UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

In Re:	U.S. Patent 7,029,774	:	Attorney Docket No. 070103.0332
Inventor:	James A. Greczyna	:	
Filed:	May 23, 2005	:	
Issued:	April 18, 2006	:	IPR No. Unassigned
Assignee:	Sony Corporation		

Title: Magnetic Recording Medium With Backside To Decrease Recording Surface Embossment

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Submitted Electronically via the Patent Review Processing System

DECLARATION OF RYOSUKE ISOBE (GROUNDS 1-2)

I, Ryosuke Isobe, declare as follows:

1. My name is Ryosuke Isobe. I am an engineering project leader with R&D and manufacturing operations experience in the data storage industry and coating technologies. I have prepared this report as an expert witness retained by FUJIFILM Corporation. In this report I give my opinions as to whether certain claims of U.S. Patent No. 7,029,774 ("the '774 Patent") are invalid. I provide technical bases for these opinions as appropriate.

2. This report contains statements of my opinions formed to date and the bases and reasons for those opinions. I may offer additional opinions based on further review of materials in this case, including opinions and/or testimony of other expert witnesses. I make this declaration based upon my own personal knowledge and, if called upon to testify, would testify competently to the matters contained herein. For my efforts in connection with the preparation of this declaration I have been compensated at my standard rate for this type of consulting activity. My compensation is in no way contingent on the results of these or any other proceedings relating to the above-captioned patent.

I. Background and Qualifications

3. I have summarized in this section my educational background, career history, publications, and other relevant qualifications. My full curriculum vitae is attached as Appendix A to this report.

A. Educational Background

4. I received a Bachelor of Engineering in Environmental Chemistry from Chiba University, Chiba, Japan.

B. Career History

5. I have 30 years of experience working in the magnetic tape industry, including experience with coating technologies for magnetic tape, manufacturing methods, production of magnetic tape products, and development of new magnetic tape materials and magnetic tape drive systems. I first worked as an R&D Manager and research staff for Konica Corporation in Tokyo, Japan, from 1983 to 1995. At Konica, I worked on developing a dual-layer coating technology for magnetic tape which is the *de facto* standard coating technique for the magnetic tape industry. I am a named inventor on 21 issued U.S. Patents for my work at Konica, including 10 patents on the dual-layer coating technology. I also collaborated with Ampex in joint product development and technology transfers of coating technologies to Ampex.

6. From 1995 to 2003, I worked at Ampex ~ Quantegy Inc. in Opelika, AL. My roles at Ampex included Senior R&D Manager, Principal Chemist, Pilot Plant Manager, and Product Manager. My work involved establishing Ampex's OEM business to develop data storage tapes. I also collaborated with Imation

Corp. in joint product development and technology transfers of coating technologies to Imation.

7. From 2003 to 2009, I worked at Quantum Corporation in Boulder, CO as a Principal Media Engineer and Principal Chemist. My work involved developing advanced magnetic tapes for Quantum data storage tape drive products, including DLT and LTO. I worked closely with magnetic tape suppliers including Fujifilm, Maxell, Imation, Sony, and TDK and led development of media to meet Quantum's system requirements. I acted as media development leader for a joint product and technology development project with Hewlett-Packard. I was also Quantum's media representative to the LTO consortium which set standards for LTO products, and helped established the specifications for LTO-4 and LTO-5 media.

8. I then worked at Imation Corp. from 2009 to 2013 as a Project Manager and Senior Principal Engineer. My work at Imation included development of a new magnetic tape material that used Barium ferrite for a high-capacity data storage format tape.

C. Publications and Patents

9. I have been awarded over 25 U.S. patents, 8 European patents, and 44 Japanese patents. Most of these patents are directed to the field of magnetic tape,

and have been cited by competitors in the magnetic recording media industry, including Fujifilm, Hitachi Maxell, Sony, TDK, and Imation.

10. I have also contributed to the Recording Media Technology sections of two International Magnetic Tape Storage Roadmaps in 2009 and 2012 by the Information Storage Industry Consortium (INSIC), which provided guidance on the likely future development of magnetic recording media over the following ten years.

D. Materials and Other Information Considered

11. I have considered information from various sources in forming my opinions. I have reviewed and considered each of the exhibits listed in the attached Appendix B (Appendix of Exhibits) in forming my opinions.

II. Understanding of the Law

12. I have applied the following legal principles provided to me by counsel in arriving at the opinions set forth in this report.

A. Legal Standard for Prior Art

13. I understand that a patent or other publication must first qualify as prior art before it can be used to invalidate a patent claim.

14. I understand that a U.S. or foreign patent qualifies as prior art to a challenged patent if the date of issuance of the patent is prior to the invention of the challenged patent. I further understand that a printed publication, such as a book or an article published in a magazine or trade publication, qualifies as prior

art to a challenged patent under § 102(a) if the date of publication is prior to the invention of the challenged patent.

15. I understand that a U.S. or foreign patent qualifies as prior art to a challenged patent if the date of issuance of the patent is more than one year before the filing date of the challenged patent. I further understand that a printed publication, such as a book or an article published in a magazine or trade publication, constitutes prior art to a challenged patent under § 102(b) if the publication occurs more than one year before the filing date of the challenged patent.

16. I understand that a U.S. patent qualifies as prior art to the challenged patent under § 102(e)(2) if the application for that patent was filed in the United States before the invention of the challenged patent.

17. I understand that a publication of a U.S. patent application qualifies as prior art to the challenged patent under § 102(e)(1) if the application was filed in the United States before the invention of the challenged patent.

18. I understand that to qualify as prior art, a reference must contain an enabling disclosure that allows one of ordinary skill to practice the claims without undue experimentation.

19. I understand that documents and materials that qualify as prior art can be used to invalidate a patent claim as anticipated or as obvious.

B. Legal Standard for Anticipation

20. I understand that, once the claims of a patent have been properly construed, the second step in determining anticipation of a patent claim requires a comparison of the properly construed claim language to the prior art on a limitation-by-limitation basis.

21. I understand that a prior art reference "anticipates" a challenged claim, and thus renders the claim invalid, if all elements of the claim are disclosed in that prior art reference, either explicitly or inherently (i.e., necessarily present or implied).

22. I understand that a prior art product "inherently anticipates" a claimed product when the prior art product and claimed product are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes. A newly-discovered property of an old article may not be patentable if the article itself is not new.

23. I understand that a patent is anticipated if, before such person's invention thereof, the invention was made in this country by another inventor who had not abandoned, suppressed, or concealed it.

24. I have written this report with the understanding that in an *inter partes* review anticipation must be shown by a preponderance of the evidence.

C. Legal Standard for Obviousness

25. I have been instructed by counsel on the law regarding obviousness, and understand that even if a patent is not anticipated, it is still invalid if the differences between the claimed subject matter and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person of ordinary skill in the pertinent art.

26. I understand that a person of ordinary skill in the art provides a reference point from which the prior art and claimed invention should be viewed. This reference point prevents a person of ordinary skill from using one's insight or hindsight in deciding whether a claim is obvious.

27. I also understand that an obviousness determination includes the consideration of various factors such as (1) the scope and content of the prior art, (2) the differences between the prior art and the challenged claims, (3) the level of ordinary skill in the pertinent art, and (4) the existence of secondary considerations such as commercial success, long-felt but unresolved needs, failure of others, etc.

28. I am informed that secondary indicia of non-obviousness may include (1) a long felt but unmet need in the prior art that was satisfied by the invention of the patent; (2) commercial success or lack of commercial success of processes covered by the patent; (3) unexpected results achieved by the invention; (4) praise of the invention by others skilled in the art; (5) taking of licenses under the patent

by others; and (6) deliberate copying of the invention. I also understand that there must be a relationship between any such secondary indicia and the invention. I further understand that contemporaneous and independent invention by others is a secondary consideration supporting an obviousness determination.

29. I understand that an obviousness evaluation can be based on a combination of multiple prior art references. I understand that the prior art references themselves may provide a suggestion, motivation, or reason to combine, but other times the nexus linking two or more prior art references is simple common sense. I further understand that obviousness analysis recognizes that market demand, rather than scientific literature, often drives innovation, and that a motivation to combine references may be supplied by the direction of the marketplace.

