of television programs to appear on the plurality of television channels. A user control apparatus, such as a remote controller, is utilized by a viewer to choose user control commands and transmit signals in response to the data processor which receives the signals in response to user control commands. A television receiver is used to display the television programs and television program schedule information. A video display generator receives video control commands from the data processor and program schedule information from the memory and displays a portion of the program schedule information in overlaying relationship with a television program appearing on a television channel in at least one mode of operation of the television programming guide. The data processor controls the video display generator with video control commands, issued in response to the user control commands, to display program schedule information for any chosen one of the plurality of television programs in overlaying relationship with at least one television program then appearing on any chosen one of the plurality of channels on the television receiver.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram showing various components of the preferred embodiment of the invention herein.

FIG. 2 is a block diagram showing the combination of program and schedule information by the video overlay device utilized in the preferred embodiment of the invention.

FIG. 3 depicts a remote controller that can be used in connection with the preferred embodiment of the electronic program guide system of the present application.

FIG. 4 depicts an alternative embodiment of the remote controller shown in FIG. 3.

FIG. 5 shows an overlay appearing on a television screen in one mode of operation of the preferred embodiment of the present invention.

FIG. 6 is a menu that appears on a television screen in a MENU mode of operation of the preferred embodiment of the present invention.

FIG. 6A is yet another menu that appears on a television screen in a MENU mode of operation of the preferred embodiment of the present invention.

FIG. 7 depicts a Viewer Preference Menu that appears on a television screen in one aspect of the preferred embodiment of the present invention.

FIG. 8 shows a Preferred Channel selection submenu.

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FIG. 9 shows an impulse ordering menu that appears on a television screen in one aspect of the preferred embodiment of the present invention.

FIG. 10 shows a Premium Services submenu that appears in one mode of operation of the preferred embodiment of the present invention.

FIG. 11 shows a graphic overlay appearing on a television screen in a BROWSE mode of operation of the preferred embodiment of the present invention.

FIG. 12 shows a graphic overlay appearing on a television screen in a BROWSE mode of operation of the preferred embodiment of the present invention having different information from that shown in FIG. 11.

FIG. 12A shows a graphic overlay appearing on a television screen in a BROWSE mode of operation in the present invention displaying schedule information for a time and channel other than that shown in FIG. 11.

FIG. 13 shows a graphic overlay appearing in a REMINDER mode of operation of the preferred embodiment of the present invention.

FIG. 14 shows yet another graphic overlay appearing in a REMINDER mode of operation of the preferred embodiment of the present invention.

FIG. 15 is yet another menu that appears on a television screen in a MENU mode of operation of the preferred embodiment of the present invention.

FIG. 16 is yet another menu that appears on a television screen in a MENU mode of operation of the preferred embodiment of the present invention.

FIG. 17 is yet another menu that appears on a television screen in a MENU mode of operation of the preferred embodiment of the present invention.

FIG. 18 shows a grid listing of schedule information displayed in an All Listings mode of operation of the preferred embodiment of the present invention.

FIG. 19 shows schedule information displayed in a Listings By Category mode of operation of the preferred embodiment of the present invention.

FIG. 20 shows schedule information displayed in a Listings By Channel mode of operation of the preferred embodiment of the present invention.

FIG. 21 shows information displayed in response to a user's request for supplemental programming information.

FIG. 22 shows programming, ordering and video promotional information displayed in a Pay-Per-View mode of operation of the preferred embodiment of the present invention.

FIG. 23 shows an ordering submenu used in conjunction with the mode of operation shown in FIG. 22.

FIG. 24 shows yet another ordering submenu used in conjunction with the mode of operation shown in FIG. 22.

FIG. 24A shows yet another ordering submenu used in conjunction with the mode of operation shown in FIG. 22.

FIG. 25 shows another grid listing of schedule information displayed in an All Listings mode of operation of the present invention.

FIG. 26 shows a Premium Services submenu that appears in one mode of operation of the preferred embodiment of the present invention.

FIG. 27 shows a Messages menu that appears in one mode of operation of the preferred embodiment of the present invention.

FIG. 28 shows exemplary messages used in connection with the menu of FIG. 27.

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FIG. 29 shows billing information used in connection with the menu of FIG. 27.

FIG. 30 shows a Key Lock Access menu that appears during one mode of operation of the preferred embodiment of the present invention.

FIG. 31 shows a menu appearing in connection with an Interactive Television mode of operation of the preferred embodiment of the present invention.

FIG. 32 shows information that appears in a Quote Watch menu in connection with the Interactive Television mode of operation shown in FIG. 31.

FIG. 33 shows other information that appears in connection with the Interactive Television mode of operation shown in FIG. 31.

FIG. 34 is a menu showing information that appears in a news display in the Interactive Television mode of operation of the preferred embodiment of the present invention.

FIG. 35 is a menu showing information that appears in a sports display in the Interactive Television mode of operation of the preferred embodiment of the present invention.

FIGS. 36A-D collectively form a flow chart showing the operational logic of a computer program that may be used to implement various aspects of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

System Configuration

FIG. 1 is a block diagram showing various components of the electronic program schedule system generally designated as 10. Physically, these system components can be located in a user's set-top cable converter box or other signal reception or processing device, such as a satellite receiver. Alternatively, the components can be mounted in a separate housing, or included as part of a television receiver, VCR, personal computer or multimedia player.

An input signal 11 is connected to a receiver 12, which receives a transmitted data stream from a data provider. The data stream may contain, for example, information about programs or services available in a particular market, geographical or otherwise. The input signal 11 can originate, for example, as part of a standard broadcast, cablecast or satellite transmission, or other form of data transmission. In the case of a cablecast transmission, the data provider is a local cable operator and the data stream contains program schedule information for all television programs and other services available in the operator's geographical market.

The data stream may be modulated and then transmitted on the cable line in any number of ways, including as part of a dedicated channel transmission operating at a frequency of, for example, 75 MHz. Those of skill in the art will understand that numerous other transmission schemes can be used to transmit the data stream, such as embedding it in the vertical blanking interval of a program broadcast signal. As will be discussed in greater detail below, according to the present invention, the transmitted data stream may additionally contain application software for implementing the electronic program guide at the user site.

The transmitted program schedule data or application software is received by the receiver 12 on signal input line 11. The received signal is passed from the receiver to a data demodulator 13, such as a QPSK demodulator, which demodulates the transmission and passes it to a buffer 15.

A microcontroller 16, such as a M68000EC, receives data passed to the buffer 15. Bootstrap operating software, which

may be used for capturing electronic program guide application software updates, is stored in a read only memory (ROM) 17. The microcontroller 16 uses the received program schedule information to build a database by storing the data in appropriately organized records in dynamic random access memory (DRAM) 18. The stored schedule information can be updated on a periodic basis, such as hourly, daily or weekly, or at any time when changes in scheduling or other factors warrant an update. The system also includes a system clock 19.

Alternatively, the program schedule information could be supplied in a ROM, disk or other non-volatile memory, or it could be downloaded to a storage disk or other data storage device. The invention herein is not directed to the particular method of transmission or reception of the schedule information.

If the microcontroller 16 recognizes the received data as application software which controls the program schedule system, as opposed to program schedule information, it stores it in non-volatile memory, such as an electrically erasable programmable ROM (EEPROM) 20 or battery-backed static RAM (SRAM). This configuration allows revised or replacement versions of the application software to be downloaded directly from the software developer to the user site through the cable or other transmission system.

In the case where an EEPROM is utilized, revised or replacement versions of the application software downloaded from the developer are first stored in DRAM 18 by the microcontroller 16, under direction of the downloading operating software stored in the ROM 17. The stored application software can then be checked for accuracy by, for example, a checksum analysis or other verification routine.

After the accuracy of the application software has been verified, the microcontroller 16 initiates a routine to re-program the EEPROM 20, where the application software is permanently stored. The microcontroller 16 will issue proper control commands to a reprogram circuit 21, which is adapted to supply the proper program voltage and logic control signals 22 required to erase and write to the EEPROM. It supplies this program voltage, Vprog, as well as any other required control signals, such as read or write enable, to the EEPROM 20 upon command from the microcontroller 16. After the EEPROM 20 has been electrically erased, the microcontroller 16 initiates transfer of the new application software from the DRAM 18 to the EEPROM 20 for storing.

When a battery-backed SRAM is utilized as nonvolatile memory, the microcontroller stores the revised or replacement version of the application software downloaded from the developer directly in the SRAM, again under direction of the downloading operating software stored in the ROM. The stored application software can then be checked for accuracy by, for example, a checksum analysis or other verification routine.

When power is first applied to the system 10, the bootstrap operating software verifies that the program guide application software is resident in memory. If it is not resident, the bootstrap operating software waits for a download of the software. Once the application software is resident, the microcontroller 16 executes the application program software from a dedicated portion of the DRAM 18. Alternatively, the application software can be executed directly from the non-volatile memory 20. Under control of the program guide application software, the microcontroller 16 first verifies that the program schedule information is resident in DRAM 18. If it is not resident, the microcon-

troller waits for a download of the program schedule information, as discussed above.

When the schedule system is operating, as discussed in greater detail hereinbelow, the microcontroller 16 takes the program schedule information stored in the DRAM 18 and, in conjunction with other downloaded data types such as stored bit maps for the screen configuration and the graphic symbol or logo displays stored in non-volatile memory 20 or, alternatively, in DRAM 18, supplies it to a video display generator (VDG) 23, which in the present embodiment may be a commercially available VGA-type graphics card, such as a Rogen card manufactured by Roctec. The VDG includes a standard RGB video generator 24, which takes the digital program schedule information sent by the microcontroller 16 and converts it to an RGB format in accordance with the bit map for the particular screen display then being presented to the user on the television receiver 27. The configuration of each screen is shown and discussed in greater detail in the System Operation section below.

The VDG also includes a Video Overlay Device 25, which accepts the RGB video input, as well as an input from conventional television tuner 28, such as a conventional tuner manufactured by General Instrument, which supplies a program signal in standard NTSC video format. The overlay device 25 converts and combines the RGB signal with the signal from the tuner 28, and produces a composite NTSC output signal containing both the program signal and the program schedule information, as shown in FIG. 2. This composite video signal is supplied to a modulator 26, shown in FIG. 1, which can be a modulator such as available from Radio Shack, and then to the television receiver 27, which the user keeps tuned to the modulated channel, for example, channel 3 or 4. The composite video signal can also be supplied directly to the television receiver 27 or other receiving device from the VDG through a video port 25A on the VDG.

The system components identified in connection with FIG. 1 can all be implemented in a preferred platform by, for example, an IBM personal computer equipped with a transmission link and a video graphics card such as those manufactured by Roctec. Other platforms, such as a cable converter box equipped with a microprocessor and memory, could also be used. In any event, those of skill in the art will appreciate that the particular details of the hardware components and data storage are a function of the particular implementation of the system, and are not the subject of the present invention.

As discussed in detail below, the user may navigate through the program schedule system with a remote controller, such as that shown in FIG. 3, which operates on conventional principles of remote control transmitter-receiver logic, such as by infrared or other signalling, or other suitable user interface. The remote controller 31 communicates with the microcontroller 16 through the remote controller receiver 29, shown in FIG. 1, which can be a Silent Partner IR receiver and which receives signals transmitted by the remote controller 31 and supplies the microcontroller 16 with a corresponding digital signal indicating the key depressed by the user.

A remote controller suitable for the present invention, such as shown in FIG. 3, which can be a remote controller manufactured by Universal Electronics, may include a power switch 32, volume 33 and mute 34 controls, an ENTER key 35, 0-9 digit keys 36, four direction arrow keys 37A and 37B, a MODE key 38 and an information key 39 that is designated with a lower case "i." The power 32,

volume 33 and mute 34 keys operate in the same manner as conventional remote controllers typically used with present-day television receivers. The numeric digit keys 36 also function in much the same manner as conventional remote controllers. A brief description of the remaining keys follows.

The MODE key 38 takes the user through various layers of the electronic program schedule system 10 and generally allows the user to return to a previous screen when he is in a submenu. The up/down direction arrow keys 37A allow a user to navigate through the different TV program channels when the program schedule system is in a FLIP or BROWSE mode, as will be fully described below, and also allow the user to navigate through highlighted bars displayed on the TV screen when in a MENU mode. The left/right direction arrow keys 37B allow the user to navigate through selected time periods when the program schedule system is in the BROWSE mode, as will also be described below. They further allow the user to navigate across subject-matter categories while in the "Categories" submenu of the MENU mode, as well as to navigate across time periods when the program schedule system is in a pay-per-view ordering mode and, in general, navigate in left or right directions to select various icons and other objects. The information, or "i," key 39 allows the user to view supplemental program and other information during the various modes of the program schedule system. The ENTER 35 key fulfills and inputs a command once the user has made a selection from the remote controller keys. The function and operation of these keys will be made more apparent in the detailed discussion of the FLIP, BROWSE and MENU modes below.

A second embodiment of the remote controller 40 is shown in FIG. 4. This embodiment of the remote controller also includes a power key 41, numeric digit keys 42, direction arrow keys 43A and 43B, information key 48, ENTER key 44, volume control 45 and mute keys 46. It also includes pound sign and star keys.

This embodiment of the remote controller further includes a number of icon keys 47A and 47B, which correspond to different submenus or modes of the program schedule system. The icons 47A and 47B may also be displayed on the TV screen when the program schedule system is operating. The icon keys essentially replace the MODE key 38 used in the embodiment of the remote controller shown in FIG. 3. Using these keys, the user can move from one mode to another simply by depressing the icon key corresponding to the desired mode of operation of the program schedule system. In the embodiment of FIG. 4, the icons 47A and 47B are shown as graphic symbols situated directly above a corresponding color-coded key. Alternatively, the color-coded keys could be eliminated and keys could be formed in the image of the icon itself.

The embodiment of the remote controller shown in FIG. 4 also includes three color-coded viewer preference keys, 48A, 48B and 48C that are situated directly above the icon keys. Each of these keys indicates to the program schedule system a distinct user-created "Channel Preference" list, which is a listing of a specific subset of channels for a particular user, arranged in the sequential order that the user wishes to view during operation of the program schedule system. The creation of the Channel Preference list is discussed in the following section. Thus, the system provides for at least three individual channel subsets for three individual users.

Additionally, each of the functions of the remote controllers can also be integrated into a keypad on the user's cable box or other hardware.

System Operation

In operation, the electronic program schedule system of the present invention functions as follows.

Flip Mode

When the user is viewing a particular program channel on the television receiver, the program schedule system defaults to a FLIP mode, shown in FIG. 5. In this mode, a graphic overlay 51 containing programming information for the channel currently tuned on the tuner is superimposed in overlaying relationship with a received program signal 55 on the screen of the television receiver 27 whenever the viewer changes the program channel, for example, by using the up/down direction arrows on the remote controller. The video overlay device 25, such as shown in FIG. 1, combines the computer-generated RGB video-graphic overlay information with the NTSC-format program signal from the tuner 28, and supplies an NTSC-format output signal, which includes the program signal from the tuner and the program schedule overlay information for viewing on the television receiver 27.

The programming information contained in the graphic overlay 51 is supplied to the RGB video generator by the microcontroller. In FLIP mode, the microcontroller first searches the program schedule database in, for example, the DRAM 18 to retrieve the programming information for the currently tuned channel 52 corresponding to the current time; i.e., the time at which the user just turned on the television receiver for viewing. The microcontroller 16 then supplies the current channel and program information to the RGB video generator 24 which converts the digital data information to RGB format and supplies it to the video overlay device 25.

In normal operation, the microcontroller 16 defaults to displaying all channels offered by the cable company prioritized by numeric order, which is determined by the broadcast channel position in the radio spectrum or the marketing judgments of local cable operators. Using a "Channel Preference" submenu, discussed below, the user can revise the content and/or sequential order of the channels presented to the television receiver 27.

In general, if the user does not issue a change-channel instruction, or other command, from the remote controller 40 within a predetermined time interval while in the FLIP mode, the microcontroller 16 instructs the VDG 23 to remove the graphic overlay 51 from the television receiver, thus presenting only a program signal 55 to the television receiver 27 for viewing. The duration of the predetermined time interval is such that it allows the user sufficient time to read the programming information contained in the overlay. The duration of the predetermined time interval during which the graphic 51 overlay appears is stored in a location in non-volatile memory 20 addressable by the microcontroller 16. The user can change the duration of the time interval, by first entering a Viewer Preference mode, and then selecting an "overlay interval" entry. The microcontroller 16 then causes a user prompt to be displayed on the screen which, for example, asks the user to select an appropriate time period for displaying in the graphic overlay on the screen. Using the numeric keys, the user can input an appropriate response, for example, a period between 5 and 60 seconds, and then depress ENTER. The new interval period is then read and stored by the microcontroller 16 in the overlay time interval location in memory.

If the user issues a change-channel command from the remote controller 40 before or after the predetermined

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overlay period has elapsed, either by using the up/down direction arrows 43A, or by entering a desired channel number using the numeric keys 42 and then depressing the ENTER key 44, the microcontroller 16 will cause the tuner 28 to tune to the desired channel—either the channel immediately preceding or following the current channel when the up or down arrow 43A is used or the specific channel entered on the numeric key pad by the user—and will also search for and immediately cause to be displayed the current program information for that channel. Thus, as the user flips through the channels, the program schedule information for any selected channel automatically appears in the graphic overlay 51 while the actual program 55 appearing on the selected channel at the particular time occupies the remainder of the screen.

The system can also be configured to issue an error message, such as an audible beep or displayed text indicating an invalid key stroke, if the user depresses either the left or right direction arrow keys while in the FLIP mode.

Browse Mode

To initiate the BROWSE mode, the user depresses the MODE switch once while in the FLIP mode when using the first embodiment of the remote controller 31 shown in FIG. 3. Utilizing the second embodiment of the remote controller 40 shown in FIG. 4, the user would depress the button below the BROWSE icon 47A.

In the BROWSE mode, the user is provided with the ability to scan through program schedule information for any channel, including, but not limited to, the channel being viewed, while at the same time continuing to view the TV program previously selected. As shown in FIG. 11, in this mode the graphic overlay information that appears in the FLIP mode is replaced with programming information for the channel being browsed, which may or may not be the channel currently being viewed by the user. After the user issues the command from the remote controller 40 to enter the BROWSE mode, a graphic overlay 111 is generated, as in the FLIP mode, with program schedule information for the currently tuned channel 112 and a textual BROWSE indicator 113 to remind the user of the currently active mode, as shown in FIG. 11.

If the user depresses either the up or down direction arrow on the remote controller 40 while in the BROWSE mode, program schedule information for either the prior or next channel is displayed in the graphic overlay portion 111 of the television receiver screen 27, while the tuner remains tuned to the channel program that appeared on the television receiver at the time the user entered the BROWSE mode, as shown in FIG. 12, and continues to so appear. Each successive depression of the up or down direction arrow key produces corresponding program schedule information for the selected channel. The graphic overlay may also include a small video window for showing the actual video signal of a currently aired program or a clip of a future program corresponding to the schedule information then appearing in the BROWSE overlay. In this way, the user can simultaneously scan program schedule information for all channels while continuously viewing at least one selected program on the television receiver. With the advent of sophisticated television receivers, it may also be possible to simultaneously display multiple broadcast programs on a single screen for viewing, or to split the screen to show, for example, broadcast programs in combination with advertisements. The BROWSE feature could be used in any of these situations.

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If, at any time during scanning of the program schedule information in the BROWSE mode, the user desires to tune the television receiver 27 from the program channel currently being viewed to the program channel indicated in the schedule information in the graphic overlay, he simply depresses the ENTER button 44 and the tuner 28 will be tuned to that channel. If the user does not want to view another channel and wishes to exit the BROWSE mode, thus removing the graphic overlay 111 with the program schedule information, he must depress the MODE key twice in the first embodiment of the remote controller 31. The first depression of the MODE key takes the user to the MENU mode, discussed below, and the second depression will take the user to the FLIP mode. Once in the FLIP mode, the graphic overlay will be removed after the duration of the time-out interval has passed. In the second embodiment of the remote controller shown in FIG. 4, the user toggles the BROWSE icon key to deactivate the BROWSE mode.

When the user first enters the BROWSE mode and begins scanning channels, the schedule information appearing in the overlay portion 111 describes the programs currently playing on any particular channel. In order to view programming information for later times, the user employs the left and right direction arrows 43B. As a consequence, the system will display future program schedule information for the particular channel previously selected by the up and down direction arrows, whether it is the channel currently being viewed or any other available channel. The schedule information presented includes the name of the program and program start/stop time. The instant embodiment of the system, in order to conserve memory, will not allow the user to view programming information for a time prior to the current time. The system could be easily modified to provide such information if adequate memory is made available.

When viewing program schedule information for a future time in the BROWSE mode, the displayed time of airing 121 of the particular show 122 is highlighted, as well as the channel number and service indicator 123, as shown in FIG. 12A. Such highlighted information reminds the user that he is viewing program schedule information for a future time. Also, when viewing program schedule information for a future time on any particular channel in the BROWSE mode, depression of the channel up direction arrow key on the remote controller 40 causes programming schedule information for the next channel to appear, which corresponds in time to the future time that was being viewed before the up key was depressed by the user. The channel down direction arrow key 43B functions identically in this mode.

If while viewing program schedule information for a future time in BROWSE mode the user depresses the ENTER key on the remote controller, the microcontroller 16 will instruct the VDG 23 to display a REMINDER overlay message 130 which, as shown in FIG. 13, is displayed as a second overlay 131 appearing above the BROWSE overlay 132. The REMINDER message 130 queries the user as to whether the system should remind the user, at a predetermined time before the start of the selected program, that he or she would like to view the selected program, as shown in FIG. 13. If the user responds affirmatively, the microcontroller 16 stores reminder data consisting of at least the channel, time and day of the selected program in a reminder buffer, which contains similar schedule information for all programs for which the user has set a reminder. At a pre-determined time before the selected program start time, for example, five minutes, the microcontroller 16 will retrieve schedule information, including title and service, based on the reminder data, and will instruct the VDG 23 to

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display a REMINDER overlay message 140 on the television receiver 27, as shown in FIG. 14, to remind the user that he or she previously set a reminder to watch the selected program. The REMINDER message 140 contains the channel, service and start time. It also displays the number of minutes before the time of airing of the particular show and updates the display every minute until the time of airing. The REMINDER message 140 also displays a "TUNE" inquiry, which asks the user if she would like to tune to the selected program. As with the overlay display time period in the FLIP mode, the user can modify the time period before a selected program that the REMINDER message appears by entering the Viewer Preference mode and revising the time entry.

Menu Mode

Using the remote controller 31 shown in FIG. 3, the user can enter the MENU mode from the BROWSE mode or from the FLIP mode by toggling the MODE button 38 once or twice, respectively. Using the remote controller 40 of FIG. 4, the user would simply depress the key 47B corresponding to the MENU icon.

Referring to FIG. 6, in the MENU mode, the system displays a plurality of menu items and icons, which correspond to and allow user selection of distinct program schedule information display formats, local cable system message boards and other on-line information services. Unlike in the FLIP and BROWSE modes, in the MENU mode no program signal from the tuner is displayed on the television receiver 27. In the embodiment shown in FIG. 6, there are four vertically selectable horizontal bars 61-64, which are accessed using the up and down direction arrows 43A on the remote controller 31 or 40. At the extreme left of each bar, an identifying icon 61A-64A is displayed, which identifies the information contained in that bar. In the embodiment of FIG. 6, the "TV GUIDE" icon 61A in the first bar corresponds to program schedule information from TV Guide® magazine, the "NOW SHOWING" icon 62A in the second bar 62 corresponds to pay-per-view and premium service events, the "MSO Logo" icon 63A in the third bar 63 corresponds to Customer Service or local cable company information messages, and the circular icon 64A in the fourth bar 64 corresponds to other interactive services available to the user. As also shown in FIGS. 6 and 6A, each bar also contains a textual description of its contents.

When the user first enters the MENU mode, the system defaults to selection of the program schedule bar. When a particular bar is selected, the textual description is removed and a plurality of icons are displayed adjacent the identifying icon. In FIG. 6, the program schedule bar 61 is selected. Using the up or down direction arrow key on the remote controller 40, the user selects a vertically adjacent bar. FIGS. 15-17 show, respectively, selection of the Pay-Per-View bar 62, the Customer Service or Messages bar 63 and the Interactive TV services bar 64.

Once a particular bar in the MENU screen is selected, the user can select a particular icon from the plurality of horizontally selectable displayed icons 65A-65C by using the left or right direction arrow and the ENTER key on the remote controller 40. Each icon contains a graphical symbol appearing in a background window of a particular color. When a particular icon is selected, it is offset from its background window and the color of the window changes. In FIG. 6, the grid icon 65A immediately adjacent the "TV GUIDE" icon in the first bar 61 is selected.

The function corresponding to each icon will now be discussed.

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In the uppermost vertically selectable horizontal bar 61, the first grid icon 65A represents an "All Listings" mode in which the program schedule information is displayed in a grid listing, such as that shown in FIG. 18. Alternatively, a single column grid-like display could be used, as that shown in FIG. 25. In this format, the vertical y-axis identifies the channel number and service while the horizontal x-axis identifies the time. The screen display of FIG. 18 also contains in the upper left-hand corner a mode identifier 180, in this case the notation "All Listings," to remind the user of the current operating mode of the system. Directly underneath the mode display is a highlighted display 181 of the channel that the user was watching before entering the MENU mode. In the upper right-hand corner, a logo icon 182 appears in a window directly above a date/time identifier 183, which alternatively displays the current date and time.

In the center of the screen display shown in FIG. 18 is a graphical Active Key Display (AKD) 184 which indicates to the user those keys on the remote controller that are active for that particular mode of the program guide display system. For example, in the screen display of FIG. 18, the cursor can only move up, down or to the right. If the user were to depress the left direction arrow key on the remote controller at that point, the system would not carry out any function since the cursor can not move to the left. Thus, the left arrow key is not active so its image is not displayed on the AKD 184. Similarly, since the system will only respond to a depression of the up, down or right direction arrow keys and the ENTER key, they are the only key images displayed on the graphical AKD 184. The MODE key, though not displayed, is always active to change from one mode to another. When the user first enters the All Listings guide, the time listing begins by default at the half-hour immediately preceding the current time unless the current time is on the hour or half-hour, in which case the display begins with the particular hour or half-hour, and the channel listing begins at the last channel being viewed by the user before entering the MENU mode. For example, in FIG. 18, the current time is displayed as 7:13 p.m., the time listing begins at 7:00 p.m. and the channel listing begins with channel 4.

In the All Listings mode, a moveable highlighted cursor 185 is used to indicate the currently selected program to the user. The user manipulates cursor movement using the direction arrow keys on the remote controller 40. Furthermore, the entire information display pages upward if the cursor is placed at the bottom of the screen and the down direction arrow is depressed, and similarly pages to the left if the cursor is at the extreme right side of the display and the right direction arrow is depressed. In this way, the user can navigate through the entire program schedule.

The folder icon 65B immediately to the right of the All Listings icon in the top horizontal bar 61 of FIG. 6 identifies a "Category Listing" mode in which program schedule information is displayed and categorized by program content, as shown in FIG. 19. The particular listing shown in FIG. 19 includes the categories of Movies, Sports, News and Children 190A-190D. The database record stored for each listing contains a content-specific identifier so the micro-controller can search the database and categorize the information by content for purposes of displaying it in the Category Listing mode. As shown in FIG. 19, the user can manipulate the cursor left or right to highlight any one of the categories which appear at the head of the listing. In FIG. 19, the "Movies" category 190A is selected. As shown, the user is given a display of all movies, prioritized by time and then alphabetically by title of show, beginning with the half-hour

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immediately preceding the current time unless the current time is on the hour or half-hour, in which case the display begins with the particular hour or half-hour. The screen display shown in FIG. 19 also includes a textual description of the current operating mode of the program schedule system, as well as the graphic AKD 184, similar to that used in connection with the All Listings mode.

As with the All Listings mode, if the user highlights a show which is currently airing, he can immediately tune to that show by depressing the ENTER key on the remote controller 40. If the highlighted show is one that will appear at future time, the user is again given the option of setting a REMINDER message.

The triangular icon 65C at the far right of the TV GUIDE bar 61 in the display of FIG. 6 identifies a "Channel Listing" mode in which the program schedule information is categorized and displayed by channel, as shown in FIG. 20. The screen display shown in FIG. 20 again includes a textual mode identifier 201, the graphic AKD 184, and the window including the logo icon 182 and alternating time/date display 183. At the head of the program listing is a list of several consecutive channels 202A-202C beginning with the last channel viewed by the user before entering the Channel Listing mode. The channel in the middle window 202B is highlighted and is the channel for which schedule information is displayed. The display identifies those programs appearing on the highlighted channel beginning with the half-hour immediately preceding the current time unless the current time is on the hour or half-hour, in which case the display begins with the particular hour or half-hour. The user can display further future listings by manipulating the cursor to the bottom of the screen and paging the display, as previously described. The user can also change the selected channel by manipulating the left or right direction arrow keys on the remote controller 40. When the user issues a change-channel command in this manner, the next consecutive channel will be displayed in the highlighted window 202B in the channel string at the head of the display, and schedule information for the newly selected channel will be displayed on the television receiver 27.

As with other modes, if a user wishes to tune to a highlighted program that is currently airing, he can do so by simply depressing the ENTER key on the remote controller 40, and if the user wishes to view a program that airs at a future time, the user is again given the option of setting a REMINDER message.

In each of the FLIP, BROWSE and MENU modes, a lower case "i" icon appears at a number of occasions in connection with certain program listings, such as movies, such as the "i" 203 shown in FIG. 20. Any time this icon appears, the user can view additional programming information, generally comprising a textual description of program content and/or other information related to the program, such as the names of cast members and the like, by depressing the "i" key 48 on the remote controller 40. An example of a display of such additional information is shown in FIG. 21.

The second horizontal bar 62 appearing on the screen in the MAIN MENU mode shown in FIG. 6 is the "Home Theater" Listing. It corresponds to Pay-Per-View events or services, specialized programming, and Premium Service programs. When this category is chosen by the user, the television receiver displays information as shown in FIG. 15. The first theater-ticket icon 150 that appears in this Home Theater bar identifies a format in which the Pay-Per-View events and premium services are displayed, as shown

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in FIG. 22. As with other modes, the user can manipulate the cursor to highlight and select any particular show. Also, the user can obtain additional information about the Pay-Per-View event or service by depressing the "i" key 48 on the remote controller 40. The Pay-Per-View menu screen display shown in FIG. 22 also includes a video display section 220 in which short promotional clips of current and future events and services can be shown to the user while the user is viewing the Pay-Per-View scheduling information. The display of FIG. 22 is bit mapped such that the advertising clips may be shown in the lower left quadrant of the screen. The clips may be shown randomly in the video display section 120 or, alternatively, the clip shown could correspond to the particular selected entry on the list of events, and would change automatically as the user navigated through the list.

When a user highlights a Pay-Per-View event or service by manipulating the cursor to the desired event or service using the direction arrow keys on the remote controller 40, he can order the event or service by depressing the ENTER button on the remote controller, thus linking schedule, promotional and ordering functions. If the user selects a particular Pay-Per-View event or service in this manner, the programming schedule system will next present to the user a Pay-Per-View ordering screen such as that shown in FIG. 23. The display includes a figure representing the cost of the event or service. The display also asks the user to choose from among a plurality of scheduled airing times 230A-230C, as well as whether the user would like to see a REMINDER message prior to the start of the Pay-Per-View event or service. The user responds to these inquiries by using the direction keys on the remote controller 40 to manipulate the cursor to the proper response and then depressing the ENTER key. After the user has ordered a Pay-Per-View event or service, the program schedule system will present the user with two ordering confirmation submenus, such as shown in FIGS. 24 and 24A. In either of these submenus, the user can confirm or cancel the Pay-Per-View event or service.

If the user confirms the order, the microcontroller 16 stores the Pay-Per-View ordering information in a location in memory. The ordering information can then be transmitted to the cable operator by the microcontroller 16 either by phone line or on the cable line where the system has two-way communication or other such interactive capability. Alternatively, a computer at the cable operator location can interrogate the memory where the microcontroller stored the Pay-Per-View ordering information. At the appropriate time, the cable operator supplies the Pay-Per-View event or service and it is received by all users who have ordered the program.

The second icon 151 in the Pay-Per-View bar of FIG. 15 identifies a specialized broadcast, cable or satellite programming service to which the user has access via the electronic program guide. In this mode, the electronic program guide application software acts to connect the user, through an appropriate data transmission link, to the programming service, at which point the user interacts with the service. Alternatively, the electronic program guide provides the navigation software, including the menus and scheduling information, for the particular programming service. Such a service could be, for example, Your Choice TV ("YCTV"), a service offering reruns of highly rated broadcast and cable programs, in which case the icon may take a form suitable to identify YCTV. The programming available on YCTV is then supplied to the user via the programming guide system.

The last icon 152 appearing in the Pay-Per-View bar of FIG. 15 identifies a display format which lists all Premium

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Services offered by the cable operator, as shown in FIG. 26. In this mode, the user can select for impulse ordering any one of the premium services by manipulating the cursor using the direction arrow keys on the remote controller and depressing the ENTER key. Similar to Pay-Per-View ordering, the system will present the user with a series of ordering displays and, if a service is ordered by the user, it will confirm the user's request using another other submenu. If confirmed, the microcontroller 16 will store the ordering information or transmit it directly to the cable operator. Once the order has been confirmed, the microcontroller can immediately allow the user access to the ordered premium service. In this manner, the user can order premium events or services on demand.

If, during FLIP or BROWSE modes, a user views a channel or schedule information for a service not subscribed to by the user, the microcontroller 16 causes an ordering submenu to appear instead of displaying a program signal along with the graphic overlay, as shown in FIG. 9. This submenu indicates to the user that she does not currently subscribe to the selected service, and then asks the user if she would like to order the service. If the user responds affirmatively, the program schedule system takes the user to the ordering submenu discussed above. In this manner, the user can order premium events or services on impulse.

The third horizontal bar 63 in the MENU mode shown in FIG. 6 is the "Messages" or "Customer Service" listing. As shown in FIG. 16, the first envelope icon 160 represents message information available from the cable operator. When the user selects the message icon, he is presented with a screen display of currently available messages, as shown in FIG. 27. The display shown in FIG. 27 includes cable system messages 270 and billing information 271. If the user selects the cable system messages option 270, she is presented with a message pertaining to the local cable operator, such as that shown in FIG. 28. If the user selects the billing status option 271 shown in FIG. 27, she is presented with a display of current billing information, such as that shown in FIG. 29.

The next icon 161 in the Customer Service information bar 63 of FIG. 16 identifies a "Viewer Preference" mode, which allows the user to create or revise a number of program schedule system operating parameters. Once selected, this display presents the user with several preference options concerning certain operating parameters of the program schedule system, as well as the viewing of certain channels and/or certain content-specific programming, for example, those shown in FIG. 7.

The first option shown in FIG. 7 is the "Parental" option 70, which can also be expressed as a "Key Lock Access" option. Once this option is initially selected by the user, the system displays a "Key Lock Access" submenu such as that shown in FIG. 30.

The Key Lock Access menu shown in FIG. 30 allows the user to control access to individual channels and programs or events by requiring the user to enter an access code "key," consisting of a user-specified four digit code in the specific embodiment discussed herein, before ordering or viewing these pre-selected channels, programs or events. The menu display shown in FIG. 30 shows a series of subject categories that are entries in the vertical y-axis selectable by the user. A particular subject category is chosen by using the up or down direction arrow keys on the remote controller 40 to highlight the desired entry. Once the user selects a particular subject category, the left and right arrow keys are used to navigate within the chosen category.

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The first subject entry shown in FIG. 30 is the "Parental Guidance" category 301. Once the user selects this category by manipulating the cursor to highlight the entry, the cursor can be then moved horizontally to an active window 302 which displays and selects one the five letter rating items in the category. The letter items represent ratings of program content as follows: "V" for violence, "N" for nudity, "L" for language, "AS" for adult situations and "PD" for parental discretion. Once the user selects a particular item, such as "L", by moving to the active window 302 using the right direction arrow key, depressing the ENTER key will indicate to the microcontroller 16 that a key lock access has been selected for programs rated with a "L" rating for violent or explicit language. The system indicates activation of a key lock access by displaying a key icon directly below the "L" category display. Once a key lock access is set, it can be deactivated by selecting the category letter and then depressing the ENTER key. This action causes the key icon to disappear. The user can change the rating category in the active window 302 by using the left or right direction arrow keys on the remote controller 40, images of which are displayed on the screen adjacent the active window as a reminder to the user. In this manner, the user can select other rating categories for setting a key lock access for any of the program content identifiers appearing in the Parental Guidance category.

