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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

UNIFIED PATENTS INC.
Petitioner

v.

AUTOLOXER LLC

IPR2017-01271
Patent 7,084,735

DECLARATION OF ROBERT LEALE

U.S. PATENT NO. 7,084,735 – CLAIMS 1–3, 5, 6, and 28

TABLE OF CONTENTS

I, Robert Leale, declare as follows:

I. INTRODUCTION

1. My name is Robert Leale. I have worked on vehicle network systems for approximately 20 years. Working on vehicle network systems has been a hobby of mine since I was a teenager.

2. Between 1997 and 2003, I was a PC technician for a local school district. I also installed my first vehicle data system into an automobile in 1997.

3. I received B.A. degrees in Communications and French Language from Grand Valley State University in 2003.

4. In 2004, I worked as a network technician for IBM, where I assisted in the day-to-day maintenance of Dow Chemical's world-wide server infrastructure.

5. Since 2005, I have worked as an engineer. Between 2005 and early 2010 I worked as an Application Engineer at Intrepid Control Systems, Inc., where I primarily assisted customers, including major vehicle manufacturers such as General Motors, Ford, and Chrysler, with solving problems relating to the integration of vehicle network systems.

6. In 2010, I started my own company, CanBusHack, Inc., and I have served as President since that time. CanBusHack assists its customers in understanding vehicle data systems through, among other things, Can Bus reverse

engineering, security algorithm extraction, embedded system firmware extraction and analysis, and total vehicle data assessment.

7. Since 2005, my work has regularly involved analyzing products created by my clients' competitors for comparison and, in some cases, to determine whether there are concerns about patent infringement.

8. Between 2011 and 2013, I taught three courses on reverse engineering of vehicle data systems.

9. I am a member of the Society of Automotive Engineers and the Special Equipment Manufacturers Association.

10. I have been retained by Unified Patents Inc. ("Unified") as an independent expert consultant in the field of vehicle communication networks. I am being compensated for the time I spend on this matter, but my compensation is not dependent on and in no way affects the substance of my statements in this declaration.

11. In forming my opinions as set forth herein, I have relied upon my education, training, and experience in the engineering of vehicle data systems and related technology and applications. A copy of my curriculum vitae is attached as Exhibit A.

12. I am not an attorney and offer no legal opinions, but in my work, I have had experience studying and analyzing patents and patent claims from the

perspective of a person skilled in the art, and have considered patent infringement concerns regarding client and client competitor products.

13. I have reviewed the specification and claims of U.S. Patent No. 7,084,735 to Michael Kapolka (the "'735 patent").

14. I have also reviewed and understand the following references, all of which I understand to be prior art to the '735 patent:

i. U.S. Patent No. 6,253,143 ("*Silvernagle*") (EX1002); and

ii. U.S. Patent No. 5,839,534 ("*Chakraborty*") (EX1003);

15. I have been asked to consider whether the references listed above in paragraph 14 disclose or suggest the features recited in the claims of the '735 patent. I have also been asked to consider the state of the art and the prior art available before time of the alleged invention. My opinions are provided in this declaration.

16. To the best of my knowledge, I have no financial interest in Petitioner. Petitioner's counsel has informed me that Autoloxer LLC purports to own the '735 patent. To the best of my knowledge, I have no financial interest in Autoloxer LLC, and I have had no contact with Autoloxer LLC, or the named inventor of the patent, Michael Kapolka. To the best of my knowledge, I similarly have no financial interest in the '735 patent. To the extent any mutual funds or other investments I own have a financial interest in the Petitioner, Unified Patents Inc., or the '735

patent, I am not aware of, nor do I have control over, any financial interest that would affect or bias my judgment.

II. TECHNOLOGY BACKGROUND

A. Vehicle Network Systems

17. Prior to the time of the alleged invention, network systems were known for interconnecting electrical components within a vehicle. These vehicle network systems provided for communication of messages between various on-vehicle computing devices. For example, prior to the time of the alleged invention, vehicles typically had electronic modules with microprocessors for controlling one or components of a vehicle. Examples of electronic modules included engine control modules (ECMs), transmission control modules (TCMs), anti-lock braking system (ABSs), and body control modules (BCMs). Centralized networks were designed to allow these modules to communicate data amongst themselves during operation of a vehicle. For example, the ECM could then inform the TCM of the engine speed, and the TCM could inform other modules of gear shifts.

18. Standard protocols were developed for communicating messages over these vehicle network systems. One example of an early standard vehicle protocol is SAE J1922. *See* SAE J1922, Powertrain Control Interface for Electronic Controls Used in Medium and Heavy-Duty Diesel On-Highway Vehicle Applications ("SAE J1922"), 1989 (EX1015). SAE J1922 provided for standard message formats for communicating control parameters between microprocessors controlling an engine,

transmission, antilock braking system (ABS)/traction control, and retarder systems. These messages included, for example, a message for limiting a speed of the engine, and a message for limiting an available torque for a current engine speed. SAE 1922 at 7, 8 (EX1015). With the implementation of standard network protocols on vehicles, modules could be designed to be compatible with the standard. A compatible module could then be "plugged" into the network with the expectation that the module would be capable of communicating with other modules on the network.

B. Electronic Control Units

19. Prior to the time of the alleged invention, it was common to include electronic control units (ECUs) within a vehicle to control various components of the vehicle. ECUs are embedded computer systems that have a microprocessor and a dedicated function within a larger electrical system. Each ECU within a vehicle typically controlled one or more electrical systems or subsystems within the vehicle. Examples of ECUs that were common before the priority date of the '735 patent include engine control modules (ECMs), powertrain control modules (PCMs), transmission control modules (TCMs), and brake control modules (BCMs). Together, the ECUs on a vehicle are often referred to as a vehicle's "computer."

20. As noted above, an engine control module (ECM) is one example of an ECU. Prior to the filing date of the '735 patent, it was known to use engine control

modules to control actuators on an internal combustion engine to ensure optimal engine performance. For example, the ECM would receive values from a variety of electronic sensors, interpret the values, and adjust the actuators based on the values. An ECM could interpret values from sensors to determine, for example, an amount of fuel to inject or how far to open a throttle valve. Prior to the filing date of the '735 patent, it was also known to allow ECMs to be programmed by an operator. An operator could connect a device, such as a laptop, to these ECMs and modify, for example, an amount to which a throttle would open based on an accelerator pedal position. It was further known that ECMs could control certain engine parameters based on known commands received over networks using standardized bus protocols. *See, e.g.*, *Chakraborty*, Abstract (EX1003).

C. Vehicle Electronic Sensors

21. Prior to the time of the alleged invention, it was well-known to use electronic sensors in a vehicle to communicate values about operation of the vehicle to the vehicle's electronic control units. An ECU could then monitor aspects of a vehicle's operation by receiving input from the sensors. Examples of sensors that could provide input to an ECU include a steering angle sensor, a vehicle speed sensor (e.g., a speedometer), an engine speed sensor (e.g., a tachometer), a throttle valve position sensor, a brake sensor, and left and right turn signal sensors. *See, e.g.*, U.S. Patent No. 2001/0003808 to Jeon et al. ("*Jeon*") at Fig. 1 (EX1016). Based on the

values received from the sensors, the ECU could then adjust vehicle components based on parameters stored within the ECU.

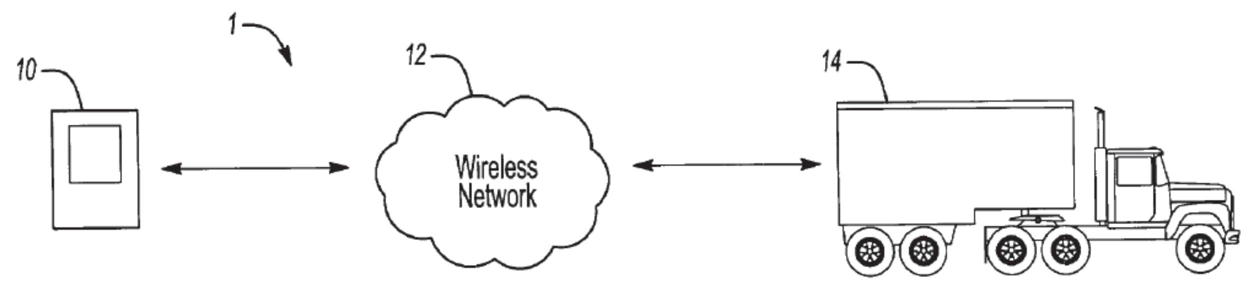
III. OVERVIEW OF THE ’735 PATENT

22. The ’735 patent concedes that, prior to its filing date, vehicle network communication protocols already existed for transmitting commands to limit engine speed and torque rating of a vehicle. ’735 patent, 3:62–65, 4:10–14 (EX1001). For example, the SAE J1922 control link standard defined a command code that could be issued over the SAE J1922 control link to limit engine speed and torque rating of a vehicle, and specified that the command code be transmitted at least every 250 milliseconds to maintain a maximum vehicle speed. ’735 patent at 3:62–65; 4:10–13 (EX1001).