30. I understand that if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.

31. I also understand that practical and common sense considerations should guide a proper obviousness analysis, because familiar items may have obvious uses beyond their primary purposes. I further understand that a person of ordinary skill in the art looking to overcome a problem will often be able to fit the

teachings of multiple publications together like pieces of a puzzle, although the prior art need not be like two puzzle pieces that must fit perfectly together. I understand that obviousness analysis therefore takes into account the inferences and creative steps that a person of ordinary skill in the art would employ under the circumstances.

32. I understand that a particular combination may be proven obvious by showing that it was obvious to try the combination. For example, when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp because the result is likely the product not of innovation but of ordinary skill and common sense.

33. I understand that the combination of familiar elements according to known methods may be proven obvious when it does no more than yield predictable results. When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, obviousness likely bars its patentability.

34. It is also my understanding that there are additional considerations that may be used as further guidance as to when a claim is obvious, including the following:

- the claimed invention is a simple substitution of one known element for another to obtain predictable results;
- the claimed invention uses known techniques to improve similar devices or methods in the same way;
- the claimed invention applies a known technique to a known device or method that is ready for improvement to yield predictable results; and
- there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent's claims.

35. It is further my understanding that a proper obviousness analysis focuses on what was known or obvious to a person of ordinary skill in the art, not just the patentee. Accordingly, I understand that any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.

36. I understand that a claim can be obvious in light of a single reference, without the need to combine references, if the elements of the claim that are not found explicitly or inherently in the reference can be supplied by the common sense of one of skill in the art.

37. I understand that a person of ordinary skill could have combined two pieces of prior art or substituted one prior art element for another if the substitution can be made with predictable results, even if the swapped-in element is different

from the swapped-out element. In other words, the prior art need not be like two puzzle pieces that must fit together perfectly. The relevant question is whether prior art techniques are interoperable with respect to one another, such that that a person of skill would view them as a design choice, or whether a person of skill could apply prior art techniques into a new combined system.

38. In sum, my understanding is that prior art teachings are properly combined where a person of ordinary skill in the art having the understanding and knowledge reflected in the prior art and motivated by the general problem facing the inventor, would have been led to make the combination of elements recited in the claims. Under this analysis, the prior art references themselves, or any need or problem known in the field of endeavor at the time of the invention, can provide a reason for combining the elements of multiple prior art references in the claimed manner.

39. I have been informed and understand that the obviousness analysis requires a comparison of the properly construed claim language to the prior art on a limitation-by-limitation basis.

40. I have written this report with the understanding that in an *inter partes* review obviousness must be shown by a preponderance evidence.

D. Legal Standard for Claim Construction

41. I have been instructed by counsel on the law regarding claim construction and patent claims, and understand that a patent may include two types of claims, independent claims and dependent claims. An independent claim stands alone and includes only the limitations it recites. A dependent claim can depend from an independent claim or another dependent claim. I understand that a dependent claim includes all the limitations that it recites in addition to all of the limitations recited in the claim from which it depends.

42. It is my understanding that in proceedings before the P.T.A.B. the claims of an unexpired patent are to be given their broadest reasonable interpretation in light of the specification from the perspective of one of skill in the art. It is my further understanding that claim terms of an expired patent are given the meaning the term would have to a person of ordinary skill in the art at the time of the invention, in view of the specification and file history. I understand that the standard used for expired patents is similar to that used in district court litigation, and that this standard is sometimes referred to as the *Phillips* standard.

43. It is my understanding that the broadest reasonable interpretation of a claim term may be the same as or broader than the construction of a term under the *Phillips* standard, but it cannot be narrower.

44. In comparing the claims of the '774 Patent to the prior art, I have carefully considered the '774 Patent and its file history in light of the understanding of a person of skill at the time of the alleged invention.

45. I understand that to determine how a person of ordinary skill would understand a claim term, one should look to those sources available that show what a person of skill in the art would have understood disputed claim language to mean. Such sources include the words of the claims themselves, the remainder of the patent's specification, the prosecution history of the patent (all considered "intrinsic" evidence), and "extrinsic" evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art.

46. I understand that, in construing a claim term, one looks primarily to the intrinsic patent evidence, including the words of the claims themselves, the remainder of the patent specification, and the prosecution history.

47. I understand that extrinsic evidence, which is evidence external to the patent and the prosecution history, may also be useful in interpreting patent claims when the intrinsic evidence itself is insufficient.

48. I understand that words or terms should be given their ordinary and accepted meaning unless it appears that the inventors were using them to mean something else. In making this determination, the claims, the patent specification, and the prosecution history are of paramount importance. Additionally, the

specification and prosecution history must be consulted to confirm whether the patentee has acted as its own lexicographer (i.e., provided its own special meaning to any disputed terms), or intentionally disclaimed, disavowed, or surrendered any claim scope.

49. I understand that the claims of a patent define the scope of the rights conferred by the patent. The claims particularly point out and distinctly claim the subject matter which the patentee regards as his invention. Because the patentee is required to define precisely what he claims his invention to be, it is improper to construe claims in a manner different from the plain import of the terms used consistent with the specification. Accordingly, a claim construction analysis must begin and remain centered on the claim language itself. Additionally, the context in which a term is used in the challenged claim can be highly instructive. Likewise, other claims of the patent in question, both challenged and non-challenged, can inform the meaning of a claim term. For example, because claim terms are normally used consistently throughout the patent, the usage of a term in one claim can often illuminate the meaning of the same term in other claims. Differences among claims can also be a useful guide in understanding the meaning of particular claim terms.

50. I understand that the claims of a patent define the purported invention. I understand that the purpose of claim construction is to understand how one

skilled in the art would have understood the claim terms at the time of the purported invention.

51. I understand that a person of ordinary skill in the art is deemed to read a claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification. For this reason, the words of the claim must be interpreted in view of the entire specification. The specification is the primary basis for construing the claims and provides a safeguard such that correct constructions closely align with the specification. Ultimately, the interpretation to be given a term can only be determined and confirmed with a full understanding of what the inventors actually invented and intended to envelop with the claim as set forth in the patent itself.

52. I understand that it is improper to place too much emphasis on the ordinary meaning of the claim term without adequate grounding of that term within the context of the specification of the challenged patent. Hence, claim terms should not be broadly construed to encompass subject matter that, although technically within the broadest reading of the term, is not supported when the claims are read in light of the invention described in the specification. Put another way, claim terms are given their broadest reasonable interpretation that is consistent with the specification and the prosecution history. Art incorporated by reference or

otherwise cited during the prosecution history is also highly relevant in ascertaining the breadth of claim terms.

53. I understand that the role of the specification is to describe and enable the invention. In turn, the claims cannot be of broader scope than the invention that is set forth in the specification. Care must be taken lest word-by-word definition, removed from the context of the patent, leads to an overall result that departs significantly from the patented invention.

54. I understand that claim terms must be construed in a manner consistent with the context of the intrinsic record. In addition to consulting the specification, one should also consider the patent's prosecution history, if available. The prosecution file history provides evidence of how both the Patent Office and the inventors understood the terms of the patent, particularly in light of what was known in the prior art. Further, where the specification describes a claim term broadly, arguments and amendments made during prosecution may require a more narrow interpretation.

55. I understand that while intrinsic evidence is of primary importance, extrinsic evidence, e.g., all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises, can also be considered. For example, technical dictionaries may help one better understand the underlying technology and the way in which one of skill in the art

might use the claim terms. Extrinsic evidence should not be considered, however, divorced from the context of the intrinsic evidence. Evidence beyond the patent specification, prosecution history, and other claims in the patent should not be relied upon unless the claim language is ambiguous in light of these intrinsic sources. Furthermore, while extrinsic evidence can shed useful light on the relevant art, it is less significant than the intrinsic record in determining the legally operative meaning of claim language.