The key lock access code itself consists of a four digit code, which the user can enter and modify at any time. To do so, the user highlights the fourth vertically selectable entry "Change Key Lock Access Code," 304 by manipulating the cursor to highlight it using the direction arrow keys on the remote controller. Once highlighted, the user enters a new four digit code or revises the then existing code and depresses the ENTER key. The microcontroller 16 then identifies the new four digit key lock access code and stores it in memory. The user can clear the key lock access code, as well as all other previously activated keys, by moving to the last entry in FIG. 30, "Clear Key Lock Access Code and All Keys," 305 which highlights the "OK" window, and then depressing the ENTER key. This action clears and deactivates all previously set keys, as well as the key lock access code.

The schedule information database record for each program contains a field that corresponds to the program content identifiers in the Parental Guidance category. During operation, the microcontroller checks this field in response to a user command to tune to or order a program, or to display its corresponding schedule information before carrying out the tuning, ordering or displaying function. If the parental guide identifier in the program schedule information database record matches any one of the activated parental guidance identifiers shown in FIG. 30, the user will be prompted to enter the four digit key lock access code before the system takes any further action. If the entered code matches the key lock access code previously entered and stored by the user as described above, the system will carry out the user request to tune to the program, to order it, or to display its corresponding schedule information. If the code is not recognized by the system, no further action will be taken and the user's request will be denied.

By manipulating the cursor using the direction arrow keys to highlight the second entry, "MPAA ratings," 308 the user can also set a key lock access for programs based on their MPAA rating code, as also shown in FIG. 30.

As with the Parental Guidance category, once the MPAA rating category has been selected, the user can move horizontally within the category to the active window 306 to

select one the five rating codes, i.e., "G" for general audiences, "PG" for parental guidance, "PG-13" for suggested parental guidance, no one under 13 admitted without an adult, "R" for restricted and "X" for x-rated. As with the Parental Guidance category, by selecting a particular rating—by using the left or right direction arrow keys until the particular rating code appears in the active window—and then depressing the ENTER key, the user sets a key lock access for the rating, in which case a key icon appears below the rating code. And, as with the Parental Guidance category, once a key lock access is set, the system will prompt the user to enter the four digit key lock access code anytime a request is made to tune to, order or display schedule information for a particular program having a rating code which matches a rating code for which key lock access has been activated.

The Key Lock Access mode also includes a subject category 303 for controlling access to channels, which may be entitled, for example, "Channel Block" or "Channel Lock." As with the Parental Guidance 301 and MPAA 308 categories, the user navigates to the Channel Block category 303 by manipulating the cursor using the direction arrow keys on the remote controller and depressing the ENTER key. Once the Channel Block category 303 has been entered, the user can move horizontally to an active window 307, which in FIG. 30 indicates channel 2. Once the user highlights this window by manipulating the cursor using the direction arrow keys on the remote controller 40, a key lock access can be set for the channel appearing in the active window. This is done, as with the other subject categories in the Key Lock Access mode, by depressing the ENTER key, which again causes a key icon to appear below the channel number in the active window. The user can move to the prior channel or to the next channel in sequence by depressing either the left or right direction arrow key on the remote controller 40. In this manner, the user can activate a key lock access for any available channel.

As with the Parental Guidance 301 and MPAA 308 categories, once a key lock access is set for a particular channel, the system will prompt the user to input the key lock access code prior to carrying out an instruction to tune to or order that channel. If the input key lock access code matches the previously stored access code, the user's instruction is carried out. Otherwise, the user's instruction is ignored. Thus, the user can control access to the audio and video program content of any available channel. In this instance, the microcontroller 16 will not allow audio or video program signals to pass to the VDG, but it will allow schedule information to appear for the channel.

The next option shown in FIG. 7 is the Channel Preference or "Favorite Channel" list option 71. By highlighting this icon and depressing the ENTER key on the remote controller 40, the user is presented with a submenu on the screen such as that shown in FIG. 8.

In normal operation, the program guide system presents channels to the user in numerical order in response to an up or down change-channel command issued by the user using one of the direction arrow keys on the remote controller. The channel number presentation sequence includes all channels offered by the cable company in the order of which they are modulated onto the channel by the operator.

The program guide system also provides the capability of selecting from among several user-defined channel presentation sequences, which are activated using one of the three "check mark" icon keys 48A, 48B or 48C on the remote controller 40 shown in FIG. 4. Each of these keys represents a preferred particular list of channels which a particular user

selects and which the microcontroller stores in memory as a "Channel Preference" list, as discussed in detail below. To activate one of these preferred channel lists, the user depresses the corresponding check-mark icon key, in which case the microcontroller may display the chosen icon on the screen in the graphic overlays and full screen displays to remind the user that a particular channel preference list is being used by the system. Once a preference list is activated, the system will limit the tuning of the television receiver and the display of schedule information only to those channels that are designated in the activated viewer preference list.

To revise the content and/or sequential order of the channels in the Channel Preference list, the user enters the MENU mode of the programming guide system. To enter the MENU mode from the FLIP mode, the user twice depresses the MODE key 38 when using the remote controller 31 of FIG. 3. To enter the MENU mode when using the alternative embodiment of the remote controller 40 of FIG. 4, the user simply depresses the MENU icon key 47B.

When first entered, the MENU mode has a screen display such as shown in FIG. 6. To select the submenu for editing the Channel Preference list, the user first selects the third horizontal bar 63, which can be titled, for example, "Messages" or "Customer Service," by manipulating the cursor using the down direction arrow key, as shown in FIG. 7. The screen of FIG. 6A is thereby displayed. The user then selects the second icon 161 appearing in that bar, indicated with a check mark, which corresponds to a "Viewer Preference" mode, by highlighting the icon using the direction arrow keys and again depressing the ENTER key. This action will cause the microcontroller 16 to display a Viewer Preference submenu such as that shown in FIG. 7. By selecting the Channel Preference or "Favorite Channel" entry 71, the user enters the Channel Preference submenu, shown in FIG. 8. If the user has not already done so, he would then depress the particular check-mark icon key on the remote controller 40 of FIG. 4 to create or revise the particular channel preference list.

In the Channel Preference menu shown in FIG. 8, a list 80 of all channels available on the particular cable system is displayed on the left side of the television receiver screen, labeled "Choices" in FIG. 8, and the viewer's preferred list 81, designated "Selected" in FIG. 8, is displayed on the right side. If a particular code, such as an END or "I" symbol appears in the first (uppermost) position 82 of the viewer preference list 81, the system displays information for all channels in numerical order in all modes of operation. This is the default mode of the system.

By selecting channels in sequence from the available list 80 and placing them in the desired order in the preference list 81, the user can select a subset of channels and/or rearrange the default sequence in response to a channel up or channel down command from the user. This is accomplished by highlighting a channel in the available list 80 using the up and down direction arrow keys on the remote controller 40 and depressing the ENTER key 44, which stores the entry temporarily in a buffer.

The microcontroller 16 stores a list of all channels previously entered in the viewer preference list 81. As a particular channel is highlighted by the user when navigating through the available channel list 80 displayed on the left side of the television screen, a window 84 appears adjacent to the particular channel highlighted by the user. If the particular channel already appears in the viewer preference list 81, the system displays a "DELETE" message in the window 84 as a reminder that the channel was previously

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selected from the available channel list 80 and can only be deleted from the list 81, which is accomplished by depressing the ENTER key 44. If the particular highlighted channel in the list 80 was not previously selected, the system displays a "SELECT" message in the window 84 as a reminder that the particular channel will be selected for addition to the viewer preference list 81 if the user depresses the ENTER key 44. The microcontroller 16 inserts a selected channel at the bottom of the list 81. In this manner, the user can select or delete channels from the viewer preference list in any desired order.

The available channel list 80 may also be provided with categorical entries 83, such as movies, news, sports or children's shows. The user may also highlight any of these entries and put them into the viewer preference list 81. If the user does include a category in his viewer preference list 81, when the user issues channel up or down commands, the system will display, in sequence, first the user's selected preferred channels in numerical order and then all channels having a program whose content corresponds to the selected category or categories at the time.

Once the user has revised the channel preference list 81 in the described manner, the microcontroller 16 will follow the stored user-specified channel sequence in response to a change-channel command made by the user employing one of the direction arrow keys. To activate the viewer preference list, the user depresses one of the three check-mark icon keys 48A, 48B or 48C on the top of the remote controller shown in FIG. 4. The viewer preference list can be used to selectively limit tuning of the television receiver or display of schedule information in any of the operating modes of the electronic program guide. In the present embodiment, once a preference list is activated, the system will limit the tuning of the television receiver and the display of schedule information in the FLIP, and BROWSE modes, as well as in the grid category and channel listings in the MENU mode, only to those channels designated in the activated viewer preference list. The tuner can not be tuned to, and no corresponding schedule information can be displayed for, any channel not entered in the viewer preference list when it is activated. In this regard, it should be noted that setting a key lock access in the Parental Guidance 301, MPAA 308 or Channel Block 303 categories produces a different result than when using other display criteria, such as the Channel Preference List of preferred channels discussed above. Thus, while a key lock access will prevent audio and video program information, but not schedule information, from being displayed or ordered absent entry of an authorization code, if a particular channel is included in the Channel Preference list and also has a key lock access activated in the Channel Block category 303 of the Key Lock Access mode, that channel or its corresponding schedule information will not be displayed at any time.

To deactivate a previously selected viewer preference list, the user toggles the appropriate check-mark icon key on the remote controller 40 of FIG. 4. Once deactivated, the system defaults to displaying and tuning all available channels, as well as displaying schedule information for all available channels.

Alternatively, the viewer preference list 81, if activated, can be used to control tuning and display of schedule information only in selected modes, such as only in the FLIP mode, thus allowing the user to tune and view corresponding schedule information only for those channels entered in the preference list 81 in the FLIP mode, while viewing all channels and corresponding schedule information in all other modes.

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In this latter configuration, as well as in the instance where no channel preference list is activated and the system is in default mode, if a channel appears in the viewer preference list 81 that corresponds to a service not subscribed to by the user, the microcontroller 16 causes an ordering submenu to appear instead of displaying a program signal along with the graphic overlay, as shown in FIG. 9. This submenu indicates to the user that he does not currently subscribe to the selected service, and then asks the user if he would like to order the service. If the user responds affirmatively, the program schedule system takes the user to another ordering submenu to confirm the user's request, as with impulse ordering.

In addition to Channel Preference keys, the remote controller 40 can also be supplied with a number of user-activated category preference icon keys, e.g., movies, sports, or children's programming. The system can be adapted to present to the user only those programs meeting particular preference category when it is activated by the user. As with the Channel Preference icons, the microcontroller may display the icon corresponding to the activated preference category to remind the user of the currently activated mode of system operation.

The question mark icon 162 at the far right of the third horizontal bar in the menu of FIG. 16 identifies a program guide system "Help" mode in which information explaining the operation of the system is displayed for the user. Again, by manipulating the cursor using the appropriate keys on the remote controller, the user can select this mode. Once selected, the next submenu appearing in the Help mode asks the user to identify the particular portion of the system about which the user would like to view Help information.

The icons appearing in the last horizontal bar of the MENU mode identify certain interactive and/or other types of information services which the programming system, acting as a gateway, makes available to the user as shown in FIG. 17. By manipulating the cursor, the user can select any one of the identified services, as shown in FIGS. 31-35.

For example, if the user initially selects the "X*PRESS" icon appearing in the last horizontal bar, he is presented with a submenu such as that shown in FIG. 31. Using the direction arrow and enter keys on the remote controller, the user selects one of the three entries appearing in the display of FIG. 31. Once a particular entry is selected, the electronic program guide connects the user to the selected service and passes control to the particular service application software, as shown in FIGS. 32-35.

Additionally, the electronic program guide could be configured to store a unique digital identifier for each program along with its schedule information and later use the identifier—e.g., by transmitting it—to indicate to a recording or storage device, such as a video recorder, that the user wishes to record the program. The program guide could also use the identifier to automatically control operation of the video recorder. The electronic program guide could also be configured to use other stored schedule information for this purpose.

The form and content of a particular computer program to implement the invention disclosed herein will be readily apparent to those skilled in the art of video system programming and graphic display. A flow chart showing the operation logic of the system is shown in FIGS. 36A-D. It will also be appreciated by those skilled in the art that there can be departure from the specific embodiment of the invention described herein without departing from the true scope of the claims appended hereto.

We claim:

1. An electronic programming guide for use with a television receiver having a plurality of television channels for displaying television programs and program schedule information for said television programs comprising:

memory means for storing television program schedule information for a set of television programs scheduled to appear on said plurality of television channels;

user control means for choosing user control commands, including television tuning, guide channel-control and guide time-control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands; and

a video display generator adapted to receive video control commands from said data processing means and program schedule information from said memory means for displaying interactively-selected successive portions of said program schedule information in overlaying relationship with another display signal currently appearing on a selected channel in at least one mode of operation of said programming guide;

said data processing means controlling said video display generator with said video control commands in response to said user control commands to display each said portion of program schedule information for any chosen one of said television programs for a predetermined display period in partial overlaying relationship with another display signal currently being received on said television receiver;

each said portion being displayed in response to corresponding consecutive ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which program schedule information is stored in said memory means, said data processing means being responsive to said television tuning commands for allowing a user to select any one of said television programs for which listing information is displayed in said partially overlaid portion of said schedule information.

2. An electronic programming guide for use with a television receiver having a plurality of television channels for displaying television programs and program schedule information for said television programs comprising:

memory means for storing television program schedule information for a set of television programs scheduled to appear on said plurality of television channels;

user control means for choosing user control commands, including television tuning and guide time-control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands; and

a video display generator adapted to receive video control commands from said data processing means and program schedule information from said memory means for displaying interactively-selected successive portions of said schedule information for a currently tuned channel in overlaying relationship with another display signal currently appearing on said channel in at least one mode of operation of said programming guide;

said data processing means controlling said video display generator to display each said portion of program schedule information in partial overlaying relationship with said currently appearing display signal, each said

portion comprising listing information for each successive one of said television programs scheduled to appear on said currently tuned channel and being consecutively displayed in response to corresponding consecutive ones of said guide control commands for successively navigating through listing information for sequential time periods for which program schedule information is stored in said memory means, said data processing means being responsive to said television tuning commands for allowing a user to select any one of said programs for which listing information is displayed in said partially overlaid portion of said schedule information.

3. An electronic programming guide for use with a television receiver having a plurality of television channels for displaying television programs and program schedule information for said television programs comprising:

memory means for storing television program schedule information for a set of television programs scheduled to appear on said plurality of television channels;

user control means for choosing user control commands, including television tuning, guide channel-control and guide time-control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands; and

a video display generator adapted to receive video control commands from said data processing means and program schedule information from said memory means for displaying interactively-selected successive portions of said schedule information for a set of channels, including ones different from a currently tuned channel, in overlaying relationship with another display signal currently appearing on said tuned channel in at least one mode of operation of said programming guide;

said data processing means controlling said video display generator to display each said portion of program schedule information in partial overlaying relationship with said currently appearing display signal, each said portion comprising listing information for each successive one of said television programs scheduled to appear on said set of channels and being consecutively displayed in response to corresponding consecutive ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which program schedule information is stored in said memory means, said data processing means being responsive to said television tuning commands for allowing a user to select any one of said television programs for which listing information is displayed in said partially overlaid portion of said schedule information.

4. An electronic programming guide for use with a television receiver having a plurality of television channels for displaying television programs and program schedule information for said television programs comprising:

memory means for storing television program schedule information for a set of television programs scheduled to appear on said plurality of television channels;

user control means for choosing user control commands, including television tuning, guide time-control and guide channel-control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands;

a video display generator adapted to receive video control commands from said data processing means and pro-

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gram schedule information from said memory means for displaying interactively-selected successive portions of said program schedule information in overlaying relationship with another display signal currently appearing on a currently tuned channel in at least one mode of operation of said programming guide; and

said data processing means controlling said video display generator to display each said portion of program schedule information in partial overlaying relationship with said currently appearing display signal, each said portion comprising listing information

for each successive one of said television programs scheduled to appear on a channel different from said currently tuned channel and being consecutively displayed in response to corresponding consecutive ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which program schedule information is stored in said memory means, said data processing means being responsive to said television tuning commands for allowing a user to select any one of said television programs for which listing information is displayed in said partially overlaid portion of said schedule information.

5. An electronic programming guide for use with a video display for displaying program schedule information for television programs appearing on a plurality of television channels comprising:

means for receiving television program schedule information for a set of television programs scheduled to appear on said plurality of television channels;

user control means for choosing user control commands, including channel-control and time-control commands, including selection commands, guide channel-control and guide time-control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands; and

a video display generator adapted to receive video control commands from said data processing means and program schedule information from said receiving means for displaying interactively-selected successive portions of said program schedule information in overlaying relationship with another display signal appearing on said video display;

said data processing means being adapted to control said video display generator with said video control commands in response to said user control commands to display for a predetermined display period each said selected portion of program schedule information in partial overlaying relationship with said another display signal currently appearing on said video display, each said portion displayed in response to corresponding consecutive ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which program schedule information has been received;

said data processing means controlling said video display generator to also selectively display reminder selection messages in at least one mode of operation of said programming guide, for allowing said user to choose selection commands in response to said reminder selection messages for selecting a reminder associated with a chosen future program, each said selected reminder message also to be displayed on said display at a predetermined time prior to the time of occurrence of

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each chosen future one of said television programs, said reminder message being displayed in overlaying relationship with another display signal being displayed at said time said reminder message is displayed.

6. The electronic programming guide according to claims 1 or 5 wherein said predetermined display period is a user-selectable variable time period chosen in response to a user control command.

7. The electronic programming guide according to claims 1, 2, 3, 4, or 5 wherein said schedule information displayed by said video display generator comprises at least program title and program channel.

8. The electronic programming guide according to claim 5 wherein said data processing means is further adapted to control said video display generator to selectively display second reminder selection messages, in at least one further mode of operation of said programming guide, for allowing said user to choose selection commands in response to said second reminder selection messages for selecting said predetermined amount of time prior to said time of occurrence of each said chosen future television program each said reminder message is to be displayed.

9. The electronic programming guide according to claim 5 wherein said video display generator displays each said reminder message in a partial overlaying relationship with said another display signal.

10. The electronic programming guide according to claims 1, 2, 3, 4, or 5 wherein said another display signal is a television program.

11. A process for use with a television receiver having a plurality of television channels for displaying television programs and program schedule information for said television programs comprising:

storing in a memory television program schedule information for a set of television programs scheduled to appear on said plurality of television channels;

providing user control means for issuing user control commands, including television tuning and guide time-control commands, and for transmitting signals in response thereto;

receiving by a data processor said user control commands;

controlling a video display generator with the data processor for displaying interactively-selected successive portions of said schedule information for a currently tuned channel in overlaying relationship with another display signal currently appearing on said tuned channel in at least one mode of operation said process; and

configuring said data processor to control said video display generator with video control commands in response to said user control commands to display each said portion of program schedule information, in partial overlaying relationship with said currently appearing display signal, for each successive one of said television programs scheduled to appear on said channel, and consecutively displaying each said portion in response to corresponding consecutive ones of said guide control commands for successively navigating through listing information for sequential time periods for which program schedule information is stored in said memory means, and also configuring said data processor to be responsive to said television tuning commands for allowing a user to select any one of said television programs for which listing information is displayed in said partially overlaid portion of said schedule information.

12. A process for use with a television receiver having a plurality of television channels for displaying television

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programs and program schedule information for said television programs comprising:

storing in a memory television program schedule information for a set of television programs scheduled to appear on said plurality of television channels;

providing user control means for issuing user control commands, including television tuning, guide channel-control and guide time-control commands, and transmitting signals in response thereto;

receiving by a data processor said user control commands;

controlling a video display generator with the data processor for displaying interactively-selected successive portions of said schedule information for a set of channels, including ones different from a currently tuned channel, in overlaying relationship with another display signal currently appearing on said tuned channel in at least one mode of operation of said process; and

configuring said data processor to control said video display generator with video control commands in response to said user control commands to display each said portion of program schedule information, in partial overlaying relationship with said currently appearing display signal, for each successive one of said television programs scheduled to appear on said set of channels, and consecutively displaying each said portion in response to corresponding consecutive ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which program schedule information is stored in said memory, and also configuring said data processor to be responsive to said television tuning commands for allowing a user to select any one of said television programs for which listing information is displayed in said partially overlaid portion of said schedule information.

13. The process of claims 11 or 12 wherein said another display signal is chosen from the group consisting of a television program, promotional video clip or an advertisement.

14. An electronic programming guide for displaying television schedule information on a video display on which is displayed a display signal, said programming guide comprising:

memory means for storing television program schedule information;

user control means for choosing user control commands, including television tuning, guide channel-control and guide time-control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands; and

a program schedule display generator coupled to said data processing means and said memory means for displaying, in a partial overlay on said display signal, user-selected portions of said schedule information comprising listing information for at least one program different from said display signal, each said portion of said schedule information being interactively selected by a user and consecutively displayed in response to consecutive user-activated ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which schedule information is stored in said memory means, said data processing means being responsive to said television tuning commands for allowing a user to

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select any one of said television programs for which listing information is displayed in said partially overlaid portion of said schedule information.

15. An electronic programming guide for displaying television schedule information on a video display on which is displayed a display signal, said programming guide comprising:

memory means for storing television program schedule information;

user control means for choosing user control commands, including selection commands, guide channel-control and guide time-control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands; and

a program schedule display generator coupled to said data processing means and said memory means for displaying, in a partial overlay on said display signal, user-selected portions of said schedule information comprising listing information for at least one program different from said display signal, each said portion of said schedule information being interactively selected by a user and consecutively displayed in response to consecutive user-activated ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which program schedule information is stored in said memory means;

said data processing means controlling said program schedule display generator to also selectively display reminder selection messages in at least one mode of operation of said programming guide, for allowing said user to choose selection commands in response to said reminder selection messages for selecting a reminder associated with a chosen future program, each said selected reminder message also to be displayed on said display at a predetermined time prior to the time of occurrence of each chosen future one of said television programs, said reminder message being displayed in overlaying relationship with another display signal being displayed at said time said reminder message is displayed.

16. An electronic programming guide for displaying television schedule information on a video display on which is displayed a display signal, said programming guide comprising:

memory means for storing television program schedule information;

user control means for choosing user control commands, including television tuning, guide channel-control and guide time-control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands; and

a program schedule display generator coupled to said data processing means and said memory means for displaying, in a partial overlay on said display signal, user-selected portions of said schedule information comprising listing information for at least one program different from said display signal, each said portion of said schedule information being interactively selected by a user and consecutively displayed in response to consecutive user-activated ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which schedule information is stored in said memory

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means, said navigation including deleting at least one program listing appearing in the overlay and adding at least another program listing in the overlay, and said data processing means being responsive to said television tuning commands for allowing a user to select any one of said television programs for which listing information is displayed in said partially overlaid portion of said schedule information.

17. An electronic programming guide for displaying television schedule information on a video display on which is displayed a display signal, said programming guide comprising:

memory means for storing television program schedule information;

user control means for choosing user control commands, including selection commands, guide channel-control and guide time-control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands; and

a program schedule display generator coupled to said data processing means and said memory means for displaying, in a partial overlay on said display signal, user-selected portions of said schedule information comprising listing information for at least one program different from said display signal, each said portion of said schedule information being interactively selected by a user and consecutively displayed in response to consecutive user-activated ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which program schedule information is stored in said memory means, said navigation including deleting at least one program listing appearing in the overlay and adding at least another program listing in the overlay; said data processing means controlling said program schedule display generator to also selectively display reminder selection messages in at least one mode of operation of said programming guide, for allowing said user to choose selection commands in response to said reminder selection messages for selecting a reminder associated with a chosen future program, each said selected reminder message also to be displayed on said display at a predetermined time prior to the time of occurrence of each chosen future one of said television programs, said reminder message being displayed in overlaying relationship with another display signal being displayed at said time said reminder message is displayed.

18. The television schedule system according to claims 14, 15, 16, or 17 wherein the navigation is controlled by user-activated direction keys provided on said user control means.

19. An electronic programming guide for displaying television schedule information on a video display on which is displayed a display signal, said television programming guide comprising:

means for receiving television program schedule information;

user control means for choosing user control commands, including television tuning commands and guide control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands; and

a program schedule display generator coupled to said data processing means and said receiving means for dis-

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playing program schedule information in a browse mode of operation of said electronic programming guide for allowing a user to interactively select display listing information, including for programs other than a currently appearing display signal, using said guide control commands, said program schedule display generator displaying said selected program schedule information in a partial overlay on said currently appearing display signal in said browse mode, said data processing means being responsive to said television tuning commands for allowing a user to select any one of said television programs for which listing information is displayed in said partially overlaid portion of said schedule information.

20. An electronic television programming guide for use with a television receiver having a plurality of television channels for displaying television programs and program schedule information for said television programs comprising:

memory means for storing television program schedule information for a set of television programs scheduled to appear on said plurality of television channels;

user control means for choosing user control commands, including television tuning and guide channel-control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands; and

a video display generator adapted to receive video control commands from said data processing means and program schedule information from said memory means for displaying interactively-selected successive portions of said schedule information for programs appearing on channels different from a currently tuned channel, in overlaying relationship with another display signal currently appearing on said tuned channel in at least one mode of operation of said programming guide;

said data processing means controlling said video display generator to display each said portion of program schedule information in partial overlaying relationship with said currently appearing display signal, each said portion comprising listing information for each successive one of said television programs scheduled to appear on a channel different from said currently tuned channel at the same time as the currently appearing display signal on said currently tuned channel and being consecutively displayed in response to corresponding consecutive ones of said guide control commands for successively navigating through listing information for sequential programs for which program schedule information is stored in said memory means, said data processing means being responsive to said television tuning commands for allowing a user to select any one of said television programs for which listing information is displayed in said partially overlaid portion of said schedule information.

21. The electronic programming guide according to claim 20 wherein said portion of displayed program schedule information comprises at least program title and program channel.

22. A process for displaying television schedule information on a video display on which is displayed a display signal comprising:

storing in a memory television program schedule information;

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providing user control means for issuing user control commands, including television tuning, guide channel-control and guide time-control commands, and for transmitting signals in response thereto;

receiving by a data processor said user control commands;

controlling a program schedule display generator with the data processor for displaying, in a partial overlay on a portion of said display signal, interactively-selected successive portions of said schedule information comprising listing information for at least one program different from said display signal; and

consecutively displaying each said portion of said schedule information in response to consecutive user-activated ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which program schedule information is stored in said memory, and also configuring said data processor to be responsive to said television tuning commands for allowing a user to select any one of said television programs for which listing information is displayed in said partially overlaid portion of said schedule information.

23. A process for displaying television schedule information on a video display on which is displayed a display signal comprising:

storing in a memory television program schedule information;

providing user control means for issuing user control commands, including selection commands, guide channel-control and guide time-control commands, and for transmitting signals in response thereto;

receiving by a data processor said user control commands;

controlling a program schedule display generator with the data processor for displaying, in a partial overlay on a portion of said display signal, interactively-selected successive portions of said schedule information comprising listing information for at least one program different from said display signal; and

consecutively displaying each said portion of said schedule information in response to consecutive user-activated ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which program schedule information is stored in said memory means; and also configuring said data processor to control said display generator to also selectively display reminder selection messages in at least one mode of operation of said programming guide, for allowing said user to choose selection commands in response to said reminder selection messages for selecting a reminder associated with a chosen future program, each said selected reminder message also to be displayed on said display at a predetermined time prior to the time of occurrence of each chosen future one of said television programs, said reminder message being displayed in overlaying relationship with another display signal being displayed at said time said reminder message is displayed.

24. A process for displaying television schedule information on a video display on which is displayed a display signal comprising:

storing in a memory television program schedule information;

providing user control means for issuing user control commands, including television tuning, guide channel-

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control and guide time-control commands, and for transmitting signals in response thereto;

receiving by a data processor said user control commands;

controlling a program schedule display generator with the data processor for displaying, in a partial overlay on a portion of said display signal, interactively-selected successive portions of said schedule information comprising listing information for at least one program different from said display signal; and

consecutively displaying each said portion of said schedule information in response to consecutive user-activated ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which program schedule information is stored in said memory means, said navigation including deleting one program listing appearing in the overlay and adding another program listing in the overlay, and also configuring said data processor to be responsive to said television tuning commands for allowing a user to select any one of said television programs for which listing information is displayed in said partially overlaid portion of said schedule information.

25. A process for displaying television schedule information on a video display on which is displayed a display signal comprising:

receiving television program schedule information;

providing user control means for issuing user control commands, including selection commands, guide channel-control and guide time-control commands, and transmitting signals in response thereto;

receiving by a data processor said user control commands;

controlling a program schedule display generator with the data processor for displaying, in a partial overlay on a portion of said display signal, interactively-selected successive portions of said schedule information comprising listing information for at least one program different from said display signal; and

consecutively displaying each said portion of said schedule information in response to consecutive user-activated ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which program schedule information is received; and

also configuring said data processing means to control said display generator to also selectively display reminder selection messages in at least one mode of operation of said programming guide, for allowing said user to choose selection commands in response to said reminder selection messages for selecting a reminder associated with a chosen future program, each said selected reminder message also to be displayed on said display at a predetermined time prior to the time of occurrence of each chosen future one of said television programs, said reminder message being displayed in overlaying relationship with another display signal being displayed at said time said reminder message is displayed.

26. The process of claims 22, 23, 24, or 25 wherein said display signal is chosen from the group consisting of a television program, promotional video clip or an advertisement.

27. The process according to claims 11, 12, 22, 23, 24, or 25 further comprising the step of displaying said program schedule information for a display period and wherein said display period is a user-selectable variable time period chosen in response to a user control command.

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28. An electronic programming guide for displaying television schedule information on a video display on which is displayed a display signal, said programming guide comprising:

means for receiving television program schedule information;

user control means for choosing user control commands, including television tuning, guide channel-control and guide time-control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands; and

a program schedule display generator coupled to said data processing means and said means for receiving for displaying, in a partial overlay on said display signal, user-selected portions of said schedule information comprising listing information for at least one program different from said display signal, each said portion of said schedule information being interactively selected by a user and consecutively displayed in response to consecutive user-activated ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which schedule information has been received, said data processing means being responsive to said television tuning commands for allowing a user to select any one of said television programs for which listing information is displayed in said partially overlaid portion of said schedule information.

29. An electronic programming guide for displaying television schedule information on a video display on which is displayed a display signal, said programming guide comprising:

means for receiving television program schedule information;

user control means for choosing user control commands, including selection commands, guide channel-control and guide time-control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands; and

a program schedule display generator coupled to said data processing means and said means for receiving for displaying, in a partial overlay on said display signal, user-selected portions of said schedule information comprising listing information for at least one program different from said display signal, each said portion of said schedule information being interactively selected by a user and consecutively displayed in response to consecutive user-activated ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which program schedule information has been received;

said data processing means controlling said program schedule display generator to also selectively display reminder selection messages in at least one mode of operation of said programming guide, for allowing said user to choose selection commands in response to said reminder selection messages for selecting a reminder associated with a chosen future program, each said selected reminder message also to be displayed on said display at a predetermined time prior to the time of occurrence of each chosen future one of said television programs, said reminder message being displayed in overlaying relationship with another display signal being displayed at said time said reminder message is displayed.

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30. An electronic programming guide for displaying television schedule information on a video display on which is displayed a display signal, said programming guide comprising:

means for receiving television program schedule information;

user control means for choosing user control commands, including television tuning, guide channel-control and guide time-control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands; and

a program schedule display generator coupled to said data processing means and said means for receiving for displaying, in a partial overlay on said display signal, user-selected portions of said schedule information comprising listing information for at least one program different from said display signal, each said portion of said schedule information being interactively selected by a user and consecutively displayed in response to consecutive user-activated ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which schedule information has been received, said navigation including deleting at least one program listing appearing in the overlay and adding at least another program listing in the overlay, and said data processing means being responsive to said television tuning commands for allowing a user to select any one of said television programs for which listing information is displayed in said partially overlaid portion of said schedule information.

31. The electronic programming guide according to claim 29 wherein said data processing means further controls said display generator to selectively display second reminder selection messages, in at least one further mode of operation of said programming guide, for allowing said user to choose second selection commands in response to said second reminder selection messages for selecting said predetermined amount of time prior to said time of occurrence of each said chosen future television program each said reminder message is to be displayed.

32. The electronics programming guide according to claim 29 wherein said display generator displays each said reminder message in a partial overlaying relationship with said another display signal.

33. An electronic guide for displaying schedule information on a video display on which is displayed a television display signal, said guide comprising:

memory means for storing information regarding scheduled events;

user control means for choosing user control commands, including television tuning, guide channel-control and guide time-control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands; and

an event schedule display generator coupled to said data processing means and said memory means for displaying, in a partial overlay on said display signal, user-selected portions of said schedule information comprising listing information for at least one receivable signal different from said display signal, each said portion of said schedule information being interactively selected by a user and consecutively displayed in response to consecutive user-activated ones of said

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guide control commands for successively navigating through listing information for sequential time periods or programs for which schedule information is stored in said memory means, said data processing means being responsive to said television tuning commands for allowing said user to select any one of said receivable signals for which listing information is displayed in said partially overlaid portion of said schedule information.

34. An electronic guide for displaying schedule information on a video display on which is displayed a television display signal, said guide comprising:

memory means for storing information regarding scheduled events;

user control means for choosing user control commands, including selection commands, guide channel-control and guide time-control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands; and

an event schedule display generator coupled to said data processing means and said memory means for displaying, in a partial overlay on said display signal, user-selected portions of said schedule information comprising listing information for at least one receivable signal different from said display signal, each said portion of said schedule information being interactively selected by a user and consecutively displayed in response to consecutive user-activated ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which schedule information is stored in said memory means, said data processing means controlling said event schedule display generator to also selectively display reminder selection messages in at least one mode of operation of said programming guide, for allowing said user to choose selection commands in response to said reminder selection messages for selecting a reminder associated with a chosen future event, each said selected reminder message also to be displayed on said display at a predetermined time prior to the time of transmission of each chosen future one of said events, said reminder message being displayed in overlaying relationship with another display signal being displayed at said time said reminder message is displayed.

35. The television schedule system according to claims 14, 15, 16, 17, or 18 wherein said display signal is chosen from the group consisting of a television program, promotional video clip or an advertisement.

36. The electronic programming guide according to claims 1, 2, 3, 4, 5 or 20 wherein said another display signal is an advertisement.

37. The electronic programming guide according to claims 1, 2, 3, 4, 5 or 20 wherein said another display signal is a promotional video clip.

38. The electronic programming guide according to claims 2, 3, 4, 14, 15, 16, 17 or 20 wherein said program schedule information is displayed for a display period and wherein said display period is a user-selectable variable time period chosen in response to a user control command.

39. An electronic programming guide for use with a video display for displaying program schedule information for television programs appearing on a plurality of television channels comprising:

means for receiving television program schedule information for a set of television programs scheduled to appear on said plurality of television channels;

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user control means for choosing user control commands, including television tuning, guide time-control and guide channel control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands; and

a video display generator adapted to receive video control commands from said data processing means and program schedule information from said receiving means for displaying interactively-selected successive portions of said program schedule information for a set of channels, including ones different from a currently tuned channel, simultaneously with another display signal appearing on said video display in at least one mode of operation of said programming guide;

said data processing means controlling said video display generator with said video control commands in response to said user control commands to display each said selected portion of program schedule information, each said portion comprising listing information for each successive one of said television programs scheduled to appear on said set of channels, simultaneously with said another display signal currently appearing on said video display, each said portion consecutively displayed in response to corresponding consecutive ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which program schedule information has been received, said data processing means being responsive to said television tuning commands for allowing a user to select any one of said television programs for which listing information is displayed.