23. The ’735 patent alleges that its disclosure relates to a new system for limiting the operational performance of a vehicle. ’735 patent, 1:29–31 (EX1001). The ’735 describes a system where remotely issued vehicle limitation control signals are received wirelessly by a device on a vehicle. ’735 patent, 1:29–36 (EX1001). A performance characteristic of the vehicle is then limited based on the received signal. ’735 patent, 1:36–38. The ’735 patent argues that this system makes it possible for a vehicle owner or operator to limit the operational performance characteristics of their vehicle. ’735 patent at 1:11–25. For example, a vehicle’s operational performance can be controlled to minimize the negative

effects of a security breach in the vehicle, or to minimize an owner's safety concerns when employees are driving their vehicles. '735 patent at 1:11–25.

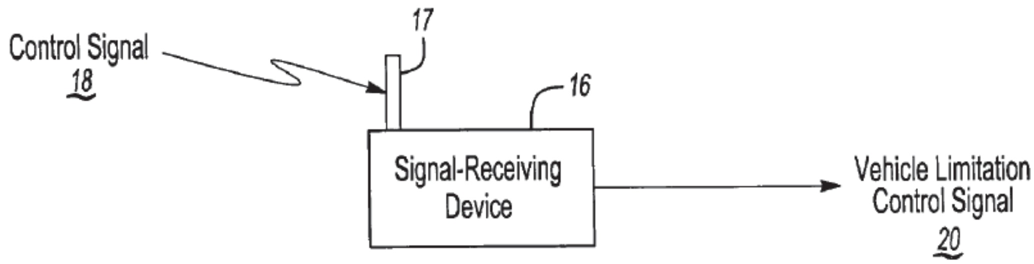
24. As one example of the environment in which the system operates, illustrated in FIG. 1 below, the '735 patent discloses a command device 10, a wireless network 12, and a vehicle 14.



'735 patent, FIG. 1 (EX1001).

Command device 10 can be used by an operator to issue a vehicle limitation control signal over wireless network 12. '735 patent, 2:12–20, 2:23–25 (EX1001). Command device 10 could be one of many different types of electronic devices, such as a computer, personal digital assistant (PDA), wireless phone, or pager. '735 patent, 2:16–20 (EX1001). The control signal causes vehicle 14 to enter a vehicle limitation mode. '735 patent, 2:20–23 (EX1001). In vehicle limitation mode, a performance characteristic of vehicle 14, such as its maximum speed, is limited. '735 patent, 2:20–23 (EX1001).

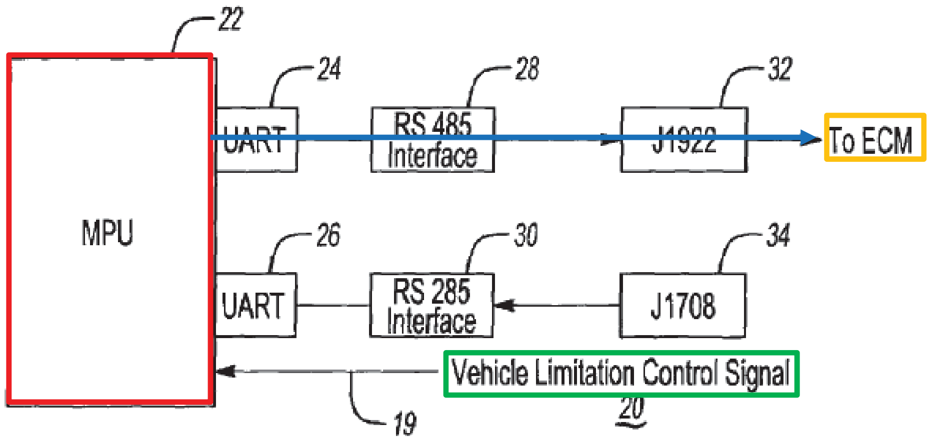
25. As illustrated in FIG. 2 below, a signal-receiving device 16 mounted on the vehicle receives the control signal from the command device and transmits a vehicle limitation control signal.



’735 patent, FIG. 2 (EX1001).

The signal-receiving device transmits the vehicle limitation control signal to a control circuit or control module within the vehicle to limit an operational characteristic of the vehicle. ’735 patent, 3:28–35 (EX1001).

26. One example of the system within the vehicle for limiting the operational characteristic is illustrated in annotated FIG. 3 below. The vehicle limitation control signal (illustrated in green) is sent to a microprocessor (MPU) (illustrated in red), and causes the MPU to initiate a vehicle limitation mode. ’735 patent, 3:42–61 (EX1001). The MPU can initiate the vehicle limitation mode by, for example, issuing commands to an Engine Control Module (ECM) (illustrated in orange). ’735 patent, 3:57–61 (EX1001).



'735 patent, FIG. 3 (EX1001) (Annotated).

The MPU can also limit the vehicle's operational characteristics by, for example, modifying a pulse-width modulated (PWM) signal input to a pulse-width modulated throttle ('735 patent, 4:58–5:5, 8:9–37 (EX1001)), or modifying a voltage input to a resistive throttle ('735 patent, 4:58–67, 7:58–8:8 (EX1001)).

27. The '735 patent also discloses that a vehicle limitation flag is stored to indicate whether the vehicle is in limitation mode. '735 patent, 4:17–35 (EX1001). In one embodiment, this flag can be a binary indicator. '735 patent, 4:18–19 (EX1001). When the vehicle limitation flag indicates that the MPU has received an active vehicle limitation signal, the MPU limits an operational characteristic of the vehicle by issuing a command to an ECM or otherwise modifying an input to a vehicle component. '735 patent, 4:7–45, 7:4–38 (EX1001).

28. But as the cited prior art demonstrates, at the time of the alleged invention, the purported new system for limiting the operational performance of a vehicle was well-known. At least the primary references of *Silvernagle* (EX1002) and *Chakraborty* (EX1003) and the combinations discussed here, show clearly that claims 1-3, 5, 6, and 28 are unpatentable as obvious.

A. Level of Ordinary Skill in the Art

29. I have considered certain issues from the perspective of a person of ordinary skill in the art ("POSA") at the time of the alleged invention. In my opinion, a person of ordinary skill in the art for the '735 patent would have had at least a Bachelor's Degree in electrical engineering, computer science, or a related subject or the equivalent and one year of experience working with vehicle network systems, or at least three years of experience working with vehicle network systems.

B. Understanding of the Law

30. I am not an attorney. For the purposes of this declaration, Petitioner's counsel has informed me about certain aspects of the law that are relevant to my opinions.

31. Petitioner's counsel have informed me that a patent claim may be "anticipated" if each element of that claim is present either explicitly or inherently in a single prior art reference. Petitioner's counsel have informed me that to be inherently present, the prior art reference must necessarily disclose the limitation,

and the fact that the reference might possibly practice or contain a claimed limitation is insufficient to establish that the reference inherently teaches the limitation.

32. Petitioner's counsel have informed me that a patent claim can be considered to have been obvious to a person of ordinary skill in the art at the time of the alleged invention. This means that, even if all of the requirements of a claim are not found in a single prior art reference, the claim is not patentable if the differences between the subject matter in the prior art and the subject matter in the claim would have been obvious to a person of ordinary skill in the art at the time of the alleged invention.

33. Petitioner's counsel have informed me that a determination of whether a claim would have been obvious should be based upon several factors, including, among others:

- the level of ordinary skill in the art at the time of the alleged invention;
- the scope and content of the prior art;
- what differences, if any, existed between the claimed invention and the prior art.