56. I understand that in general, a term or phrase found in the introductory words of the claim, the preamble of the claim, should be construed as a limitation if it recites essential structure or steps, or is necessary to give life, meaning, and vitality to the claim. Conversely, a preamble term or phrase is not limiting where a patentee defines a structurally complete invention in the claim body and uses the preamble only to state a purpose or intended use for the invention. In making this distinction, one should review the entire patent to gain an understanding of what the inventors claim they actually invented and intended to encompass by the claims.

57. I understand that language in the preamble limits claim scope (i) if dependence on a preamble phrase for antecedent basis indicates a reliance on both the preamble and claim body to define the claimed invention; (ii) if reference to the preamble is necessary to understand limitations or terms in the claim body; or (iii)

if the preamble recites additional structure or steps that the specification identifies as important.

58. I understand that an indefinite article "a" or "an" in patent parlance carries the meaning of "one or more" in open-ended claims containing the transitional phrase "comprising." I understand that, unless the claim is specific as to the number of elements, the article "a" receives a singular interpretation only in rare circumstances when the patentee evinces a clear intent to so limit the article, and thus, under this conventional rule, the claim limitation "a," without more, requires "at least one."

E. Legal Standard for Priority Date

59. I further understand that the "priority date" of a patent is the date on which it is filed, or the date on which an earlier-filed patent application is filed if the patentee properly claims the benefit of priority to that earlier-filed patent application. I further understand the priority date is used to determine the filing date of a patent for purposes of determining whether a reference qualifies as prior art under § 102(b).

60. I understand that a patentee is permitted to claim the benefit of priority to an earlier-filed application as a continuation, divisional, or continuation-in-part application. In order to properly claim the benefit of priority as a continuation or divisional application, I understand that the later-filed application

cannot include any material that would constitute new matter. Further, I understand that to properly claim the benefit of priority as a continuation-in-part application, only those claims in the later-filed application that find adequate written description and enablement in the earlier-filed application are entitled to the earlier-filed application's priority date. It is my understanding that written description and enablement are two different requirements that must both be satisfied to properly claim the benefit of an earlier priority date. Further, it is my understanding that conclusive evidence that one requirement is met is not equally conclusive evidence that the other has been met.

61. I understand that under the first of these requirements, the claims of the later-filed application must be supported by adequate written description in the earlier-filed application. I understand that adequate written description will describe the claimed invention in sufficient detail that a person of ordinary skill in the art would conclude that the patentee was in possession of what is claimed in the later-filed application at the time of the earlier-filed application. It is my understanding that one factor to consider is whether the earlier-filed application puts the public in possession of what is claimed in the later-filed application.

62. I understand that adequate written description is evaluated on a claim-by-claim basis. It is also my understanding that each claim limitation must find

adequate support in the earlier-filed application for a claim in the later-filed application to properly claim the benefit of the earlier priority date.

63. I further understand that the earlier-filed application must enable the claims of the later-filed application. I understand that a particular claim is enabled if, when filed, the earlier-filed application contained sufficient information to enable a person of ordinary skill in the art to make and use the invention claimed in the later-filed application. It is my understanding that a claim is enabled if a person of ordinary skill in the art could practice the claimed invention without undue or unreasonable experimentation. I understand that a determination of whether the amount of experimentation is "undue" considers several factors, including:

- the quantity of experimentation required to make or use the invention;
- the amount of direction or guidance presented;
- the presence of working examples, if any;
- the nature of the invention;
- the state of the prior art;
- the level of a person of ordinary skill;
- the level of predictability in the art; and
- the breadth of the claims.

64. However, I also understand that none of these factors is determinative, and that other factors can be considered as well. I understand that enablement is

evaluated as of the filing date of the later-filed application, and that the claims of the later-filed application are evaluated on a claim-by-claim basis.

III. Level of Skill of One of Ordinary Skill in the Art

65. In determining the characteristics of a hypothetical person of ordinary skill in the art of the '774 Patent at the time of the claimed invention, I considered several things, including various prior art techniques relating to magnetic tape, the type of problems that such techniques gave rise to, and the rapidity with which innovations were made. I also considered the sophistication of the technologies involved, and the educational background and experience of those actively working in the field. I also considered the level of education that would be necessary to understand the '774 Patent. Finally, I placed myself back in the relevant period of time, and considered the academics, engineers, and graduate students that I had worked with in the field of materials science and magnetic tape. I came to the conclusion that the characteristics of a person of ordinary skill in the field of art of the '774 Patent would have been a person with (a) a bachelor's degree in materials science, electrical engineering, mechanical engineering, chemistry, or a closely related field, and at least five years of experience—either in industry or academic research—relating to magnetic tape, or (b) a master's degree or higher in materials science, electrical engineering, mechanical engineering, chemistry, or a closely related field, and at least three years of experience—either

in industry or academic research—relating to magnetic tape. A person with less education but more relevant practical experience, or more relevant education but less practical experience, may also meet this standard. I was a person of ordinary skill in the art at the time of the alleged invention of the '774 Patent.

IV. Technology Background

66. Magnetic tape has been a medium for audio cassettes, video tapes, and data recordings for decades and persists as a popular choice for long-term data storage due to its lower cost and superior durability. *See* Ex. 1001 at 1:16-20; Ex. 1006 at [0002].

A. Magnetic Tape Composition

67. Magnetic tape typically comprises layers coated on the surface of a supporting substrate. *See, e.g.*, Ex. 1004 at Abstract. One side of the tape consists of a magnetic layer for recording data, and optionally includes a non-magnetic layer underneath. *See* Ex. 1010 at 2:61-65. A recording head is run across this magnetic "front" side, or magnetic surface, to read or write to the tape. The "back" side of the tape consists of a backside coating layer (also referred to as a backcoat layer) on the substrate. *See, e.g.,* Ex. 1004 at 1:16-32. Figure 1 below shows these layers in a cross-sectional view of magnetic tape.

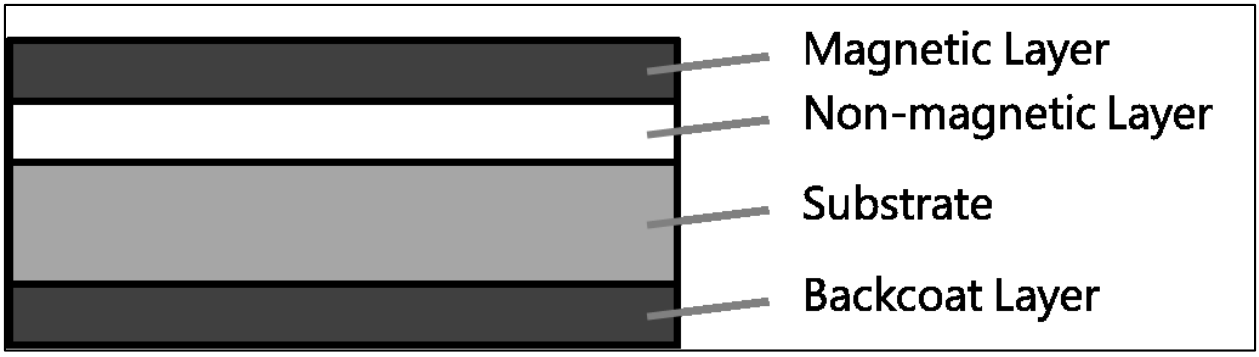

Figure 1: Cross-Section View of Tape

68. The backcoat, or backside coating, protects the tape when it is wound and also reduces overall friction when the tape is in use. *See, e.g.*, Ex. 1004 at 1:21-31 ("[A] backside coating may be coated on the backside of the nonmagnetic support to provide a roughened, uneven surface and thereby reduce the coefficient of friction of the backside surface"). The backcoat generally consists of non-magnetic particles, such as carbon black, suspended in a binder. *See e.g.,* Ex. 1004 at 1:33-34, 6:56-57; Ex. 1009 at 2:45-57; Ex. 1010 at 6:32-33. The binder is usually a type of polymer, polyvinyl, or resin. *See e.g.,* Ex. 1004 at 3:23-30; Ex. 1009 at 11:24-27; Ex. 1010 at 6:34-42.