40. An electronic programming guide for displaying television schedule information on a video display on which is displayed a display signal, said programming guide comprising:

memory means for storing television program schedule information;

user control means for choosing user control commands, including television tuning, guide channel-control and guide time-control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands; and

a program schedule display generator coupled to said data processing means and said memory means for displaying, simultaneously with said display signal, user-selected portions of said schedule information comprising listing information for at least one program different from said display signal, each said portion of said schedule information being interactively selected by a user and consecutively displayed in response to consecutive user-activated ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which schedule information is stored in said memory means, said data processing means being responsive to said television tuning commands for allowing a user to select any one of said television programs for which listing information is displayed.

41. An electronic programming guide for use with a television receiver having a plurality of television channels for displaying television programs and program schedule information for said television programs comprising:

memory means for storing television program schedule information for a set of television programs scheduled to appear on said plurality of television channels;

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user control means for choosing user control commands, including selection commands and guide time-control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands;

a video display generator adapted to receive video control commands from said data processing means and program schedule information from said memory means for displaying interactively-selected successive portions of said schedule information for a currently tuned channel in overlaying relationship with another display signal currently appearing on said channel; and

said data processing means controlling said video display generator to display each said portion of program schedule information in partial overlaying relationship with said currently appearing display signal, each said portion comprising listing information for each successive one of said television programs scheduled to appear on said currently tuned channel and being consecutively displayed in response to corresponding consecutive ones of said guide control commands for successively navigating through listing information for sequential time periods for which program schedule information is stored in said memory means;

said data processing means controlling said video display generator to also selectively display reminder selection messages in at least one mode of operation of said programming guide, for allowing said user to choose selection commands in response to said reminder selection messages for selecting a reminder associated with a chosen future program, each said selected reminder message also to be displayed on said television receiver at a predetermined time prior to the time of occurrence of each chosen future one of said television programs, said reminder message being displayed in overlaying relationship with another display signal being displayed at said time said reminder message is displayed.

42. An electronic programming guide for use with a television receiver having a plurality of television channels for displaying television programs and program schedule information for said television programs comprising:

memory means for storing television program schedule information for a set of television programs scheduled to appear on said plurality of television channels;

user control means for choosing user control commands, including selection commands, guide channel-control and guide time-control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands; and

a video display generator adapted to receive video control commands from said data processing means and program schedule information from said memory means for displaying interactively-selected successive portions of said schedule information for a set of channels, including ones different from a currently tuned channel, in overlaying relationship with another display signal currently appearing on said tuned channel;

said data processing means controlling said video display generator to display each said portion of program schedule information in partial overlaying relationship with said currently appearing display signal, each said portion comprising listing information for each successive one of said television programs scheduled to appear on said set of channels and being consecutively

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displayed in response to corresponding consecutive ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which program schedule information is stored in said memory means;

said data processing means controlling said video display generator to also selectively display reminder selection messages in at least one mode of operation of said programming guide, for allowing said user to choose selection commands in response to said reminder selection messages for selecting a reminder associated with a chosen future program, each said selected reminder message also to be displayed on said television receiver at a predetermined time prior to the time of occurrence of each chosen future one of said television programs, said reminder message being displayed in overlaying relationship with another display signal being displayed at said time said reminder message is displayed.

43. An electronic programming guide for use with a television receiver having a plurality of television channels for displaying television programs and program schedule information for said television programs comprising:

memory means for storing television program schedule information for a set of television programs scheduled to appear on said plurality of television channels;

user control means for choosing user control commands, including selection commands, guide time-control and guide channel-control commands, and transmitting signals in response thereto;

data processing means for receiving said signals in response to said user control commands; and

a video display generator adapted to receive video control commands from said data processing means and program schedule information from said memory means for displaying interactively-selected successive portions of said program schedule information in overlaying relationship with another display signal currently appearing on a currently tuned channel;

said data processing means controlling said video display generator to display each said portion of program schedule information in partial overlaying relationship with said currently appearing display signal, each said portion comprising listing information for each successive one of said television programs scheduled to appear on a channel different from said currently tuned channel and being consecutively displayed in response to corresponding consecutive ones of said guide control commands for successively navigating through listing information for sequential time periods or programs for which program schedule information is stored in said memory means;

said data processing means controlling said video display generator to also selectively display reminder selection messages in at least one mode of operation of said programming guide, for allowing said user to choose selection commands in response to said reminder selection messages for selecting a reminder associated with a chosen future program, each said selected reminder message also to be displayed on said television receiver at a predetermined time prior to the time of occurrence of each chosen future one of said television programs, said reminder message being displayed in overlaying relationship with another display signal being displayed at said time said reminder message is displayed.

44. The electronic programming guide according to claim 41, 42, or 43 wherein said data processing means is further

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adapted to control said video display generator to selectively display second reminder selection messages, in at least one further mode of operation of said programming guide, for allowing said user to choose selection commands in response to said second reminder selection messages for selecting said predetermined amount of time prior to said time of occurrence of each said chosen future television program each said reminder message is to be displayed.

45. The electronic programming guide according to claim 41, 42, or 43 wherein said video display generator displays each said reminder message in a partial overlaying relationship with said another display signal.

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46. The electronic programming guide according to claim 41, 42, or 43 wherein said another display signal is an advertisement.

47. The electronic programming guide according to claim 41, 42, or 43 wherein said another display signal is a promotional video clip.

48. The electronic programming guide according to claim 41, 42, or 43 wherein said program schedule information is displayed for a display period and wherein said display period is a user-selectable variable time period chosen in response to a user control command.

* * * * *

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Title of Invention: Television receiver

Application No.: 59-197308

Date of Application: 20 September 1984

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Specification

Title of Invention: Television receiver

Claims

In respect of a television receiver having a timer function and which is at the very least able to display a calendar on the screen of the receiver, a television receiver which, in addition to being able at least to store in its memory items for a schedule and dates for a schedule, is arranged such that when the display mode for said calendar is selected, said schedule is displayed together with said calendar on the same receiver screen when the month of the calendar being displayed matches the month of said schedule.

Detailed Description

(Field of Industrial Use)

The invention relates to a television receiver having a timer function arranged such that a clock and calendar can be displayed on the receiver screen, and in particular a television receiver such that when a schedule has been assigned for the same month as the month of the calendar being displayed on the receiver screen, this schedule can be displayed at the same time as the calendar.

(Prior Art)

With television receivers provided with a timer function, the ability to display not only the time and date using part or all of the television screen, but also the content of any

programming while viewing the TV screen gives the television receiver a multi-purpose function, making it extremely useful for users since the information displayed can be checked on the TV screen.

Television receivers achieving this multi-purpose function have already been proposed by the Applicant (for example Laid-Open Patent 59-100181).

As the present invention is very well suited for application to this kind of television receiver, the prior art disclosed in Japanese Patent Application 59-100181 will be described.

Fig. 5 is a diagram showing the layout of an example of a television receiver described above, (1) being the tuner, (2) the video intermediate frequency amplifier circuit, (3) the video detection circuit, (4) the video output circuit, (5) the cathode ray tube (CRT), (6) the audio intermediate frequency amplifier circuit, (7) the output amplifier, (8) the speaker, (9) the horizontal and vertical deflection circuits, (11) the deflection system, (12) the electronic tuning circuit, (13) the decoder for channel selection signals from a remote control or from within the receiver, and (14) the channel selection voltage formation circuit. Furthermore, the output of decoder (13) is supplied to AC power supply control circuit (17). (18) is the remote control signal photo-receptor element.

Moreover (20) is a control circuit with a program timer function used for image display, its main unit being a micro-computer. Having received instructions from this control circuit (20), the CRT control circuit (25) built into a character generating device is activated. Red, green and blue character signals (numbers, letters, symbols and the like) S_R , S_G and S_B are generated from CRT control circuit 25. Moreover, in addition to blanking signal BLK,

which is sent to video output circuit (4) to blank out the television screen from control circuit (20), where necessary audio control signal S_A is output to audio control circuit (27) so that a buzzer will sound when key operation is terminated.

AND circuit (19) is provided to override the input from a remote control signal using pulse P_1 when a control signal from control circuit (20) is sent to electronic tuning circuit (12).

(28) is a mode-switching key provided on the main body of the receiver, and in this example the key is a PPC (programmable pick-up center) (29), which is a time key that switches the programming time on and off, the command data from these being sent to the CPU via an I/O port provided on control circuit (20).

Fig. 6 shows an example of a key array provided on commander (30). Commander (30) can be used for channel selection, to switch power on and off, and also to preset the current time as described above. Of the plurality of keys, (31) are direct selection keys for the channels, the PPC key is a mode-switching key having an identical function to the one provided on the main body, (32) and (33) are plus and minus keys, (34) and (35) are shift keys for shifting the data setting symbol [$\downarrow$] to the left and the right, (36) being a pencil-type clock start key. Timer display and calendar display are executed based on commands from the micro-computer.

Fig. 7 is a display flow chart which shows the relationship between the above-mentioned screen display and key operation, and using this to describe the main operational procedure, first of all when the power is switched on the normal television screen appears (Step a) and if the PPC key is deployed at this point with the current time not yet set, a pre-set day, month, year and time unrelated to the actual day, month, year and time will be

superimposed on the television screen (Step b). An example of the day, month, and year and time display is shown in Fig. 8A. This is simply an example of a pre-set month, day and year and time.

When the correct time is set and the clock is already functioning, the actual day, month and year and time are superimposed on the display (Step c). If the current time is not already set, the current time is now set (Step d) and when the clock start key (36) is switched on (Step e), the timer program will run from this point, starting the clock, the process then moving on to Step c. If the PPC key is pushed instead of the clock start key (36) when the cursor of the data-setting symbol [$\downarrow$] displayed in the year position is not above the "hundred" digit, it will enter clock start mode in the same way as when clock start key (36) is deployed, and the calendar for the month will be displayed in place of the TV broadcast screen (Step f). If the PPC key is pushed during Step c, the calendar for the month will be displayed in the same way.

If the PPC key is deployed after Step f, the process moves to channel programming mode (Step g), and the channel programming image is displayed in place of the TV broadcast image on the CRT screen. An example of the programming image is shown in Fig. 8B. Channel programming is done in the form of "which channel, what day, what time?" and in this example the timer is set to switch off roughly two hours after it switches on. Since the channel programming has no direct relationship with the gist of this invention, a more detailed explanation will be omitted.

If the PPC key is pushed during the channel programming procedure, or after the channel programming has been completed, the normal television image will be restored.

Moreover if the PPC key is deployed during Step b, or pushed again during Step d, and furthermore when the cursor is above the "hundred" digit (without the clock start key having been operated), a demonstration calendar will be displayed (Step h). An example of a demonstration calendar is shown in Fig. 8C.

In this way the demonstration calendar shows the month and year displayed in Step b. This demonstration calendar then displays the calendar for the following months in sequential increments at intervals of a few seconds (2 to 3 seconds). In this process the days of the calendar first of all disappear to be replaced in the next instant by a sequential display from day 1 in a scroll down display. The calendar follows the Gregorian system, and will display from January 0000 through to December 9999.

Thus if the day, month, year and time have not been set, the monthly calendar pages will automatically enter a turning mode, so that it is possible to check visually that the current time has not been set. When the PPC key is pressed in this situation, the display changes to the channel programming mode.

(Problems to be Resolved by the Invention)

The arrangement is convenient with the above described television receiver because due to the provision within the receiver of control circuit (20) and CRT control circuit (25), the current time display, calendar display and channel programming display are all done using the television screen.

However, this kind of television receiver would be even more convenient if there was a display function which allowed the schedule of the family using the television receiver on a

daily basis to be displayed. Of course, were it possible to display the schedule even without the above-mentioned display functions, it would not change the fact that it would be very useful as the device would still have a more multi-purpose function than a conventional receiver.

With the calendar display mode to be selected in such a case, it would be very helpful from the point of view of schedule checking if the schedule for the month corresponding to the displayed calendar month could be automatically brought up onto the same screen together with this calendar.

Thus this invention is a device which resolves this technical difficulty, and proposes a television receiver in which the schedule is simultaneously displayed together with the calendar when a schedule has been assigned for the same month as the displayed calendar month.

(Means of Resolving the Problems)

In order to achieve the above-mentioned technical aims, in this invention the receiver has built into it control circuit (20) comprising a micro-computer, and CRT control circuit (25), the contents of the schedule being displayed together with the calendar on the TV screen by entering the schedule data into control circuit (20) using commander (30).

(Operation)

Where the schedule data is input using commander (30), the input data are displayed on the television screen (Fig. 3D). When the calendar display mode is selected after inputting the

schedule data, if the clock timer is in operation not only is the monthly calendar displayed on television screen S, the schedule for the same month is checked (Fig.1, Step 46) and where a monthly schedule is found to have been assigned, the monthly schedule is displayed on the same screen together with this monthly calendar (Fig. 3F).

Where a monthly schedule has not been assigned, the process does not move on to Step 47, and only the monthly calendar is displayed. Where there are multiple assignments on the monthly schedule, these schedules will all be displayed together with the calendar.

(Embodiment)

An example of a television receiver according to this invention will now be described in detail with reference to Figs 1-4, as applied to the television receiver shown in Fig. 5.

The images for the schedule to be superimposed on the TV screen will, for example as shown in Fig. 3A, comprise the symbol M_s , which shows the type of schedule, the date (month, day) and time (hours and minutes) of the appointment, and the schedule title (category) M_T , there being some six types of the symbol M_s to choose from in this example, as shown in Fig. 4 A-F.

Picture A in this diagram is the symbol for appointments, and similarly Picture B is the schedule for driving, Picture C the sports schedule (for example tennis) Picture D the schedule for birthdays, Picture E the schedule for dates and Picture F the symbol for domestic schedules.

All of these symbols M_s are generated in the CRT control circuit (25) based on instruction data from the micro-computer. In this example the types of symbols are pre-determined, but by using data input from commander 30 it is possible to set up new symbols.

Even though a television receiver having the structure shown in Fig. 5 is used in principle with this invention, the program data read into the ROM of control circuit (20) differs from that shown in Fig. 5.

Fig. 2 is a flowchart showing how the images displayed for these kinds of schedules relate to the key operation, with parts identical to the display flow in Fig. 7 being indicated with the same symbol and thereby omitted from the description.

In this embodiment, switching the power on activates Step i in the schedule image display process, and as will be explained later, the schedule for the day is superimposed on the television image (Fig. 3G). The superimposed image of the schedule can be removed by pressing the PPC key, thus entering Step a of the display mode.

When adding display functions, the monthly calendar display in Step f or the demonstration calendar display in Step h have a restricted display area as shown in Fig. 3B. When schedules have already been assigned, the space created by reducing the area allows the schedule content for that month to be displayed together with the selected calendar month when a schedule exists which corresponds to the displayed calendar month (Fig. 3F).

In contrast, when schedules have not yet been assigned, or when the schedule has not been assigned for the corresponding calendar month, the schedule image will not be displayed.

When the PPC key is deployed in Step f or h, the process enters the schedule programming display mode (Step j) if the PPC key is pressed within 4 seconds of the previous deployment of the PPC key. If no schedule has yet been assigned, only the symbol area M_A and the colons [:] dividing the month, day and time will be displayed on the top left of screen S, as shown in Fig. 3C. At this time cursor [$\downarrow$] will be above the symbol area M_A , and the desired symbol can be selected for display by pressing the plus and minus keys (32), (33).

On pressing the plus key (32), symbol M_S shown in Fig. 4A will first of all be displayed in symbol area M_A , and where it is wished to make changes to this symbol, deployment of plus key (32) will change it sequentially through from Fig. 4B to F. If the minus key (33) is deployed the order of the change of the display reverses. When the desired symbol M_S has been selected, the shift key (35) is operated. Having done this the [$\downarrow$] cursor will move in front of the month symbol, and the required monthly schedule can be then selected by using the above-mentioned plus and minus keys (32) and (33), and after selecting the month, the shift key (35) can be used to move the [$\downarrow$] cursor in front of the day space in the same way, and the day can then be set using the same procedure.

This procedure is used for setting times for the schedule, and after setting times the [$\downarrow$] cursor is moved so that the schedule title can be selected. The title display is in English or alphabetic script. Selection of letters from A-Z is done using the plus and minus keys (32) and (33).

For example, when setting the schedule "Tennis from 10.00 am on 21 September" (the first item in the schedule), this first schedule SK_1 will be displayed on the top left of screen S as shown in Fig. 3D. Confirmation of the schedule content is done looking at TV screen S.

The second item on the schedule, SK_2 , is displayed to the right (top right of screen S) of the first schedule item SK_1 . In this embodiment it is possible to set up to six items in the schedule, and Fig. 3D shows an example of the schedule arrangement.

It is possible to set a number of appointments for the same month, and the scheduled items may be the same.

Once the content of the schedule has been set the PPC key is deployed, and since this is usually done within 4 seconds from the previous deployment of the PPC key, at this time the screen reverts to Step a, and the normal television image is displayed in place of the schedule display.

In this example, it is possible to input and display telephone contact information in addition to the schedule display functions, and if the PPC key is deployed less than 4 seconds since the schedule setting mode was selected with the PPC key, it moves to Step h, the phone book setting mode.

In phone book setting mode, the page number is displayed on the right hand side as shown in Fig. 3E in addition to symbol M_S for the phone book displayed on the top left of screen S, with the contact information (name, number) being displayed on the remainder of screen S. The contact numbers for up to eight people can be displayed in rows on a single page, and in this example four pages' worth, in other words the contact information for 32 people, can be stored in the memory and displayed.

The [↓] cursor is now on the page number, and after specifying the page the shift key (35) can be used to move the [↓] cursor to the name column, and here the name is entered, spelling out the surname in alphabet letters with an initial for the first name, and in the number column the number is entered using hyphens as shown in the figure. In this example the maximum is fourteen letters, with space for up to twelve numbers.

The alphanumeric codes A-Z and 0-9 are all selected using the plus and minus keys (32 and (33).

Once the programming of the phone book is complete, the process returns to Step a when the PPC key is deployed.

Fig. 1 is a flowchart showing an example of the display operation according to the invention, following the program data written into the ROM provided in control circuit (20).

When the program starts, Step 40 confirms whether or not the monthly calendar display mode is present, and where the monthly calendar display mode has been selected using the PPC key, the process moves to Step 41 where this year's data is placed in Y and this month's data in M, the days for the monthly calendar being calculated in Step 42 using the micro computer, and the resultant monthly calendar displayed on TV screen S (Step 43, Fig. 3B).

If the clock start key has been deployed, the timer for the clock will not start, in which case the pre-set demonstration calendar will immediately be displayed. The month of the

display calendar can be changed on the display by moving the [↓] cursor in front of the month category and deploying the plus and minus keys (32), (33) in that position.

Simultaneously with the display of the calendar, in Step 44 the counter is initialized to 1. This counter is provided to identify the plurality of schedules pre-stored in the memory. Once initialization of the counter has been performed, the process moves to Step 45, and the month for the first assigned schedule (first item, in other words schedule $n=1$) is read out from the memory and its data placed at N.

This data N is examined at Step 46 to see if it matches data M indicating the current month, and if the respective data matches, the process moves to Step 47, and the first schedule is displayed together with the calendar (Fig. 3F).

The display position, as shown in the figure, is the top left hand corner of the screen in this example. The screen also displays the symbol for the first schedule, the month and day assigned, the time and the title of the schedule.

Following display of the schedule image, the process moves to Step 48, and the above-mentioned counter increases incrementally by 1. If data N and M do not match, the process moves to Step 48, omitting Step 47, and the counter increases by 1 in the same way. In other words, in this case only the calendar is displayed on the TV screen.

As the count of the counter increases, the process moves to Step 49, where a check is made to see if N is greater than 6, and where N is 6 or less, returns to Step 42, where a check is made to see whether data N of the n^{th} schedule item corresponding to the count value of the counter set at Step 48 matches data M of the current month, and the process then repeats in

the same way as described above. For this reason only the maximum number of schedules that can be set ($n=6$) are pre-assigned, and where for example the 3rd, 4th and 5th schedules are assigned for the current month, the 3rd, 4th and 5th schedules are simultaneously displayed together with monthly calendar on the television screen using the above-mentioned control routine. Fig. 3F shows an example of the display array in this case.

At Step 49 a check is made to see whether n exceeds 6, and then at Step 50 a check is made to see whether the calendar month displayed on the television screen has changed or not, and where it has changed, the process returns to Step 42. Where the month has not changed the process moves on to Step 51, where a check is made to see whether the PPC key has been deployed or not, and where it has been deployed it moves to the next display Step mode. Where the PPC key has not been deployed, the process moves to Step 52, where a check is made to see whether 30 seconds has elapsed since the last change of calendar display mode, the calendar and the schedule image being displayed continuously on the screen until 30 seconds has elapsed. However, if 30 seconds have already elapsed, it moves automatically to the next display mode.

Thus in this example, as long as the PPC key is not operated before 30 seconds have elapsed, the above-mentioned display mode will continue.

The reason why 30 seconds is specified as the time limit for switching over to the automatic display mode is that this is considered to be sufficient time for the calendar display month and the schedule contents to be read off from the start of the calendar and schedule image display.

However, in contrast to the above example, it is possible to use a loop which returns the process directly to Step 50 without providing Step 52. In this case as long as the PPC key is not deployed the process will not move on to the next display mode.

The display routine shown in Fig. 1 ensures that each time the month changes the next month's schedule is always automatically displayed together with the calendar display. Thus once the TV power is switched on, deployment of the PPC key allows the current monthly schedule to be displayed on the television screen together with the monthly calendar, so that there is no fear of an appointment being missed.

(Effect of the Invention)

According to this invention as described above, since it is possible to confirm the schedule assigned for that month together with the monthly schedule along with the display of the monthly calendar, providing that several days or several months of schedule have been stored as described, it is possible to definitely prevent mistakes such as the forgetting of appointments, thus proving extremely useful in practice.

Moreover, the month of the calendar displayed on the television screen can be altered using the plus and minus keys, and moreover since the schedule corresponding to the new month in this case will be displayed on the same screen, it is possible to easily and reliably confirm a schedule for several months ahead.

Thus this invention is very well suited for use with a television receiver having the display functions as shown in Fig. 5.

Brief Description of the Drawings

Fig.1 shows an example of a display flowchart for the television receiver relating to this invention

Fig.2 is a chart showing an example of the display shift

Fig.3 shows examples of the display images

Fig.4 shows examples of the symbols used for the schedule

Fig.5 shows an example of the system of the television receiver used to describe this invention

Fig.6 shows an example of a key array for a commander unit

Fig.7 is a chart showing an example of display shift for Fig. 2

Fig.8 shows examples of display images

20: Control circuit

25: CRT control circuit

S_R B S_B : Alphanumeric signals

Key to Figs

Fig. 1 A: Start

40: Current month calendar display mode?

41: Y-year

M-month

42: Calendar day calculation

- 43: Calendar display
- 44: n-1
- 45: N - schedule for the nth month
- 47: Display nth schedule
- 50: Has year, month or day changed?
- 51: Has PPC key been deployed?
- 52: Has 30 seconds elapsed?

Fig. 2

- Switch power on
- i: TV display / schedule display
 - a: TV display
 - (time not set)
 - b: TV display / year/month/day and time display
 - d: year/month/day/time set
 - e: clock start key
 - c: TV display / month/day/day and time display
 - f: display of monthly calendar
 - h: display of demonstration calendar
 - j: schedule setting display
 - k: display of phone book
 - g: channel programming display
 - other: 4 seconds elapse

Fig. 3

B: September 1984

Sunday Monday Tuesday Wednesday Thursday Friday Saturday

C: month/day

D: 21 September

3 November

F: 21st September

September 1984

Sunday Monday Tuesday Wednesday Thursday Friday Saturday

Fig. 6

A: 1st January 2001

C: January 2001

Fig. 7

Switch power on

- i: TV display / schedule display
- a: TV display
- (time not set)
- b: TV display / year/month/day and time display
- d: year/month/day/time set
- e: clock start key
- c: TV display / month/day/day and time display
- f: display of monthly calendar
- h: display of demonstration calendar
- g: channel programming display

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⑭ 発明の名称 テレビジョン受像機

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明 細 書

発明の名称 テレビジョン受像機

特許請求の範囲

タイマー機能を有し、少なくともカレンダーを受像管面上に表示できるようにしたテレビジョン受像機において、スケジュールの項目やスケジュールの日付を少なくともメモリできるようにすると共に、上記カレンダー表示モードが選択されたときには、表示されたカレンダーの月と上記スケジュールの月が一致した場合、上記カレンダーと共に上記スケジュールが同一受像管面上に表示されるようになされたテレビジョン受像機。

発明の詳細な説明

(産業上の利用分野)

この発明は時計やカレンダーを受像管面上に表示できるようになされたタイマー機能を有するテレビジョン受像機、特に受像管面上に表示されたカレンダーの月と同一月のスケジュールがセットされているとき、このカレンダーと共にそのスケジュールが表示ができるようなテレビジョン受像機に関

する。

(従来の技術)

タイマー機能を有するテレビジョン受像機では、テレビ画面の一部又は全部を利用して時刻やカレンダーの表示と共に、チャンネル内容の予約表示をテレビ画面をみながら行なえるようにした方が、テレビジョン受像機を多目的に使用でき、しかも表示内容をテレビ画面をみながら確認できるので、ユーザにとって極めて便利である。

このような目的を實現できるテレビジョン受像機を本出願人は先に提案した(例えば特願昭59-100181号等)。

この発明は、このようなテレビジョン受像機に適用して好適であるので、まず特願昭59-100181号に開示された先願技術を説明する。

第5図は上述したテレビジョン受像機の一例を示す系統図であって、(1)はチューナ、(2)は映像中間周波増幅回路、(3)は映像検波回路、(4)は映像出力回路、(5)は受像管(CRT)であり、また(6)は音声中間周波増幅回路、(7)は出力アンプ、(8)はス

ビークであり、(9)は水平、垂直偏向回路、(11)は偏向系である。(12)は電子同期回路で、(13)はリモコン信号及び受像機内部の送局信号を受けるデコーダ、(14)はチャンネル送局電圧形成回路である。また、デコーダ(13)の出力はAC電源のコントロール回路(17)に供給される。(18)はリモコン信号の受光素子である。

また、(20)は画像表示のためのプログラムタイマー機能を有した制御回路であって、その本体はマイクロコンピュータである。この制御回路(20)の指令を受けてキャラクター発生器内蔵のCRT制御回路(25)が動作する。CRT制御回路(25)からは赤〜青の文字信号(数字、文字、記号等)SR、SG、SBが生成される。また制御回路(20)からはテレビ画像消去用のブランキング信号BKが映像出力回路(4)に送出されると共に、必要に応じてキー操作の終了タイミングにブザー音が鳴るように、音声コントロール信号SAが音声コントロール回路(27)に送出される。

なお、アソド回路(19)は制御回路(20)から

電子同期回路(12)へコントロール信号を送出しているとき、パルスP₁によってリモコン信号の入力を禁止するためのものである。

(28)は受像機本体に設けられたモード切換キー、この例ではPPC(Programmable Pick Up Center)キーであり、(29)は予約タイマーをオン、オフできるタイマーキーであって、これらは制御回路(20)に設けられたI/Oポートを介してその指令データがCPU内に取り込まれる。

第5図はコマンド(30)に設けられたキー配列の一例を示す。コマンド(30)はチャンネル送局、電源のオン、オフ等のほか、上述した項時刻などのプリセット用としても使用される。複数のキーのうち、(31)はチャンネルのダイレクト選択キー、PPCキーは本体側に設けられたものと同一機能のモード切換キー、(32)、(33)は「+」、「-」キー、(34)、(35)はデータ設定マーク「I」を左右にシフトするためのシフトキー、(36)はペンシル型の時計スタートキーである。時刻表示、カレンダー表示等はマイクロコンピュ

ータの指令に基いて実行される。

第7図は上述した画像表示をキー操作に関連して説明した表示フローチャートで、これを用いて操作手順の概略を説明すると、まず主電源の投入によって通常のテレビ画像(ステップa)が映り、ここでPPCキーを押すと、現時刻が未セットの場合にはテレビ画像に、現実の年月日等とは無関係に予め定められた年月日と時刻がスーパーインポーズされる(ステップb)。年月日及び時刻表示の一例を第8図Aに示す。予め定められた年月日は一例に過ぎない。

現時刻がセットされて既に時計が動いているときは現実の年月日と時刻がスーパーインポーズされて表示される(ステップc)。現時刻が未セットの場合で、現時刻をセットし(ステップd)、時計スタートキー(36)をオンすると(ステップe)、その時点からタイマープログラムが動作して刻時開始となり、ステップcに移る。時計スタートキー(36)を操作するのではなく、PPCキーを押すと、「年」の位置に表示されたデータ設

定マークである「I」のカーソルが、「100」年代にないときには、時計スタートキー(36)の操作と同様に刻時開始モードとなると共に、テレビ画像に代えて当月のカレンダーが表示される(ステップf)。ステップcの状態からPPCキーを押すと同様に当月のカレンダーが表示される。

ステップfのあとにPPCキーを押すと、チャンネル予約モードとなり(ステップg)、CRT管面上にはテレビ画像に代えてチャンネル予約画像が表示される。予約画像の一例を第8図Bに示す。チャンネル予約は「何曜日の何時から何チャンネル」とし、タイマーオフ時間はこの例ではタイマーオンから約2時間に固定される。チャンネル予約についてはこの発明の要旨と直接関係がないので、これ以上の説明は省略する。

チャンネル予約中又はチャンネル予約終了後PPCキーを押すと、通常のテレビ画像が表示される。

また、ステップbの状態でPPCキーを押したとき、又はステップdの状態で、しかもカーソル

が「100」年代の位置にある状態（時計スタートキーを操作しない状態）で夫々PPCキーを押すと、デモンストレーション用のカレンダーが表示される（ステップh）。デモ用カレンダーの一例を第8図Cに示す。

このように、デモ用カレンダーはステップbにおいて表示された年月が表示される。そして、このデモ用カレンダーは数秒（2〜3秒）間隔でインクリメントされて順次次の月のカレンダーが表示される。この場合、カレンダーの日付は一旦すべて消え、次の順次に1日から順次日が表示されるようなスクロールダウン表示となされる。カレンダーはグレゴリー暦に従い、0000年1月から9999年12月まで表示される。

このように、年月日、時刻がセットされていないときは、月単位のカレンダーは自動めくり状態となり、現時刻の未セット状態が視覚的に確認できるようになされている。この状態でPPCキーを押すと、チャンネル予約表示に切換えられる。

〔発明が解決しようとする問題点〕

たカレンダーの月と同一の月のスケジュールが予めセットされているときには、このカレンダーと共にそのスケジュールが同時に表示されるようなテレビジョン受像機を提案するものである。

〔問題点を解決するための手段〕

上述の技術的課題を達成するため、この発明ではマイクロコンピュータで構成された制御回路（20）とCRT制御回路（25）を受像機内に設け、制御回路（20）に、コマンド（30）からスケジュールデータを入力することによってテレビ画面上にスケジュール内容をカレンダーと共に表示する。

〔作用〕

コマンド（30）を利用してスケジュールデータを入力する場合、入力データはテレビ画面上に表示される（第3図D）。スケジュールデータ入力後カレンダー表示モードが選択されたときには、時計タイマーが動作中であれば、テレビ画面S上に当月のカレンダーが表示されると共に、当月のスケジュールがチェックされ（第1図ステップ46）、当月のスケジュールが予めセットされているとき

上述のテレビジョン受像機では、受像機内に制御回路（20）と、CRT制御回路（25）とを備えることによって現時刻表示、カレンダー表示、チャンネル予約表示をテレビ画面を利用して行えるので頗る便利である。

ところで、このようなテレビジョン受像機に、このテレビジョン受像機を日常使用する家族のスケジュールを表示できるような表示機能があれば一層便利である。勿論、上述のような表示機能がない場合でもスケジュール表示が可能であれば、従来の受像機よりも多目的使用ができることとなるので便利になることには疑いない。

この場合、カレンダー表示モードが選択されたときには、その表示カレンダーの月と同一月に設定されているスケジュールの内容が、このカレンダーと共に、同一のテレビ画面に自動的に映出されるようにした方が、スケジュールの確認等を図る上で便利である。

そこで、この発明ではこのような技術的課題を解決したものであって、テレビ画面上に表示され

には、この当月のカレンダーと共に、当月のスケジュールが同一画面上に表示される（第3図F）。

当月のスケジュールが設定されていない場合にはステップ47を過ぎないので、当月のカレンダーのみ表示される。当月のスケジュールが複数設定されているときには、それらのスケジュールがすべてカレンダーと共に表示される。

〔実施例〕

続いて、この発明に係るテレビジョン受像機の一例を、第5図に示すテレビジョン受像機に適用した場合につき第1図〜第4図を参照して詳細に説明する。

テレビ画面にスーパーインポーズされるべきスケジュール用画像は、例えば第3図Aに示すように、スケジュールの種類を表すシンボルマークMsとスケジュールの日付（月、日）と時刻（時分）とスケジュールのタイトル（項目）Mtとで構成され、シンボルマークMsは例えば第4図A〜Fに示すように、この例では6種類用意されている。

同図Aは待ち合わせ用のシンボルマークであり、

以下同様に同図Bはドライブ用のスケジュール、同図Cはスポーツ（例えばテニス）用のスケジュール、同図Dは誕生日用スケジュール、同図Eはデート用のスケジュール、同図Fは家事用のスケジュールを示すシンボルマークである。

これらのシンボルマークM_Sはいずれもマイクロコンピュータの指令データに基づきCRT制御回路（25）内で生成される。なお、この例ではこれらのシンボルマークの種類は固定されているが、コマンド（30）のデータ入力に基づいて新たにシンボルマークを設定することも可能である。

この発明では基本的には第5図に示す構成のテレビジョン受像機が使用されるも、制御回路（20）のROMに蓄えられるべきプログラムデータが第5図の場合と相違する。

第2図はこのようなスケジュール用の画像表示をキー操作に関連して説明した表示フローチャートで、第7図の表示フローと同一の部分は同一符号を付しその説明を省略する。

この実施例では主電源がオンされることによ

てスケジュール画像の表示ステップIとなり、後述するようにテレビ画像に当日のスケジュールがスーパーインポーズされる（第3図G）。当日のスケジュール画像はPPCキーの操作によって消去されて、ステップOの表示モードとなる。

スケジュール表示機能を付加する場合、ステップIの当月のカレンダー表示あるいはステップhのデモ用カレンダー表示は第3図Bに示すように、その表示エリアが決められる。カレンダー表示エリアを決めることによって生ずるエリアは、スケジュールが既に設定されている場合で、表示されたカレンダー月に当るスケジュール月が存在するときのみ、そのカレンダー用のスケジュール内容が、選択された月のカレンダーと共に表示される（第3図F）。

これに対し、スケジュールが未だセットされていないとき、あるいは当該カレンダー月にスケジュールがセットされていないときには、スケジュール画像は表示されない。

ステップI又はhの状態でPPCキーを操作した場合でこのPPCキーの操作が直前に押された

PPCキーから4秒経過していないときは、スケジュールセット表示モードとなる（ステップJ）。スケジュールが全くセットされていないときには、第3図Cに示すように、シンボルマークエリアM_Aと月日及び時刻の時分区分切りマーク「:」だけが、画面Sの左上部に表示される。このときカーソル「↓」はシンボルマークエリアM_Aの上部にあり、このとき「+」、「-」キー（32）、（33）を押すことによって所定のシンボルマークが選択的に表示される。

「+」キー（32）を押すと、まず第4図AのシンボルマークM_SがシンボルマークエリアM_Aに表示され、シンボルマークを変更したいときはさらに「+」キー（32）を押すことによって第4図BからFに向かって順次変更される。「-」キー（33）のときは変更表示が逆になる。希望するシンボルマークM_Sを設定したのちはカーソルキー（35）を操作する。こうすると、カーソル「↓」は「月」の前に移動するから、上述の「+」、「-」キー（32）、（33）によって設定すべきス

ケジュールの月を選択し、月をセットしたのちは、同様にシフトキー（35）を使用して「日」の前にカーソル「↓」を移動し、同様の手順で日がセットされる。

このようなセット操作がスケジュール設定時刻についても行われ、時刻セット後はカーソル「↓」を移動してスケジュールのタイトルが設定される。タイトル表示は英語若しくはローマ字である。A～Zの選択は「+」、「-」キー（32）、（33）で行われる。

例えば、「9月21日午前10時からテニス」というスケジュール（第1番目のスケジュール）をセットすると、第3図Dに示すようにこの第1番目にセットされたスケジュールSK₁が画面Sの左上部に表示される。なお、これらスケジュールの内容の設定はテレビ画面Sをみながら行われる。