34. Petitioner's counsel have informed me that a single reference can render a patent claim obvious if any differences between that reference and the claims would have been obvious to a person of ordinary skill in the art. Alternatively, the teachings of two or more references may be combined in the same

way as disclosed in the claims, if such a combination would have been obvious to one having ordinary skill in the art. In determining whether a combination based on either a single reference or multiple references would have been obvious, it is appropriate to consider, among other factors:

- whether the teachings of the prior art references disclose known concepts combined in familiar ways, and when combined, would yield predictable results;
- whether a person of ordinary skill in the art could implement a predictable variation, and would see the benefit of doing so;
- whether the claimed elements represent one of a limited number of known design choices, and would have a reasonable expectation of success by those skilled in the art;
- whether a person of ordinary skill would have recognized a reason to combine known elements in the manner described in the claim;
- whether there is some teaching or suggestion in the prior art to make the modification or combination of elements claimed in the patent; and
- whether the innovation applies a known technique that had been used to improve a similar device or method in a similar way.

35. Petitioner's counsel have informed me that one of ordinary skill in the art has ordinary creativity, and is not an automaton. Petitioner's counsel have

informed me that in considering obviousness, it is important not to determine obviousness using the benefit of hindsight derived from the patent being considered.

IV. CLAIM CONSTRUCTION

36. In my analysis I have given the claim terms their broadest reasonable interpretation in light of the specification. I have considered whether any claim term has been defined in the specification, and for those terms which lack a definition in the specification, I have similarly applied the broadest reasonable interpretation that is consistent with the interpretation that one skilled in the art would have applied at the time of the alleged invention.

37. In the following subsections I discuss specific interpretations that I applied for certain claim terms. I have given any claim terms not included in the following discussion their broadest reasonable interpretation in light of the specification as commonly understood by those of ordinary skill in the art.

A. "command message"

38. The term "command message" should be interpreted to mean a signal that orders something to occur. The '735 patent does not define a "command message." At best, the '735 patent discusses transmission of a "command code" that limits the maximum speed of the vehicle. '735 patent 4:41–44 (EX1001).

39. The proposed construction is consistent with the specification of the '735 patent, and with the ordinary use of the terms "command" and "message." *See*

Definition (1) of "command," IBM Dictionary of Computing, 1994, 116 (defining a "command" as "An order for an action to take place") (EX1014); *see also* Definition (5) of "command," The IEEE Authoritative Dictionary of IEEE Standards Terms, Seventh Edition, 2000, 193 (defining a "command" as "A pulse, signal, or set of signals initiating one step in the performance of a controlled operation") (EX1013); Definition (3) of "message," IBM Dictionary of Computing, 1994, 428 (defining a "message" as "A communication sent from a person or program to another person or program") (EX1014); Definition (3) of "message," The IEEE Authoritative Dictionary of IEEE Standards Terms, Seventh Edition, 2000, 687 (defining a "message" as "A value or set of values representing an interface event between functions. The term as used here is intended to be very primitive, not implying a particular structure or interface protocol unless modified by an appropriate adjective (like transaction-initiation message). A message can be arbitrarily simple (a signal) or complicated") (EX1013).

B. "flag"

40. The term "flag" should be interpreted to mean an indicator used to indicate a condition. The '735 patent does not define "flag." The '735 patent describes a "vehicle limitation flag." '735 patent, 4:17–18 (EX1001). The '735 patent does not limit the flag to a binary indicator. '735 patent 4:18–20 ("The J1922

vehicle limitation flag is preferably a binary indicator that stores whether or not the vehicle is in limitation mode") (emphasis added) (EX1001).

41. The proposed construction is consistent with the specification of the '735 patent, and with the ordinary use of the term "flag." *See* Definition (1) of "flag," Microsoft Press Computer Dictionary, Third Edition, 1997, 198 (defining a "flag" as "Broadly, a marker of some type used by a computer in processing or interpreting information; a signal indicating the existence of status of a particular condition") (EX1024).

V. THE CHALLENGED CLAIMS ARE UNPATENTABLE

42. Challenged claims 1-3, 5, 6, and 28 recite and claim features that were known in the art prior to the earliest priority date of the '735 patent, and are obvious in view of the prior art.

A. Standard Vehicle Network Protocols Provided for Transmission of Vehicle Limitation Command Messages Long Before the Priority Date of the '735 Patent

43. When the application that led to the '735 patent was filed, there was nothing new or inventive about transmitting a command message across a vehicle network to control an operational characteristic of a vehicle. This concept had been known and widely used since at least over a decade before the priority date of the '735 patent.

44. For example, the version of the SAE J1922 control link standard issued in 1989 provided standard messages for communicating between electronic controls for an engine, transmission, antilock braking system (ABS)/traction system, and a retarder system. *See* SAE J1922, Powertrain Control Interface for Electronic Controls Used in Medium and Heavy Duty Diesel On-Highway Vehicle Applications ("SAE J1922"), December 1989 at 1 (EX1015). These messages included a transmission to powertrain message that provided for engine speed or engine torque control. SAE J1922 at 7 (EX1015). SAE J1922 specified that, in Mode 01, the engine functioned as a speed regulator with the transmission providing a speed command in bytes 2 and 3 of the transmission to powertrain message. SAE J1922 at 7, 8 (EX1015). In Mode 10, the engine functions as a torque regulator with the transmission providing a torque command in byte 3 of the message, with byte 2 of the message being omitted. SAE J1922 at 7, 8 (EX1015). In Mode 11, the transmission commands an engine speed upper limit in byte 2 of the message, and commands an engine torque limit in byte 3 of the message. SAE J1922 at 7, 8 (EX1015). The SAE J1922 standard further specified that, for Modes 01, 10, and 11, the transmission to powertrain message should be broadcast every 0.025 seconds. SAE J1922 at 7 (EX1015). In the absence of this broadcast message, the engine would default to Mode 00 after a predetermined length of time. SAE J1922 at 8 (EX1015).

45. Use of the SAE J1922 standard engine speed and torque limiting control mode messages to control the speed of a vehicle was well-known before the priority date of the '735 patent. For example, *Chakraborty* discloses implementing an intelligent cruise control system by transmitting engine speed control mode or engine speed and torque limiting control mode messages of the SAE J1922 standard to an engine control module. *Chakraborty*, Abstract (EX1003). *Chakraborty* discloses that electronically controlled internal-combustion engines were well established in 1995, and that standards, such as SAE J1922 and SAE J1939 provided for control modes of these electronically controlled engines. *Chakraborty*, 1:56-2:18 (EX1003). *Chakraborty* describes that, in a normal mode, engine fueling was controlled based primarily on input received from the vehicle operator, typically via the accelerator pedal. *Chakraborty*, 2:18-21 (EX1003). In speed control mode, engine fueling was controlled to maintain a substantially constant engine speed. *Chakraborty*, 2:23-25 (EX1003). In torque control mode, a substantially constant engine output torque was provided regardless of engine speed and vehicle speed. *Chakraborty*, 2:25-28 (EX1003). In speed and torque limit control mode, an upper limit on engine speed and/or engine output torque was provided. *Chakraborty*, 2:28-29 (EX1003).

B. Wirelessly Transmitting Command Messages to a Vehicle for Controlling the Speed of the Vehicle was Known Long Before the Priority Date of the '735 Patent

46. There was nothing new or inventive about wirelessly transmitting a command message to control a vehicle's speed at the time that the '735 patent was filed. This concept had been widely discussed in patent publications and papers well before the priority date of the '735 patent.

47. For example, *Silvernagle*, which was published in June 2001, discloses transmitting programmable parameters, such as limits on engine speed, ground speed, and acceleration, from a handheld programmer unit to a vehicle control unit on a vehicle over an infrared connection. *Silvernagle*, 5:23-33, 5:62-6:7 (EX1002). As further discussed herein, *Silvernagle* discloses providing a modified tachometer signal to an electronic ignition system based on the programmable parameters to control an engine speed, ground speed, or acceleration. *Silvernagle*, 4:62-12 (EX1002).