B. Embossment of the Magnetic Surface

69. Magnetic recording tape is stored on reels. When wound around a reel, each "winding" of the tape is stacked on top of another winding, with the backcoat surface of one winding superposed onto the magnetic layer of the next previous winding. *See* Ex. 1005 at [0014].

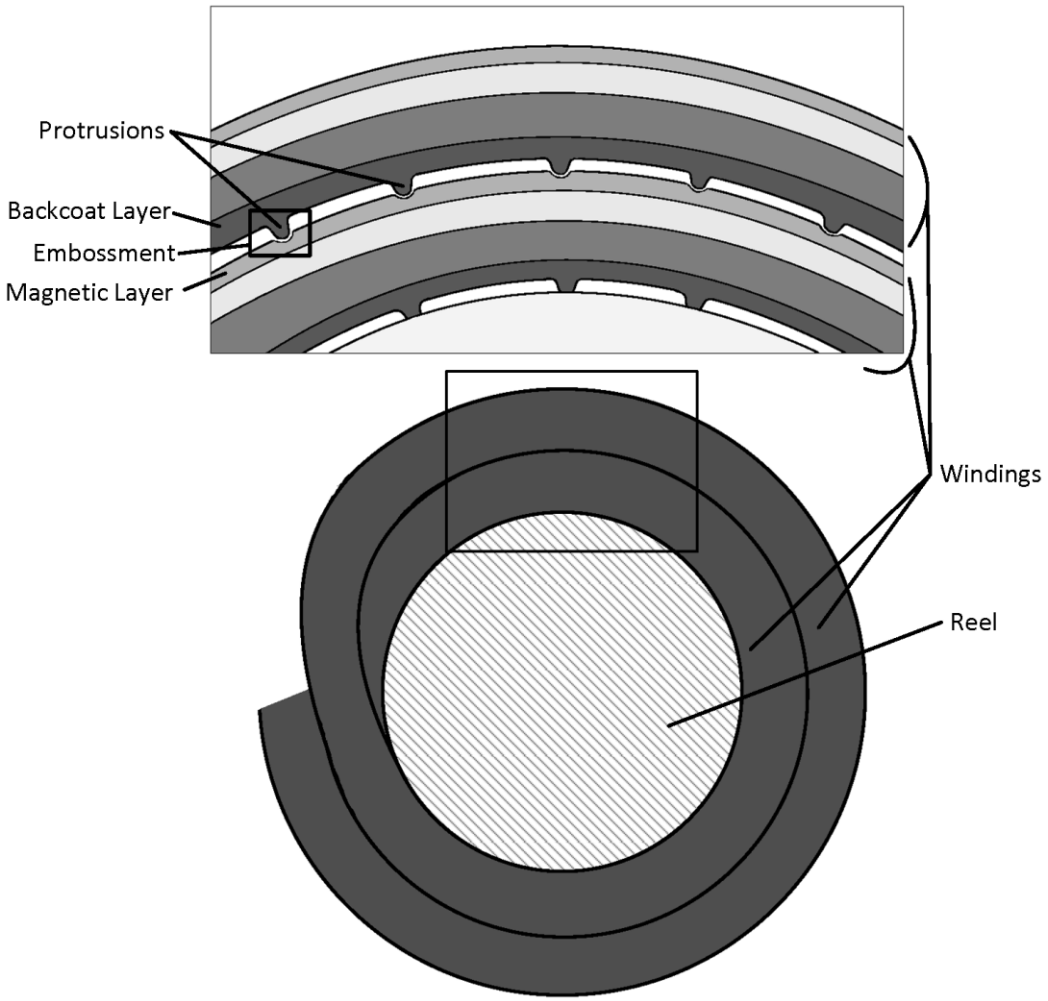

Figure 2: Cross-Section View of Wound Reel of Magnetic Tape

70. Due to this contact, peaks or protrusions on the backcoat layer can impress pits into the front surface of the magnetic layer, causing deformations and potential data errors in the magnetic layer. Ex. 1004 at 5:57-59; Ex. 1010 at 4:4-7. This process is widely recognized in the art and referred to by many names, including "embossment," "transfer," "imprint," or "show-through." *See* Ex. 1004 at 4:67-5:3 ("using too many backside particles has been known to cause undesired performance problems, e.g. increased bit error rate due to ***embossing*** of the

magnetic layer"); Ex. 1009 at 1:49-54 ("protrusions on a backcoat layer cause pits (called '***transfer***') on a magnetic layer surface because the protrusions bite into the magnetic layer surface when the backcoat layer and the magnetic layer are superposed"); Ex. 1005 at [0015] ("if there are excessively large protrusions on the back coat surface, the protrusion shape can ***imprint*** itself on the magnetic layer"); Ex. 1006 at [0003] ("the so-called '***show-through***' wherein the back coat layer and the magnetic layer will be in pressure contact with each other"); Ex. 1015 at [0044] ("it is preferred for the backcoating layer 5 to be as smooth as possible to prevent the surface profile of the backcoating layer from being transferred to the magnetic layer").

71. The transfer of protrusions—even small ones—from the backcoat to the magnetic layer can reduce the performance of the magnetic layer, causing potential bit errors or reduced signal-to-noise ratio. *See* Ex. 1004 at 5:1-3. Embossments may also cause a decreased output rate or even loss of signal. Ex. 1009 at 1:55-57. Furthermore, embossments may substantially reduce the magnetic layer's coating film strength, increasing vulnerability to coating film tears. Ex. 1005 at [0015].

C. Reducing Large Protrusions to Address Embossment

72. It was known in the art that a rougher surface, e.g., a surface with large or frequent protrusions, resulted in a greater amount of embossment. Ex.

1005 at [0015] ("if there are excessively large protrusions on the back coat surface, the protrusion shape can imprint itself on the magnetic layer"); Ex. 1015 at [0044] ("it is preferred for the backcoating layer 5 to be as smooth as possible to prevent the surface profile of the backcoating layer from being transferred to the magnetic layer"); Ex. 1012 at [0176] ("the surface of the backcoat layer becomes coarse and thus the surface roughness of the backcoat layer may be transferred to the reverse side of the magnetic layer (embossing)"); Ex. 1013 at 2, ll. 22-23 ("if the surface of the backside coating layer is too rough, the backside coating layer tends to damage the smooth surface of the magnetic layer"). As was widely known in the art, smaller peaks meant smaller embossments on the magnetic surface, and fewer peaks meant fewer embossments. Ex. 1015 at [0044] ("it is preferred for the backcoating layer 5 to be as smooth as possible to prevent the surface profile of the backcoating layer from being transferred to the magnetic layer").

73. (This paragraph number intentionally omitted.)

D. Fine-Grain Carbon Black

74. The prior art recognized that the embossment problem could be alleviated by the use of uniform, fine-grain carbon black particles in the backcoat layer. *See* Ex. 1009 at 3:63-4:3 ("The use of a carbon black of uniform particle distribution and cluster size distribution results in protrusions of uniform height being present on the surface of the backcoat layer. When the mean primary particle

size of the carbon black contained in the backcoat layer falls within the aforementioned range [10-150 nm], a backcoat layer having good surface smoothness, high coating strength, and low surface resistivity is obtained."); Ex. 1006 at [0010] ("In order to make sure that the unevenness of the back coat layer will not show through the magnetic layer, the particle size of the carbon black will be preferable to be 0.3 μm or less. The particularly preferable particle size will be 0.01 ~ 0.1 μm"); Ex. 1010 at 7:8-10 ("For ease of [mean roughness] control, it is preferred to use carbon black having a primary particle size of 15 to 80 nm, particularly 17 to 40 nm."). This led to a smoother backside surface as compared to formulations that included a mixture of fine-grain particles and large particles. *See* Ex. 1011 at 8:12-9:43 (Table 1) (comparing surface protrusions for various mixtures of fine particles of carbon black and coarse particles of zinc oxide); Ex. 1013 at 6 (Table 2) (comparing surface density of large protrusions for mixtures of fine particles of carbon black and coarse particles of carbon black where mixtures containing higher concentrations of coarse particles contain more protrusions).