第2番目のスケジュールSK₂は第1番目のスケジュールSK₁の右側（画面Sの右上部）に、その内容が表示される。実施例では、0～6番目までスケジュール内容をセットすることができ、

スケジュール配列の一例を第3図Dに示す。

なお、同一月に複数のスケジュールをセットすることも可能であり、スケジュールの項目は同一であってもよい。

スケジュール内容をセットしたのちPPCキーを操作すると、このPPCキー操作は直前に押されたPPCキーより4秒経過している場合が多いので、このときはステップAに戻り、このスケジュール表示に代えて通常のテレビ画像が表示される。

この例ではスケジュール表示機能のほかに、電話帳の内容も入力、表示できるようになされており、PPCキーにてスケジュールセットモードを選択してから4秒経過前に再びPPCキーが操作されると、ステップBに移り、電話帳セットモードに移る。

電話帳セットモードでは、第3図Eに示すように、画面Sの左上部に電話帳のシンボルマークM_Sが表示されると共に、その右側にはページ数が表示され、残りの画面Sに電話帳(氏名、番号)が

表示される。1ページには8人分の電話番号が縦列表示され、この例では4ページ、従って32人分の電話番号がメモリ及び表示できるようになされている。

カーソル「I」はページ数のところにあり、ページ指定係シフトキー(35)によってカーソル「I」は氏名欄に移動し、ここにローマ字で姓(フルスベル)と名の頭文字とによって、氏名がセットされ、番号欄では図のように「- (ハイフン)」で結合された番号がセットされる。この例の場合、ローマ字は14文字まで入力でき、番号は12桁まで入力できる。

氏名用のアルファベットA~Z及び番号0~9はいずれも、「+」、「-」キー(32)、(33)によって選択される。

電話帳セットが完了したのちPPCキーを押すと、ステップAに戻る。

さて、第1図は初期回路(20)に設けられたROM内に書き込まれたプログラムデータにしたがった、この発明に係る表示動作の一例を示すフ

ローチャートである。

プログラムがスタートすると、ステップ40で当月のカレンダー表示モードか否かがチェックされ、当月のカレンダー表示モードがPPCキーにより選択されたときには、ステップ41に移って今年のデータがY、今月のデータがMと置かれて、ステップ42において当月のカレンダーの曜日がマイクロコンピュータにて演算され、演算された当月のカレンダーがテレビ画面S上に表示される(ステップ43、第3図B)。

時計スタートキーが操作されていないときには時計用タイマーがスタートしていないので、この場合には直ちに予め設定されたデモ用カレンダーが表示される。表示されたカレンダーの月はカーソル「I」を「月」の前に移動させ、この状態で「+」「-」キー(32)、(33)を押すことにより、その表示カレンダーの月を変更することができる。

カレンダーが表示されると同時に、ステップ44においてカウンタが1に初期設定される。このカウンタは予めメモリされた複数種類のスケジュール

を指定するためのものである。カウンタの初期設定が終了すると、ステップ45に移り、最初に設定されたスケジュール(第1番目、すなわちn=1のスケジュール)の設定月がメモリから読みだされてそのデータがNと置かれる。

このデータNはスケジュール46で当月を示すデータMとの一致がチェックされ、失々のデータが一致したときにはスケジュール47に移り、第1番目のスケジュールがカレンダーと共に表示される(第3図F)。

表示されるべき位置は同図のように、この例では画面の左上の隅である。また、表示される画像は第1番目のスケジュールを示すシンボルマーク、設定した月日、時刻及びスケジュールのタイトルである。

スケジュール画像の表示後はステップ48に移り、先のカウンタが1だけインクリメントされる。データNがMと一致しないときには、ステップ47を経ないでステップ48に移り、同様にカウンタがインクリメントされる。従って、この場合にはテレ

ビ画面にはカレンダーのみ表示される。

カウンタがインクリメントされると、ステップ41に移り、 n が6以上か否かがチェックされ、 n が6以下であるときには、ステップ42に戻り、ステップ48で設定されたカウンタのカウント値に対応した n 番目のスケジュールのデータ N と当月を示すデータ M の一致がチェックされることにより、上述したと同様な動作が繰り返される。そのために、設定できる最大のスケジュール数($n=6$)だけスケジュールが予め設定されており、そのうちのたとえば、3、4及び5番目のスケジュールの設定月が当月である場合には、上述の制御ルーチンにより、3、4及び5番目のスケジュールが夫々同一のテレビ画面上に当月のカレンダーと共に表示されることになる。この場合の表示位置の一例を第3図Fに示す。

ステップ49で n が6以上になったことがチェックされると、ステップ50に移り、テレビ画面上に表示されているカレンダーの月が変更されたか否かがチェックされ、変更されたときにはステップ42

に戻る。月の変更がないときにはステップ51に移り、P P Cキーが押されたかどうかチェックされ、操作されたときには次の表示ステップモードに変更される。P P Cキーが操作されないときにはステップ52に移り、カレンダー表示モードに切り換わってから30秒が経過したかどうかチェックされ、30秒が経過するまでは、カレンダーとスケジュールの画像が表示され続ける。しかし、30秒が経過すると、自動的に次の表示モードに移る。

このように、この例では30秒が経過するまではP P Cキーが操作されない限り、上述の表示モードが継続する。

自動表示モードの切換え時間として30秒に設定したのはカレンダー及びスケジュール画像が表示されてからそのカレンダーの表示月及びスケジュール内容を判読する時間として充分な時間と考えられるからである。

この例とは異なり、ステップ52を設けずに直接ステップ50に戻るようなループにしてもよい。この場合には、P P Cキーが押されない限り、次の

表示モードには遷移しない。

第1図に示す表示ルーチンは当月が変更される毎度、動作するからスケジュールの設定月には必ず、カレンダー表示と共にその月のスケジュールが自動的に表示されることになる。従って、テレビ電源をオンしてP P Cキーを操作すれば当月のカレンダーと当月のスケジュールを同時にテレビ画面に表示することができ、スケジュールを徒過するおそれはない。

(発明の効果)

以上説明したようにこの発明によれば、当月のカレンダー表示に加え、前以て数日前或いは数ヶ月前のスケジュールをメモリしておけば、当月のスケジュール表示と共に当月に設定されてあるスケジュールを確認することができるから、当月のスケジュールを忘れるようなミスを確実に防止でき、実用上極めて便利である。

また、テレビ画面上に表示されるカレンダーの月は+、-キーの操作で表示月を変更でき、しかもこの場合その変更月に対応したスケジュールが同

一のテレビ画面上に表示されるので、数ヶ月先のスケジュールをも容易かつ確実に確認することができる。

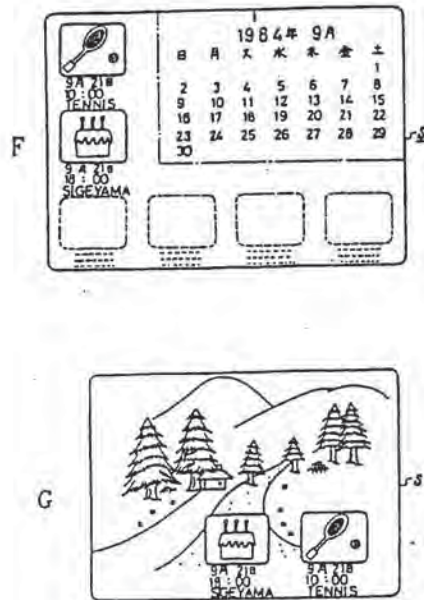
従って、この発明は第5図に示すような表示機能を有するテレビジョン受像機に適用して極めて好適である。

図面の簡単な説明

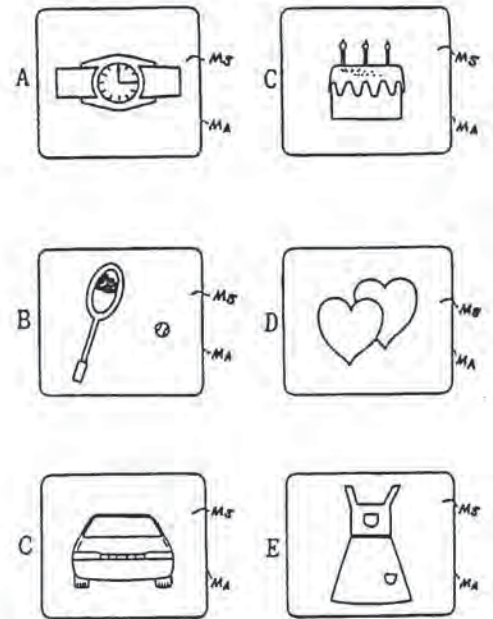
第1図はこの発明に係るテレビジョン受像機の表示フローチャートの一例を示す図、第2図は表示遷移の一例を示す図、第3図はその表示画像の一例を示す図、第4図はスケジュール用シンボルマークの一例を示す図、第5図はこの発明の説明に供するテレビジョン受像機の一例を示す系統図、第6図はコマンドのキー配列の一例を示す図、第7図は第5図の表示遷移の一例を示すチャート、第8図は表示画像の一例を示す図である。

(20)は制御回路、(25)はCRT制御回路、 $S_R \sim S_B$ は文字信号である。

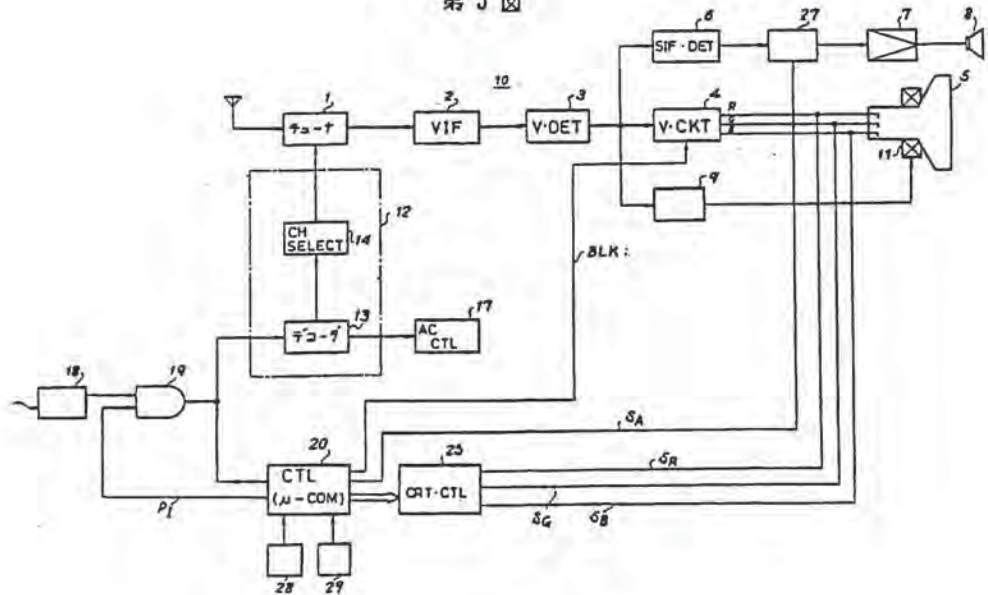
第 3 図



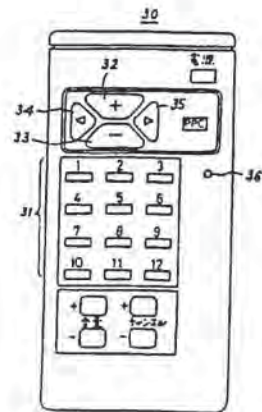
第 4 図



第 5 図



第 6 图



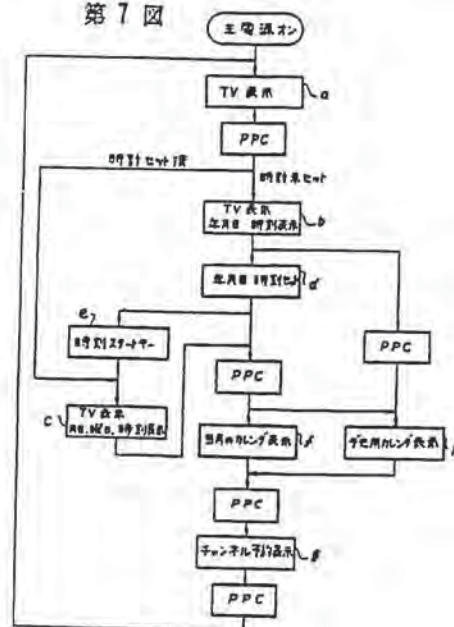
第 8 圖 B

[TIMER] MON 0:53:00
ON SUN 1:00 12CH
ON : CH
ON : CH
BK SUN 2:00 ~ 1H

C

2001年 1月						
SU	MO	TU	WE	TH	FR	SA
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

第 7 圖



LIBM1001 SUP3

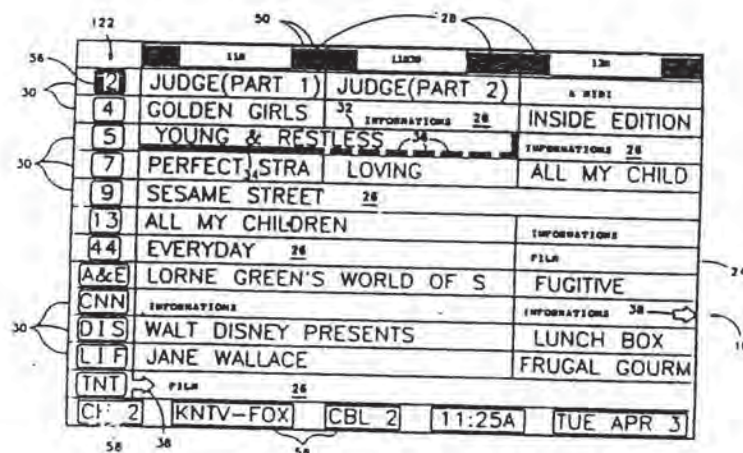
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(54) Title: USER INTERFACE FOR TELEVISION SCHEDULE SYSTEM



(57) Abstract

Screen (10) for a user interface of a television schedule system and process consists of an array (24) of irregular cells (26), which vary in length, corresponding to different television program lengths of one half hour to one-and-one half hours or more. Because of the widely varying length of the cells (26), if a conventional cursor used to select a cell location were to simply step from one cell to another, the result would be abrupt changes in the screen (10). By restricting cursor movements to the regular cells, abrupt screen changes will be avoided. A conventional offset shadow (34) which is a black bar underlines the entire cell and wraps around the right edge of the cell. To tag the underlying position which defines where the cursor (32) is and thus, where it will move next portions (36) of the black bar outside the current underlying position are segmented, while the current position is painted solid.

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-1-

USER INTERFACE FOR TELEVISION SCHEDULE SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention:

The present invention relates generally to a system
5 and process that allows a television viewer to access
on screen television program listings and use the program
listings in an easy and convenient way to control
operation of a video cassette recorder (VCR) or other
recording device. In addition, it relates to such a
10 system and process that creates a directory of recorded
programs by title for easy retrieval and program
playback. More particularly, it relates to such a system
and process in which the VCR or other recording device
is controlled by a simple selection of program title and
15 a record command, even for recording at a future date
and time. Most especially, it relates to such a system
and process incorporating an intuitive user interface.

2. Description of the Prior Art:

The difficulty of setting a VCR for automatic
20 recording at a future date is notorious. Even users who
are technically sophisticated will often make mistakes
in the VCR programming procedure that cause them to
record the wrong program or not to record anything at
all. This difficulty has even resulted in a substantial

body of humor dedicated to the subject of programming VCRs.

The difficulty of VCR programming has been alleviated somewhat by the development of VCRs that use
5 a television set as a display for user prompts and feedback to the user during the programming process. U.S. Patent 4,908,713, issued March 13, 1990 to Michael R. Levine, discloses such a VCR using the television set as a display for VCR programming with an interactive user
10 interface for directing the user on a step-by-step basis. Such a user interface removes a great deal of the mystery from VCR programming, but users still have difficulty with such a command-based interface and encounter problems carrying out the programming without making
15 mistakes that cause them to miss recording programs they would like to watch at a different time than when they are broadcast.

Commonly assigned U.S. Patent 4,706,121, issued November 10, 1987 to Patrick Young, discloses a system
20 and process in which user selections from television schedule information are used for automatic control of a VCR. That patent also contains a description of a proposed user interface for such a system and process. However, the provision of a highly intuitive user
25 interface that makes such a system and process easy and convenient to operate is a difficult task. Further development of this system and process has produced considerable change in the user interface as originally proposed.

30 In addition to simplifying VCR programming, users who do a substantial amount of program taping also need an improved system and process for keeping track of their recorded programs. Commonly assigned Application Serial No. 07/219,971, filed July 15, 1988, in the name of
35 Patrick Young, discloses a system and process that

provides indexing capability for taped material. A user interface for a television schedule system and process should also handle this capability on an intuitive basis.

Thus, while the art pertaining to the control of
5 VCRs and to television schedule systems is a well-developed one, a need still remains for a television schedule system and process incorporating an improved user interface. In particular, unlike most computer menus, a grid TV guide is an array of irregular cells,
10 where the cell size can vary from a fraction of an hour to many hours--extending well beyond the current screen. If this array is navigated by a cursor that goes from cell to cell, a single cursor command can produce violent screen changes. For example, a cursor right command may
15 cause an abrupt jump to a cell situated several hours from the current page. Not only is this unsettling, but may take considerable effort to recover. Clearly, a gentler cursor motion is needed for the irregular cells found in a grid TV guide.

20 Printed grid television schedule guides often include additional information besides the program title and broadcast names. Such grids are also typically provided in combination with a more detailed printed schedule that contains a synopsis of each program,
25 whether the program is a repeat, ratings for movies, and other information. When using a television set as a display for a schedule system, the size and resolution of the television display limit the amount of text that can be displayed with the grid. Improved techniques are
30 required for conveying the most amount of information to the user in an easily understood manner within the limitations of the television display. When a large number of channels are available for viewing, there is also a need to order the display of information most
35 conveniently for the user.

SUMMARY OF THE INVENTION

Accordingly, it is an object of this invention to provide a television schedule system and process with a user interface that is configured to compensate for the particular nature of the television schedule information.

It is a further object of the invention to provide such a user interface having a cursor operation that compensates for an irregular grid format of the television schedule information.

It is another object of the invention to provide such a user interface in which the schedule information is presented in a format that compensates for limited resolution of the television display.

It is still another object of the invention to provide such a user interface in which supplemental schedule information is presented in overlays that obscure a minimum amount of useful other information.

It is a still further object of the invention to provide such a user interface in which order of presentation of the schedule information is customizable by user preference.

The attainment of these and related objects may be achieved through use of the novel television schedule system and process user interface herein disclosed. A television schedule system including a user interface in accordance with this invention has a display. A means is connected to the display for displaying the television schedule on the display as an array of irregular cells which vary dimensionally in length, corresponding to different television program time lengths. A means is connected to the display for providing a cursor with the television schedule on the display. The cursor has a variable length corresponding to the length of a selected one of the irregular cells

in which the cursor is located. A means is connected to the means for providing the cursor for moving the cursor in the array in a series of equal length steps. At least some of the irregular cells have a length which is greater than the length of the steps.

In the process of operating a television schedule system with the user interface of this invention, the television schedule is displayed as an array of irregular cells which vary dimensionally in length, corresponding to different television program time lengths. A cursor is provided with the television schedule on the display, the cursor has a variable length corresponding to the length of a selected one of the irregular cells in which the cursor is located. The cursor is moved in the array in a series of equal length steps, with at least some of the irregular cells having a length which is greater than the length of the steps.

In another aspect of the invention, a control system for a video recording machine has a controller for starting and stopping the video recording machine, for recording video information on recording media, and for playing recorded video information on recording media. A display generator provides display image generation signals. A means supplies information to the display generator for generation of display images relating to operation of the video recording machine. The means for supplying information includes means for generating a recording media position indicator graduated as segments corresponding to programs recorded on the recording media.

In a process for controlling a video recording machine, a recording media position indicator is graduated as segments corresponding to programs recorded on the recording media. The recording media position

indicator is displayed as position of a selected one of the recording media in the video recording machine is changed.

In a further aspect of the invention, a television
5 schedule system a display and means connected to the display for displaying the television schedule on the display. The means for displaying a schedule is configured to allow selection by a user of a first number
10 of desired channels for display of schedule information which is less than a second number of available channels. A programmable tuner is connected to the means for displaying a schedule. The programmable tuner is configured to follow the first number of desired channels
15 when the television schedule is shown on the display in response to a channel up or channel down command. The programmable tuner is configured to follow the second number of available channels in the absence of the television schedule on the display in response to a channel up or channel down command.

20 In a process for operating a television schedule system, a first number of desired channels is selected for display of schedule information, which is less than a second number of available channels. The schedule information is displayed on a display. The first number
25 of desired channels is followed when the schedule information is shown on the display in response to a channel up or channel down command. The second number of available channels is followed in the absence of the television schedule on the display in response to a
30 channel up or channel down command.

The attainment of the foregoing and related objects, advantages and features of the invention should be more readily apparent to those skilled in the art, after review of the following more detailed description of the
35 invention, taken together with the drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

Figures 1-3 are diagrammatic representations of a television schedule grid incorporating the user interface for the system and process of this invention.

5 Figure 4 is a diagrammatic representation of a screen display used in the system and process of the invention.

10 Figures 5-7 are additional diagrammatic representations of the television schedule grid incorporating the user interface for the system and process of the invention.

Figure 8 is a flow chart for understanding the operation of the Figure 7 diagram.

15 Figures 9-10 are additional diagrammatic representations of screen displays of the user interface for the system and process of the invention.

Figure 11 is a flow chart for understanding the operation of the Figures 9-10 diagrams.

20 Figures 12-13 are diagrammatic representations of taping and tape index screen displays of the user interface for the system and process of the invention.

Figure 14-17 are diagrammatic representations of program selection by category screen displays of the user interface for the system and process of the invention.

25 Figure 18 is a flow chart for understanding operation of the Figures 14-18 diagrams.

Figure 19 is a flow chart for understanding operation of the Figure 20 diagram.

30 Figure 20 is a diagrammatic representation of a channel customization screen display of the user interface for the system and process of the invention.

Figure 21 is a diagrammatic plan view of a control panel for the system of the invention.

35 Figure 22 is a block diagram of a television schedule system in accordance with the invention.

DETAILED DESCRIPTION OF THE INVENTION

Turning now to the drawings, more particularly to Figures 1-7, there are shown a series of menu screens 10, 12, 14, 16, 18, 20 and 22 used in operation of the system and carrying out the process of the invention. Screens 10, 12, 14, 18 and 20 each consists of an array 24 of irregular cells 26, which vary in length, corresponding to different television program lengths of one half hour to one-and-one half hours or more. The array is arranged as three columns 28 of one-half hour in duration, and twelve rows 30 of program listings. Some of the program listings overlap two or more of the columns 28 because of their length. Because of the widely varying length of the cells 26, if a conventional cursor used to select a cell location were to simply step from one cell to another, the result would be abrupt changes in the screens 10, 12, 14, 18 and 20 as the cursor moved from a cell 26 of several hours length to an adjacent cell in the same row. Such abrupt changes disorient a user of the system.

An effective way of taming the motion is to assume that behind every array 24 is an underlying array of regular cells. By restricting cursor movements to the regular cells, abrupt screen changes will be avoided. However, there is now a potential ambiguity between the underlying cell which governs cursor movement and a visible cell 26 which holds the program title.

Viz.: if the cursor moves in half hour steps, and the cell length is, say four hours, should the cursor be 1/2 hour long or four hours long? If the cursor only spans the interval of the underlying cell (1/2 hour), the cursor appears to be highlighting a segment of the cell, which is misleading. On the other hand, if the cursor spans the entire four hours of the TV listing, the cursor underlying position will be obscure. In this

case, cursor right/left commands will appear inoperative while traversing a long cell. The absence of feedback following a cursor command is befuddling to users. Therefore, an innovative cursor 32 (Figure 1) for the irregular array 24 is required which satisfies several conflicting requirements.

With the cursor 32, the entire cell 26 is 3-D highlighted, using a conventional offset shadow 34. The offset shadow 34 is a black bar that underlines the entire cell and wraps around the right edge of the cell. To tag the underlying position--which defines where the cursor 32 is and thus, where it will move next--portions 36 of the black bar outside the current underlying position are segmented, while the current position is painted solid.

For an half hour cell 26, the offset shadow's underline bar will always be solid black. Figures 2 and 3 show the cursor 32 as it appears for a half-hour program. For programs that go beyond 1/2 hour, only the current 1/2 hour position will be solid black. All remaining positions will be stripped. If the cursor is moved left or right, the solid section will move accordingly, providing complete visual feedback. Thus, this modified 3D offset shadow cursor 32 satisfies the demands stated above: it spans the entire cell, yet clearly highlights the current underlying position. Movement of the cursor 32 will always be visible even for cells 26 that are much longer than the underlying cell.

A grid continuity icon 38 is shown in Figure 1. Printed grid television schedule guides often include parenthetical comments, (such as "cont'd") to indicate program continuity. In an electronic guide displayed on a TV screen, limited text space precludes parenthetical comments. To conserve space, an icon 38

will be used to indicate cell 26 continuity. At the border of a cell 26 that is continued to the next screen, an arrow icon 38 pointing to the right will be overlaid. The arrow direction always points to right, which is the direction of program elapse.

Figures 2 and 3 show recording status representations. When a program has been selected for recording, its listing cell 26 will be outlined or highlighted in red, as indicated at 40. If guard time has been added or deleted, the cell will be stretched or shrunk to reflect the change. Cell 26 continuity will be treated the same as above. There are four other record status representations:

If the cell is actively being recorded, the outline 40 will blink off and on.

A recorded cell will be displayed with a solid red background 42 (Note: Not shown in drawing).

A mis-recorded cell will be indicated by red hash-marks 44 over the title. A mis-recording can be the result of insufficient tape, VCR loss of power, stopped before completion, etc.

A program linking icon 46 is shown in Figure 5. After each schedule update, the schedule system examines the new listings for the occurrence of any titles that match a title in Linked Titles (Figure 23). If a title matches, it will automatically be tagged for recording. When a linked program is displayed in the guide, it will have two identifiers: a red outline 40 indicating that the title has been selected for recording, and a link icon 46 appended to the title to indicate that this title was link-selected. After a linked program has been recorded, it will be treated like any recorded program with the title shaded in red. To differentiate this recording from others, the link icon will remain appended to the title.

Further details on the linking feature are given in screen 19 of Figure 23. 1) A linked program 47 may be suspended by the user (perhaps to avoid conflict with a pending recording), by de-selecting the link title in the Link List screen, under the Record Memo command. A suspended link program will still be identified by a link icon, but the red-outline will be suppressed since the program will not be recorded. 2) A smart link process is used to tame the matching of titles when there is a likelihood of excessive candidates for recording. The Lucy show, for example, is often syndicated on several channels. Untamed linking of Lucy may result in a plethora of recordings. For such series, the link list will include the channel and time as well as the link title. For the avid Lucy-phile, the user can locate each series individually for linking. If there is more than one link title of the same name, the series will be numbered, in the order of acquisition. Thus, the second Lucy will be identified as Lucy (Two), at 47.

Figures 1-3 show the columns 28 headed by half-hour header status indicators. The 1/2 hour header strip across the top of the grid TV guide has two auxiliary functions: 1) as an indicator 48 of pending or in-progress recording scheduled at that time, and 2) as a time-bar 50 to delineate the past from the future. The past is darkened, while the future is lightly shaded. If there is an in-progress recording, the 1/2 hour header will be red-outlined at 48 in the same manner as a pending recording title cell 26.

Figure 6 shows a television schedule grid screen 20 with a program note overlay 52. With limited text capacity on TV displays, it is preferable to display as many lines of TV listings as feasible. To handle program notes, which are text intensive, on-demand overlays 52

revert back to the usual numerical order. When the last channel on a page is reached, the next Tuner command will change the channel to the channel listed at the beginning of the following page.

5 When a channel to which the tuner is tuned is displayed on the grid 24, it is highlighted, as shown at 56. A grid 24 page may be changed by either a page command or by entering a channel Up/Dn command as described above. If a page is turned using the page
10 command, the current channel is now located in the previous page, and will not be seen in the new page. Therefore, the new page must suppress the highlighting of a channel, since that indicates the current channel. Note that information about the current channel will
15 still be presented in the channel information boxes 58 at the bottom of the screen.

When is the highlighting re-enabled? Once into the new page, the first channel up/down command will cause the tuner to automatically change to the channel listed
20 in the last or first row 30 respectively of the new page. Since the tuner channel is now located on the new page, the current channel will be highlighted again.

If the channel highlighting is not suppressed after a page is selected, by definition, the tuner must be
25 changed to track the highlighted channel. This is undesirable since casual paging should not cause the channel to change.

When a guide is first opened, as shown in Figure 2, both the cursor 32 and the current channel 56 are
30 situated on the same row 30 of the grid 24. When the channel 56 is changed, it is desirable to drag the cursor 32 along with the channel in unison. In doing so, the cursor 32 will be ready for a Select command (to retrieve the program note) or for a Record It command. Cursor
35 dragging by the channel command takes place whenever the

channel 56 and cursor 32 are united on the same row. If they are not united, the cursor 32 is disengaged from the channel command. Note that dragging is not reciprocal; moving the cursor 32 does not affect channel selection.

Figure 7 shows a screen 22, showing a program list 58 for a single channel, generated by toggling a user What's On TV command, which switches between the grid 24 and the list 58. The list 58 consists of rows 60 of sequential program listings on the channel and a channel information field 62. Program notes are overlaid on the list 58 in the same manner as shown in Figure 6 for the grid 24.

Each What's On TV command alternates between the grid guide 24 and the What's Next on Channel row guide 58. While viewing the grid guide 24, the next What's On TV command will replace the grid guide 24 with a single-channel row guide 58. Figure 8 is the flow diagram for the What's On TV command.

The page relationship between the two guides 24 and 58 are tightly coupled. The single channel guide will open to the channel and schedule time that was selected by the cursor 32 on the grid 24. While viewing the single channel guide 58, the Up/Down channel command may be used to change the channel to be listed. When exiting the single channel guide 58 and returning to the grid guide 24, the grid cursor 32 will be pointed to the channel and schedule time last selected on the single channel guide 58.

Figures 9 and 10 show channel grazing overlays 64 and 66 that provide information on current programs when switching channels while watching television. In the overlay 64, when scanning channels, the title of each program is overlaid at 68, along with the name of the TV service (HBO, ABC etc.), the cable channel number,

and the current date, day of week, and time in the channel information field 62. The overlay 66 is the same as the overlay 64 except that this overlay includes a program note 70, which is similar to the program note 52 in Figure 6, but contains information pertinent to a program currently being broadcast on the selected channel. To access program notes, press the Select key. In addition to the program note 70, elapsed time is indicated by a percentage calibrated time bar 72. The bar is bracketed by S for start, and F for finish. By default, titles will appear automatically when channels are scanned. Grazing Titles may be de-activated using the CANCEL key. To restore auto-titles, press Select while viewing TV. The flow diagram governing titles/program notes, while viewing TV, is shown in Figure 11.

An express recording screen 74 is shown in Figure 12. The express recording screen includes the following information:

- Title of Program
- Length of Program
- Tape Time Remaining
- Recording Speed.

Figure 13 shows a tape index screen 76. Locating a recorded segment is often an arduous task when several programs have been recorded on the tape. Without a table of contents, the VCR users muddle through stretches of recording trying to find what's recorded on the tape, where the beginning of the desired program is, and where the tape is now. Some premium VCRs provide tape indexing that automatically finds the start of each recording. However, while the viewer can find the start of a recording, the indexing VCRs do not record titles. The net result is about as useful as a having a table of contents without chapter titles. Considerable searching

is still required to find what is recorded at each index.

The tape index screen 76 provides a virtual tape directory, giving the equivalent function of a table of contents for a tape recording. There is a list 78 of titles of recorded programs, a pointer 80 to the start of the program, and a current position indicator cursor 82 showing the "chapter" location on the tape. The virtual directory is automatically compiled, revised and stored in off-tape memory as the user records over the tape.

The What's on Tape command will display a list of titles of programs recorded on the tape. The title of the selected program (the segment of tape that is positioned over tape head) is highlighted by the cursor 82. The tape position pointer 80 dynamically tracks the current tape position. All searching is done simply by title, bypassing the need for index numbers. The tape directory is equivalent to a table of contents showing titles, but not page number. It automatically opens to the starting page by simply pointing to the title of the program. In addition to the tape directory 78 of recorded programs, the screen 76 includes a program duration field 84, a recorded speed of each title field 86, a remaining time left on tape field 88, a remaining time left on program field 90 and a next scheduled recording time field 92.

The virtual tape directory is generated as follows. It is difficult to implement a competent self-contained tape directory for a non-random access storage such as a video tape. No matter where the directory is stored on the tape, the latent access time to locate the directory and return to current position (for a standard six hour tape) is excruciating slow, in the order of 6 to 10 minutes.

If redundant directories are recorded uniformly across the tape to minimize latency time, the problem of sluggishness is merely shifted from playback to updating the multiple directories. After each video
5 program is recorded, the entire tape must be scanned to update each directory. Even if this update process is automated, there is a question of excessive wear on tapes and the VCR itself. Viz: each recording, no matter how short, results in high-speed scanning of the entire tape
10 in order to revise all directories.

Even more troubling is the question of when to perform the update, since there is no "safe" period for the VCR to take control. For example, the user may have stopped the tape momentarily, perhaps to skip
15 commercials, only to find that the VCR has commandeered control and place the tape in a high speed update mode. The safest update is one that is user-initiated. Unfortunately, few VCR users will follow a regimented procedure of updating after each recording session.
20 Clearly, an on-tape directory based on existing technology is not satisfactory.

The following innovative solution, the "virtual tape directory", stores directory information in off-tape memory and does not require an on-tape directory or any
25 augmentation of the video cassette. Since the directory is held in external memory instead of the tape, it is best suited for tapes that have recently been played and recorded, the "working tapes".

When a program is recorded, the title of the program
30 is written to the data (control track) channel of the tape and, at the same time stored in a non-volatile (NV) memory. Other information about the recorded program, such as length of program, theme category, date recorded, and tape identifier code may be written to the data

channel, as well as stored in the NV memory. The NV memory is adequate to support a number of working tapes.

When a tape is first loaded, the tape data channel will be scanned for a few seconds to identify the recorded program under the tape head. This data will be matched against the directories stored in NV memory. If there is a match, the directory of the working tape will be displayed immediately when the What's On Tape key is pressed. The "virtual" tape directory appears to have been read from the tape, but is actually obtained from NV memory.

If there is no match, a new directory for the tape will be created. During playback and recording of this tape, a virtual directory will be generated for that tape. Directories of inactive tapes will be automatically purged from memory as new working tapes are introduced.

It is relatively easy to estimate remaining time of a scheduled televised program with the assist of a clock and a TV schedule. In contrast, there are few clues as to current location during playback of a recorded program, particularly when there are several recorded segments on a tape. Tape index counters or running-time clocks require diligent bookkeeping before the start of a recorded segment. Few consumers will tinker with 5 or 6 digit numbers when a "ballpark" indicator is adequate, such as, "is the program about over?", or "about when does the next segment starts?".

Clearly, there is need to provide a location indicator without the burden of bookkeeping.

To provide an at-a-glance indicator of relative tape location, an on-screen tape position gauge 94 has been devised. The tape position gauge 94 consists of a vertical bar 96 with the arrow pointer 80 located on the left edge of the screen 76. The arrow 80 dynamically

tracks the current tape position as the tape is advanced or rewound.

The gauge 94 is graduated, not in linear units, but in units of recorded segments 98 with each segment labelled with its program title. Thus, a 10 minute program or a 6 hour program is represented as one vertical unit corresponding to the width of a segment 98. However, the gauge 94 is linear within each segment 98. If the arrow is pointing at the upper 25% of the program segment 98, it indicates that the tape head is positioned over the first 25% of the program. If a conventional linear gauge were displayed, a far more complicated gauge would be required, that would likely confuse rather than clarify.

Thus, this tape gauge 94 provides a quick capsule indication of the where the tape head is currently positioned, relative to the current program, and relative to other programs or the tape, and the title of other programs.