48. Several additional patent publications disclosed the concept of wirelessly transmitting command messages for controlling a speed of a vehicle well before the priority date of the '735 patent. These patent publications contemplated transmitting these messages over a variety of different transmission media. *See, e.g.*, US 2001/0003808 to Jeon et al. ("*Jeon*"), published June 14, 2001, at ¶¶ [0023]-[0025] (disclosing transmission of speed control signals to vehicles with wireless radio frequency communications) (EX1016); *see also* US

6,052,644 to Murakami et al. ("*Murakami*"), published April 18, 2000, at 24:11-17, 25:45-66 (disclosing transmission of speed control commands from a base station to a vehicle over a wireless radio connection) (EX1017); US 5,769,051 to Bayron et al. ("*Bayron*"), published June 23, 1998, at 2:38-45, 2:54-58 (disclosing transmission of speed control commands via a wireless optical or radio communications link) (EX1018); US 6,772,061 to Berthiaume et al., filed August 20, 2001, published August 3, 2004, at 4:18-31, 5:39-42 (disclosing transmission of speed control commands via a wireless optical or radio frequency data link) (EX1019).

49. Projects in Europe and Asia involving wireless controlling of vehicle speed existed before the priority date of the '735 patent. For example, the UK External Vehicle Speed Control (EVSC) project studied and proposed a strategy for implementing Intelligent Speed Adaptation (ISA) in the UK. *See* "Implementing Intelligent Speed Adaptation in the UK: Recommendations of the EVSC Project" to Carsten et al., 2000, at 2-4, 6 (discussing mandatory maximum speed control by transmission of speed control commands from Dedicated Short Range Communication (DSRC) beacons to a vehicle's engine control unit (ECU)) (EX1020); *see also* "Intelligent Speed Adaptation: The Best Collision Avoidance System?" to Carsten et al., 2001, at 1-2, 4, 5 (discussing transmission of speed control commands over DSRC that limited vehicle speed through ignition

retardation and fuel starvation) (EX1021); "External Vehicle Speed Control, Phase I Results, Executive Summary," to Carsten et al., 1998, at 6, 10 (discussing a UK project for transmission of speed control commands over DSRC and a Swedish project for transmission of speed control commands from roadside beacons, and providing a proposed architecture for a full EVSC system) (EX1022). Similarly, projects in Asia were focused on controlling a vehicle's speed based on roadside-to-vehicle radio frequency (RF) commands. *See* "Speed Adaptation System for Vehicles using RF Communication" to Song et al., 2000, at 1-3 (disclosing automatic control of a vehicle acceleration pedal based on commands received from a roadside RF transmitter) (EX1023).

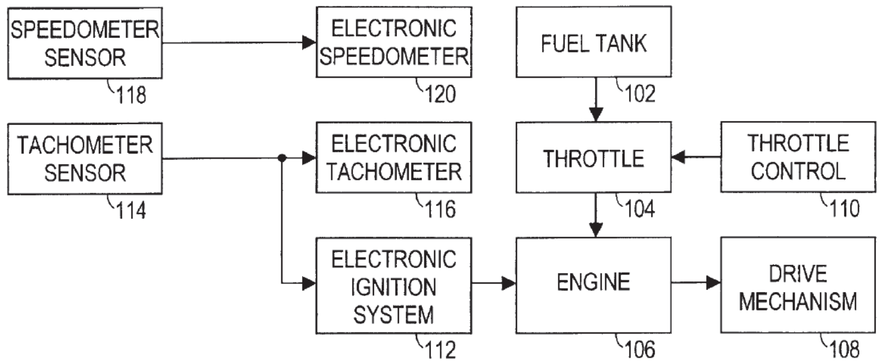
VI. INVALIDITY OF THE CHALLENGED CLAIMS

A. Ground I: Claims 1–3, 5, and 28 are obvious over *Silvernagle* and *Chakraborty*

50. In this section, I explain why every element of claims 1–3, 5, and 28 of the '735 patent would have been obvious to a POSA in view of *Silvernagle* and *Chakraborty*, arranged as in the claims.

1. *Overview of* Silvernagle

51. *Silvernagle* discloses modifying a prior art configuration of an engine system, such that a vehicle's engine speed or ground speed can be limited. Figure 2 below illustrates a prior art configuration of an engine system, according to *Silvernagle*.

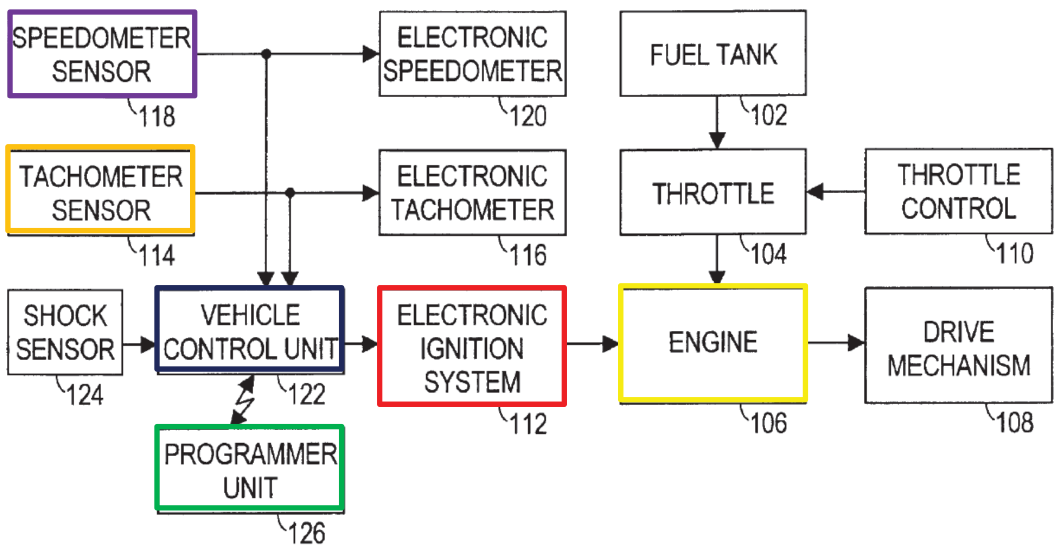


***Silvernagle*, FIG. 2 (EX1002).**

In the prior art configuration, a fuel tank 102 is coupled to provide fuel to an engine 106 via a throttle 104. *Silvernagle*, 3:26–29 (EX1002). Engine 106 converts an amount of fuel into power to drive a vehicle drive mechanism 108 based on the vehicle operator's use of throttle control 110. *Silvernagle*, 3:29–33 (EX1002). The conversion of fuel into drive power depends upon timed ignition pulses from electronic ignition system 112. *Silvernagle*, 3:35–37 (EX1002). To provide these ignition pulses, electronic ignition system 112 relies on a signal from tachometer sensor 114, which provides a signal indicative of engine speed. *Silvernagle*, 3:37–40 (EX1002). The tachometer signal is an electronic pulse train (e.g., a repetitive series of voltage pulses) which is indicative of the position of a corresponding engine element. *Silvernagle*, 3:40–45 (EX1002).

52. As depicted in annotated Figure 3 below, *Silvernagle* discloses modifying the prior art engine configuration by inserting a vehicle control unit between the tachometer sensor and the electronic ignition system. The modified

system includes a tachometer sensor (outlined in orange), a speedometer sensor (outlined in purple), a vehicle control unit (outlined in blue), a programmer unit (outlined in green), an electronic ignition system (outlined in red), and an engine (outlined in yellow).



***Silvernagle*, FIG. 3 (EX1002) (Annotated).**

In the modified configuration, the vehicle control unit receives speedometer signals from the speedometer, and receives tachometer signals from the tachometer. *Silvernagle*, 3:64–4:1 (EX1002).

53. A handheld programmer unit is used for programming operation parameters into the vehicle control unit over an infrared connection. *Silvernagle*, 4:11–13, 5:47–53 (EX1002). The operation parameters can include limits on engine speed, ground speed, and acceleration. *Silvernagle*, 6:1–2 (EX1002). Once

received, the operation parameters are stored in a nonvolatile memory in the vehicle control unit. *Silvernagle*, 5:23–25 (EX1002).