75. Using fine-grain carbon black created a smoother surface with fewer sharp peaks (i.e. spikes or sharp protrusions) compared to a backcoat created with both fine-grain and coarse-grain carbon black, thus preventing embossment. *See* Ex. 1013 at 6 (Table 2); Ex. 1005 at [0129] (Table 1). By reducing the number of sharp peaks, the surface roughness of the backcoat becomes closer to a random

distribution (e.g., corresponding to a normal or Gaussian distribution). Thus the prior art recognized that embossment could be prevented if large carbon black particles were omitted and relatively uniform, fine-grain carbon black was used instead.

76. Numerous references recognized this problem and taught the same solution. For example, in Sasaki, reducing the prevalence of large protrusions (i.e., spikes) on the backcoat, improved the performance of the tape, and reduced damage. Ex. 1005 at [0016] ("[I]t is necessary to create a back coat that reduces protrusion imprinting upon the magnetic layer during long-term storage"). Naoe notes the same problem and teaches a backcoat layer with the same solution as the '774 Patent of using uniform fine-grain carbon black particles. Ex. 1006 at [0003] ("if the surface of the back coat layer was roughened … the so-called 'show-through' wherein the back coat layer and the magnetic layer will be in pressure contact with each other, the unevenness of the back coat layer would show through the magnetic layer"), [0010] ("to make sure that the unevenness of the back coat layer will not show through the magnetic layer … [t]he particularly preferable particle size will be 0.01 ~ 0.1 μm").

77. Ex. 1009 ("Zinbo") notes that "protrusions on a backcoat layer cause pits (called 'transfer') on a magnetic layer surface because the protrusions bite into the magnetic layer surface when the backcoat layer and the magnetic layer surface

are superposed[.]" Ex. 1009 at 1:50-53. Zinbo teaches "[t]he use of a carbon black of uniform particle distribution and cluster size distribution" including embodiments of backcoat layers containing only carbon black particles with a mean particle diameter of 17 nm. *See id.* at 3:63-3:66, 21:10-24.

78. Ex. 1010 ("Ishii") notes that "[w]hen the magnetic tape is wound, the surface profile of the backcoating layer are transferred to the surface of the magnetic layer to impair the surface smoothness of the magnetic layer." Ex. 1010 at 4:4-7. Ishii recognized that the size of backcoat carbon black particles provided a means for controlling the backside roughness. *See id.* at 6:1-4 ("Means for controlling the [mean roughness] within the above range includes adjustment of the particle size of various particles to be contained in the backcoating layer 5, especially carbon black particles"). In particular, "it is preferred to use carbon black having a primary particle size of 15 to 80 nm, particularly 17 to 40 nm." *Id.* at 7:8-10. These examples "undergo little transfer of the surface profile of the backcoating layer." Ex. 1010 at 16:2-3.

E. The Statistical Consequences of Using Fine-Grain Carbon Black

79. Numerous prior art references teach the use of fine-grain carbon black with particles of approximately uniform size. *See supra* ¶¶74-78. These teachings eliminated the use of large particles in the backside coating, which the prior art recognized as a cause of embossment. *See id.* By removing these large particles,

the prior art reduced the prevalence of peaks, i.e., spikes, on the backside surface. *See, e.g.,* Ex. 1005 at [0092], [0129] (Table 1); Ex. 1013 at 6 (Table 2). A consequence of reduced peaks, as was commonly known in the art, would have been a reduction in several statistical measures of those peaks. For example, the average height of those peaks (e.g., the peak height mean) would have been reduced. Similarly, the average peak-to-valley separation would have been smaller.

80. Another consequence of a backcoat using uniform carbon black particles would have been an approximately Gaussian roughness distribution. Under standard principles of probability such as the central limit theorem, random processes of this sort tend to result in Gaussian distributions, i.e., a bell curve. In statistics, the "moments" of a random variable are often used to characterize the statistical distribution. Most commonly, this includes the first moment (the mean or average) and the second moment (the variance or square root of the standard deviation).

81. The third and fourth moments can also be used. The third moment is known as "skew," and the fourth moment "kurtosis." By definition, a Gaussian distribution has a skew of 0 and a kurtosis of 3. A person of ordinary skill in the art would have known that kurtosis is normalized so that "a truly Gaussian surface generally has a kurtosis value of three." *See* Ex. 1014 at 4:28-29. Thus, a corollary of the prior art teachings regarding the use of fine-grain, uniformly-sized carbon

black would have included a surface roughness that approached a skew of 0 and a kurtosis of 3.

82-83. (These paragraph numbers intentionally omitted.)

V. The '774 Patent

A. Summary of the '774 Patent

84. The '774 Patent recognizes a problem with the "[t]ypical backsides" of magnetic tape, which "include carbon black … having particle sizes configured to form a smooth background with some larger particles dispersed therein[.]" Ex. 1001 at 1:47-51. The '774 Patent alleges that, because the prior art backcoat included particles of two different sizes, its surface roughness had a bimodal distribution reflecting the smooth background of the smaller carbon black particles, in one mode, and the peaks created by the larger particles, in another. *See id.* at 2:1-12. "The bimodal roughness of the backside surface 18 defines a plurality of peaks 20 and valleys 22." Ex. 1001 at 2:5-7.

85. While the use of large particles had some benefits—it "generally improve[d] durability and frictional characteristics of the backside during manufacturing and use"—it also led to the problem of "embossment." *Id.* at 1:47-51, 2:17-24. "Embossment," as used in the '774 Patent, describes a problem when tape is wound: "the interaction between the peaks 20 of the second winding 14 and the front surface 16 of the first winding 12 causes the peaks 20 to be imprinted or

otherwise transmitted to the front surface 16 of the first winding 12." *Id.* at 2:17-21. "The imprints, pits, or embossments defined in the front surface 16 can damage the recording characteristics of the magnetic recording tape 10." *Id.* at 2:21-24. The '774 Patent is directed to a magnetic recording medium with a backside surface "configured to decrease pitting or embossment of a recording surface of the magnetic recording medium." Ex. 1001 at 1:10-12.

B. Summary of the Alleged Invention

86. To address the embossment problem, the '774 Patent proposes using uniform carbon black of a diameter between 10-30 nm. Ex. 1001 at 5:22-26 ("the carbon black particles of the backside 36 are substantially uniform in size. In one embodiment, the carbon black particles … [have] average particle size from about 10 nm to about 30 nm[.]"). The '774 Patent explains that the magnetic tape of the invention is "configured to provide a relatively random backside surface," as compared with the "typical bimodal backside surface common in the prior art." *See* Ex. 1001 at 5:18-21 (citations omitted). The alleged invention uses carbon black particles in the backside layer that are "substantially uniform in size." *Id.* at 5:22-23.

87. This use of fine-grain carbon black, and the elimination of large backside particles, is illustrated by Figs. 1 (describing the prior art) and 3 (showing the alleged invention) of the '774 Patent below. *See* Ex. 1001, Figs. 1, 3:

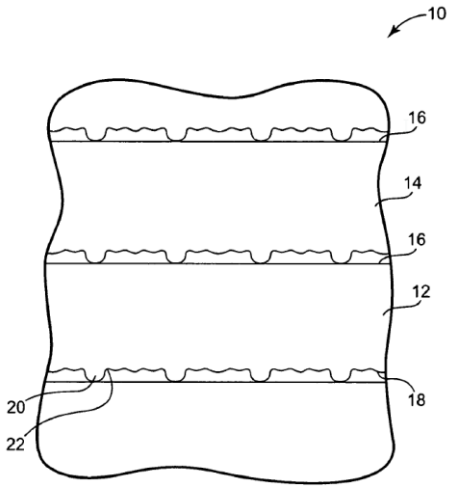

Fig. 1
(PRIOR ART)

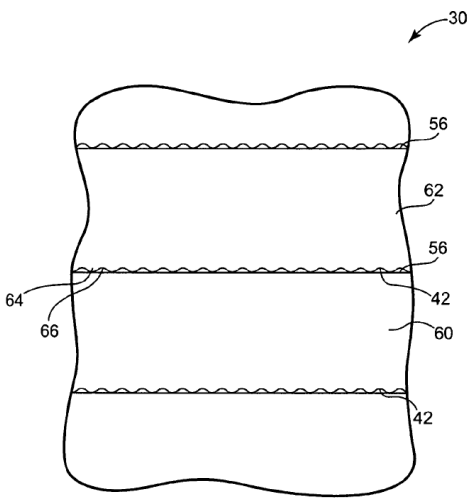

Fig. 3

88. The '774 Patent achieves its alleged invention through its use of relatively uniform carbon black particles of less than 30 nm in the backcoat. Both of its embodiments (Examples 1 and 2) use nearly identical backside formulations as the "Comparative Examples," with the notable exception of backside particles, which are 10-24 nm (carbon black) for the embodiments and 270 nm or greater for the comparative examples. *See* Ex. 1001 at 10:18-11:47. The disclosed compositions for these examples are shown below in terms of percent weight. *See* Ex. 1001 at 10:19-11:47.