The tape index screen 76 includes a tape motion indicator field 100. When the tape is undergoing high speed repositioning, the What's On This Tape (WOT) screen 76 will be displayed. During high speed search of a long program, the tape gauge 94 will appear to be dormant, since the gauge is relatively coarse for programs of long duration. To supplement the tape gauge 94, the tape indicator 100 is included. During high speed positioning, one of these messages will be displayed in the space above twin-hub tape icon 102: GO PLAY, GO RECORD, FORWARDING, REVERSING, PAUSE, and STOP.

GO PLAY is displayed while the tape is repositioning to the selected title. When the title is reached, the WOT screen 76 will be displaced by the playback video. GO RECORD is displayed while the tape is positioning to

the selected program segment 98, where the new recording will be written.

Figures 14-17 show Theme function screens 104. The Theme function allows the viewer to quickly sort the downloaded schedule and display a subset schedule based on a subject of interest. The user has the freedom to select listings sorted first by major themes, second by topic(s) within a theme, and/or by topic qualifiers. All guides sorted by theme, topic and qualifier will be displayed in a row-tabulated format and begins by listing programs nearest to the current half-hour. The theme function screens 104 have the following attributes: Rotating Themes. There are four theme categories, with each theme title enclosed in horizontally-arranged selection boxes 106. From left to right, the themes are: [Movies] [Sports] [Specials] [TV Fare]

Figure 18 is a flow diagram defining the Theme command. Topic Selection. There are up to 16 topics 108 for each theme arranged in an 8 row by two column field 110. Any number of topics may be selected under a selected theme. Topics is a logical OR function, meaning that each listing that meets the definition of the topic will be displayed. For example under the theme of Movies, if the topic titles Comedy and Satire are selected, a subset schedule of both comedy movies and satire movies will be displayed.

Default All Selection. When the Theme screen 104 is first opened, the first slot (upper left most topic 108) will be highlighted. This is the ALL function, which is the sum of all topics 108 for the selected theme. The ALL function was created to minimize key stroking. Without an all topic category, the user must enable all 16 topics 108 individually. Conversely, if the user wishes to go from an all topics to an individual topic,

the user must cursor to and deselect each of the other 15 topics.

Qualifiers. Each theme includes a group of search attributes or qualifiers 112. The qualifiers for each theme 106 are shown in the respective one of Figures 14-17 for each theme 106. Any number of qualifiers can be enabled at one time. These qualifiers perform a logical OR functions; they will select for display all listings (sorted first by theme and topic) that satisfy the qualifiers.

The qualifiers 112 are positioned for easy selection. The selection of qualifiers is made using the usual cursor commands. When a theme 106 is initially opened, by default, the cursor is located near the top of the screen. To minimize cursor commands, the qualifiers are also located near the top of the screen. In contrast, placing the qualifiers at the bottom of the screen would require a round trip of up to 16 key strokes.

The complete theme sorting strategy is defined as follows:

Listings = (Topic A + Topic B + etc.)*(Qualifier A + Qualifier b + etc.)

This may be read as listing all Topic A that also meets Qualifier A or Qualifier B, plus all Topic B that also meets Qualifier A or Qualifier B, etc.

Qualifiers, topics and themes are rooted in relational database operations and allow logical sorting of the schedule. To support these higher order of sorting, auxiliary data must be delivered to the VCR. In contrast, simple sorting operations, such as sorting by time and by channel are inherent in the fundamental information of a TV guide, and do not require auxiliary search data.

The keystroke sequence for using the themes screens 104 are as follows. While watching TV, the first Theme

key command will summon the opening theme screen with the left most theme, Movies, highlighted. Further theme commands will rotate the theme selection from left to right. Each theme screen will be initialized to the ALL (topics) selection. If no topic selection is made, an all topics guide for the selected theme will be displayed upon depressing the Select/Goto command.

To additionally sort the theme by a single topic, position the cursor key to the desired topic and depress the Select/Goto key. Use the cursor to return to a topic.

To sort by more than one topic, position the cursor over each desired topic and depress the Select key. When finished, press Select/Goto to display a multiple-topic guide.

To sort by one or more attributes, position the cursor over each desired attribute and press the Select key. When finished, move the cursor to a topic and press Select/Goto to retrieve the theme/attribute-sorted TV guide.

Other than express recording, all recording activities are controlled with the Record Memo screen 16 of Figure 4. The Record Memo screen 16 is accessed with a Record Memo key. When the Record Menu key is depressed, the following titles enclosed in horizontally-arranged selection boxes 114 will appear at the top of the opening screen. From left to right:

[Pending	[Recorded	[Linked	[On-Grid
Recordings]	Programs]	Titles]	Prog.]

Each Record Memo key command will highlight a new selection, rotating from left to right, and wrapping around to Pending Recordings after the right most position. Figure 19 is a flow diagram defining the Record Memo command.

Figure 20 shows a Channel Customization screen 116. The screen 116 allows the user to customize channels to match viewing interest, providing a compact listing as well as eliminating undesired channels during up down scanning. During schedule update, a list of all cable channels available at the subscriber's cable system (or broadcast stations for over-the-air subscribers) is also delivered to the VCR. This unabridged set of channels may be customized using screen 116.

The channel customization screen 116 has two fields, a 3 column field 118 listing up to 36 unabridged channels and a single column field 120 listing 12 favorite MY channels. The latter is a replica of the channel descriptor column 122 (Figure 1) of the opening grid guide. Additional pages are available (using the page key to swap between the pages) to accommodate systems with more than 36 channels. Each cell 124 in the 3 column field 118 contains the following information: Channel number and program service name (such as HBO or station KTVU, 2). The cell 124 is color-coded to indicate the following states:

ON, default state before any customization, with the cell 124 in light green background.

MY, favorite channels listed in the single column field 120, also shown in the three column field 118 with a blue background.

OFF, a channel deleted from all guides, as well as during Channel Up/Dn scanning (still accessible using the ten key channel keypad). OFF cells have a gray background.

When first installed, the system assigns the first 12 (listed in numerical order) channels as MY favorites. The channel status may be changed by selecting a channel and picking a state, MY, ON, or OFF using the SELECT key.

Since only 12 favorites are allowed, the user must

first remove a favorite channel by changing the status of an existing favorite channel to OFF or ON. When that is done, the first column will automatically open up a space for the next MY selection. When a new MY is
5 selected, the MY column 120 will automatically insert the new selection in the prescribed order. The order of listing in the MY favorite channel column 120 is as follows:

10 All favorite broadcast stations will be listed first in numerical order. Next, all cable services will be listed in alphabetical order.

A new cable service, which displaces a previous service, will be inserted under the previous status. Example: If the channel was MY, the new service will be
15 MY. However, a new cable service that appears on a new channel will be initialized ON.

Figure 21 shows a front panel 130 for a remote controller of the schedule system. The top half of the front panel 130 corresponds to a conventional remote
20 controller for a television set and a VCR. Included are a dual function ten key keypad 132, with the alternate functions of each key and its digit shown, a TV/VCR toggle key 134, volume and channel up/down keys 136, and VCR control keys 138. The lower half of the front panel
25 130 contains control keys that are specific to the schedule system. Included are a What's On Tape key 140, a What's On TV key 142, a Theme key 144, a Record Memo key 146, a Record It key 148, a Link It key 150, a Help/Menu key 152, a Select/Goto key 154, Left, Right,
30 Up, Down and Page Cursor keys 156, a Return TV/VCR key 158 and a Cancel/Undo key 160. The use of these keys has either been explained above or is apparent from their labels.

Figures 22A and 22B are block diagrams of television
35 schedule systems/tape controllers 180 and 182 in which

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the user interface is used. The schedule system/controller 180 is applicable to existing television equipment, where the schedule system is separate from the basic television equipment.

5 Programmable tuner 202 is shown as part of a cable decoder. The schedule system/controller 182 is shown as integrated into a VCR 211. In this version, a cable decoder is not required, and tuner 207 is part of the VCR 211. It should be clear from these two systems 180 and 182 that the schedule/tape controller may be

10 integrated into other television equipment, such as a cable decoder or a TV/Monitor receiver. It is also practical to implement the entire schedule/tape controller in a remote controller by adding a text

15 display, such as an LCD screen, on remote controller 212.

In the system 180, programmable tuner 202, which may be part of a cable decoder unit, receives a TV signal from antenna 200 and/or from cable input 205. Tuner output 216 goes to a vertical blanking interval (VBI) decoder 222, which may be a closed caption decoder or

20 a high speed teletext decoder. Listing information and other support information, such as cable channel assignment data, will be transmitted over the VBI by one or more local stations or cable channels several times

25 a day or continuously.

When update is required, programmable tuner 202 will be tuned automatically to the station or cable channel carrying the data. After the VBI signal is processed by CPU 228, the listing data is stored in schedule memory

30 232, while the cable channel assignment data is stored in cable-specific RAM memory 238. This data is used to convert generic TV source names, such as HBO, to channel assignments for the specific cable system.

Other information transmitted to the schedule/tape

35 controller 180 and stored in the system RAM memory 240

includes clock update data to set system clock 230 automatically, schedule update time, which may vary from once a day to a continuously transmitted format, new theme categories, and last minute schedule change data.

5 For a What's on TV request, the listing stored in schedule memory 232 is retrieved, processed by CPU 228, and outputted to video display generator 224. Video switcher 226 is enabled by CPU output 246 to select the video display generator 224 output whenever schedule data
10 is to be presented to the TV/monitor 210.

When a request to time-shift record a program is made, the title of the program and its record parameters (channel, start time and length) is copied from the schedule memory 232 to the Record Memo RAM memory 236.
15 When the system clock 230 matches the schedule time, the CPU 228 will issue a channel command to the programmable tuner of the cable decoder 202, and a power on and record command to VCR 206 by means of an infrared remote driver 214 directed at infrared input ports of these two
20 devices. In the VCR integrated version 182, the command to the tuner 207 is made on a wired bus 264.

In addition to programming by selecting a title from the on-screen schedule, it is also possible to program the VCR 206 or 211 and the cable decoder 202 or 207 with
25 remote controller 212. In this mode, programming information is entered into the remote controller 212, and at the required time, the remote controller 212 will issue programming commands to the proper TV device. While there are many universal remote controllers that
30 offer programming capability, none allow the user to enter generic names, such as station and cable channel names, and have the CPU convert the names to specific channels for tuning the VCR or the cable decoder. This is implemented by incorporating CPU 228 and the cable-
35 specific RAM 238 in the remote controller 212.

Remote controller 212 and infrared remote driver 214 are capable of emulating the infrared command instructions required by the cable decoder 202 and VCR 206. The command emulation codes for the remote driver 5 214 are stored in cable decoder IFR code RAM/ROM memory 239. Commands for popular cable decoders and VCRs are pre-programmed in ROM. Alternatively, the infrared commands of the original remote controller may be learned by aiming the controllers at the IFR input receiver 264 10 and storing the command codes in RAM memory 239 after processing by CPU 228. This process is well known in the art of universal remote controllers and need not be detailed here.

As shown in Figure 22A, the VCR 206 and cable 15 decoder 202 may be manually controlled by remote controller 212, or it may be automatically controlled by infrared remote driver 214.

During recording, the tape index location of the VCR 206 will be transmitted over control/data bus 270 20 to the CPU 228. This start address information is stored in tape directory RAM memory 234, together with the program title. The bus 270 also carries VCR control commands for recording, playback, tuner selection, and other functions, including power on/off.

25 Once a program is recorded, its title and other program information is stored in a section of the Record Memo RAM memory 236. To play back a recorded program, the What's on Tape request will cause a directory of recorded programs on the tape to be displayed. When a 30 program is selected for playback from this directory, the tape will fast forward or reverse to the tape index location specified in the Tape Directory RAM memory 234.

In the system 182, schedule/tape controller 220 is embedded in the VCR 211. The VCR tape mechanism 252 35 contains all the record and playback electronics of the

video recorder, less the programmable tuner 207. Data recorded on the control track of a tape is coupled to the CPU 228 over input bus 258 and output bus 256. The art of recording data on the control track is well known, for example, in recent VCRs with indexing capability. CPU 228 commands to the VCR 211 are carried over bus 254. When schedule information is to be displayed, video switcher control input 246 selects the display generator on line 218. At other times, video switcher 226 selects the output of the VCR mechanism 252 on line 250.

Schedule information may be downloaded from the VBI. Alternatively or supplementally, it may be downloaded from a telecommunication line 270 to modem 268 and to CPU 228 via line 266. Other means of delivering schedule information can be employed, including the use of a subcarrier channel on the cable service.

It should now be readily apparent to those skilled in the art that a system and method incorporating a novel user interface capable of achieving the stated objects of the invention has been provided. The user interface that is configured to compensate for the particular nature of the television schedule information. The user interface has a cursor operation that compensates for an irregular grid format of the television schedule information. The user interface presents the schedule information in a format that compensates for limited resolution of the television display. The user interface presents supplemental schedule information in overlays that obscure a minimum amount of useful other information. Order of presentation of the schedule information in the interface is customizable by user preference.

It should further be apparent to those skilled in the art that various changes in form and details of the invention as shown and described may be made. It is

intended that such changes be included within the spirit
and scope of the claims appended hereto.

WHAT IS CLAIMED IS:

1. A television schedule system, which comprises:
a display,
means connected to said display for displaying the
5 television schedule on the display as an array of
irregular cells which vary dimensionally in length,
corresponding to different television program time
lengths,
means connected to said display for providing a
10 cursor with the television schedule on the display, said
cursor having a variable length corresponding to the
length of a selected one of the irregular cells in which
the cursor is located,
means connected to said means for providing the
15 cursor for moving the cursor in the array in a series
of equal length steps, with at least some of the
irregular cells having a length which is greater than
the length of the steps.
2. The television schedule system of Claim 1 in
20 which said means for providing the cursor is configured
to provide the cursor with a first portion corresponding
to one of the steps at which the cursor is positioned
having a first appearance and a second portion outside
the one of the steps at which the cursor is positioned
25 having a second appearance different than the first
appearance.
3. The television schedule system of Claim 2 in
which the first portion of the cursor has a solid
appearance and the second portion of the cursor is
30 segmented.
4. The television schedule system of Claim 1 in
which said means for displaying the schedule is

configured to show a portion of the array corresponding to a given period of time, said means for displaying the schedule being further configured to display a continuity icon with programs contained only in part within the
5 given period of time.

5. The television schedule system of Claim 1 in which said means for displaying the schedule is further configured to display the irregular cells with a different appearance to indicate recording status.

10 6. The television schedule system of Claim 5 in which said means for displaying the schedule is configured to display the irregular cells with different appearances to show that a program has been selected for recording, is presently being recorded, has been
15 recorded, and was mis-recorded.

7. The television schedule system of Claim 1 in which said means for displaying the schedule is further configured to display a linking icon with programs that are to be recorded in combination with other programs.

20 8. The television schedule system of Claim 1 in which said means for displaying the schedule is further configured to display a time status indicator delineating past time from future time.

25 9. The television schedule system of Claim 1 in which said means for displaying a schedule is further configured to display a program note overlay for a selected program on a portion of the array.

10. The television schedule system of Claim 9 in which said means for displaying a schedule is further

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configured to display the program note overlay in different locations to avoid masking a title of the selected program.

11. The television schedule system of Claim 1 in
5 which said means for displaying a schedule is further configured to allow selection by a user of a first number of desired channels for display of schedule information which is less than a second number of available channels.

12. The television schedule system of Claim 1
10 additionally comprising a television tuner connected to said means for displaying a schedule and in which said means for displaying a schedule is further configured to display a channel to which said television tuner is tuned with a different appearance than other channels
15 in the schedule.

13. The television schedule system of Claim 12 in which said means for displaying a schedule is further configured so that the cursor follows a change in a channel to which said television tuner is tuned.

14. The television schedule system of Claim 1 in
20 which said means for displaying a schedule is further configured to display alternatively a schedule for a plurality of channels covering a first time period or a schedule for a single channel covering a second time
25 period.

15. The television schedule system of Claim 1
additionally comprising a television set connected to
said means for displaying a schedule and in which said
means for displaying a schedule is further configured
30 to display an overlay containing information on a

television program being shown on said television set when a channel being shown on the television set is changed.

16. The television schedule system of Claim 15 in
5 which the information on the television program includes program title, name of television service, channel number, date and time.

17. The television schedule system of Claim 16 in
10 which said means for displaying a schedule is further configured to provide an alternate overlay including a program note for the television program being shown on said television set.

18. The television schedule system of Claim 1
15 additionally comprising a recording device connected to said means for displaying a schedule and in which said means for displaying a schedule is further configured to display information about recording in response to a user command to record a program.

19. The television schedule system of Claim 1
20 additionally comprising a recording device connected to said means for displaying a schedule and in which said means for displaying a schedule is further configured to display an index of recorded programs.

20. The television schedule system of Claim 19 in
25 which the index of recorded programs includes an identification by title.

21. The television schedule system of Claim 19 in
which the index of recorded programs includes a pointer

showing current location on a recording medium in said recording device.

22. The television schedule system of Claim 21 in which the pointer is graduated in segments corresponding
5 to each recorded program on the recording medium, and linearly with respect to position in each segment.

23. The television schedule system of Claim 19 additionally comprising a memory for the index connected to said means for displaying a schedule, said memory
10 having a capacity to store an index for a plurality of recording media for said recording device.

24. The television schedule system of Claim 23 in which the recording media include a data channel and said recording device is configured to include a title of a
15 program recorded on the recording media in the data channel, said means for displaying a schedule is further configured to compare a title in the data channel with the index in said memory and to display an index for the recording medium in said recording device based on a
20 match of the title on the recording medium with the index in the memory.

25. The television schedule system of Claim 24 in which said means for displaying a schedule is further configured to generate an index during playback and
25 recording with the recording medium and to store the index in said memory in the absence of a match between a title on the recording medium with the index in the memory.

26. A process for operating a television schedule
30 system, which comprises:

displaying the television schedule as an array of irregular cells which vary dimensionally in length, corresponding to different television program time lengths,

- 5 providing a cursor with the television schedule on the display, the cursor having a variable length corresponding to the length of a selected one of the irregular cells in which the cursor is located, moving the cursor in the array in a series of equal
10 length steps, with at least some of the irregular cells having a length which is greater than the length of the steps.

27. The process of Claim 26 additionally comprising providing the cursor with a first portion corresponding
15 to one of the steps at which the cursor is positioned having a first appearance and a second portion outside the one of the steps at which the cursor is positioned having a second appearance different than the first appearance.

- 20 28. The process of Claim 27 in which the first portion of the cursor has a solid appearance and the second portion of the cursor is segmented.

29. The process of Claim 26 in which the schedule is shown as a portion of the array corresponding to a
25 given period of time, the process additionally comprising displaying a continuity icon with programs contained only in part within the given period of time.

- 30 30. The process of Claim 26 in which the irregular cells are displayed with a different appearance to indicate recording status.

31. The process of Claim 30 in which the irregular cells are displayed with different appearances to show that a program has been selected for recording, is presently being recorded, has been recorded, and was mis-
5 recorded.

32. The process of Claim 26 additionally comprising displaying a linking icon with programs that are to be recorded in combination with other programs.

33. The process of Claim 26 additionally comprising
10 displaying a time status indicator delineating past time from future time.

34. The process of Claim 26 additionally comprising displaying a program note overlay for a selected program on a portion of the array.

15 35. The process of Claim 34 in which the program note overlay is displayed in different locations to avoid masking a title of the selected program.

36. The process of Claim 26 additionally comprising displaying schedule information for a first number of
20 desired channels which is less than a second number of available channels in response to user selection of the desired channels.

37. The process of Claim 26 additionally comprising tuning a television tuner to a channel and displaying
25 the channel to which said television tuner is tuned with a different appearance than other channels in the schedule.

38. The process of Claim 37 in which the cursor follows a change in a channel to which the television tuner is tuned.

39. The process of Claim 26 in which the television schedule is alternatively displayed as a schedule for a plurality of channels covering a first time period or a schedule for a single channel covering a second time period.

40. The process of Claim 26 additionally comprising displaying an overlay containing information about a television program being shown on a television set connected to the television schedule system when a channel being shown on the television set is changed.

41. The process of Claim 40 in which the information on the television program includes program title, name of television service, channel number, date and time.

42. The process of Claim 41 additionally comprising providing an alternate overlay including a program note for the television program being shown on said television set.

43. The process of Claim 26 additionally comprising displaying information about recording in response to a user command to record a program.

44. The process of Claim 26 additionally comprising connecting a recording device to the schedule system and displaying an index of recorded programs.

45. The process of Claim 44 in which the index of recorded programs includes an identification by title.

46. The process of Claim 44 in which the index of recorded programs includes a pointer showing current
5 location on a recording medium in the recording device.

47. The process of Claim 46 in which the pointer is graduated in segments corresponding to each recorded program on the recording medium, and linearly with respect to position in each segment.

10 48. The process of Claim 44 additionally comprising storing an index for a plurality of recording media for the recording device in a memory.

49. The process of Claim 48 in which the recording media include a data channel and a title of a program
15 recorded on the recording media is included in the data channel, the process additionally comprising comparing a title in the data channel with the index in the memory and displaying an index for a recording medium in the recording device based on a match of the title on the
20 recording medium with the index in the memory.

50. The process of Claim 49 in which an index is generated during playback and recording with the recording medium and stored in the memory in the absence of a match between a title on the recording medium with
25 the index in the memory.

51. A control system for a video recording machine, which comprises a controller for starting and stopping the video recording machine, for recording video information on recording media, and for playing recorded

video information on recording media, a display generator for providing display image generation signals, means for supplying information to said display generator for generation of display images relating to operation of
5 the video recording machine, said means for supplying information including means for generating a recording media position indicator graduated as segments corresponding to programs recorded on the recording media.

10 52. The control system for a video recording machine of Claim 51 in which said recording media position indicator is graduated according to position of the recording media within a program segment.

15 53. The control system for a video recording machine of Claim 51 in which said control system includes a memory and a means for storing indexes of video material recorded on the recording media in said memory.

20 54. The control system for a video recording machine of Claim 53 in which the recording media include a data channel and said control system has a means for including a title of a program recorded on the recording media in the video recording machine and a time of recording the program in the data channel, said control system including a means for comparing the title of the
25 program and the time of recording with indexes in said memory and displaying an index for a selected one of the recording media based on a match between the program title and recording time on the selected one of the recording media with the indexes in said memory.

30 55. The control system for a video recording machine of Claim 54 in which said system includes a means

for generating an index during playback and recording with the selected one of the recording media and to store the generated index in said memory in the absence of a match between a title and recording time on the selected
5 one of the recording media with the indexes in said memory.

56. The control system for a video recording machine of Claim 51 in which the video recording machine is a video cassette recorder and the recording media are
10 video tape.

57. A system comprising the control system for a video recording machine of Claim 51 connected to a video recording machine.

58. A process for controlling a video recording
15 machine, which comprises generating a recording media position indicator graduated as segments corresponding to programs recorded on the recording media and displaying the recording media position indicator as position of a selected one of the recording media in the
20 video recording machine is changed.

59. The process for controlling a video recording machine of Claim 58 in which the recording media position indicator is graduated according to position of the recording media within a program segment.

25 60. The process for controlling a video recording machine of Claim 58 additionally comprising storing indexes of video material recorded on the recording media in a memory.

61. The process for controlling a video recording machine of Claim 60 additionally comprising including a title of a program recorded on the recording media and a time of recording the program in a data channel on the recording media and comparing the title of the program and the time of recording with the indexes in the memory and displaying an index for a selected one of the recording media based on a match between the program title and recording time on the selected one of the recording media with the indexes in said memory.

62. The process for controlling a video recording machine of Claim 61 additionally comprising generating an index during playback and recording with the selected one of the recording media and storing the generated index in the memory in the absence of a match between a title and recording time on the selected one of the recording media with the indexes in the memory.

63. A control system for a video recording machine, which comprises a controller for starting and stopping the video recording machine, for recording video information on recording media, and for playing recorded video information on recording media, a memory, a means connected to said memory for storing indexes of video material recorded on the recording media in said memory, the recording media include a data channel and said control system has a means for including a title of a program recorded on the recording media in the video recording machine in the data channel, said control system including a means for comparing the title of the program with indexes in said memory and displaying an index for a selected one of the recording media based on a match between the program title on the selected one of the recording media with the indexes in said memory.

64. The control system for a video recording machine of Claim 63 in which said system includes a means for generating an index during playback and recording with the selected one of the recording media and to store
5 the generated index in said memory in the absence of a match between a title on the selected one of the recording media with the indexes in said memory.

65. The control system for a video recording machine of Claim 63 in which the video recording machine
10 is a video cassette recorder and the recording media are video tape.

66. A system comprising the control system for a video recording machine of Claim 63 connected to a video recording machine.

15 67. A process for controlling a video recording machine, which comprises storing indexes of video material recorded on recording media in a memory, the recording media including a data channel, including a title of a program recorded on the recording media in
20 the video recording machine in the data channel, comparing the title of the program with indexes in the memory and displaying an index for a selected one of the recording media based on a match between the program title on the selected one of the recording media with
25 the indexes in said memory.

68. The process for controlling a video recording machine of Claim 67 additionally comprising generating an index during playback and recording with the selected one of the recording media and storing the generated
30 index in the memory in the absence of a match between

a title on the selected one of the recording media with the indexes in the memory.

69. A television schedule system, which comprises:
a display,

5 means connected to said display for displaying the television schedule on the display,

said means for displaying a schedule being configured to allow selection by a user of a first number of desired channels for display of schedule information

10 which is less than a second number of available channels,
a programmable tuner connected to said means for displaying a schedule,

said programmable tuner being configured to follow said first number of desired channels when said
15 television schedule is shown on said display in response to a channel up or channel down command, and said programmable tuner being configured to follow the second number of available channels in the absence of said television schedule on said display in response to a
20 channel up or channel down command.

70. The television schedule system of Claim 69 additionally comprising means connected to the display for providing a cursor with the television schedule on the display, and in which said means for displaying a
25 schedule is further configured so that the cursor follows a change in a channel to which said programmable tuner is tuned.

71. The television schedule system of Claim 69 in which said means for displaying the schedule is
30 configured to show the schedule as an array, a portion of the array corresponding to a given period of time, said means for displaying the schedule being further

configured to display a continuity icon with programs contained only in part within the given period of time.

72. The television schedule system of Claim 69 in which said means for displaying the schedule is further
5 configured to display programs with a different appearance to indicate recording status.

73. The television schedule system of Claim 72 in which said means for displaying the schedule is configured to display the programs with different
10 appearances to show that a program has been selected for recording, is presently being recorded, has been recorded, and was mis-recorded.

74. The television schedule system of Claim 69 in which said means for displaying the schedule is further
15 configured to display a linking icon with programs that are to be recorded in combination with other programs.

75. The television schedule system of Claim 69 in which said means for displaying the schedule is further configured to display a time status indicator delineating
20 past time from future time.

76. The television schedule system of Claim 69 in which said means for displaying a schedule is further configured to display a program note overlay for a selected program on a portion of the display.

25 77. The television schedule system of Claim 76 in which said means for displaying a schedule is further configured to display the program note overlay in different locations to avoid masking a title of the selected program.

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78. The television schedule system of Claim 69 in which said means for displaying a schedule is further configured to display a channel to which said television tuner is tuned with a different appearance than other
5 channels in the schedule.

79. The television schedule system of Claim 78 in which said means for displaying a schedule is further configured so that the cursor follows a change in a channel to which said television tuner is tuned.

10 80. The television schedule system of Claim 69 in which said means for displaying a schedule is further configured to display alternatively a schedule for a plurality of channels covering a first time period or a schedule for a single channel covering a second time
15 period.

81. The television schedule system of Claim 69 additionally comprising a television set connected to said means for displaying a schedule and in which said means for displaying a schedule is further configured
20 to display an overlay containing information on a television program being shown on said television set when a channel being shown on the television set is changed.

82. The television schedule system of Claim 81 in
25 which the information on the television program includes program title, name of television service, channel number, date and time.

83. The television schedule system of Claim 82 in which said means for displaying a schedule is further
30 configured to provide an alternate overlay including a

program note for the television program being shown on said television set.

84. The television schedule system of Claim 69 additionally comprising a recording device connected to said means for displaying a schedule and in which said means for displaying a schedule is further configured to display information about recording in response to a user command to record a program.

85. The television schedule system of Claim 69 additionally comprising a recording device connected to said means for displaying a schedule and in which said means for displaying a schedule is further configured to display an index of recorded programs.

86. The television schedule system of Claim 85 in which the index of recorded programs includes an identification by title.

87. The television schedule system of Claim 85 in which the index of recorded programs includes a pointer showing current location on a recording medium in said recording device.

88. The television schedule system of Claim 87 in which the pointer is graduated in segments corresponding to each recorded program on the recording medium, and linearly with respect to position in each segment.

89. The television schedule system of Claim 85 additionally comprising a memory for the index connected to said means for displaying a schedule, said memory having a capacity to store an index for a plurality of recording media for said recording device.

90. The television schedule system of Claim 89 in which the recording media include a data channel and said recording device is configured to include a title of a program recorded on the recording media in the data channel, said means for displaying a schedule is further
5 configured to compare a title in the data channel with the index in said memory and to display an index for the recording medium in said recording device based on a match of the title on the recording medium with the index
10 in the memory.

91. The television schedule system of Claim 90 in which said means for displaying a schedule is further configured to generate an index during playback and recording with the recording medium and to store the
15 index in said memory in the absence of a match between a title on the recording medium with the index in the memory.

92. A process for operating a television schedule system, which comprises:
20 selecting a first number of desired channels for display of schedule information which is less than a second number of available channels,
displaying the schedule information on a display,
following the first number of desired channels when
25 the schedule information is shown on the display in response to a channel up or channel down command, and
following the second number of available channels in the absence of the television schedule on the display in response to a channel up or channel down command.

30 93. The process of Claim 92 in which the schedule information is shown as a portion corresponding to a given period of time, the process additionally comprising

displaying a continuity icon with programs contained only in part within the given period of time.

94. The process of Claim 92 in which programs in the schedule information are displayed with a different appearance to indicate recording status.

95. The process of Claim 94 in which the programs are displayed with different appearances to show that a program has been selected for recording, is presently being recorded, has been recorded, and was mis-recorded.

96. The process of Claim 92 additionally comprising displaying a linking icon with programs that are to be recorded in combination with other programs.

97. The process of Claim 92 additionally comprising displaying a time status indicator delineating past time from future time.

98. The process of Claim 92 additionally comprising displaying a program note overlay for a selected program on a portion of the schedule information.

99. The process of Claim 98 in which the program note overlay is displayed in different locations to avoid masking a title of the selected program.

100. The process of Claim 92 additionally comprising tuning a television tuner to a channel and displaying the channel to which said television tuner is tuned with a different appearance than other channels in the schedule information.

101. The process of Claim 37 additionally comprising tuning a television tuner to a channel and in which a cursor follows a change in a channel to which the television tuner is tuned.

5 102. The process of Claim 92 in which the schedule information is alternatively displayed as a schedule for a plurality of channels covering a first time period or a schedule for a single channel covering a second time period.

10 103. The process of Claim 92 additionally comprising displaying an overlay containing information about a television program being shown on a television set connected to the television schedule system when a channel being shown on the television set is changed.

15 104. The process of Claim 103 in which the information on the television program includes program title, name of television service, channel number, date and time.

20 105. The process of Claim 104 additionally comprising providing an alternate overlay including a program note for the television program being shown on said television set.

25 106. The process of Claim 92 additionally comprising displaying information about recording in response to a user command to record a program.

107. The process of Claim 92 additionally comprising connecting a recording device to the schedule system and displaying an index of recorded programs.

108. The process of Claim 107 in which the index of recorded programs includes an identification by title.

109. The process of Claim 107 in which the index of recorded programs includes a pointer showing current
5 location on a recording medium in the recording device.

110. The process of Claim 109 in which the pointer is graduated in segments corresponding to each recorded program on the recording medium, and linearly with respect to position in each segment.

10 111. The process of Claim 107 additionally comprising storing an index for a plurality of recording media for the recording device in a memory.

112. The process of Claim 111 in which the recording media include a data channel and a title of
15 a program recorded on the recording media is included in the data channel, the process additionally comprising comparing a title in the data channel with the index in the memory and displaying an index for a recording medium in the recording device based on a match of the title
20 on the recording medium with the index in the memory.

113. The process of Claim 112 in which an index is generated during playback and recording with the recording medium and stored in the memory in the absence of a match between a title on the recording medium with
25 the index in the memory.