54. Once operation parameters have been stored, the vehicle control unit determines whether to modify the tachometer signal it receives from the tachometer sensor based on a current engine speed or ground speed. *Silvernagle*, 1:52–57 (EX1002). When the current engine speed or ground speed does not exceed a predetermined limit set by one of the operation parameters, the vehicle control unit passes the tachometer signal to the electronic ignition system. *Silvernagle*, 4:65–5:2 (EX1002). However, when the current engine speed or ground speed does exceed a predetermined limit set by one of the operation parameters, the vehicle control unit asserts a suppress signal and blocks pulses in the tachometer signal, thereby fooling the electronic ignition system into firing less than would otherwise be expected. *Silvernagle*, 5:2–7 (EX1002). Thus, by modifying the tachometer signal, the vehicle control unit limits the engine speed and ground speed of the vehicle, so that they do not exceed a pre-stored value. *Silvernagle*, 1:46–2:6 (EX1002).

2. *Claim 1 is obvious in view of* Silvernagle *and* Chakraborty

55. Claim 1 recites: A system for limiting performance of a vehicle, comprising:

a first controller located aboard said vehicle and configured to control, in accordance with a stimulus originating from a location local to the vehicle, to a first operational performance characteristic;

a command device located remotely from the vehicle and configured to send a control signal via a wireless communication network;

a receiving device located aboard said vehicle and configured to receive said control signal; and

a second controller located aboard the vehicle and configured to limit, in response to said control signal, said control of said vehicle to a second operational performance characteristic when said stimulus indicates to said first controller to control said vehicle to the first operational performance characteristic;

wherein said second controller is further configured to (i) transmit to said first controller, responsive to said control signal, a vehicle limitation command message to place said vehicle in a vehicle limitation mode, and (ii) cause a vehicle limitation flag to be stored in non-volatile memory, and wherein said vehicle limitation flag is indicative of maintaining said vehicle in said vehicle limitation mode.

a) "[a] system for limiting performance of a vehicle"

56. In my opinion, *Silvernagle* discloses this limitation.

57. As discussed above in Section VI.A.1, *Silvernagle* describes modifying a prior art configuration of an engine to limit a vehicle's engine speed or ground speed. In this prior art configuration, a fuel tank provides fuel to the

vehicle's engine via a throttle. *Silvernagle*, 3:28–29 (EX1002). The amount of fuel provided to the engine depends on control of a throttle by a vehicle operator. *Silvernagle*, 3:29–33 (EX1002). The engine converts the fuel into drive power based on timed ignition pulses from an electronic ignition system. *Silvernagle*, 3:35–37 (EX1002). The electronic ignition system provides the pulses based on an electronic pulse train signal (e.g., a repetitive series of voltage pulses) received from a tachometer sensor. *Silvernagle*, 3:37–46 (EX1002).

58. *Silvernagle* describes modifying the prior art engine configuration by coupling a vehicle control unit between the tachometer sensor and the electronic ignition system. *Silvernagle*, 1:42–44 (EX1002). The vehicle control unit determines the vehicle's engine speed from the tachometer sensor (*Silvernagle*, 3:37–40 (EX1002)), and determines the vehicle's ground speed from a speedometer sensor. (*Silvernagle*, 1:44–46 (EX1002)). A handheld programmer unit is used to program various operation parameters into the vehicle control unit. *Silvernagle*, 4:11–13, FIG. 3 (EX1002). The parameters may include, for example, limits on engine speed (e.g., rpm of 3500), ground speed (e.g., speed limit of 15), and/or acceleration (e.g., acceleration limit of 5). *Silvernagle*, 6:1–7, 6:52–57 (EX1002).

59. When a programmed engine speed or ground speed is not exceeded, the vehicle control unit sends the tachometer signal it receives to the electronic

ignition system, so that the vehicle is fully responsive to the operator's control of the throttle. *Silvernagle*, 4:65–5:2 (EX1002). However, when the engine speed or ground speed exceeds a programmed limit, the vehicle control unit modifies the tachometer signal by removing pulses from the signal. *Silvernagle*, 1:52–57 (EX1002). The modified signal is then sent from the vehicle control unit to the electronic ignition system, which fools the electronic ignition system into not firing. *Silvernagle*, 5:2–6 (EX1002). This reduces the power produced by the engine and limits the vehicle's engine speed and ground speed. *Silvernagle*, 5:5–7 (EX1002).

b) "a first controller located aboard said vehicle and configured to control, in accordance with a stimulus originating from a location local to the vehicle, to a first operational performance characteristic"

60. In my opinion, *Silvernagle* discloses this limitation.

61. *Silvernagle* discloses an electronic ignition system 112 located on the vehicle. *Silvernagle*, FIGs. 1, 3 (EX1002). When a programmed engine speed or ground speed limit has not been exceeded, the vehicle control unit passes a tachometer signal it receives from a tachometer sensor to the electronic ignition system. *Silvernagle*, 4:62–5:2 (EX1002). The tachometer sensor can be, for example, a Hall effect sensor located near a crankshaft, a magneto, or a camshaft in the engine, and the tachometer signal can be an electronic pulse train (e.g., a

repetitive series of voltage pulses). *Silvernagle*, 3:40–46 (EX1002). Thus, the tachometer signal is a "stimulus originating from a location local to the vehicle."

62. The electronic ignition system uses the received signal to provide timed ignition pulses to the engine. *Silvernagle*, 3:37–40 (EX1002). The engine uses these timed ignition pulses to convert an amount of fuel into drive power. *Silvernagle*, 3:35–37 (EX1002). Thus, the electronic ignition system controls the conversion of fuel by the engine based on the tachometer sensor to maintain a desired engine speed or ground speed, and is a "first controller located aboard said vehicle and configured to control, in accordance with a stimulus originating from a location local to the vehicle, to a first operational performance characteristic."

c) "a command device located remotely from the vehicle and configured to send a control signal via a wireless communication network"

63. In my opinion, *Silvernagle* discloses this limitation.

64. *Silvernagle* discloses a handheld programming unit for programming operational parameters, such as an engine speed limit and a ground speed limit, into the vehicle control unit. *Silvernagle*, Abstract, 4:11–13, 5:33–6:7 FIG. 5 (EX1002). The handheld programming unit sends commands and parameter settings to the vehicle control unit over an infrared (wireless) connection. *Silvernagle*, 5:43–53 (EX1002). Thus, the handheld programming unit sends commands and operational parameters (is a "command device" "configured to

send a control signal") via an infrared connection (a "wireless communication network"). The handheld programming unit is not wired to the vehicle control unit, and is thus "located remotely from the vehicle." The handheld unit can be used to transport information received from the vehicle to a central computer system for archiving and more extensive analysis. *Silvernagle*, 2:18-24 (EX1002). Thus, the handheld unit can be located even more remotely from the vehicle when transporting information for archiving.

d) "a receiving device located aboard said vehicle and configured to receive said control signal"

65. In my opinion, *Silvernagle* discloses this limitation.

66. *Silvernagle* discloses that a handheld programmer unit is used to program various operation parameters into the vehicle control unit. *Silvernagle*, 4:11–13, FIG. 3 (EX1002). The microcontroller of the vehicle control unit is coupled to infrared port logic, which receives commands and parameter settings (e.g., engine speed limit, ground speed limit, acceleration limit) from the handheld programmer unit. *Silvernagle*, 5:23–33, FIGs. 4, 5. (EX1002). Thus, the vehicle control unit and its infrared port logic are a "receiving device located aboard said vehicle and configured to receive said control signal."

e) "a second controller located aboard the vehicle and configured to limit, in response to said control signal, said control of said vehicle to a second operational performance characteristic when said stimulus indicates to said first

controller to control said vehicle to the first operational performance characteristic"

67. In my opinion, *Silvernagle* discloses this limitation.

68. *Silvernagle* discloses a vehicle control unit located on the vehicle. *Silvernagle*, FIG. 4 (EX1002). Operational parameters, such as engine speed limits and ground speed limits, are stored in the vehicle control unit based on commands and parameter settings ("control signal") received from a handheld programmer unit. *Silvernagle*, 5:23–33, 6:1–7 (EX1002).

69. The vehicle control unit monitors signals received from the tachometer sensor and the speedometer sensor and determines whether the engine speed or ground speed has exceeded a limit set by one of the operational parameters. *Silvernagle*, 1:52–62, 3:66–4:4 (EX1002). If the engine speed or ground speed has exceeded one of these pre-set limits, the vehicle control unit asserts a suppression signal, which blocks pulses in the tachometer signal and fools the electronic ignition system into not firing, thereby reducing the power produced by the engine. *Silvernagle*, 5:2–15 (EX1002).