Backcoat Components	**Ex. 1**	**Ex. 2**	**Comp. Ex. C1**	**Comp Ex. C2**
Filler (Titanium dioxide)	10.6%	11.2%	11.1%	11%
Wear Particles (alumina)	2.2%	2.3%	2.2%	2.3%
Dispersant for pigments	2.0%	2.1%	2.1%	2.1%
Hard binder	22.2%	22.5%	22.5%	22.5%
Soft binder	14.8%	14.9%	14.9%	14.9%
Activator	15.2%	10.2%	10.2%	10.2%
Carbon Black (15nm)	8.3%			

Carbon Black (24nm)	24.7%	36.8%	36.7%	36%
Carbon Black (270 nm)				1%
Silica (700 nm)			0.2%	

89. The '774 Patent does not disclose any specifics for other aspects of tape manufacturing, such as dispersion quality, backcoat thickness, heat curing, winding tension, calendering, and substrate roughness. *See* generally Ex. 1001. The '774 Patent only discloses one distinguishing factor between its embodiments (Examples 1 and 2) and the comparative examples of the prior art: the use of fine-grain carbon black of less than 30 nm diameter. *See id.*

90. However, the use of fine-grain carbon black in the backside coating was already known in the art as a solution to embossment. Ex. 1010 at 7:8-10 ("[f]or ease of [mean roughness] control, it is preferred to use carbon black having a primary particle size of 15 to 80 nm, ***particularly 17 to 40 nm***") (emphasis added); Ex. 1005 at [0058] ("Carbon black may be a combination of fine particle carbon black with a mean particle size of 10 to 50nm and medium particle carbon black … or, ***preferably made up entirely of the fine particle carbon black***") (emphasis added). Years before the '774 Patent was filed, prior art magnetic tape already featured backcoat layers containing carbon black only of a single size below 30 nm. *See, e.g.,* Ex. 1009 at 21:10-24 (using only ***17 nm*** carbon black particles); Ex. 1010 at 13:26-39 (backcoat chart) (using only ***18 nm*** carbon black particles); Ex. 1011 at 6:38-40 (describing use of carbon black particles with

diameter of 0.03 μm (30 nm)), Table 1 (example where ***only 30 nm carbon black*** is used); Ex. 1012 at [0225] (using ***only 25 nm carbon black*** particles in backcoat layer).

C. Summary of the Claimed Subject Matter

91. The independent claims of the '774 Patent do not recite a particular manufacturing method or composition of magnetic tape. Instead, the claims are directed to measurements of physical and recording characteristics of tape that allegedly result from the use of uniform, fine-grain carbon black in the backcoat layer as compared with bimodal coatings having fine-grain and large, coarse particles. Ex. 1001 at 9:14-21, 12:50-14:41. The claims recite statistical measures of the surface roughness of the backside of the tape that can be applied to a wide range of magnetic tapes, including for example (a) skew, (b) kurtosis, (c) peak height mean, (d) peak-to-valley roughness, and (e) plateau ratio. *Id.* Some dependent claims recite measurements of the recording properties of the magnetic tape, including skirt signal-to-noise ratio and small error rate. *Id*.

92. The '774 Patent discloses that the claimed statistical measurements are achieved by its embodiments—i.e., Examples 1 and 2 which use fine-grain carbon black of 10-24 nm diameter—but not the Comparative Examples, which, as explained above, contain large backside particles of size 270 nm and greater. *See* Ex. 1001 at 10:1-14 (Table 1):

TABLE 1

	Surface Measurement Parameters				
Example	Skew (R_{sk})	Peak Mean Height (R_{pm})	Peak-to-Valley Roughness (R_z)	Plateau Ratio (R_{pm}/R_z)	Kurtosis (R_{ku})
1	0.30	177 nm	291 nm	0.61	3.4
2	0.40	172 nm	276 nm	0.62	3.5
C1	0.53	234 nm	346 nm	0.68	4.3
C2	0.80	327 nm	449 nm	0.73	5.6
C3	0.90	369 nm	515 nm	0.72	5.2
C4	0.89	482 nm	675 nm	0.71	5.2

93. Rather than claim the alleged invention or any particular method for manufacturing magnetic tape, the '774 Patent attempts to claim the end result of its disclosed manufacturing method, i.e., the ranges of surface roughness measurements that allegedly result from the use of fine-grain carbon black on the backside coating. *See* Ex. 1001 at 12:51-14:41. While these claimed measurements were not expressly disclosed in some of the prior art, the underlying magnetic tape compositions—including the use of fine-grain carbon black—were well known in the art. *See supra* ¶¶72-78. According to the '774 Patent, these prior art compositions would have resulted in the measurements that it claims. *See* Ex. 1001 at 10:1-14 (Table 1); 10:18-11:47 (describing composition of Examples 1 and 2 and Comparative Examples C1 and C2).

94. (This paragraph number was intentionally omitted.)

D. '774 Patent Claims

95. I understand that Petitioner is challenging the validity of claims 1-13 and 15-20 of the '774 Patent in the Petition for *Inter Partes* Review. Claims 1, 15, and 20 are independent, while claims 2-13 depend on claim 1, and 16-19 depend on claim 15. These claims are set forth below:

(i) Claim 1

A magnetic recording medium comprising:

a substrate defining a first surface and a second surface opposite the first surface;

a magnetic side formed over the first surface of the substrate and defining a recording surface; and

a backside coated on the second surface of the substrate and configured to decrease embossment of the recording surface, the backside defining a backside surface opposite the substrate, the backside surface having a skew less than about 0.5 and a kurtosis less than about 4.0.

(ii) Claim 2

The magnetic recording medium of claim 1, wherein the magnetic side includes at least one layer, and the at least one layer includes a magnetic recording layer.

(iii) Claim 3

The magnetic recording medium of claim 1, wherein the backside surface

has a peak height mean less than about 200 nm.

(iv) Claim 4

The magnetic recording medium of claim 1, wherein the backside surface has a peak-to-valley roughness less than about 325 nm.

(v) Claim 5

The magnetic recording medium of claim 4, wherein the peak-to-valley roughness is less than about 300 nm.

(vi) Claim 6

The magnetic recording medium of claim 1, wherein the backside surface has a plateau ratio of less than or equal to about 0.65.

(vii) Claim 7

The magnetic recording medium of claim 1, wherein the kurtosis value is less than or equal to about 3.7.

(viii) Claim 8

The magnetic recording medium of claim 1, wherein the magnetic recording medium has a skirt signal-to-noise ratio of greater than about 0.2 relative dB along a substantial entirety of a total length of the magnetic recording medium.

(ix) Claim 9

The magnetic recording medium of claim 1, wherein a first skirt signal-to-noise ratio measured at any first location along a total length of the magnetic recording medium varies from a second skirt signal-to-noise ratio measured at any

second location along the total length of the magnetic recording medium by less than about 0.5 dB.