122	11:00 AM	11:30 AM	12:00 PM
2	JUDGE(PART 1)	JUDGE(PART 2)	AT NOON
4	GOLDEN GIRLS	NEWS	INSIDE EDITION
5	YOUNG & RESTLESS	NEWS	NEWS
7	PERFECT STRA	LOVING	ALL MY CHILD
9	SESAME STREET		
13	ALL MY CHILDREN		NEWS
44	EVERYDAY		MOVIE
A&E	LORNE GREEN'S WORLD OF S		FUGITIVE
CNN	NEWS		NEWS
DIS	WALT DISNEY PRESENTS		LUNCH BOX
LIF	JANE WALLACE		FRUGAL GOURM
TNT	MOVIE		
CH 2	KNTV-FOX	CBL 2	11:25A
			TUE APR 3

FIG. - 1

SUBSTITUTE SHEET

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32	40	48	11:00 AM	11:30 AM	12:00 PM
			JUDGE(PART 1)	JUDGE(PART 2)	AT NOON
[2]	[4]		GOLDEN GIRLS	NEWS	INSIDE EDITION
	[5]		YOUNG & RESTLESS ²⁶		NEWS ²⁶
	[7]		PERFECT STRA	LOVING	ALL MY CHILD
	[9]		SESAME STREET ²⁶		
	[13]		ALL MY CHILDREN		NEWS
	[44]		EVERYDAY ²⁶		MOVIE
[A&E]			LORNE GREEN'S WORLD OF S		FUGITIVE
[CNN]			NEWS		NEWS
[DIS]			WALT DISNEY PRESENTS		LUNCH BOX
[LIF]			JANE WALLACE		FRUGAL GOURM
[TNT]			MOVIE ²⁶		
[CH 2]	[KNTV-FOX]	[CBL 2]	[11:25A]	[TUE APR 3]	

FIG.-2

SUBSTITUTE SHEET

44	11:00 AM		11:30 AM		12:00 PM	
	JUDGE (PART 1)		JUDGE (PART 2)		AT NOON	
[2]	GOLDEN GIRLS		NEWS ²⁶		INSIDE EDITION	
[4]	YOUNG & RESTLESS				NEWS ²⁶	
[5]	PERFECT STRA		LOVING		ALL MY CHILD	
[7]	SESAME STREET					
[9]	ALL MY CHILDREN				NEWS ²⁶	
[13]	EVERYDAY ²⁶				MOVIE	
[44]	LORNE GREEN'S WORLD OF S				FUGITIVE	
[A&E]	NEWS				NEWS	
[CNN]	WALT DISNEY PRESENTS				LUNCH BOX	
[DIS]	JANE WALLACE				FRUGAL GOURM	
[LIF]	MOVIE ²⁶					
[TNT]	[KNTV-FOX]		[CBL 2]			
[CH 2]						

FIG.-3

SUBSTITUTE SHEET

PENDING RECORDINGS	RECORDED PROGRAMS	LINKED TITLES	ON GRID PROG
NEWS	CH 4	4/3 11:30A	:30
ROSEANNE	CH 13	4/3 9:00P	:30
ALL MY CHILDREN	CH 7	4/4 12:00P	1:00
MACNEIL, LEHRER	CH 9	4/4 6:30P	1:00
QUANTUM LEAP	CH 4	4/5 10:00P	1:00
NOVA	CH 9	4/5 8:00P	1:00
MOVIE: ALIEN NATION	HBO	4/5 9:00P	2:00
ALL MY CHILDREN	CH 7	4/6 12:00P	1:00
CHEERS	CH 5	4/6 7:00P	:30
MOVIE: SUMMER JOB	SHO	4/6 9:00P	2:00
NBA BASKETBALL	CH 5	4/7 4:00P	?
	SP		EP

FIG.-4

SUBSTITUTE SHEET

	11:00 AM	11:30 AM	12:00 PM
[2]	JUDGE(PART 1)	JUDGE(PART 2)	AT NOON
[4]	GOLDEN GIRLS	NEWS ²⁶	INSIDE EDITION
[5]	YOUNG & RESTLESS	⁴⁶	NEWS ²⁶
[7]	PERFECT STRA	LOVING	ALL MY CHILD
[9]	SESAME STREET ²⁶		
[13]	ALL MY CHILDREN		NEWS ²⁶
[44]	EVERYDAY		MOVIE
[A&E]	LORNE GREEN'S WORLD OF S		FUGITIVE
[CNN]	NEWS ²⁶		NEWS
[DIS]	WALT DISNEY PRESENTS		LUNCH BOX
[LIF]	JANE WALLACE		FRUGAL GOURM
[TNT]	MOVIE ²⁶		
[CH 2]	[KNTV-FOX]	[CBL 2]	[11:25A]
			[TUE APR 3]

FIG. -5

SUBSTITUTE SHEET

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	11:00 AM	11:30 AM	12:00 PM
2	JUDGE(PART 1)	JUDGE(PART 2)	AT NOON
4	GOLDEN GIRLS	NEWS 26	INSIDE EDITION
5	YOUNG & RESTLESS		NEWS 26
7	PERFECT STRA	LOVING	ALL MY CHILD
9	SESAME STREET 26		
13	ALL MY CHILDREN		NEWS 26
44	EVERYDAY 26		MOVIE
A&E	LORNE GREEN'S WORLD OF S		FUGITIVE
CNN	NEWS	52	NEWS
DIS	DOROTHY BRINGS SOPHIA'S SISTER (NANCY WALKER) OVER FROM SICILY AS A BIRTHDAY SURPRISE		
LIF			
TNT			
CH 2	KNTV-FOX	CBL 2	11:25A
			TUE APR 3

FIG. -6

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WHAT'S NEXT ON CHANNEL 2			
11:00 A	JUDGE (PART 1)		
11:30 A	JUDGE (PART 2)		
12:00 P	AT NOON		
1:00 P	MOVIE: ANATOMY OF A SEDUCTION		
3:00 P	ALVIN AND THE CHIPMUNKS		
3:30 P	SUPER MARIO BROS. SUPER SHOW		
4:00 P	CHIP'N DALES RESCUE RANGERS		
4:30 P	DUCKTALES		
5:00 P	SILVER SPOONS		
5:30 P	THREE'S COMPANY		
6:00 P	WHO'S THE BOSS		
6:30 P	MAMA'S FAMILY		
7:00 P	CHEERS		
[CH 2]	[KNTV-FOX]	[CBL 2]	[11:25A] [TUE APR 3]

SUBSTITUTE SHEET

FIG.-7

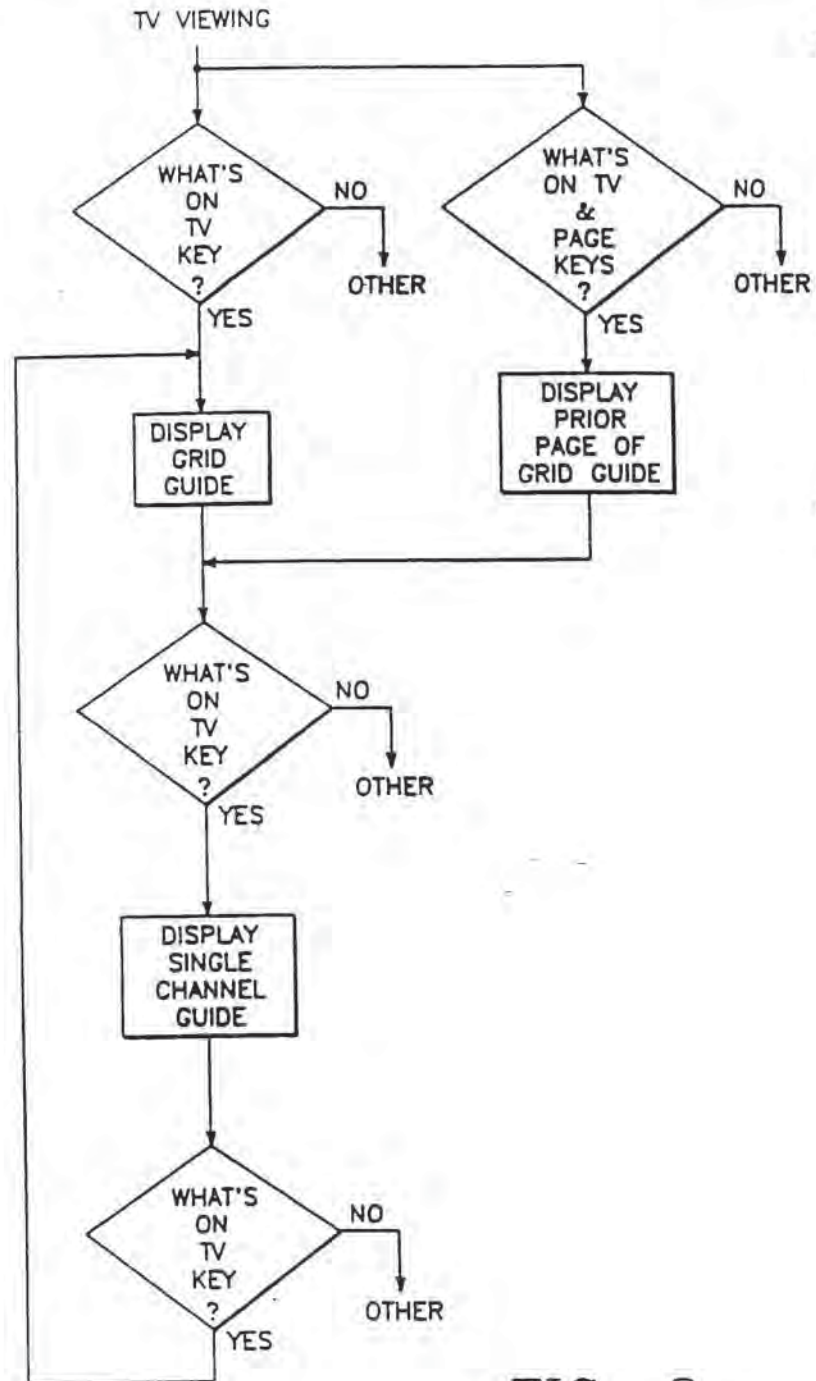


FIG.-8

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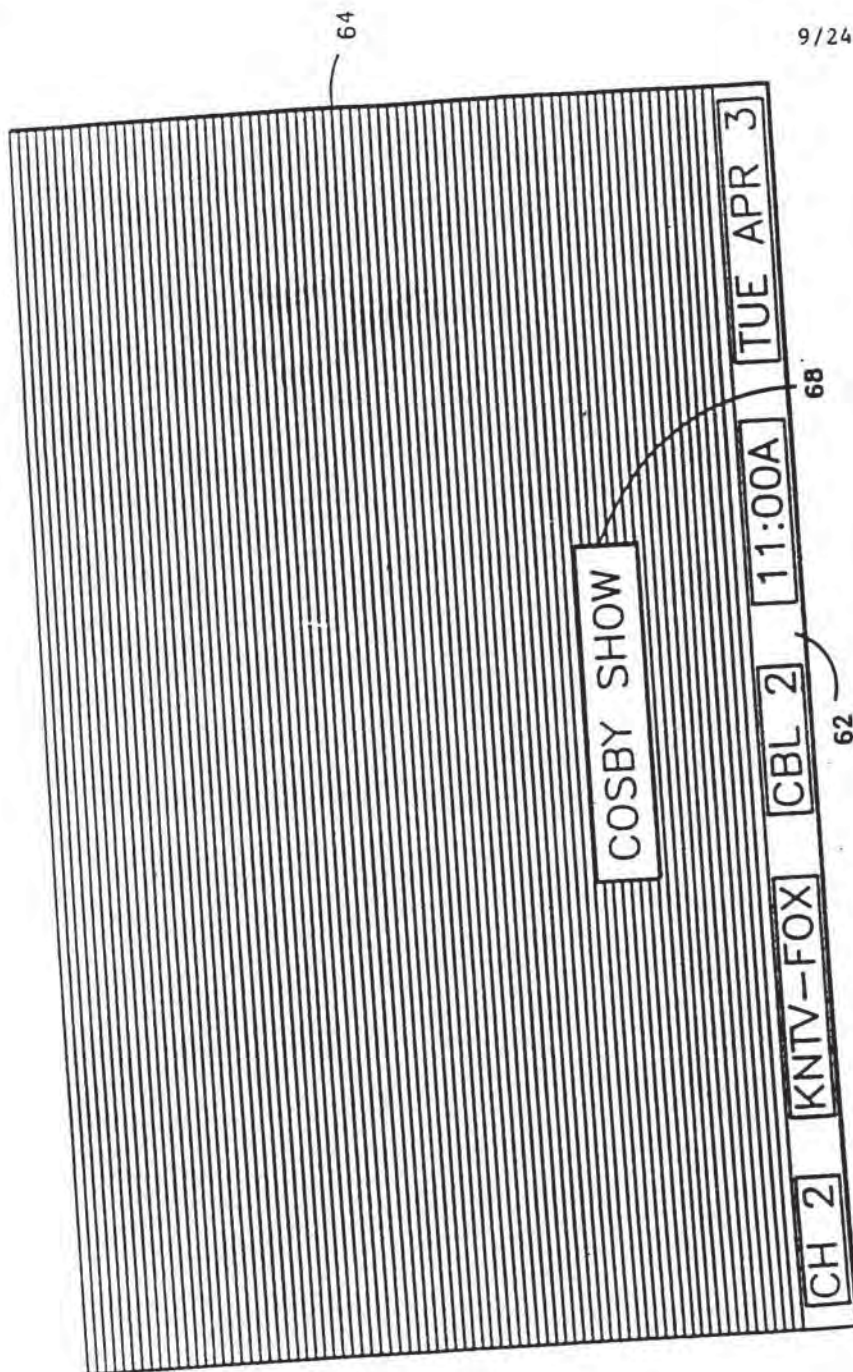


FIG. -9

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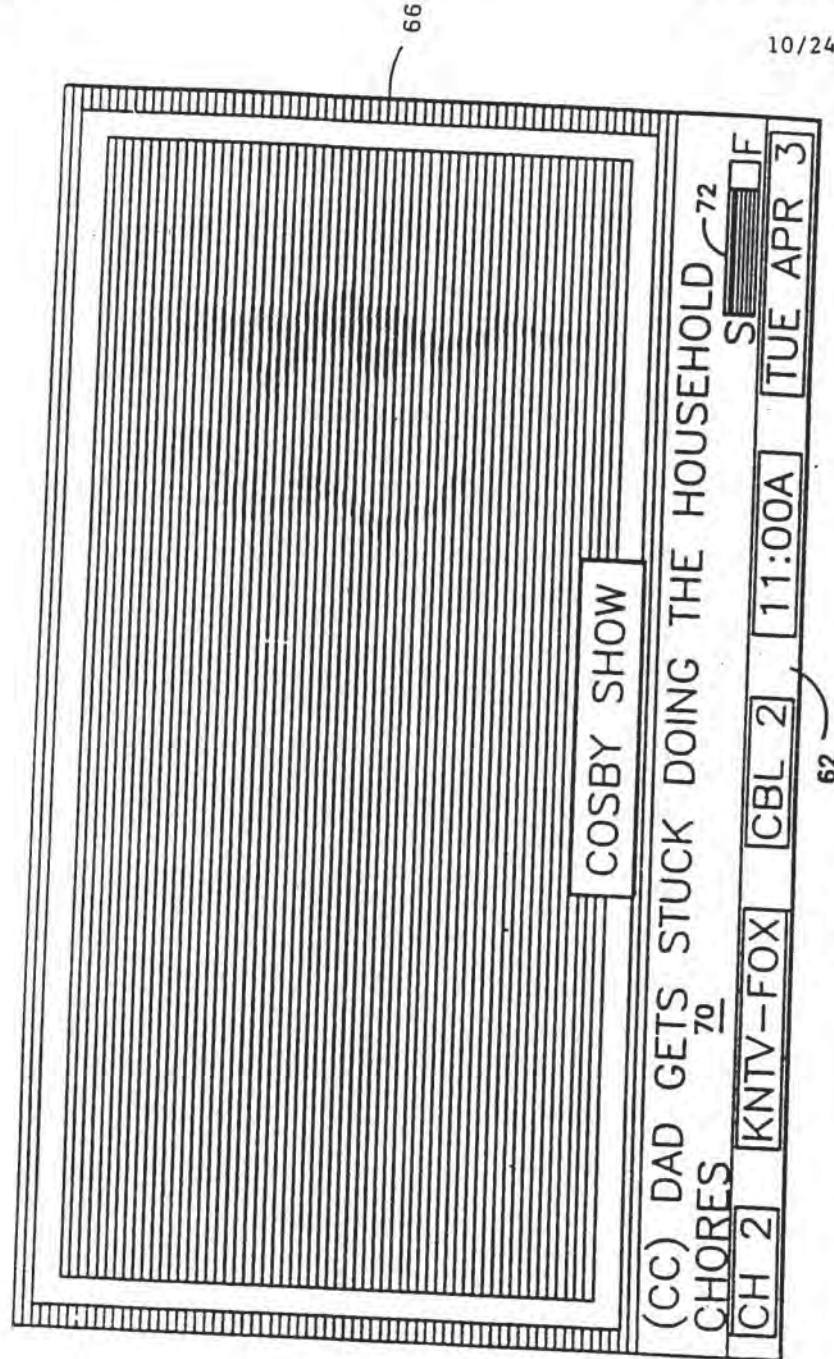


FIG. -10

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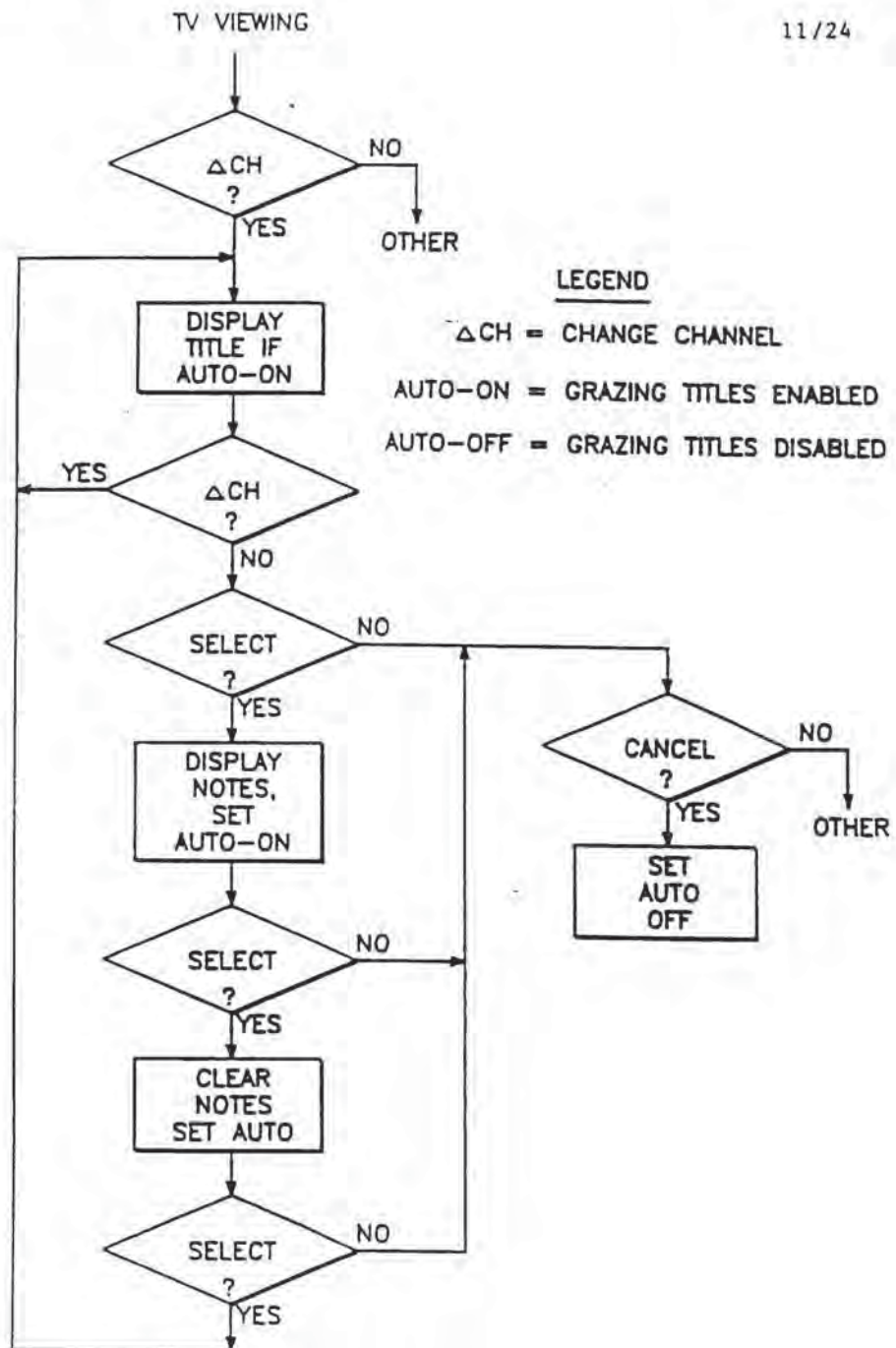


FIG.-11

SUBSTITUTE SHEET

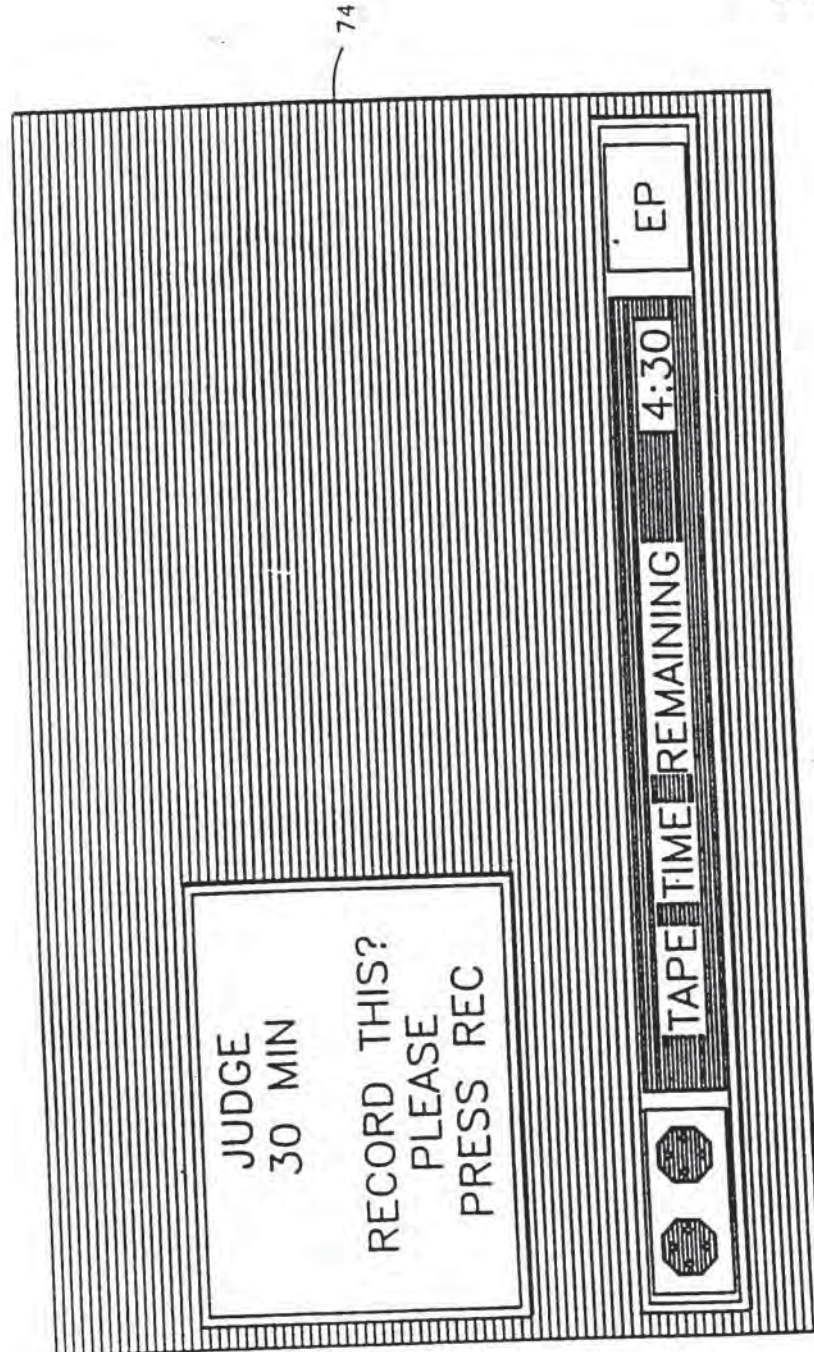


FIG. -12

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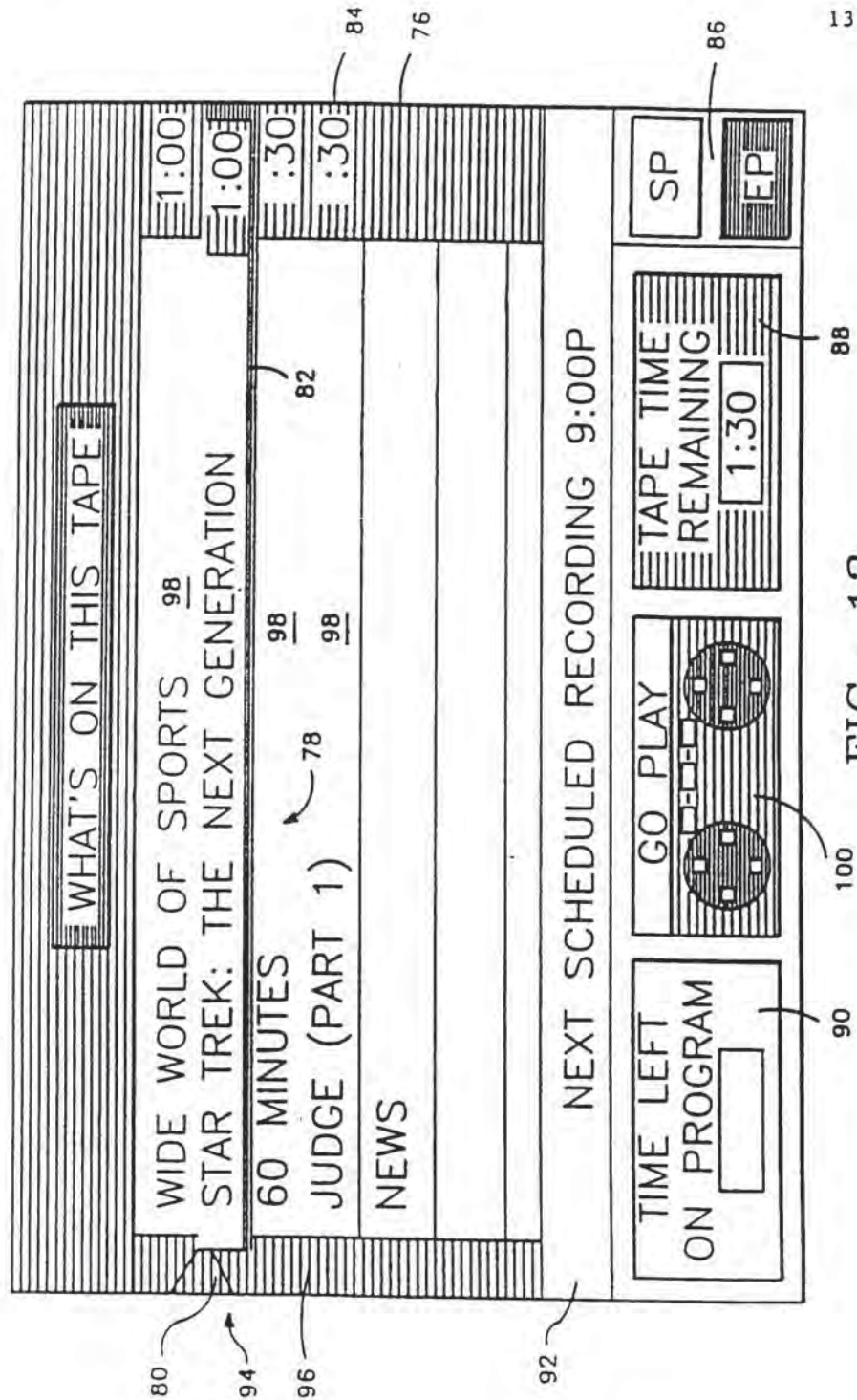


FIG. -13

SUBSTITUTE SHEET

112

110

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SUBSTITUTE SHEET

THEMES			
MOVIES ¹⁰⁶	SPORTS	SPECIALS	TV FARE
G	PG	***	***
NR	R	**	*
ALL MOVIES ¹⁰⁸	FOREIGN FILMS		
ACTION/ADVENTURE ¹⁰⁸	SUSPENSE/HORROR		
BIOGRAPHY/HISTORY	MUSICAL ¹⁰⁸		
COMEDY	SATIRE		
DOCUMENTARY	SOCIAL ISSUES		
DRAMA/ROMANCE	SCIENCE FICTION		
FAMILY/CHILDREN ¹⁰⁸	SCIENCE/NATURE		
FANTASY/ANIMATION	WESTERN		

FIG.-14

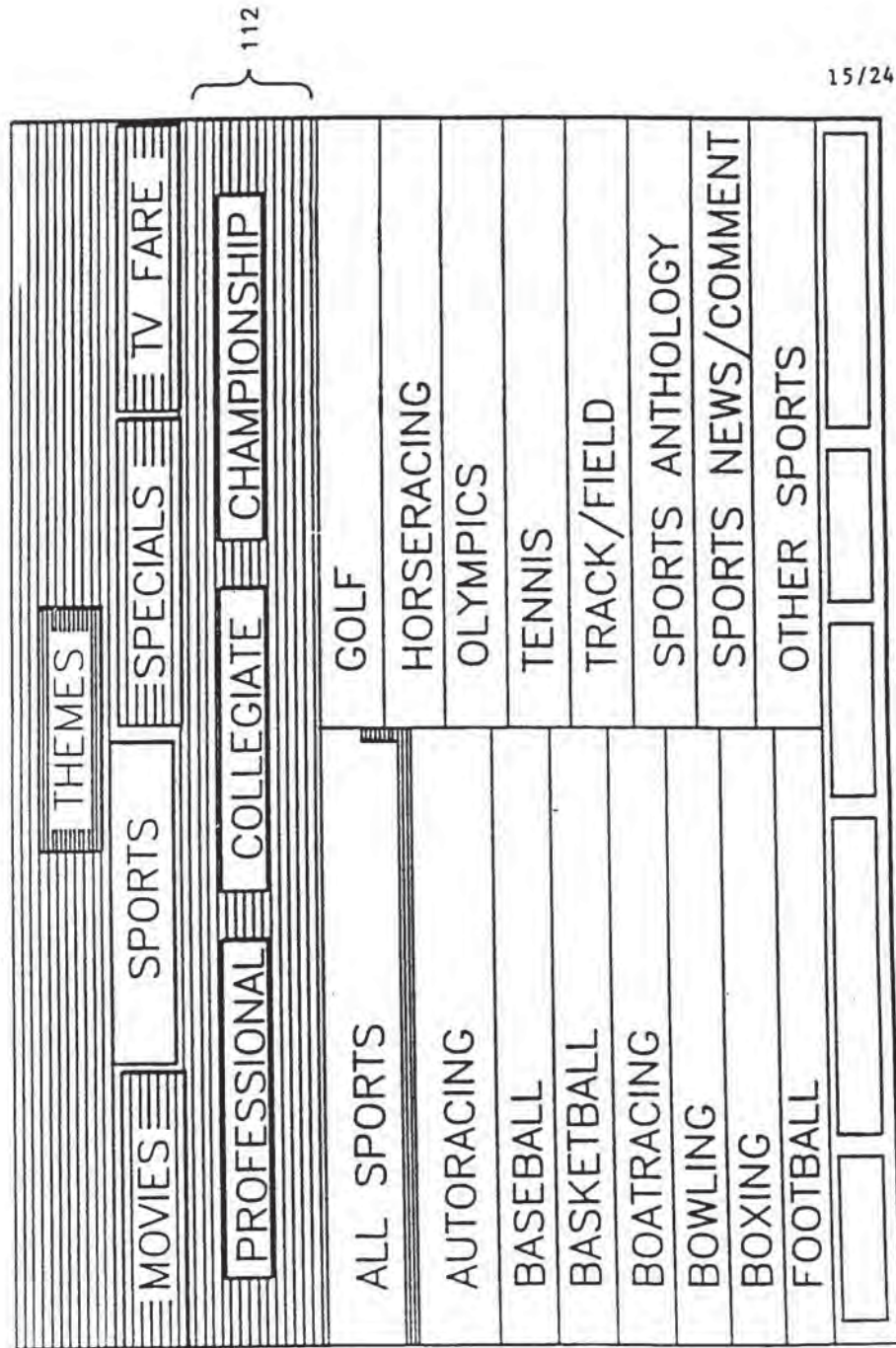


FIG.-15

112

THEMES	
MOVIES	TV FARE
SPORTS	SPECIALS
LIVE	FIRST RUN
RERUN	

ALL SPECIALS	NEWS
AWARD/PAGEANTS	PICK OF THE WEEK
COMEDY	PIPELINE PROGRAMS
DRAMA	BULLETIN BOARD
ENTERTAINMENT	
FAMILY/CHILD	
HOLIDAY	
MINI-SERIES	

FIG. - 16

SUBSTITUTE SHEET

THEMES			
MOVIES	SPORTS	SPECIALS	TV FARE
LIVE	FIRST RUN	RERUN	
ALL TV FARE	ETHNIC/DEVOTIONAL		
ACTION/ADVENTURE	GAME SHOWS		
ANIMATION/CARTOON	HEALTH/EXERCISE		
BUSINESS/FINANCE	NEWS/INFORMATION		
CHILDREN	MUSIC		
COMEDY/VARIETY	SCI FI/HORROR		
DRAMA/SUSPENSE	SCIENCE/NATURE		
EDUCATIONAL	TALK SHOWS		

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FIG. - 17

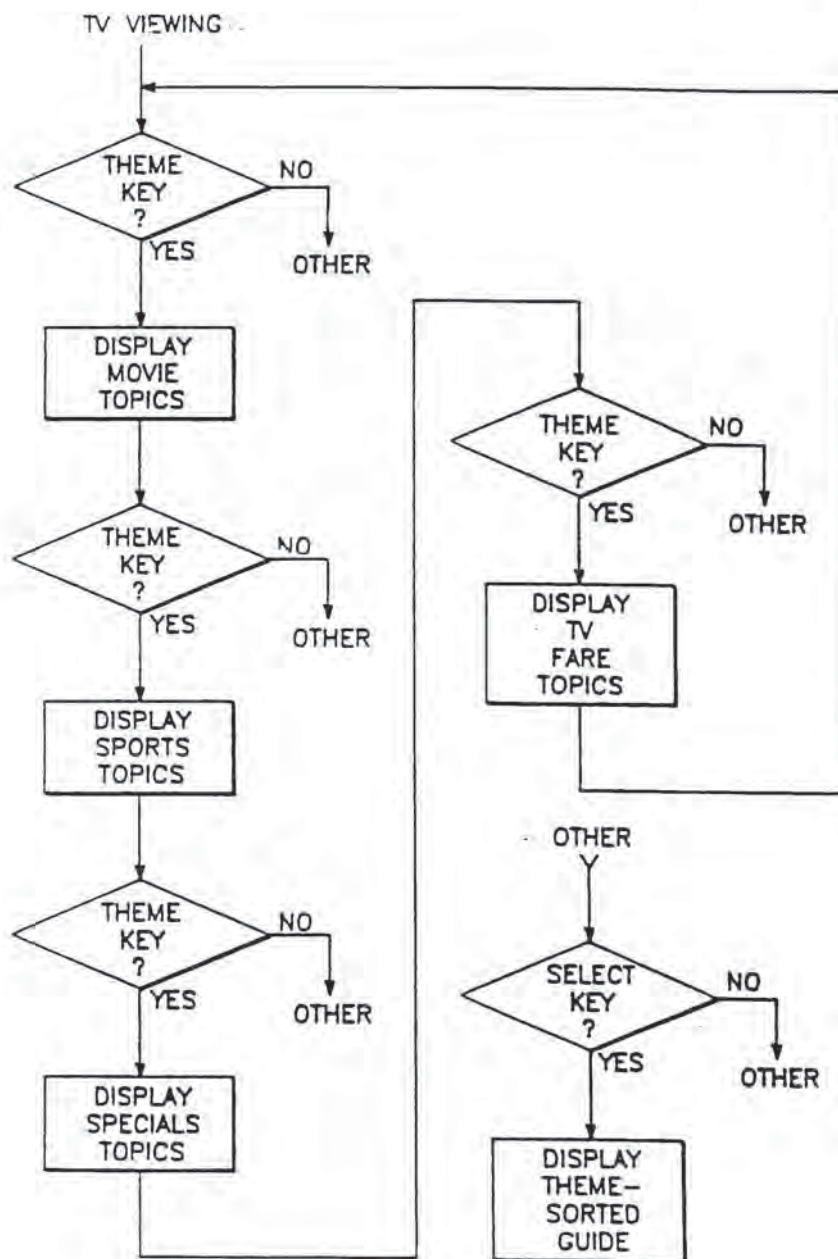


FIG.-18

SUBSTITUTE SHEET

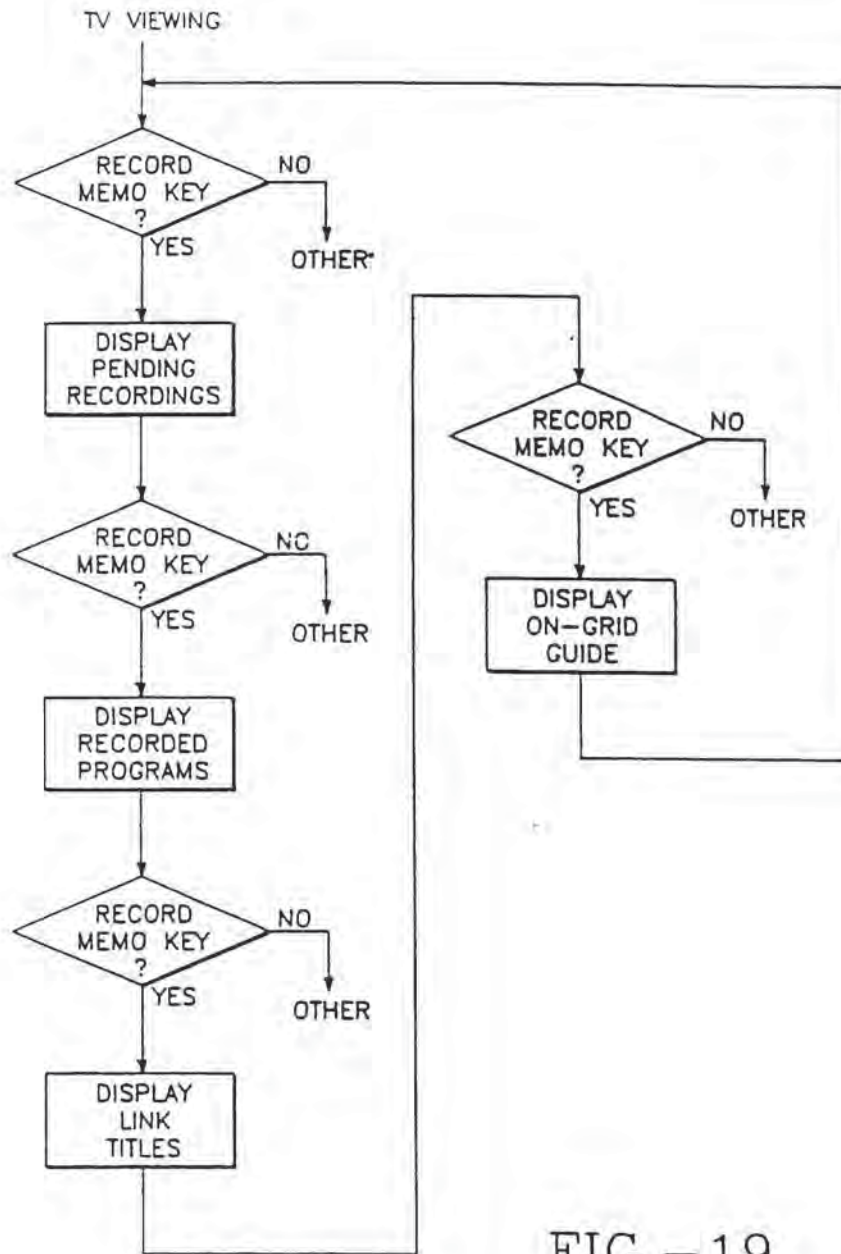


FIG.-19

SUBSTITUTE SHEET

CHANNEL CUSTOMIZATION PAGE 1

MY	2	3	4	5	7	9	20	44	HBO	SHO	CNN	DIS	ESPN
	2	3	4	5	7	9	20	44					
	KTVU-2	KICU-36	KRON-4	KPIX-5	KSTS-48	KGO-7	KTEH-54	KQED-9	KDTV-14	KNTV-11	KBHK-44	KQEC-32	
	14	15	16	17	18	19	20	21	22	23	24	25	
	WGN	PPVW	KVOF-38	WTBS	KCSM-60	KTSF-26	KOFY-20	TRVL	CBN	CBB	BDSS	BARC	
	26	27	28	29	30	31	32	33	34	35	36	37	
	CSPAN	MAX	CSPAN	EDUC	DIS	VH-1	SHO	CNN	ESPN	LIF	HBO	GALA	
USE SELECT TO CHANGE STATUS: MY OFF ON													