70. Thus, despite the tachometer signal indicating a first engine speed to the electronic ignition system representative of a desired engine speed or ground speed ("said stimulus indicat[ing] to said first controller to control said vehicle to the first operational performance characteristic"), when the engine speed or ground speed exceeds the pre-set limit, the vehicle control unit ("second controller") limits

the firing of the electronic ignition system to an amount representative of a second engine speed or second ground speed ("limits said control of said vehicle to a second operational performance characteristic") by suppressing pulses of the tachometer signal before the tachometer signal is sent to the electronic ignition system.

f) "wherein said second controller is further configured to (i) transmit to said first controller, responsive to said control signal, a vehicle limitation command message to place said vehicle in a vehicle limitation mode"

71. In my opinion, *Silvernagle* discloses this limitation.

72. *Silvernagle* discloses that, when an engine speed or ground speed exceeds a pre-set limit set by the handheld programmer unit ("responsive to said control signal"), an output signal module within the vehicle control unit produces a modified tachometer signal ("vehicle limitation command message"). *Silvernagle*, 1:52–2:6 (EX1002). The modified tachometer signal is sent to the electronic ignition system ("transmit[ted] to said first controller" from "said second controller"), causing the electronic ignition system to provide fewer ignition pulses to the engine and thereby reducing engine power ("plac[ing] said vehicle in a vehicle limitation mode"). *Silvernagle*, 1:52–2:6 (EX1002).

g) "[wherein said second controller is further configured to] cause a vehicle limitation flag to be stored in non-volatile memory"

73. In my opinion, *Silvernagle* discloses this limitation.

74. *Silvernagle* discloses that programmable parameters can be received from a handheld programmer unit over an infrared connection. *Silvernagle*, 5:26–33, 5:46–53, 5:62–66 (EX1002). The programmable parameters can include, for example, a limit on engine speed, a limit on ground speed, or a limit on acceleration ("a vehicle limitation flag"). *Silvernagle*, 6:1–7 (EX1002). *Silvernagle* further discloses that the parameters received from the handheld programmer unit are stored in a nonvolatile memory within the vehicle control unit. *Silvernagle*, 5:23–33.

h) "wherein said vehicle limitation flag is indicative of maintaining said vehicle in said vehicle limitation mode"

75. In my opinion, *Silvernagle* discloses this limitation.

76. *Silvernagle* discloses storing a limit on engine speed, a limit on ground speed, or a limit on acceleration ("a vehicle limitation flag") in nonvolatile memory of the vehicle control unit. *Silvernagle*, 5:23–33, 5:62–6:7 (EX1002). The vehicle control unit performs a software loop as shown in FIG. 6. *Silvernagle*, 6:8–11 (EX1002).

77. As shown in FIG. 6, whenever a tachometer pulse is detected from the tachometer sensor, the vehicle control unit checks a KILLCOUNT variable to determine whether the tachometer pulse should be suppressed. *Silvernagle*, 6:58–7:3 (EX1002). If the KILLCOUNT variable is greater than zero, the vehicle control unit suppresses the tachometer pulse, decrements the KILLCOUNT

variable, and proceeds to step 214, where the loop resets and starts again. *Silvernagle*, 7:3–6, FIG. 6 (EX1002). If the KILLCOUNT variable is zero, the vehicle control unit compares a calculated RPM with the programmed engine speed limit. *Silvernagle*, 7:6–8 (EX1002). If the programmed engine speed limit has not been exceeded, the vehicle control unit proceeds to step 214, where the loop resets and starts again. *Silvernagle*, 7:8–9 (EX1002). If the programmed engine speed has been exceeded, the vehicle control unit sets the KILLCOUNT to a positive value before proceeding to step 214. *Silvernagle*, 7:8–15 (EX1002).

78. Similarly, if a speedometer pulse is received, the vehicle control unit compares a calculated speed with a programmed ground speed limit. *Silvernagle*, 7:16–28 (EX1002). If the limit has not been exceeded, the vehicle control unit proceeds to step 214, where the loop resets and starts again. *Silvernagle*, 7:28–30 (EX1002). If the limit has been exceeded, the vehicle control unit sets the KILLCOUNT to a positive value in step 238 before proceeding to step 214. *Silvernagle*, 7:29–35 (EX1002).

79. As discussed above, the software loop in the vehicle control unit continues to check a programmed engine speed limit and a programmed ground speed limit as the software loop repeats over time. The programmed engine speed and ground speed limits are therefore "indicative of maintaining said vehicle in said vehicle limitation mode."

i) "first controller" and "second controller is configured to (i) transmit to said first controller . . . a vehicle limitation command message to place said vehicle in a vehicle limitation mode"

80. To the extent a narrow interpretation of either of the terms "first controller" or "second controller is configured to (i) transmit to said first controller . . . a vehicle limitation command message to place said vehicle in a vehicle limitation mode" is taken, and to the extent one might argue that the electronic ignition system of *Silvernagle* is not a controller, or that the modified tachometer signal of *Silvernagle* is not a vehicle limitation command message to place the vehicle in a vehicle limitation mode, these features were all well-known at the time of the alleged invention.

81. For example, *Chakraborty* discloses a system for implementing an intelligent cruise control on a vehicle using standard engine control modes. *Chakraborty*, Abstract (EX1003). The system includes an electronic control module (ECM) which controls an engine. *Chakraborty*, 4:57–59 (EX1003). The ECM contains logic rules implemented in a programmed microprocessor to effect control of various vehicle systems and subsystems. *Chakraborty*, 8:17–20 (EX1003). The ECM communicates with a variety of sensors, such as an electronic accelerator pedal sensor (APS), and controls the engine based on signals from these sensors. *Chakraborty*, 7:6–11, 11:31–40 (EX1003).

82. *Chakraborty* discloses and teaches to one of ordinary skill that, at the time it was filed in 1995, electronically controlled internal-combustion engines were well-established in the art and had been used in various types of vehicles, such as heavy-duty tractor semi-trailer vehicles. *Chakraborty*, 1:56–59 (EX1003). *Chakraborty* discloses that SAE J1922 was a particularly interesting standard for providing electronic engine control for vehicles. *Chakraborty*, 2:4–10 (EX1003).

83. The SAE J1922 standard defined various control modes for electronically controlled engines, including a normal mode, a speed control mode, a torque control mode, and a speed and torque control mode. *Chakraborty*, 2:15–18 (EX1003). In normal mode, engine fueling was controlled based primarily on input received from the vehicle operator, typically via an accelerator pedal. *Chakraborty*, 2:18–21 (EX1003). In speed control mode, engine fueling was controlled to maintain a substantially constant engine speed. *Chakraborty*, 2:23–25 (EX1003). In torque control mode, a substantially constant engine output torque (as a percentage of total available torque) was effected regardless of engine speed and vehicle speed. *Chakraborty*, 2:25–28 (EX1003). In speed and torque limit control mode, an upper limit was imposed on engine speed and/or engine output torque. *Chakraborty*, 2:28–29 (EX1003). Override modes could be used to override the current operating mode and command the engine to operate at a particular engine speed or engine output torque. *Chakraborty*, 2:30–32 (EX1003).

The control mode was based on commands received by the engine controller, which could be generated by various other vehicle systems or subsystems or by the vehicle operator. *Chakraborty*, 2:32–42 (EX1003).

84. *Silvernagle* and *Chakraborty* are each directed to systems designed to control speed of a vehicle. For example, both *Silvernagle* and *Chakraborty* are designed to limit the speed of a vehicle to an upper limit. To a POSA at the time of the alleged invention, it would have been obvious to modify *Silvernagle* in light of the teachings of *Chakraborty* to include an ECM that receives signals from various sensors and subsystems over a standardized vehicle network protocol. It would have further been obvious to a POSA at the time of the alleged invention to modify the vehicle control unit of *Silvernagle* to transmit a control mode message in accordance with the SAE J1922 standard to an ECM, in light of the teachings of *Chakraborty*.