(x) Claim 10

The magnetic recording medium of claim 1, wherein the magnetic recording medium has a small error rate of less than about 0.5 errors/m along a substantial entirety of a total length of the magnetic recording medium.

(xi) Claim 11

The magnetic recording medium of claim 1, wherein a first small error rate measured at any first location along a total length of the magnetic recording medium varies from a second small error rate measured at any second location along the total length of the magnetic recording medium by less than about 0.25 error/m.

(xii) Claim 12

The magnetic recording medium of claim 1, wherein the backside includes a plurality of carbon black particles having an average size less than or equal to 30 nm.

(xiii) Claim 13

The magnetic recording medium of claim 12, wherein the plurality of carbon black particles have an average size less than or equal to 25 nm.

(xiv) Claim 15

A magnetic recording medium comprising:

a substrate defining a first surface and a second surface opposite the first surface;

a magnetic side coated on the first surface of the substrate and defining a recording surface; and

a backside coated on the second surface of the substrate and configured to decrease the embossment of the recording surface, wherein the backside defines a backside surface opposite the substrate, the backside surface having a peak height mean less than about 200 and a peak-to-valley roughness less than about 325 nm.

(xv) Claim 16

The magnetic recording medium of claim 15, wherein the backside surface has a skew less than about 0.5.

(xvi) Claim 17

The magnetic recording medium of claim 15, wherein the peak-to-valley roughness is less than about 300 nm.

(xvii) Claim 18

The magnetic recording medium of claim 15, wherein a first skirt signal-to-noise ratio measured at any first location along a total length of the magnetic recording medium varies from a second skirt signal-to-noise ratio measured at any second location along the total length of the magnetic recording medium by less than about 0.5 dB.

(xviii)Claim 19

The magnetic recording medium of claim 15, wherein a first small error rate measured at any first location along a total length of the magnetic recording medium varies from a second small error rate measured at any second location along the total length of the magnetic recording medium by less than about 0.25 error/m.

(xix) Claim 20

A magnetic recording medium comprising:

a substrate defining a first surface and a second surface opposite the first surface;

a magnetic side coated on the first surface of the substrate and defining a recording surface; and

a backside coated on the second surface of the substrate and configured to decrease the embossment of the recording surface, wherein the backside defines a backside surface opposite the substrate, the backside surface having a skew less than about 0.5, a kurtosis less than about 4.0, a peak height mean of less than about 200, and a peak-to-valley roughness less than about 325 nm.

VI. The Challenged Claims

96. The '774 Patent has 20 claims. Claims 1, 15, and 20 are independent. Claims 2-14, and 16-19 are dependent claims. I have considered invalidity with respect to claims 1-13, and 15-20.

97. (This paragraph number was intentionally omitted.)

VII. Claim Construction

98. For purposes of this *Inter Partes* Review I have considered the claim language, specification, and portions of the prosecution history, to determine the meaning of the claim language as it would have been understood by a person of ordinary skill in the art at the time of the invention. For the purposes of the invalidity grounds discussed in this declaration, I do not believe that any explicit constructions are necessary, and have applied the plain and ordinary meaning in view of the broadest reasonable interpretation and the description in the '774 Patent.

99-111. (These paragraph numbers were intentionally omitted.)

VIII. Summary of the Prior Art

112. There are a number of patents and publications which constitute prior art to the '774 Patent. I have reviewed and considered the following prior art patent and printed publications, which I believe were all publicly available prior to May 23, 2005, the earliest priority date claimed on the face of the '774 Patent. A description of these references follows. None of these references were presented to the USPTO during prosecution. *See* Ex. 1002 at 6.

A. Law

113. Law is U.S. Patent No. 5,670,747, filed April 15, 1994, and issued March 04, 1997. Ex. 1004 at 1. Law qualifies as prior art under at least §§ 102(a)

and (b), being a publication that was published more than one year prior to the filing date of the '774 Patent.

114. Law is directed to a magnetic recording medium composed of a support with two major surfaces, a magnetic layer on one surface and a backside coating on the other. Ex. 1004 at 2:47-52. The backside coating comprises substantially the same components as the '774 Patent. *See* Ex. 1004 at 8:34-10:42 (Table 1); *see infra* ¶¶125-127. These components include 30 nm carbon black. *Id.* Law teaches that a tape comprising fine-grain, uniform carbon black may exhibit various improved running properties. *See* Ex. 1004 at 2:38-44.

B. Sasaki

115. Sasaki is a Japanese published patent application, Publication No. 2003-317228, filed April 23, 2003, and published November 07, 2003. Ex. 1005 at 1. Sasaki qualifies as prior art under at least §§ 102(a) and (b), being a publication that was published more than one year prior to the filing date of the '774 Patent.

116. Sasaki teaches that "excessively large protrusions" on the surface of the backcoat applied to a magnetic tape substrate may cause damage to the magnetic layer's surface. Ex. 1005 at [0014]. These protrusions may imprint onto the magnetic layer during production, storage, or use, causing reduced performance characteristics. Ex. 1005 at [0014]. As one way to reduce the size and frequency of

large protrusions, Sasaki teaches the use of carbon black, "preferably made up entirely of the fine particle [10 to 50 nm] carbon black." Ex. 1005 at [0058].

117-123. (These paragraph numbers were intentionally omitted.)

IX. GROUND 1: Law Anticipates Claims 1-12, and 15-20 of the '774 Patent

124. The '774 Patent includes claim elements directed to particular measurements of the surface roughness of tape, e.g., skew, kurtosis, peak height mean, peak-to-valley roughness, and plateau ratio. *Supra* ¶¶91-93. According to the '774 Patent, these measurements result from the use of carbon black particles with a diameter of 30 nm or less: its two embodiments (Examples 1-2) both use backcoat carbon black particles between 15-24 nm, in contrast to the "comparative examples," which include carbon black particles of 270 nm or silica particles of 700 nm in the backcoat. *See* Ex. 1001 at 10:46-52; 11:12-16; 11:39-43. The '774 Patent does not disclose any other distinguishing factor between its examples and the comparative examples. *See id.* at 10:18-11:55. For example, although manufacturing methods or tape characteristics such as dispersion quality, backcoat thickness, heat curing, winding tension, calendering, and substrate roughness could potentially impact backcoat surface roughness, the '774 Patent does not specify any particular composition or method for these factors. Instead, the only noted difference between the inventive examples and the non-inventive comparative examples is that the non-inventive examples include large carbon black or silica

particles. The '774 Patent does, however, contrast the surface roughness measurements of its embodiments with the comparative examples: the '774 Patent's embodiments (Examples 1 and 2) both purportedly possess the claimed measurements, while the comparative examples (C1–C4) do not. *See* Ex. 1001 at 10:1-14 (Table 1) (annotated):

TABLE 1

		Surface Measurement Parameters				
	Example	Skew (R_{sk})	Peak Mean Height (R_{pm})	Peak-to-Valley Roughness (R_z)	Plateau Ratio (R_{pm}/R_z)	Kurtosis (R_{ku})
Within claimed ranges	1	0.30	177 nm	291 nm	0.61	3.4
	2	0.40	172 nm	276 nm	0.62	3.5
Outside claimed ranges	C1	0.53	234 nm	346 nm	0.68	4.3
	C2	0.80	327 nm	449 nm	0.73	5.6
	C3	0.90	369 nm	515 nm	0.72	5.2
	C4	0.89	482 nm	675 nm	0.71	5.2

As stated in the '774 Patent, the differences between the surface measurements for its embodiments (Examples 1-2) and Comparative Examples are due to the absence of large backside particles. The '774 Patent notes that "[a]ccordingly, Examples 1 and 2 are example magnetic recording mediums with similarly sized carbon black particles that do not generally include carbon black textured particles." Ex. 1001 at 10:52-55. By contrast, Comparative Example C1 includes "silica texture particles having a primary size of about 700 nm. Accordingly, use of the silica texture particles increases the height of peaks formed in the resultant magnetic tape

medium, which as seen in Table 1 generally leads to increased surface parameter measurements as compared to Examples 1 and 2." Ex. 1001 at 11:15-20. Comparative Example C2 includes about 1.0 percent per unit weight of carbon black texture particles having a primary size of about 270 nm. *Id.* at 11:39-43. "Accordingly, use of the carbon black texture particles increases the height of peaks and other surface measurement parameters of the resultant magnetic tape medium, which generally lead to higher rates of and more pronounced embossments." Ex. 1001 at 11:43-47. Comparative Examples C3 and C4 contain higher proportions of 270 nm carbon black particles, "[a]s such, Comparative Examples C3 and C4 generally further increase the number of peaks as opposed to Comparative Example C2." Ex. 1001 at 11:53-55. In short, the '774 Patent attributes the lower surface measurement parameters of its embodiments ("Skew (R_{sk})," "Peak Mean Height (R_{pm})," "Peak-to-Valley Roughness (R_z)," "Plateau Ratio (R_{pm}/R_z)," "Kurtosis (R_{ku})") to the use of fine-grain carbon black without large silica or carbon black particles. Ex. 1001 at 10:46-55, 11:15-20, 11:40-47, 11:53-55.