120

124

118

116

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FIG. -20

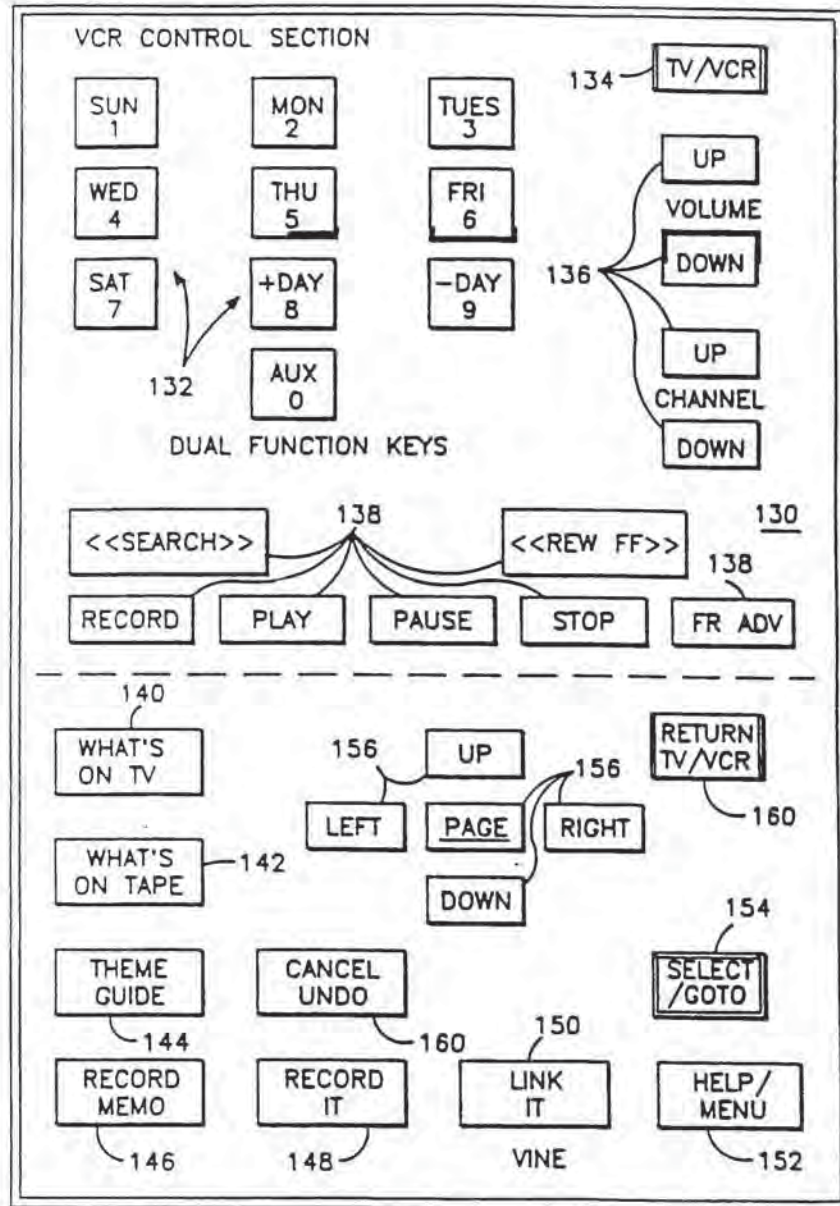


FIG.-21

SUBSTITUTE SHEET

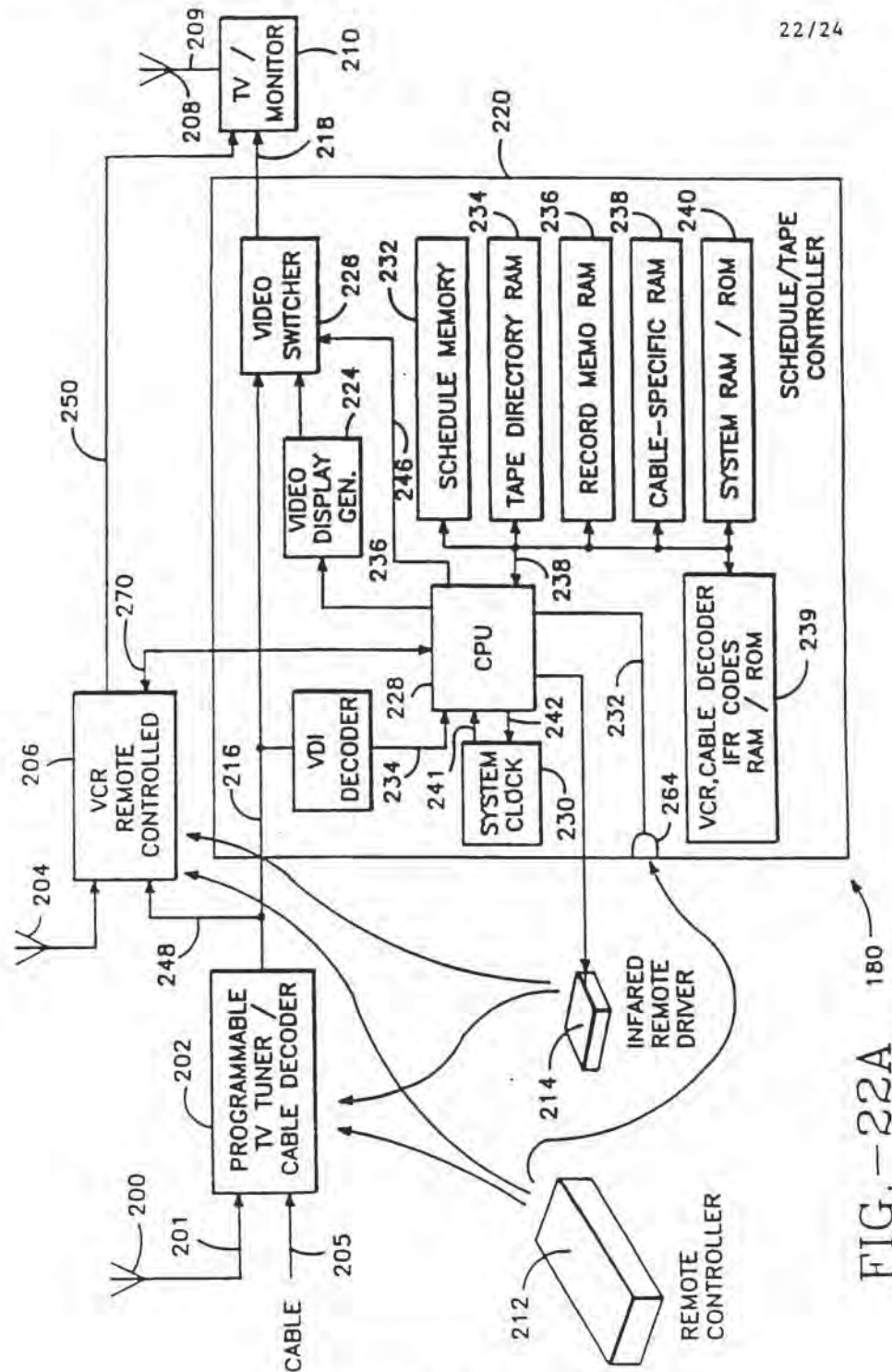


FIG. -22A

SUBSTITUTE SHEET

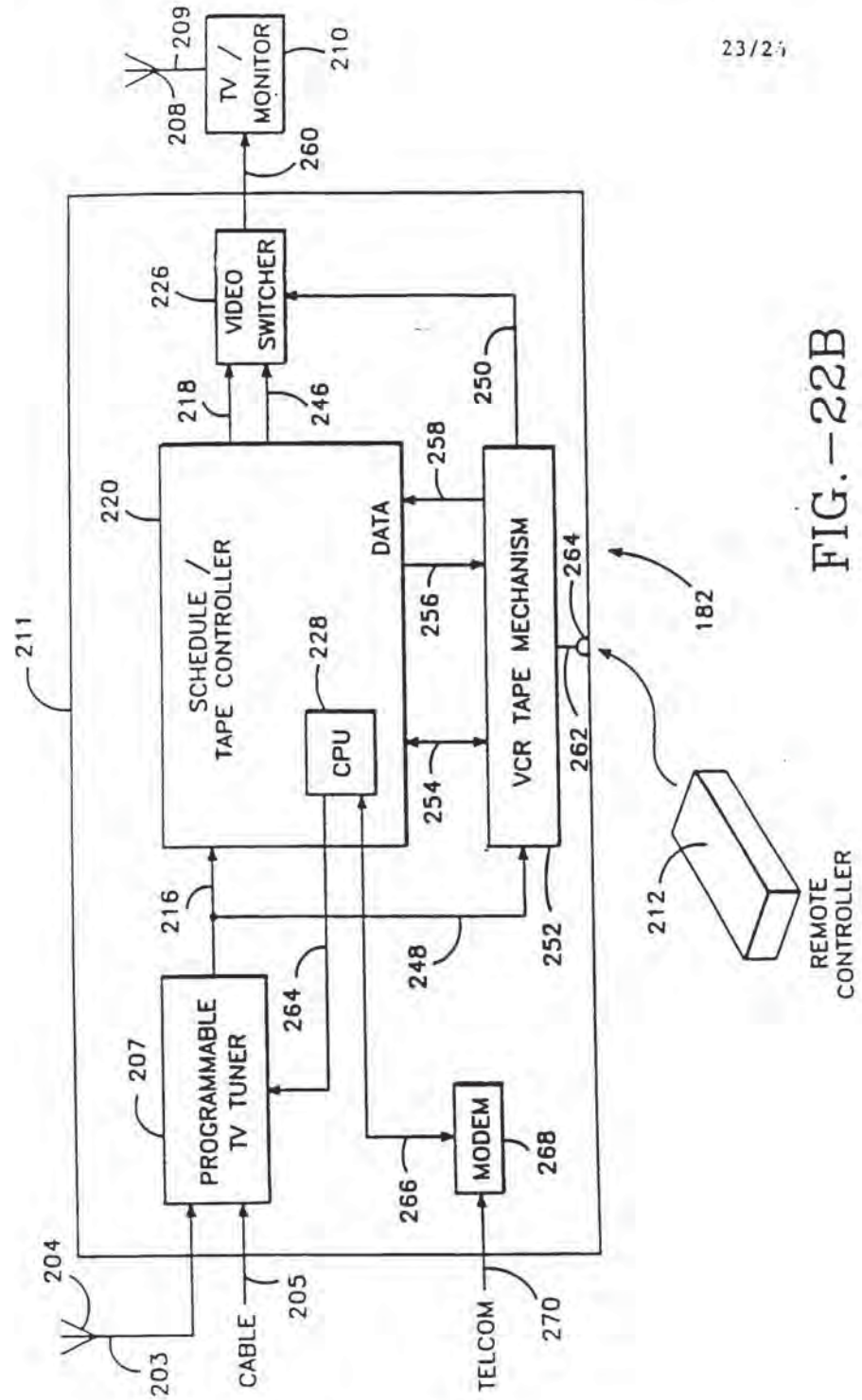


FIG. -22B

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FIG. -23

ROVI_CC-ITC-COMP-0054437

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(21) International Application Number: PCT/US92/10109 (22) International Filing Date: 30 November 1992 (30.11.92) (30) Priority data: 799,987 29 November 1991 (29.11.91) US (71) Applicant: SCIENTIFIC-ATLANTA, INC. [US/US]; One Technology Parkway South, P.O. Box 105600, Norcross, GA 30092-2967 (US). (72) Inventors: BANKER, Robert, O. ; 1581 Chambee Gap Road, Cumming, GA 30130 (US). BACON, Kinney, C. ; 2820 Springtime Court, Lawrence, GA 30243 (US). BAGLEY, Julius, B. ; 296 Sandhurst Way, Marietta, GA 30060 (US).		(74) Agents: SHEA, Michael, J. et al.; Banner, Birch, McKie & Beckett, 1001 G Street, N.W., 11th Floor, Washington DC 20001 (US). (81) Designated States: AU, JP. Published With international search report.

(54) Title: METHOD AND APPARATUS FOR PROVIDING MESSAGE INFORMATION TO SUBSCRIBERS IN A CABLE TELEVISION SYSTEM



(57) Abstract

A subscriber terminal apparatus for a television in an in-band subscription television system is provided. The subscriber terminal includes a receiver for receiving a television signal including video, audio, and data information. A selector selects a channel of the television signal. A memory stores a plurality of barker screens providing messages regarding one or more channels of the television signal. An on-screen display control circuit controls the display of the barker screens on the television. A processor retrieving a barker screen from the memory and supplies the retrieved screen to the on-screen display control circuit if the barker screen provides a message regarding a selected channel. Barker screen information may also be obtained from a dedicated data channel or a six megahertz video barker channel.

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- 1 -

**METHOD AND APPARATUS FOR PROVIDING MESSAGE
INFORMATION TO SUBSCRIBERS IN A CABLE TELEVISION SYSTEM**

TECHNICAL FIELD

The present invention generally relates to a method and apparatus for providing information to subscribers in a cable television system and, more particularly, to a method and apparatus for generating and forwarding messages including characters for display on a television receiver in a cable television system. The messages may, for example, include barker information.

BACKGROUND OF THE INVENTION

One important feature of a cable television system is the capability of a system operator to effectively provide information to subscribers. Video barker channels are one example of such information. For example, when a subscriber selects a channel which he or she is not able to view, a six megahertz video barker channel may be tuned which provides a message such as shown in Figure 1 on the subscriber's television to indicate that the selected channel is not available for viewing. A subscriber may not be able to view a selected channel for a number of reasons. For example, the selected channel may have a pay-per-view event which the subscriber has not purchased. Alternatively, the channel may be a premium channel for which the subscriber is not authorized. The channel may also be under parental control or may simply not be available in the cable system. Each of these reasons may prevent a subscriber from viewing a selected channel.

In prior art systems, the same video barker channel is typically tuned for each of the above situations. Accordingly, a generic message such as that shown in Figure 1 is provided. Thus, although a subscriber is provided an indication that he or she cannot view a selected channel, no specific reason is provided. Of course, an operator could provide

separate barker channels for each of these situations and others. However, the use of separate six megahertz video barker channels to provide such information reduces the number of channels available for other programming.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a method and apparatus for providing message information to subscribers.

It is a further object of the present invention to provide message information to a subscriber utilizing a minimum bandwidth.

In accordance with the present invention, a subscriber terminal apparatus for a television in an in-band subscription television system includes a receiver for receiving a television signal including video, audio, and data information. A selector selects a channel of the television signal. A memory stores a plurality of barker screens providing messages regarding one or more channels of the television signal. An on-screen display control circuit controls the display of the barker screens on the television. A processor retrieving a barker screen from the memory and supplies the retrieved screen to the on-screen display control circuit if the barker screen provides a message regarding a selected channel.

This arrangement permits specific information to be provided to a subscriber tuning a channel which he or she is not able to view for a particular reason. This capability is provided without the need for using a six megahertz video barker channel and thus the channel capacity of a system operator is enhanced.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the invention and many of the attendant advantages thereof will be readily obtained as the invention becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings.

Figure 1 depicts a prior art barker provided to inform a subscriber that a channel is unavailable.

Figure 2 is a block diagram of a headend for an in-band cable television system in accordance with the present invention.

Figure 3 is a block diagram of scrambler 204f shown in Figure 2.

Figure 4 is a block diagram of a baseband subscriber terminal in accordance with the present invention.

Figure 5A is a block diagram of the on-screen display control of Figure 4.

Figure 5B illustrates memory locations of RAM of the on-screen display of Figure 5A.

Figure 5C illustrates the configuration of the on-screen display.

Figure 6A illustrates a message transaction in accordance with the present invention.

Figure 6B illustrates a message definition transaction in accordance with the present invention.

Figure 7 illustrates an on-screen message alert in accordance with the present invention.

Figure 8 illustrates a barker transaction in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 2 is a block diagram of a subscription television system in which the present invention may be implemented. Billing computer 201 includes a subscriber database and generates a monthly bill for the subscribers in the system based on level of service and any pay-per-view and impulse pay-per-view purchases. System control computer 202 such as an HP-1000 is interfaced to billing computer 201. System control computer 202 receives transactions such as authorization transactions from billing computer 201 and formats and forwards transactions to headend controller 203 and addressable transmitter (ATX) 208. System control computer 202 also generates system set-up parameters such as scrambled channels. System control computer 202 configures tuning frequencies of the channels provided to the subscribers and controls on-screen display as described in greater detail below. A system control computer interface is responsible for

gathering and appropriately routing the data leaving the system control computer 202. Out-of-band data is sent to addressable transmitter 208 and in-band data is sent to headend controller 203.

Addressable transmitter 208 transmits data to out-of-band subscriber terminals via a dedicated FM data channel such as a 108.2 megahertz data channel in the cable television distribution system. This channel, known as the data carrier, is used to transmit both addressable commands intended for a particular out-of-band subscriber terminal and global commands intended for all out-of-band subscriber terminals in the system. Out-of-band subscriber terminals contain a receiver that is listening to the commands sent over this data channel. Unlike the in-band transactions described in detail below, out-of-band subscriber terminals receive data over this channel no matter what channel the subscriber terminal is tuned to.

Headend controller 203 is coupled to system control computer 202 and formats system control computer transactions for scramblers 204a-204f. Headend controller 203 stores all transactions and has the ability to perform continuous refreshes. The requirement to constantly, repetitively and efficiently transmit the information base arises since there is no permanently tuned data channel for in-band data transactions. Thus, all information flow to the in-band subscriber terminals is subject to the indeterminate availability of a data path to the in-band subscriber terminals. However, to further complicate matters, some of the information is real time critical, i.e. it may pertain to events that currently in progress or it may be critical to maintenance or service changes. In other information, although less time critical in nature, may be of considerable value. Some information is pertinent only to certain of the data streams while certain information causes a write to nonvolatile memory in the in-band subscriber terminals and must be sent at minimal intervals.

Different groups of data are transmitted on a serial data channel from headend controller 203 to the scramblers. These data groups or data streams are: (1) OFF channel data, (2) barker channel data, (3) pay-per-view (PPV) channel data, (4) premium channel data, (5) scroll channel data, and (6) message channel data. Reference should be made

to U.S. Patent No. 5,058,160, incorporated herein, for details of data streams (1)-(4). Data streams (5) and (6) relate to the communication of message information from a system operator to subscribers and are discussed in greater detail in a commonly assigned application entitled "Method and Apparatus for Providing Message Information to Subscribers in a Cable Television System" (Attorney Docket No. 1263.038213) filed on an even date herewith and incorporated herein by reference. Each data stream has a unique group address that is received only by scramblers having a matching address. For instance, premium channel data may have a group address of 01, and therefore all scramblers on premium channels should have a group address of 01. Headend controller 103 determines which data is output in each data stream. In an alternative embodiment, scroll channel data and message channel data may be provided to scramblers 204e and 204f on a separate channel in order to maintain a high data rate for the information in data streams (1)-(4).

Scramblers 204a-204f are coupled to headend controller 203 and may be used to selectively scramble television signals for improved security in a subscription television system that is equipped with appropriate descramblers. The video, for example, may be scrambled in any manner known in the art including sync suppression and video inversion. For illustrative purposes only, it is assumed that scramblers 204a-204f respectively correspond only to data streams (1) - (6) identified above. The outputs of scramblers 204a-204f are respectively supplied to modulators 205a-205f. The outputs of modulators 205a-205f are supplied to combiner 206 which outputs a television signal for distribution over distribution system 208 to both in-band subscriber terminals 209 and out-of-band subscriber terminals 210. Data from scramblers, e.g., 204a, can also be provided to data inserter 207 for the transmission of in-band data on non-scrambled channels.

Figure 3 is a block diagram of scrambler 204f shown in Figure 2. Scrambler 204f receives message channel data from headend controller 203. The message channel data includes character information for display screens which may be addressed to one or more subscriber terminals for display on an associated television. Scrambler 204f

includes data circuitry 301, digital circuitry 302, analog circuitry 303, and video inversion circuitry 304. Data circuitry 301 includes line interfaces 305 and 306, synchronous data link control (SDLC) 307, microprocessor 308, and digital circuit interface 309. SDLC 307 controls communication via line interface 306 between scrambler 204f and headend controller 203. Microprocessor 308 receives and processes information from SDLC 307. Information such as message information is stored in non-volatile message memory of microprocessor 308. To ensure sufficient memory for message data, there is preferably at least 128 K of non-volatile message memory. Read/write memory of microprocessor 308 stores temporary information. Interface circuit 309 interfaces the data circuitry 301 to the digital circuitry 302.

Digital circuitry 302 includes interface circuit 310, phase locked loop 311, microprocessor 312, inversion control circuit 313, video attenuation logic 314, timing and tag information generator 315, digitized pulse generator 316, and parameter selection circuit 317. Interface circuit 310 interfaces digital circuitry 302 with data circuitry 301. Microprocessor 312 controls all essential functions and features of scrambler 204f. Microprocessor 312 extracts and processes message data from the data circuitry 301 and controls the scrambling modes of the system. Digitized pulse generator 316 generates the specific pulses placed on the sound carrier via the analog circuitry under the control of microprocessor 312. These pulses represent authorization and control information, descrambling information including timing pulses, and message information. Microprocessor 312 is also coupled to parameter selection circuitry 317 which may be a front panel display and keyboard which permits an operator to select various modes of operation, e.g., scrambling.

Analog circuitry 303 includes AM modulator 318, video attenuation circuitry 319, low pass filter 320, buffer amplifier 321, scene illumination detector 322, and synchronization separator 323. AM modulator 318 modulates the pulses from pulse generator 316 onto an audio IF signal from modulator 205f and outputs the modulated signal to modulator 205f. Video attenuation circuitry 319 selectively provides sync suppression type scrambling and attenuates a video IF

signal from modulator 205f under the control of video attenuation logic 314.

Baseband video input is filtered with low pass filter 320 which may be a sharp cut-off phase equalized low pass filter. Low pass filter 320 removes high frequency noise that could interfere with the baseband video. After filtering, the video is amplified back to its original level by video amplifier 321. Sync separator 323 extracts synchronization information which is then sent to microprocessor 312 to provide timing information such as composite and vertical sync and odd/even field indication. Scene illumination detector 322 determines the average luminance level of a scene, which level is supplied to an A/D converter of microprocessor 312. Microprocessor 312 uses this luminance information to detect scene changes in order to determine when scrambling modes may optimally be changed. The composite synchronization signal is supplied to the input of phase locked loop (PLL) 311. Phase locked loop 311 locks the system clock to the line rate.

The baseband video signal from amplifier 321 is also supplied to video inversion circuitry 304. Video inversion circuitry 304 includes automatic gain control (AGC) and DC clamping circuitry 324, split sync generator 325, and video inversion circuit 326. The AGC of circuit 324 adjusts the incoming signal to a predetermined value such as 1 V peak to peak. The DC clamping of circuitry 324 forces the bottom of the sync tip to be at ground. The output of circuitry 324 is supplied to a split synchronization circuit 325. The details of split synchronization circuitry is discussed in detail in commonly assigned U.S. Patent No. 4,924,498, incorporated herein by reference. The output of split synchronization circuitry 325 is provided to inverting circuitry 326 for inverting the baseband video about an inversion axis. Inversion is controlled in accordance with signals from inversion control circuit 313.

Scrambler 204e receives scroll channel data from headend controller 203. The scroll channel data includes character information which defines barker screens which have been designed by the system operator on system control computer 202. Scrambler 204e is

configured in the same manner as scrambler 204f but need not include a 128 K memory. Rather, a 32 K of non-volatile memory may be utilized. Scramblers 204e and 204f respectively store the scroll channel data and message channel data and continuously output the data on the corresponding scroll and message channels. Since the scroll channel data and the message channel data preferably define a plurality of barker and message screens, the stored data is output in a loop. Thus, if there are 8 barker screens, the information for the first screen is followed by the information for the second screen and so on. When the information for the eighth screen is sent, it is followed by the information for the first screen. A similar loop is established for the message channel data. Details of scramblers 204a-204d may be found in the above-identified U.S. Patent No. 5,058,160.

Figure 4 is a block diagram illustrating the components of a subscriber terminal 209 in accordance with the present invention. Although the subscriber terminal is described below as a baseband subscriber terminal, it will be apparent that other subscriber terminals such as RF subscriber terminals may be utilized. The signal from distribution system 208 is supplied to up/down converter 401. Up/down converter 401 uses a phase locked loop under the control of data and control circuit 402 to convert a selected RF input signal to a 4.5 megahertz signal. Filter 403 such as a SAW filter filters the signal. Demodulating and descrambling circuitry 404 demodulates and descrambles the filtered signal under the control of data and control circuit 402. Demodulating and descrambling circuitry 404 also performs pulse detection to recover the data modulated onto the audio carrier. The data is supplied to data and control circuit 402. Volume control of the audio is performed by demodulating and descrambling circuitry 404 under the control of data and control circuit 402 and microprocessor 410 as described in U.S. Patent No. 5,054,071, incorporated herein by reference.

The output of demodulating and descrambling circuitry 404 is an unscrambled baseband video signal which is supplied to on-screen display control circuit 406. On-screen display control circuit 406 is preferably a Mitsubishi M50556 on-screen display controller. On-screen

display control circuit 406 selectively generates on-screen character displays in place of or overlaid on the video signal. Modulator 407 converts the signal containing the video, audio, and/or characters from display control 406 on channel 3/4 which is supplied to television 408.

Microprocessor 410 controls the overall operation of subscriber terminal 400. Keyboard 411 on a front panel of subscriber terminal 209 generates subscriber supplied signals for channel tuning, volume level, and the like which are supplied to microprocessor 410. Remote receiver 415 receives commands from IR remote 412, as is well known in the art, and provides the commands to microprocessor 410. Reset circuitry 416 resets microprocessor 410 and/or data and control circuit 402 to ensure proper operation of the system if there have been power failures, power surges, and the like. When keyboard 411 or IR remote 412 is utilized to select a channel, microprocessor 410 instructs data and control circuit 402 to appropriately control up/down converter 401 to tune the selected channel. Data and control circuit 402 utilizes recovered descrambling data to generate appropriate control signals, e.g. inversion control and sync restore signals for descrambling the input television signal. Microprocessor 410 determines whether data and control circuit 402 carries out descrambling on the basis of authorizations downloaded from system control computer. LED display 413 displays channel numbers and diagnostics. NVM 414 stores data, e.g., authorizations, terminal configurations. Subscriber terminal 400 may optionally include IPPV module 417. Module 417 allows the subscriber to authorize his or her subscriber terminal to receive a pay-per-view event, store the data associated with the purchase of that event in non-volatile memory, and transmit the data to the system operator via a telephone return path or an RF return path. The subscriber is then billed for the purchased events.

Figure 5A is a block diagram of the Mitsubishi M50456 on-screen display control circuit. The on-screen display control includes character ROM 501 for storing a character set. In a preferred embodiment, the following sixty four characters are stored in character ROM 501:

blank

capital letters A-Z
 cursor — icon
 numbers 0-9
 blank volume level
 four volume level bars
 (Pound Sterling)
 [] ? - : \$ ' , . * # & +
 single character Am Pm Ch

Display RAM 502 is set with data from microprocessor 410 via serial input S_{IN} to generate on screen displays using these sixty four characters. This data may be provided from a number of sources. A first source is message data from message channel data scrambler 204f. A second source is scroll channel data from scroll channel data scrambler 204e. A third source is barker data from ROM of subscriber terminal microprocessor 410. Another source of display information is menu screen information stored in microprocessor ROM 420. The use of such memory screens is described in greater detail in a commonly assigned application entitled "Method and Apparatus for Providing an On-Screen User Interface for a Subscription Television Terminal" (Attorney Docket No. 1263.038211), incorporated herein by reference. Reference may also be made to Scientific Atlanta Publication No. 69P2837 entitled: Model 8600 Set Top Terminal User's Guide" available from Scientific Atlanta and incorporated herein. Display RAM 502 includes 240 memory locations for characters to be displayed on television 408. As shown in Figure 5B, each memory location includes a blinking bit which determines whether the character is blinking, character color bits which determine the color of the character, and a character code identifying one of the characters stored in ROM 501. The configuration of the on-screen display is shown in Figure 5C and can be seen to consist of ten rows of twenty four characters each. The information in display RAM 502 determines what appears at each of the screen positions 1-240.

There are three modes of on-screen display control circuit. The first mode simply provides the video of a selected channel. The second mode is a video overlay mode in which character information is

overlaid on the video of a selected channel. The second mode may be used for example to display time, channel number, and channel identification information when a subscriber tunes to different channels. Channel identification information is described in a commonly assigned copending application entitled "Method and Apparatus for Displaying Channel Identification Information" (Attorney Docket No. 1263.038212), filed on an even date herewith and incorporated herein by reference. The third mode is a character mode in which character information is presented on a plain background. This mode is preferably used for messages, for example.

It will be apparent that a system operator may utilize either mode to display information to subscribers and the present invention is not limited to with respect to whether information is presented on a solid background or overlaid onto a video signal.

Addressable message transaction transmissions for on-screen display may be forwarded to subscriber terminals in the cable system using message scrambler 204f. Figure 6A illustrates a message transaction transmission for forwarding characters to subscriber terminals. Each message transaction transmission has a display number field associated therewith for identifying a message. In accordance with a present embodiment, the display numbers may range from 0 to 65535, although the invention is not limited in this respect. Additionally, a subset of the display numbers, for example from 0 to 7, are reserved for barker text downloaded by scroll channel scrambler 204e as discussed in greater detail below. Each message may include up to sixteen screens, each screen having 240 characters. The characters for each screen are sent in up to eleven sequenced transactions such as illustrated in Figure 6A. A sequence number field identifies the transaction transmissions in the sequence of transaction transmissions. The transaction transmissions also include a screen number field for identifying the screens in a sequence of screens and a last screen flag for identifying the last screen in a sequence of screens. If the message is less than 240 characters and message scrambler 204f is configured to transmit variable length messages, fewer transaction transmissions need to be sent to complete the message. The message transaction

transmission shown in Figure 6A may then also include a last transaction flag. As discussed in U.S. Patent No. 5,058,160, the rate at which transactions are sent is 29 transactions per second. At this transaction rate, slightly more than three seconds is required to send eight 240 character messages over the same message channel. Accordingly, the average wait to start receiving one of these messages is approximately 1.5 seconds.

The message channel utilizes a scrambler configured as scrambler 204f with internal data RAM which stores the message loop from headend controller 103 and retransmits it constantly to the subscriber terminals under the control of microprocessor 312. The serial nature of the system is such that as the number of messages in the message loop increases, the response time for a subscriber to receive a message increases. Additional message channels may be utilized to speed up the response time.

The message transaction also permits a system operator to instruct on-screen display control circuit 406 to blank the display on television 408 until the entire screen is received and ready for display. Alternatively, on-screen display control circuit 406 may display the characters as they are received until the message is completed.

A message definition transaction transmission is depicted in Figure 6B. An ID field identifies the transaction transmission as a message definition. This transaction transmission indicates that a message has been sent to the subscriber terminal. The messages may be individually addressed or addressed to members of a group of subscriber terminals defined by the address data. Using a downloaded transaction, a subscriber terminal can be assigned to one or more groups. In a preferred embodiment, 64 groups are defined, but the invention is not limited in this respect. The message definition transaction defines a background color field for setting the background color of the on-screen display and a tuning field which instructs the terminal which channel to tune to receive the message which, in this example, is the message channel. When a subscriber terminal receives a message definition transaction transmission which is addressed to it or to any group of which it is a member, a message alert in accordance

with the alert data field may be provided. The subscriber may view the message by use of a menu structure described in a commonly assigned application entitled "Method and Apparatus for Providing an On-Screen User Interface for a Subscription Television Terminal" (Attorney Docket No. 1263.038211), incorporated herein by reference. In order to obtain the message, data and control circuit 402 of the subscriber terminal tunes up/down converter 401 to the channel defined by the tuning field and searches for a message transaction transmission with the same display number as in the message definition transaction transmission. In a preferred embodiment, the tuning data instructs the subscriber terminal to tune either the channel currently tuned, one of the message channels, the scroll channel, or the OFF channel to retrieve the appropriate message. The message definition transaction transmission of Figure 6B is preferably sent on all datastreams output by headend controller 103 in order to most quickly inform a subscriber that he or she has a message.

Although multiple messages may be sent to a subscriber terminal, each subscriber terminal only maintains one pending message definition transaction. This is the message obtained by using the menu structure referenced above. As long as messages are not read, the pending message definition is updated as new message definition transactions are received. The priority of this update is in accordance with the display number in the message definition transaction, such that for two unread messages, the lower display number is read first. A message that has not been read always has priority over a message which has been read.

When a subscriber terminal receives a message definition transaction defining a message for that subscriber terminal, a message alert may be provided. For example, microprocessor 410 may control a segment of LED display 413 to blink on and off. The LED alert ends when the last screen of the message is received and if there are no more active unread messages for the subscriber terminal. The message definition may include data which instructs microprocessor 410 to generate an on-screen message alert. If such data is included in the message definition transaction, an on-screen message alert such as that

in Figure 7 will overlay the video until a key on keyboard 411 of the subscriber terminal or remote control 412 is pressed. Preferably, the character codes and layout of the on-screen message alert are stored in ROM of microprocessor 410. The message definition transaction instructs microprocessor 410 to supply the appropriate character codes and layout information to on-screen display control 406. No alert may be given and no messages received if the subscriber terminal is not tuned to a channel with data.

When the message is displayed, it remains on the screen until the user changes the screen. If there are multiple screens, the subscriber may cycle through all message screens and back to the beginning as many times as desired. At each new screen, there will be a waiting time until the appropriate screen is retrieved. When the last screen of a message has been received, the message is defined as being read. After all active messages have been read, the messages can be reread.

Messages are transmitted for a period of time configured by the headend so that message channel data is minimized. An active message control transaction from the headend flags all groups with active messages is sent periodically. This controls message expiration.

As noted above, a subset of the message transactions may be used for barkers, i.e., message transaction transmissions having display numbers of 0-7 associated therewith. It will be apparent that more or less barkers may be used. It is desirable that a system operator provide specific information to a subscriber concerning, for example, his inability to view a particular channel. Such specific information promotes a user friendly interface with the subscriber. A number of conditions exist for which such barkers are useful. Barkers may tuned if a subscriber terminal is

1. is OFF
2. is tuned to a non-existent channel
3. is not authorized for a channel
3. has timed-out, i.e, has been disconnected from the cable for longer than a predetermined period of time
4. has been tampered with

5. tunes a parentally controlled channel
6. tunes a pay-per-view channel without a preview
8. tunes an IPPV channel with no free time
9. has a full IPPV event memory
10. is turned ON

In accordance with the present invention, one method of providing barkers to subscribers is through the use of downloaded text barkers using the scroll channel output of scrambler 204e. The scroll channel is a dedicated data channel which only sends transactions that define downloaded text barkers. These downloaded text barkers are defined by the system control computer and downloaded to the subscriber terminal. Each text barker may include up to 16 pages, each page including 240 characters. Although barkers are a subset of messages utilizing a predetermined range of display numbers, they are preferably transmitted on the separate scroll channel so that other data streams, including message data, are not affected.