85. Given the similarities in structure, objectives, and operation between *Silvernagle* and *Chakraborty*, a POSA would have been motivated to implement *Chakraborty*'s technique of using an ECM and a standardized vehicle network protocol to communicate signals between various sensors, vehicle subsystems (such as the vehicle control unit of *Silvernagle*), and an ECM, and to control an engine accordingly, in order to provide a variety of enhanced features and conveniences based on increased computational speeds and standardized vehicle

networks that had become available. *See, e.g.*, *Chakraborty*, 1:12–30. A POSA would also have been motivated to implement *Chakraborty*'s technique of using an ECM to receive signals over standardized vehicle networks to provide greater customization flexibility, by allowing standardized components from different manufacturers to be integrated together in a vehicle communications network. *See, e.g.*, *Chakraborty*, 1:18–30 (EX1004).

86. Modifying *Silvernagle* to include an ECM that communicates with vehicle sensors and subsystems over a standardized network protocol, such as SAE J1922, and modifying the vehicle control unit of *Silvernagle* to send control mode messages to the ECM to control engine speed using SAE J1922, would have been within the abilities of a POSA and could be accomplished with a high chance of success.

3. *Claim 2 is obvious in view of* Silvernagle *and* Chakraborty

87. Claim 2 depends from claim 1.

88. Claim 2 recites: The system of claim 1, wherein said first operational performance characteristic is a first speed of said vehicle, and wherein said second operational performance characteristic is a second speed of said vehicle, and wherein said second speed is less than said first speed.

a) "wherein said first operational performance characteristic is a first speed of said vehicle, and wherein said second operational performance characteristic is a second

speed of said vehicle, and wherein said second speed is less than said first speed"

89. In my opinion, *Silvernagle* discloses this limitation.

90. As discussed above, *Silvernagle* discloses detecting when a ground speed ("first operational performance characteristic is a first speed of said vehicle") has exceeded a predetermined limit. *Silvernagle*, 1:52–57 (EX1002). When the ground speed has exceeded the predetermined limit, the vehicle control unit suppresses tachometer pulses from a tachometer sensor to get the vehicle under the predetermined limit ("second operational performance characteristic is a second speed of said vehicle" where "said second speed is less than said first speed"). *Silvernagle*, 1:58–2:3 (EX1002). The number of consecutive tachometer pulses that are suppressed can depend on the margin by which the predetermined ground speed limit has been exceeded. *Silvernagle*, 2:4–6 (EX1002). A software loop in the vehicle control unit continually checks to see whether the ground speed is over the predetermined limit while the vehicle operates, and continually suppresses tachometer signals when the ground speed is over the predetermined limit. *Silvernagle*, FIG. 6 (EX1002).

4. *Claim 3 is obvious in view of* Silvernagle *and* Chakraborty

91. Claim 3 depends from claim 1.

92. Claim 3 recites: The system of claim 1, wherein said command device comprises a device selected from a group of devices consisting of (i) a computer; (ii) a personal digital assistant; (iii) a wireless telephone; and (iv) a pager.

a) "wherein said command device comprises a device selected from a group of devices consisting of (i) a computer; (ii) a personal digital assistant; (iii) a wireless telephone; and (iv) a pager"

93. In my opinion, *Silvernagle* discloses this limitation.

94. *Silvernagle* discloses a handheld programmer unit for programming operational parameters of the vehicle control unit. *Silvernagle*, 5:62–66 (EX1002). The handheld unit includes a microcontroller that executes software stored in a nonvolatile memory in response to input from the operator of the handheld programmer unit. *Silvernagle*, 5:44–62 (EX1002). Thus, the handheld programmer unit is a computer.

5. *Claim 5 is obvious in view of* Silvernagle *and* Chakraborty

95. Claim 5 depends from claim 1.

96. Claim 5 recites: The system of claim 1, wherein said first controller is an electronic-control module (ECM) of said vehicle, and wherein the second controller is configured to transmit, responsive to said control signal, a vehicle limitation command message to the ECM via an SAE J1922 data link.

a) "wherein said first controller is an electronic-control module (ECM) of said vehicle, and wherein the second controller is configured to transmit, responsive to said control

signal, a vehicle limitation command message to the ECM via an SAE J1922 data link"

97. As discussed above in Section VI.A.2.i, in my opinion, it would have been obvious to a POSA at the time of the alleged invention to *Silvernagle* to include an ECM that receives signals from various sensors and subsystems over a standardized vehicle network protocol, in light of the teachings of *Chakraborty*. In my opinion, it would have further been obvious to a POSA at the time of the alleged invention to modify the vehicle control unit of *Silvernagle* to transmit a control mode message in accordance with the SAE J1922 standard to an ECM, in light of the teachings of *Chakraborty*. *See* Section VI.A.2.i.

6. *Claim 28 is obvious in view of* Silvernagle *and* Chakraborty

98. Claim 28 recites: A system for limiting performance of a vehicle, comprising:

a command device located remote from said vehicle and configured to send a control signal via a wireless communication network;

a receiving device located aboard said vehicle and configured to receive said control signal; and

a controller configured to (i) transmit, responsive to said control signal, a vehicle limitation command message to place said vehicle in a vehicle limitation mode, wherein said vehicle limitation command message is transmitted via an SAE J1922 data link to an electronic-control module of the vehicle, and (ii) cause a vehicle limitation flag to be stored in non-volatile memory, wherein said vehicle limitation flag is indicative of maintaining said vehicle in the vehicle limitation mode.

a) "[a] system for limiting performance of a vehicle"

99. In my opinion, *Silvernagle* discloses this limitation.

100. As discussed above in Section VI.A.2.a, *Silvernagle* discloses "[a] system for limiting performance of a vehicle."

b) "a command device located remote from said vehicle and configured to send a control signal via a wireless communication network"

101. In my opinion, *Silvernagle* discloses this limitation.

102. As discussed above in Section VI.A.2.c, *Silvernagle* discloses "a command device located remotely from the vehicle and configured to send a control signal via a wireless communication network."

c) "a receiving device located aboard said vehicle and configured to receive said control signal"

103. In my opinion, *Silvernagle* discloses this limitation.

104. As discussed above in Section VI.A.2.d, *Silvernagle* discloses "a receiving device located aboard said vehicle and configured to receive said control signal."

d) "a controller configured to (i) transmit, responsive to said control signal, a vehicle limitation command message to place said vehicle in a vehicle limitation mode, wherein said

vehicle limitation command message is transmitted via an SAE J1922 data link to an electronic-control module of the vehicle"

105. As discussed above in Section VI.A.2.f, in my opinion, *Silvernagle* discloses a "controller" "configured to (i) transmit" "responsive to said control signal, a vehicle limitation command message to place said vehicle in a vehicle limitation mode."

106. To the extent a narrow interpretation of the term "controller configured to (i) transmit . . . a vehicle limitation command message to place said vehicle in a vehicle limitation mode" is taken, and to the extent one might argue that the modified tachometer signal of *Silvernagle* is not a vehicle limitation command message that is transmitted via an SAE J1922 data link to an electronic-control module of the vehicle," these features were well-known at the time of the alleged invention.

107. For example, *Chakraborty* discloses a system for implementing an intelligent cruise control on a vehicle using standard engine control modes. *Chakraborty*, Abstract (EX1003). The system includes an electronic control module (ECM) which controls an engine. *Chakraborty*, 4:57–59 (EX1003). The ECM contains logic rules implemented in a programmed microprocessor to effect control of various vehicle systems and subsystems. *Chakraborty*, 8:17–20 (EX1003). The ECM communicates with a variety of sensors, such as an

electronic accelerator pedal sensor (APS), and controls the engine based on signals from these sensors. *Chakraborty*, 7:6–11, 11:31–40 (EX1003).

108. *Chakraborty* discloses that, at the time it was filed in 1995, electronically controlled internal-combustion engines were well-established in the art and had been used in various types of vehicles, such as heavy-duty tractor semi-trailer vehicles. *Chakraborty*, 1:56–59 (EX1003). *Chakraborty* discloses that a particularly interesting standard for providing electronic engine control for vehicles included the SAE J1922 standard. *Chakraborty*, 2:4–10 (EX1003).

109. The SAE J1922 standard defined various control modes for electronically controlled engines, including a normal mode, a speed control mode, a torque control mode, and a speed and torque control mode. *Chakraborty*, 2:15–18 (EX1003). In normal mode, engine fueling was controlled based primarily on input received from the vehicle operator, typically via an accelerator pedal. *Chakraborty*, 2:18–21 (EX1003). In speed control mode, engine fueling was controlled to maintain a substantially constant engine speed. *Chakraborty*, 2:23–25 (EX1003). In torque control mode, a substantially constant engine output torque (as a percentage of total available torque) was effected regardless of engine speed and vehicle speed. *Chakraborty*, 2:25–28 (EX1003). In speed and torque limit control mode, an upper limit was imposed on engine speed and/or engine output torque. *Chakraborty*, 2:28–29 (EX1003). Override modes could be used to override the

current operating mode and command the engine to operate at a particular engine speed or engine output torque. *Chakraborty*, 2:30–32 (EX1003). The control mode was based on commands received by the engine controller, which could be generated by various other vehicle systems or subsystems or by the vehicle operator. *Chakraborty*, 2:32–42 (EX1003).

110. *Silvernagle* and *Chakraborty* are each directed to systems designed to control speed of a vehicle. For example, both *Silvernagle* and *Chakraborty* are designed to limit the speed of a vehicle to an upper limit. To a POSA at the time of the alleged invention, it would have been obvious to modify *Silvernagle* to include an ECM that receives signals from various sensors and subsystems over a standardized vehicle network protocol, in light of the teachings of *Chakraborty*. It would have further been obvious to a POSA at the time of the alleged invention to modify the vehicle control unit of *Silvernagle* to transmit a control mode message in accordance with the SAE J1922 standard to an ECM, in light of the teachings of *Chakraborty*.

111. Given the similarities in structure, objectives, and operation between *Silvernagle* and *Chakraborty*, a POSA would have been motivated to implement *Chakraborty*'s technique of using an ECM and a standardized vehicle network protocol to communicate signals between various sensors, vehicle subsystems (such as the vehicle control unit of *Silvernagle*), and an ECM, and to control an

engine accordingly, in order to provide a variety of enhanced features and conveniences based on increased computational speeds and standardized vehicle networks that had become available. *See, e.g.*, *Chakraborty*, 1:12–30. A POSA would also have been motivated to implement *Chakraborty*'s technique of using an ECM to receive signals over a standardized vehicle network to provide greater customization flexibility by allowing components from different manufacturers to be integrated together in vehicle communications network. *See, e.g.*, *Chakraborty*, 1:18–30 (EX1004).

112. Modifying *Silvernagle* to include an ECM that communicates with vehicle sensors and subsystems over standardized network protocols, and modifying the vehicle control unit of *Silvernagle* to send control mode messages to the ECM to control engine speed, would have been within the abilities of a POSA and could be accomplished with a high chance of success.

e) "[a controller configured to] (ii) cause a vehicle limitation flag to be stored in non–volatile memory, wherein said vehicle limitation flag is indicative of maintaining said vehicle in the vehicle limitation mode"

113. In my opinion, *Silvernagle* discloses this limitation.

114. As discussed above in Sections VI.A.2.g and VI.A.2.h, *Silvernagle* discloses a "controller" "configured to" "cause a vehicle limitation flag to be stored in non-volatile memory," "wherein said vehicle limitation flag is indicative of maintaining said vehicle in said vehicle limitation mode."

B. Ground II: Claim 6 is obvious in view of *Silvernagle*, *Chakraborty*, and *Applicant Admitted Prior Art*

115. In this section, I explain why, in my opinion, every element of claim 6 of the '735 patent would have been obvious to a POSA in view of *Silvernagle*, *Chakraborty*, and *Applicant Admitted Prior Art*, arranged as in the claims.

1. *Claim 6 is obvious in view of* Silvernagle*,* Chakraborty*, and* Applicant Admitted Prior Art

116. Claim 6 depends from claim 5, which depends from claim 1.

117. Claim 6 recites: The system of claim 5, wherein said second controller is configured to transmit said vehicle limitation command message at least once every 250 ms.

a) "wherein said second controller is configured to transmit said vehicle limitation command message at least once every 250 ms"

118. As discussed in Sections VI.A.2.i and VI.5.a, in my opinion, to a POSA at the time of the alleged invention, it would have been obvious to modify *Silvernagle* to include an ECM that receives signals from various sensors and subsystems over a standardized vehicle network protocol, in light of the teachings of *Chakraborty*. In my opinion, it would have further been obvious to a POSA at the time of the alleged invention to modify the vehicle control unit of *Silvernagle* to transmit a control mode message in accordance with the SAE J1922 standard to an ECM, in light of the teachings of *Chakraborty*.

119. To the extent *Silvernagle* and *Chakraborty* do not teach or suggest transmitted a vehicle limitation command message at least once every 250 milliseconds, this feature was well-known at the time of the alleged invention.

120. For example, Applicant's Admitted Prior Art discloses that "the J1922 standard recites that a speed limit command code be transmitted at least every 250 ms to maintain a maximum vehicle speed in place." '735 patent at 4:10–13 (EX1001). In my opinion, to a POSA at the time of the alleged invention, it would have been obvious to modify the combination of *Silvernagle* and *Chakraborty* to transmit a speed limit command code at least every 250 milliseconds, in light of the disclosure of the '735 patent indicating that this feature was part of the J1922 standard at the time of filing. A POSA would have been motivated to transmit the speed limit command code at least every 250 milliseconds, as discussed in the '735 patent, to conform with the standard and ensure that a maximum vehicle speed is maintained in place. *See* '735 patent at 4:10–13 (EX1001).

VII. AVAILABILITY FOR CROSS–EXAMINATION

121. In signing this declaration, I recognize that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross examination in the case and that cross examination will take place within

the United States. If cross examination is required of me, I will appear for cross examination within the United States during the time allotted for cross examination.

VIII. RIGHT TO SUPPLEMENT

122. I reserve the right to supplement my opinions in the future to respond to any arguments that the Patent Owner raises and to take into account new information as it becomes available to me.

IX. JURAT

123. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Dated: April 12, 2017

Robert Leale
Orion, MI

EXHIBIT A

ROBERT LEALE

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EDUCATION

Grand Valley State University, Allendale, MI
B.A. Communications **2003**
Emphasis Video Production

Grand Valley State University, Allendale, MI
B.A. French Language **2003**

EXPERT WITNESS EXPERIENCE

Audionics Systems Inc. vs AAMP of Florida, Inc. **2014-2015**
Deposed as Expert Witness, Create expert report in terms of Validity and Infringement.

AAMP of Florida, Inc. vs Automotive Data Solutions, Inc. **2015-2016**
Deposed as Expert Witness, Create expert report in terms of Infringement.

TEACHING EXPERIENCE

Vehicle Networks Hacking **2011**
Course on Vehicle Data Reverse Engineering for DefCon 19

Vehicle Networks Reverse Engineering **2013**
Course on Reverse Engineering Vehicle Data at Blackhat Europe

Center for Advanced Vehicle Environments (CAVE) Vehicle Data Reverse Engineering **2012 -2016**
Created Courses for understanding how vehicle systems work and how to Reverse Engineer vehicle embedded systems

Vehicle CAN Bus Communications and Diagnostics Reverse Engineering **2014-2016**
Course on Reverse Engineering Vehicle Data at Blackhat USA

RELATED EXPERIENCE

CanBusHack, Inc.
President **February 2010 – Present**
Provide Reverse Engineering Services to customers who seek to learn more about vehicle data systems including, but not limited to, Can Bus data reverse engineering, security algorithm extraction, embedded system firmware extraction and analysis, and total vehicle data assessment.

Intrepid Control Systems, Inc.
Application Engineer **June 2005 – February 2010**
Assists customers such as GM, Ford, Chrysler and their suppliers with understanding testing and integration problems of vehicle network systems. Including, but not limited to, test automation for durability tests. Assist customers in Vehicle Data Reverse Engineering a.k.a. competitive analysis of proprietary vehicle systems for the purpose of comparison and, in some cases, patent infringement.

IBM Global Services
Network Technician **2004**
Assisted in the day-to-day maintenance of Dow Chemical's world-wide server infrastructure.

Grandville Public Schools
Computer/Network Technician **1997-2003**
Computer PC repair, setup, and configuration. Assisted users with day-to-day issues. Setup computers and computer networks and support.

LANGUAGES

English – Native Language
French – Speak fluency, read and write with moderate proficiency