A barker transaction transmission is illustrated in Figure 6. The transaction transmission includes an identification identifying it as a barker transaction transmission and information regarding each of the barker conditions specified above. For each condition, the transaction transmission includes a background color field for setting the background color on which the barker information is presented. The information may be presented on one of a number of different solid colors such as low intensity blue, high intensity blue, black, green, blue, red, and magenta. Alternatively, the information may be overlaid onto the video information. The transaction transmission also includes a field identifying where the appropriate barker information may be found. The information may be found on a six megahertz video channel, the scroll channel, or in the read only memory 420 of microprocessor 410, as set forth in greater detail below. The transaction transmission also includes the display number for the barker screen or screens as discussed above.

The transaction also identifies the channel which is tuned after the scroll channel data is obtained. The final channel tuned may be the selected channel, the video barker, the scroll channel, or the OFF

channel. As noted above, microprocessor 410 preferably instructs on-screen display control circuit 406 to present barkers on a solid background, the color of the background being determined in accordance with the instructions contained in the barker transaction. Accordingly, it does not matter what channel is tuned by the up/down converter. Accordingly, the up down converter may be set to any channel after the barker screen information is retrieved. This is a useful feature since it allows a system operator to instruct the subscriber terminal to tune to a data channel while the subscriber is viewing a barker. The subscriber terminal then has an opportunity to receive any data addressed to it. This is particularly beneficial if, for example, a pay-per-view type barker is being viewed. Thus, it may be that the subscriber is awaiting authorization for some event. Thus, the barker transaction may instruct microprocessor 410 to control ASIC 202 to set up/downconverter 201 to the data channel having fast-poll pay-per-view authorization data. This allows a subscriber to quickly obtain authorization information. By instructing the subscriber terminal to tune a particular data channel upon the viewing of a particular barker, the system operator can connect the subscriber terminal to a data channel most likely to quickly provide data such as authorizations. Thus, the barker transaction includes two tuning instructions. The first instructs the subscriber terminal to tune to where the barker information may be found. The second instructs the subscriber terminal to tune to where other information may be found.

Thus, in accordance with the present invention, downloaded text barkers are forwarded from the headend. Since the barker information characters are sent via a data transaction, a video barker channel is not necessary and the cable operator can utilize the valuable channel capacity. Although long response times could arise if the transactions containing the barker channel characters were interleaved with other transactions in the system, this may be overcome by the utilization of a separate scroll channel for the barkers. This channel includes only the barker transactions and no others.

Also in accordance with the present invention, barker information may be provided using a six megahertz video channel.

Finally, barker information may be generated from screens stored in ROM. As noted above, a number of conditions exist for which a barker screen is desirable. A number of these conditions are routine. Accordingly, in accordance with the present invention, information for generating a number of barker screens is stored in read only memory of microprocessor 410. When a subscriber selects a channel requiring one of these ROM barkers, the barker transaction instructs microprocessor 410 that the screen characters are in ROM and provides the appropriate display number. Microprocessor 410 uses the display number to retrieve the appropriate character codes and other display information which is then provided to on-screen display control 406. As noted above, if downloaded text barkers are utilized, the barker transaction instructs microprocessor 410 that the screen characters are on a data channel and provides the appropriate display number. Microprocessor 410 tunes the subscriber terminal accordingly and uses the display number to retrieve the barker data. However, with ROM barkers, there is no delay while waiting for data. Further, as with the downloaded text barkers, there is no need of a six megahertz video barker channel and thus channel capacity for other programming is increased. Various ROM barkers may be implemented.

An OFF barker such as illustrated in Figure 9A may be presented when the subscriber terminal is OFF. Since the subscriber terminal is OFF, the OFF barker is simply a blank screen. As discussed in greater detail in the above-identified U.S. Patent No. 5,058,160, when a subscriber terminal is switched OFF, an OFF channel is tuned for the purpose of receiving in-band data.

An INVALID CHANNEL barker such as illustrated in Figure 9B may be presented when a subscriber selects a channel which does not appear in the cable system. Thus, a subscriber is informed that a particular channel is not available.

A NOT AUTHORIZED barker such as illustrated in Figure 9C may be presented when a subscriber selects a channel having a premium service which the subscriber has not ordered. Thus, a subscriber is informed that he or she has not ordered a particular channel. It is noted that this barker uses the channel identification

information HBO which is described in greater detail the the above-referenced commonly assigned application.

A TIME-OUT barker such as illustrated in Figure 9D may be presented if the subscriber terminal does not periodically receive a refresh signal transmitted from the headend. The refresh period is globally controlled by the headend. Thus, a subscriber is informed that he or she should check the connection of the input cable to the terminal in order to ensure proper operation.

A TURN-ON barker such as illustrated in Figure 9E may be presented every time a subscriber terminal is switched ON. The barker is cleared when the subscriber changes the channel.

A PARENTAL CONTROL barker such as shown in Figure 9F may be presented when a subscriber selects a channel which is under parental control. This barker is cleared when parental control of the channel is released such as by entry of an appropriate parental code number. Thus, a subscriber is informed that a particular channel is under parental control. It is noted that this barker uses the channel identification information HAPY which is described in greater detail the the above-referenced commonly assigned application.

A TAMPER barker such as illustrated in Figure 9G may be presented when the microprocessor of the subscriber terminal detects tampering. As can be seen, this barker is blank.

The PPV barker such as illustrated in Figure 9H may be presented when a subscriber selects a channel showing a pay-per-view event and no preview time is remains or has been provided. If the user calls and buys the event, the headend will authorize the subscriber terminal and the event may be viewed. This barker may also be presented when an IPPV channel is selected and an event is not purchasable, i.e., it is outside the purchase window. Thus, a subscriber is informed that a particular channel may not be viewed since it contains pay-per-view or impulse pay-per-view events. It is noted that this barker uses the channel identification information PPV1 which is described in greater detail the the above-referenced commonly assigned application.

The IPPV - NO PURCHASE barker such as illustrated in Figure 9I may be presented when a subscriber attempts to purchase an IPPV event and he or she is not permitted to make any additional purchases. This situation may arise, for example, when a subscriber has not paid for recent IPPV purchases or recent IPPV purchases have not been reported back to the billing computer. Thus, a subscriber is informed that he or she is unable to purchase any additional IPPV events.

The IPPV HELP barker such as illustrated in Figure 9J may be presented when the subscriber selects a channel showing an IPPV event and the purchase window is still active. Thus, a subscriber is informed that he or she can purchase the event being shown on the selected channel. It is noted that this barker uses the channel identification information HTCH which is described in greater detail in the above-referenced commonly assigned application.

It will be apparent that the above-identified ROM barkers are merely representative of a currently preferred embodiment and the present invention is not limited in this respect.

It is to be understood that the invention is not limited to the illustrations described and shown herein which are deemed to be merely illustrative. The invention rather is intended to encompass all such modifications which are within its spirit and scope as defined by the appended claims.

WE CLAIM

1. A subscriber terminal apparatus for a television in an in-band subscription television system, comprising:

a receiver for receiving a television signal including video, audio, and data information;

selecting means for selecting a channel of said television signal;

a memory for storing a plurality of barker screens providing messages regarding one or more channels of said television signal;

an on-screen display control circuit for controlling the display of said barker screens on said television; and

processing means for retrieving a barker screen from said memory and supplying the retrieved screen to said on-screen display control circuit if the barker screen provides a message regarding a selected channel.

2. A method of displaying information on a television, the method comprising the steps of:

receiving a television signal including video, audio, and data information;

selecting a channel of said television signal;

storing a plurality of barker screens providing messages regarding one or more channels of said television signal; and

retrieving a stored barker screen and supplying the retrieved screen to said television if the barker screen provides a message regarding a selected channel.

3. A subscriber terminal apparatus for a television in an in-band subscription television system, comprising:

a receiver for receiving a television signal including video, audio, and data information;

selecting means for selecting a channel of said television signal;

an on-screen display control circuit for controlling the display of character information on said television;

a tuner for tuning a channel of said television signal having in-band character data providing messages regarding one or more channels of said television signal; and

processing means for tuning said tuner to retrieve character data and for supplying the retrieved character data to said on-screen display control circuit if the in-band character data relates to a selected channel.

4. A method of displaying information on a television, the method comprising the steps of:

receiving a television signal including video, audio, and data information;

selecting a channel of said television signal;

tuning to a channel of said television signal having in-band character data if the in-band character data relates to a selected channel; and

supplying the character data to said television.

1/8

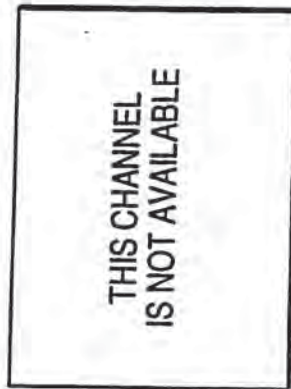


FIG. 1

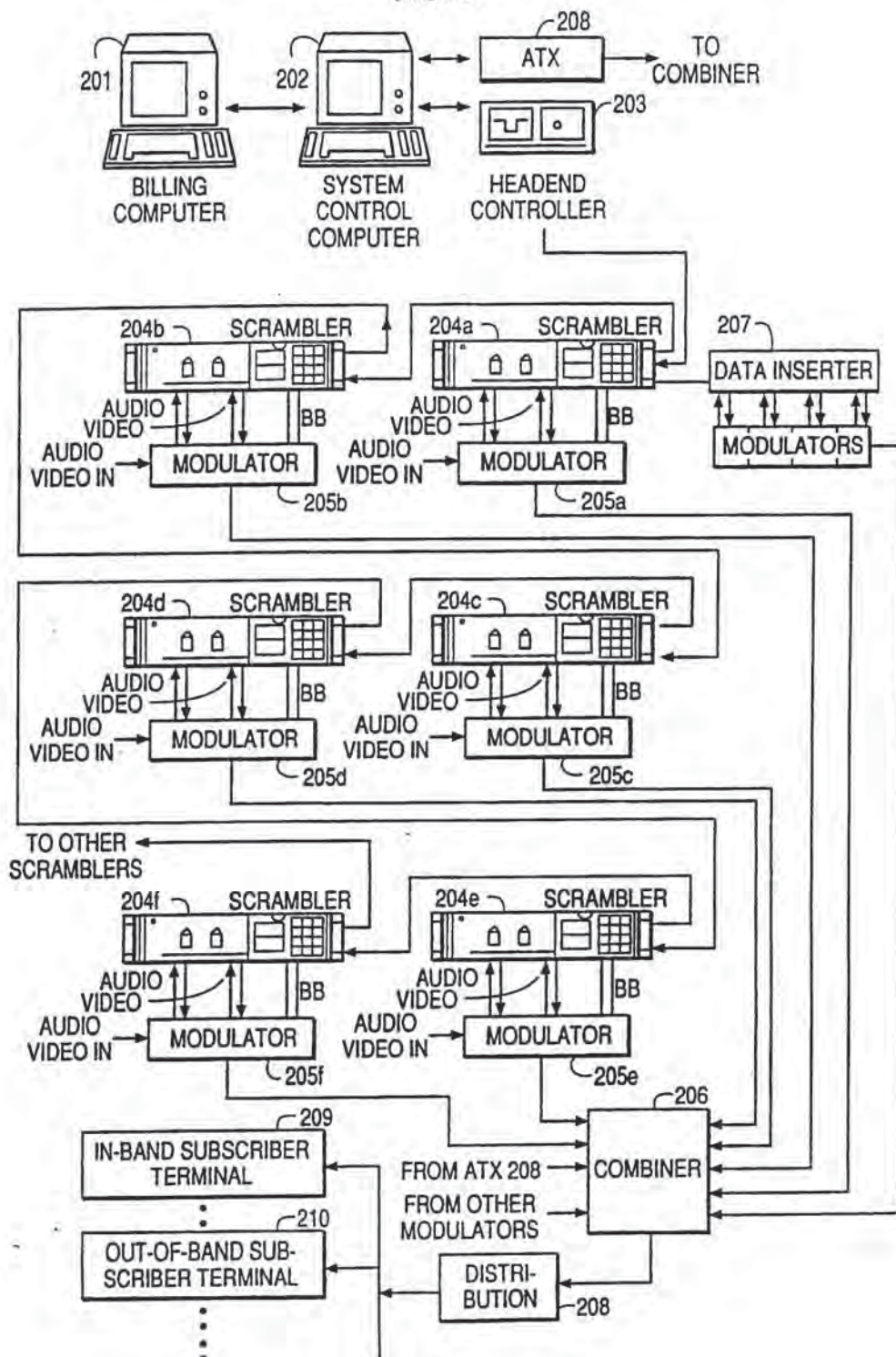


FIG. 7

ID	COND. 1	COND. 2	COND. 3	COND. 4	COND. 5	COND. 6	COND. 7	COND. 8	COND. 9	COND. 10
BACK- GROUND COLOR	BARKER LOCATION	DISPLAY NUMBER	FINAL TUNE CHANNEL							

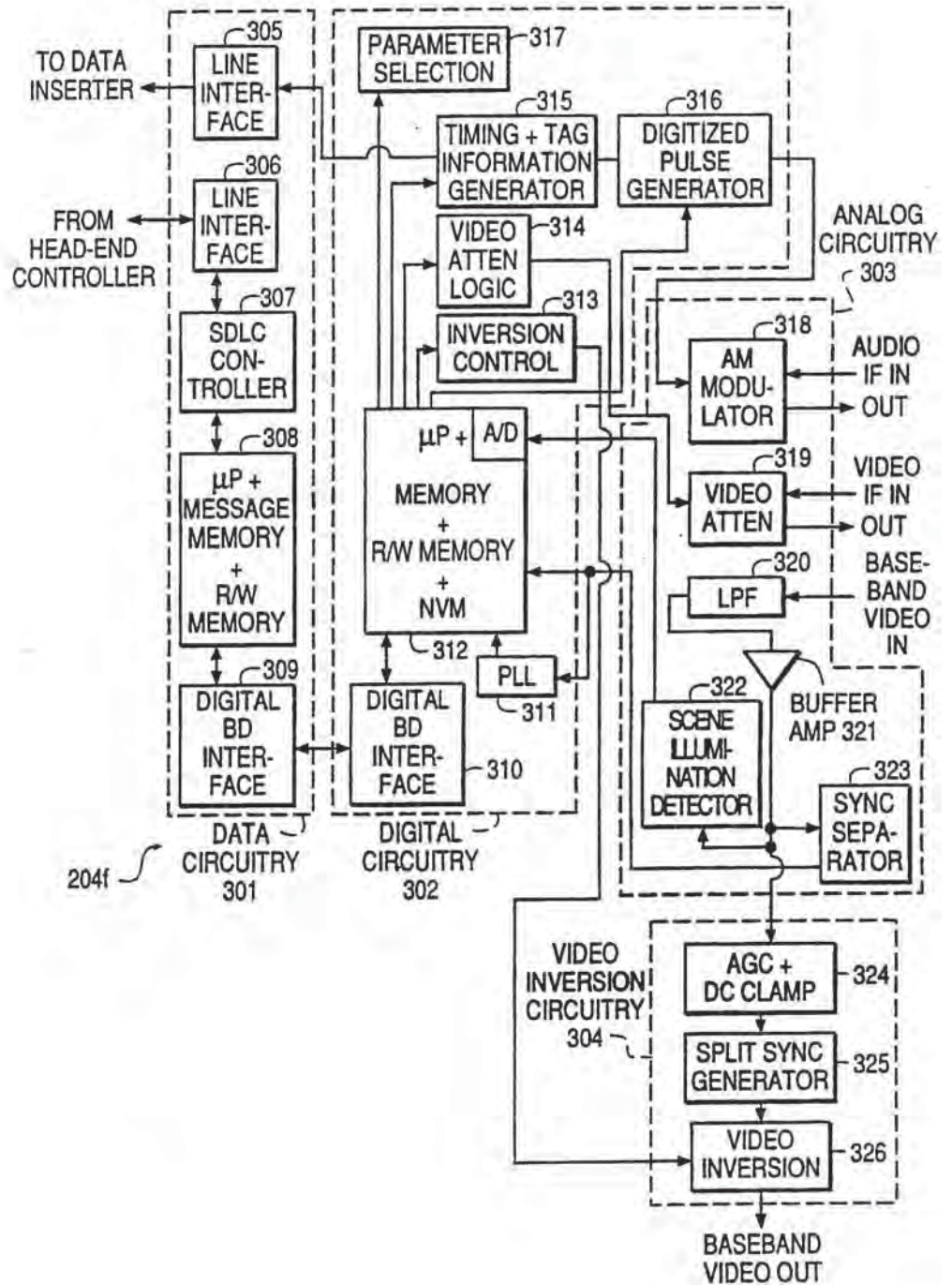
FIG. 8

FIG. 2



3 / 8

FIG. 3



4 / 8

FIG. 4

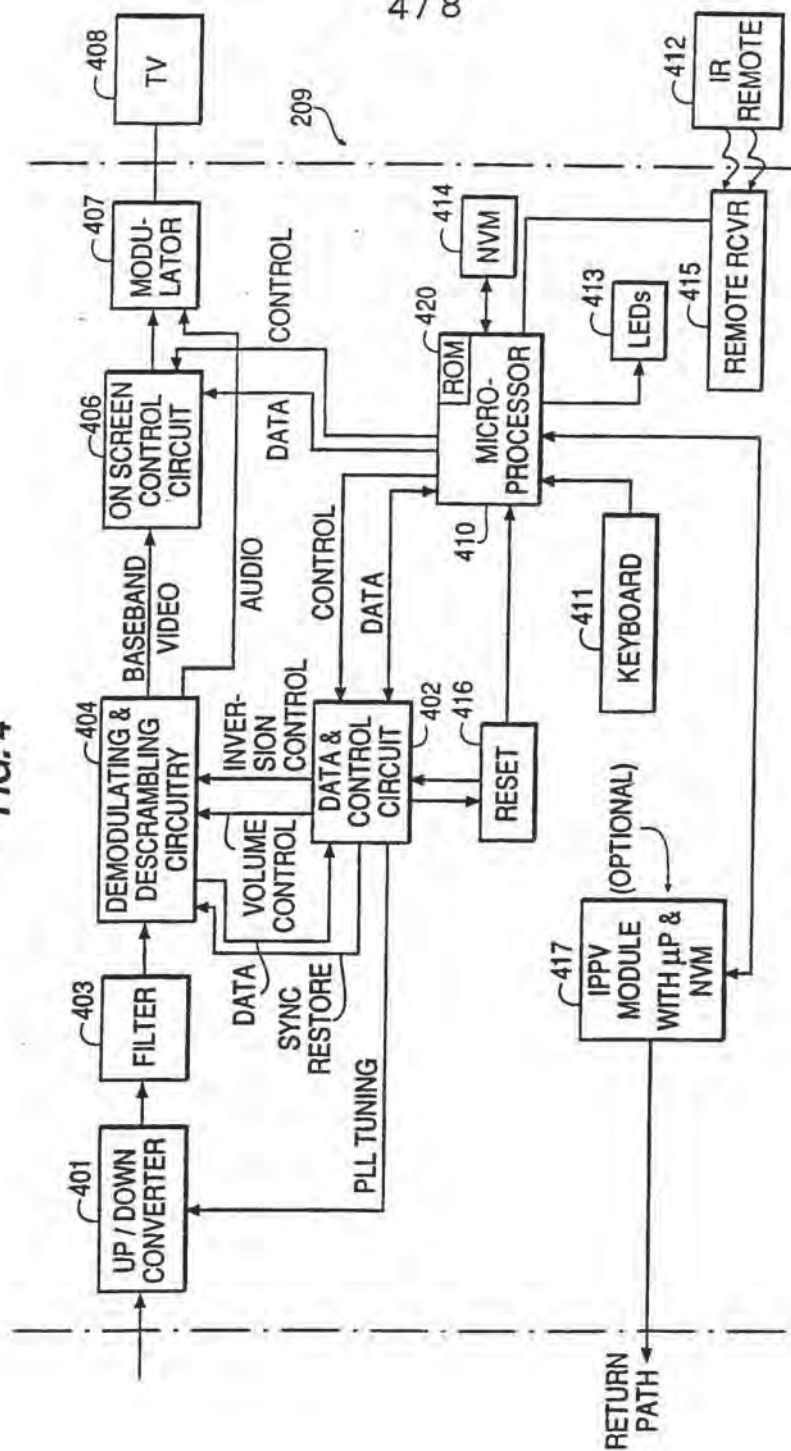


FIG. 5A(1)

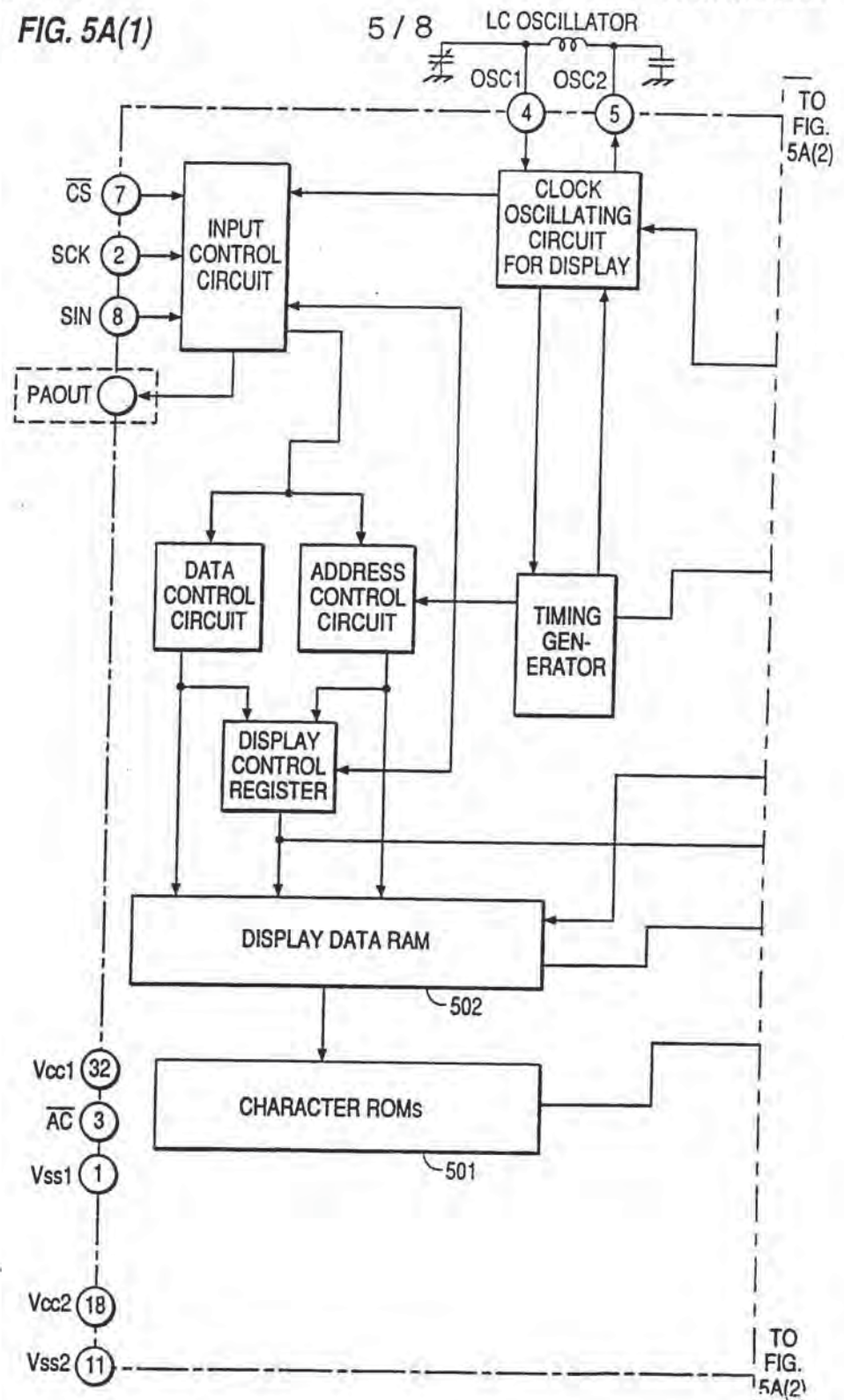
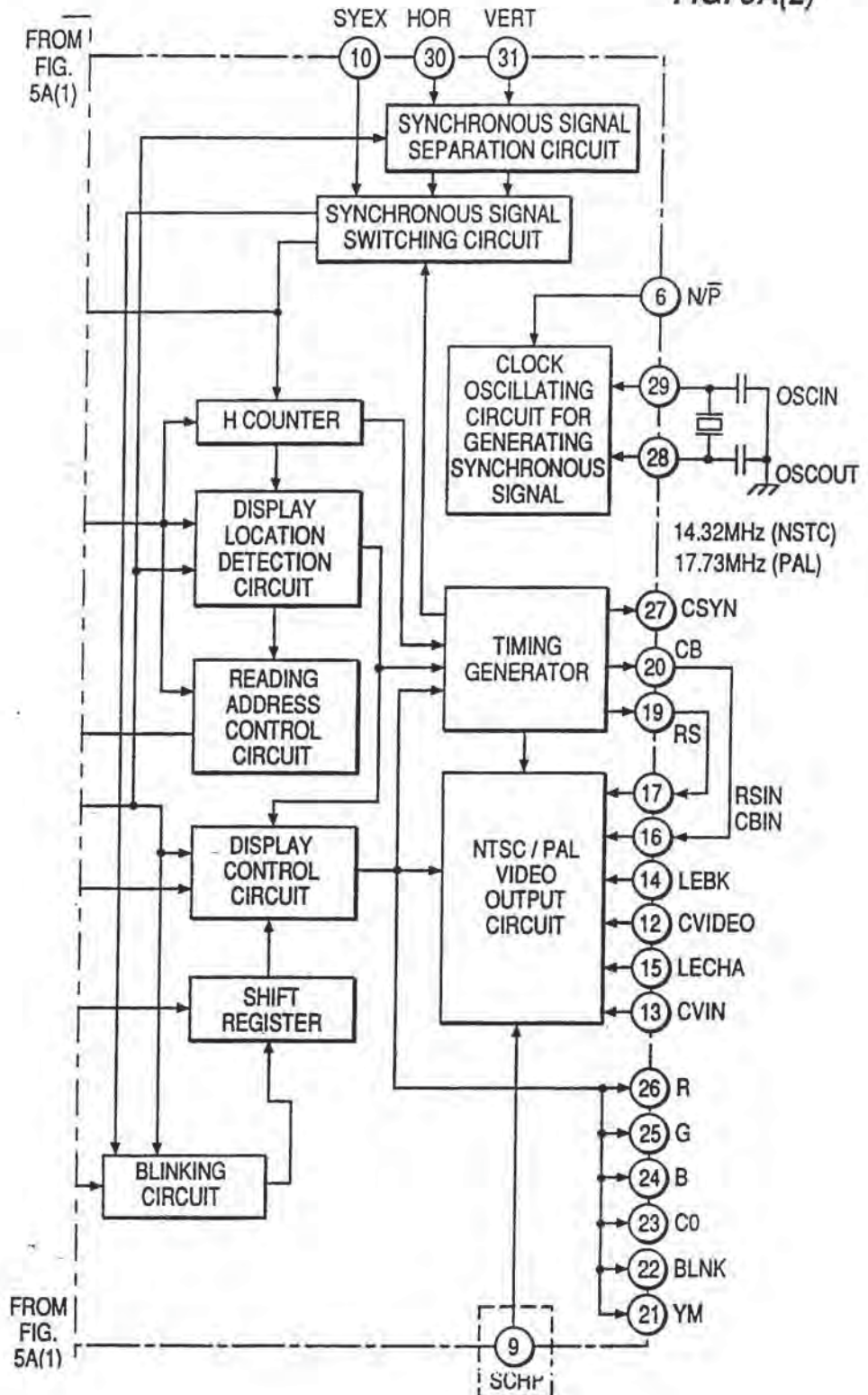


FIG. 5A(2)



CHARACTER COLOR BITS	BLINKING BIT	CHARACTER CODE
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FIG. 5B

DISPLAY NUMBER	SCREEN NUMBER	LAST SCREEN FLAG	SEQUENCE NUMBER	CHARACTERS
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FIG. 6A

ID	ON SCREEN ALERT DATA	DISPLAY NUMBER	BACKGROUND COLOR	TUNING DATA	MESSAGE EXPIRATION	ADDRESS DATA
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FIG. 6B

7/8

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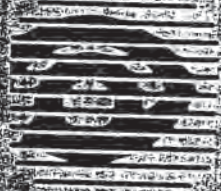
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168
169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192
193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216
217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240

FIG. 5C

RECEIVED

JAN 5 1993

GROUP 260



INSIGHT
MAGAZINE

32

GROUP 260

JAN 5 1993

RECEIVED

MON 2 7:30P MIDNIGHT RUN 2:30P

M MIDNIGHT RUN 2 HRS 30 MINS

T A BOUNTY HUNTER TRIES TO ELUDE THE
T MOB, THE FBI AND ANOTHER BOUNTY HUNTER
T WHILE TRANSPORTING A BAIL-JUMPING
T ACCOUNTANT BACK TO CALIFORNIA. >>
W ROBERT DE NIRO, CHARLES GRODIN, YAPHET
W KOTTO

W ***=CRITIQUE. 1983. OTHER MOVIES.
T ACTION. COMEDY. R-RESTRICTED.
T PROFANITY. MATURE THEMES.

3:25P MON JAN 4

GERALDO 55 MINS LEFT

THE REAL AMY FISHER STORY: TEENAGER AMY
FISHER'S SECRET LIFE AS AN ESCORT GIRL
LEADS TO HER AFFAIR WITH A MARRIED MAN
AND A PLOT TO KILL HIS WIFE.

TALK.

3:05P MON JAN 4

MON 2 7:30P MIDNIGHT RUN 2:30P

M MIDNIGHT RUN 2 HRS 30 MINS

T A BOUNTY HUNTER TRIES TO ELUDE THE
T MOB, THE FBI AND ANOTHER BOUNTY HUNTER
T WHILE TRANSPORTING A BAIL-JUMPING
T ACCOUNTANT BACK TO CALIFORNIA. >>
W ROBERT DE NIRO, CHARLES GRODIN, YAPHET
W KOTTO

W ***=CRITIQUE. 1983. OTHER MOVIES.
T ACTION. COMEDY. R-RESTRICTED.
T PROFANITY. MATURE THEMES.

3:25P MON JAN 4

MON 2 7:30P MIDNIGHT RUN 2:30P

M MIDNIGHT RUN 2 HRS 30 MINS

T A BOUNTY HUNTER TRIES TO ELUDE THE
T MOB, THE FBI AND ANOTHER BOUNTY HUNTER
T WHILE TRANSPORTING A BAIL-JUMPING
T ACCOUNTANT BACK TO CALIFORNIA. >>
W ROBERT DE NIRO, CHARLES GRODIN, YAPHET
W KOTTO

W ***=CRITIQUE. 1983. OTHER MOVIES.
T ACTION. COMEDY. R-RESTRICTED.
T PROFANITY. MATURE THEMES.

3:25P MON JAN 4

PENDING RECORDINGS

5 GOLDEN GIRLS 1/04 4:00P :30

GOLDEN GIRLS
MON 4:00P 30 MINS

TO CATCH A NEIGHBOR: POLICE SET UP
SURVEILLANCE EQUIPMENT TO STAKE OUT A
NEIGHBOR WHO IS A JEWEL THIEF, BUT
BLANCHE AND DOROTHY WOULD RATHER SNARE
THE POLICE OFFICERS. >> BEA ARTHUR.
BETTY WHITE, RUE MCCLANAHAN

CLOSED CAPTION.

3:23P MON JAN 4

PENDING RECORDINGS	
2	MIDNIGHT RUN 1/04 7:30P 2:30
3:28P MON JAN 4	

JAN 4	MON TUE WED THU FRI SAT SUN	3:30P	4:30P
2	TOM & JERRY	STEVEN SPIEL	BATMAN: THE
4	GERALDO	MAURY POVICH	
5	COSBY SHOW	GOLDEN GIRLS	INSIDE EDITI
	OPRAH WINFRE	DONAHUE	
9	MACNEIL/LEHR	BARNEY & FRI	SESAME STREE
10	GERALDO	OPRAH WINFREY	
11	HEAD OF THE	CHEERS	HARD COPY
14	CADENAS DE A	CRISTINA	
20	BARNABY JONE	BONANZA	
25	CMC WITH MIMI	CHEN	UN INVIA TO M
35	HIGHWAY TO	IMMORTALITY	
44	TALE RECORD	REQUEST ACCEPTED	TROOP
5	KPIX-CBS	3:30P	MON JAN 4

MON (2)	7:30P	MIDNIGHT RUN	2:30P
MON 4	8:00P	PURE LUCK	2:00
MON 48	11:00P	MOJADOS DE CORAZON	2:00
TUE 7	1:30A	THE FOUR DEUCES	2:00
TUE 48	10:00A	LAS LOCURAS DEL PROFE	2:00
TUE 48	12:00P	ROBIN AND THE SEVEN H	2:30
TUE 48	1:00P	LA NIÑA POPOFF	2:00
WED 48	10:00A	MATENAL LEON	2:00
WED 48	9:00P	JUAN CHARRASQUERO/GA	2:00
WED 48	11:00P	CINCO MACOS ASALTAN L	2:00
THU 48	10:00P	RECORD REQUEST ACCEPTED	2:00
THU 44	1		
3:26P			MON JAN 4



MOVIES		
OTHER MOVIES	135	
DRAMA	50	
COMEDY	36	
ACTION	14	
ADVENTURE	12	
WESTERN	9	
MYSTERY	6	
SUSPENSE	6	
THRILLER	4	
ROMANCE	5	
TELEVISION	5	
3:20P MON JAN 4		

MON TUE WED THU FRI SAT SUN		
JAN 4	3:00P	3:30P 4:00P
2	MERRIE MELODY & JERRY	STEVEN SPIEL
4	GERALDO	MAURY POVICH
5	DESIGNING NO COSBY SHOW	GOLDEN GIRLS
6	OPRAH WINFREY	DONAHUE
9	MACNEIL/LEHRER NEWS HOUR	BARNEY & FRI
10	GERALDO	OPRAH WINFREY
11	GROWING PAIN HEAD OF THE	CHEERS
14	CADENAS DE AMARGURA	CRISTINA
20	BARNABY JONES	BONANZA
26	LITTLE PRINCE CHC WITH MIMI CHEN	MATLOCK
36	HIGHWAY TO HEAVEN	
43	CHIP 'N' DAL TALE SPIN	DARKWING DUC
3:16P MON JAN 4		

MON TUE WED THU FRI SAT SUN		
MON 2	7:30P MIDNIGHT RUN	2:30
MON 4	8:00P PURE LUCK	2:00
MON 4B	11:00P MOJADOS DE CORAZON	2:00
TUE 7	1:30P THE FOUR DEUCES	2:00
TUE 4B	10:00P LAS LOCURAS DEL PROFE	2:00
TUE 44	12:00P BOB IN AND THE SEVEN H	2:30
TUE 4B	1:00P LA NINA POPOFF	2:00
WED 4B	10:00P MARTEN AL LEON	2:00
WED 4B	9:00P JUAN CHARRASQUERO/GA	2:00
WED 4B	11:00P CINCO MACOS ASALTAN L	2:00
THU 4B	10:00P DOORABLES CRIMINALES	2:00
THU 44	12:00P FLAP	2:00
3:22P MON JAN 4		

PENDING RECORDINGS		
5	GOLDEN GIRLS	1/04 4:00P :30
2	MIDNIGHT RUN	1/04 7:30P 2:30
5	GOLDEN GIRLS	1/05 4:00P :30
5	GOLDEN GIRLS	1/06 4:00P :30
5	GOLDEN GIRLS	1/07 4:00P :30
3:31P MON JAN 4		



THEMES		DATE
CHILDREN/EDUCATION/SCIENCE		
CRIME/DRUGS		
ENTERTAINMENT/VARIETY		
MOVIES		
NEWS/TALK/MAGAZINE		
OPENING CREDITS		
PRERECORDED SPORTS		
SAFE BLOCK		
ACTION/MYSTERY/HORROR		
RELIGION		
MISCELLANEOUS		

3:18P MON JAN 4