125. Law teaches a substantially identical backcoat formulation and structure compared to Examples 1-2 of the '774 Patent and therefore establishes a prima facie case of anticipation based on its inherent disclosure of the claimed characteristics. First, Law recognizes the same embossment problem as the '774

Patent (*see* Ex. 1004 at 6:37-39), identifies the same cause ("protruding particles," *see id.*), and discloses the same structure of fine-grain, uniformly-sized carbon black backcoat particles that allegedly results in the claimed measurements (Ex. 1004 at 8:67-10:10 ("Vulcan XC-72 Carbon black from Cabot Corporation (30 nm)")). Law further teaches a magnetic tape with a structure and composition that is substantially identical to that of the '774 Patent, particularly with respect to the allegedly novel composition, as summarized in the below table.[1]

Backcoat Components	**'774 Ex. 1**	**'774 Ex. 2**	**Law Sample 5**
Filler	10.6%	11.2%	8.00%[2]
Wear Particles	2.2%	2.3%	9.05%

[1] I have compared the components of the '774 Patent examples with Sample 5 of Law by relative weight percentages, as the '774 Patent discloses. Even if the comparisons were made by volumetric percentages, the relative volumes of the components would be similar.

[2] Law uses "X-60 ZEEOSPHERES" that are ceramic composites of silica, aluminum oxide, alpha-iron oxide, and titanium dioxide. *See* Ex. 1004 at 4:33-44.

Backcoat Components	'774 Ex. 1	'774 Ex. 2	Law Sample 5
Dispersant for pigments	2.0%	2.1%	2.41%[3]
Hard binder	22.2%	22.5%	14.24%[4]

[3] Law uses 0.16 parts Emcol Phosphate, 0.16 parts phosphorylated polyoxyalkyl polyol, and 2.09 parts lecithin. Ex. 1004 at 7:33-10:42 (Table I) (Sample 5). These are all examples of dispersants. *See, e.g.*, Ex. 1001 at 6:39-43 ("[d]ispersions for forming the backside 36 may further comprise one or more wetting agents. Useful wetting agents include lecithin, emcol acetate, phosphorylated polyoxyalkyl polyols"); Ex. 1007 at 14:19-23 ("[e]xamples of wetting [a]gents suitable for dispersing the carbon black include Emcol Phosphate, Emcol Acetate, phosphorylated polyoxyalkyl polyols… and the like. Lecithin is most preferred.").

[4] Law uses 4.27 parts "VAGH vinyl chloride resin" and 9.97 parts "styrene-allyl alcohol copolymer. Ex. 1004 at 7:33-10:42 (Table I) (Sample 5). Both are examples of "hard" components of a binder. *See, e.g.,* Ex. 1008 at 11:16-21 (describing example magnetic recording medium using as hard binder resins "a vinyl chloride/vinyl alcohol/vinyl acetate copolymer available from Union Carbide as VAGH" and "[styrene]/allyl alcohol copolymer").

Backcoat Components	'774 Ex. 1	'774 Ex. 2	Law Sample 5
Soft binder	14.8%	14.9%	14.3%[5]
Activators	15.2%	10.2%	15.83%[6]

[5] Law uses 14.3 parts "[h]ydroxy-functional polyurethane," which a person of ordinary skill in the art would have known to be a "soft" component of a binder. *See, e.g.,* Ex. 1004 at 5:17-22 ("it is preferred to use an additional cobinder polymer or resin… to contribute a soft component to the polymeric binder matrix… Examples of suitable cobinder resins include multi-hydroxy-functional polyurethanes").

[6] Law uses 15 parts polyisocyanate and 0.83 parts "ADMA-[]6 alkyl-dimethylamine [catalyst]." The '774 Patent describes an "activator" as being a "crosslinking agent." Ex. 1001 at 6:57-58. Polyisocyanate is a well-known crosslinking agent. *See, e.g.*, Ex. 1007 at 2:33-38 (describing "polyisocyanate crosslinking agents"); Ex. 1008 at 5:2-3 ("[e]xamples of suitable crosslinkers include polyisocyanates"). Alkyldimethylamine is a tertiary amine that may be used as a catalyst for aiding the crosslinking reaction. Ex. 1007 at 12:50-53 ("a catalyst, e.g. dibutyltin dilaurate or a tertiary amine, may also be added in suitable catalytic amounts in order to facilitate this crosslinking reaction").

Backcoat Components	'774 Ex. 1	'774 Ex. 2	Law Sample 5
Carbon Black (30 nm or smaller diameter)	33.0[7]%	36.8%	36.2%

See Ex. 1001 at 10:19-11:55; Ex. 1004 at 7:33-10:42 (Table 1).

126. Though the formulations have slight variance in the percentages of some components, the '774 Patent admits that variations in components such as wear particles, hard binders, and activators do not provide any significant effect on surface roughness with respect to its examples and comparative examples. The '774 Patent does not attribute any particular significance to these features (e.g., amounts of wear particles, hard binders, and activators used) and admits that unclaimed "comparative" examples have similar formulations for these features. *See supra* ¶89, Ex. 1001 at 11:27-31 ("The backsides of Comparative Examples C2-C4 are each formed with similar amounts of… filler particles… wear particles, a dispersant for pigments, a hard binder, a soft binder, and an activator as described with respect to Examples 1 and 2.").[8]

[7] Example 1 uses 8.3% carbon black with 15 nm diameter, and 24.7% with 24 nm, for a total of 33% carbon black with diameters of less than 30 nm. Ex. 1001 at 10:46-50.

[8] The '774 Patent further does not specify any particle size for components such as the wear particles or fillers. However, as the '774 Patent admits that the same wear

127. The ’774 Patent differentiates the embodiments of the alleged invention from the non-inventive comparative examples by use of a backside coating with fine-grain, relatively uniform carbon black. Ex. 1001 at 11:12-20, 11:43-55 (“use of the [large size] carbon black texture particles increases the height of the peaks… which generally lead to… more pronounced embossments.”). This is disclosed by Law. Ex. 1004 at 8:67-10:10 (Table 1). Law discloses a substantially identical structure as the ’774 Patent Examples 1 and 2 and thus establishes a prima facie case of anticipation based on its inherent disclosure of the claimed characteristics.

128. Additionally, the disclosed methods of manufacturing the example tape in Law are similar to the methods recited in the ’774 Patent for coating and calendering the backside coating on a magnetic tape. Examples 1 and 2 of the ’774 Patent do not require any particular methods of manufacture, beyond specifying that “[a] backside is layered on a bottom surface of the PEN substrate.” Ex. 1001 at 10:21-22. The ’774 Patent does generally describe methods of manufacturing magnetic tape which are substantially identical to the methods used for Example 1 of Law:

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particles and fillers are used in the comparative examples, their size is not a part of the alleged invention - only the size of the carbon black particles is at issue.

Manufacturing Method	'774 Patent	Law
Coating and Drying	"The substrate 32 is coated with the backside 36 material on the lower side 40 of substrate 32, and the backside 36 is dried, typically using conventional ovens." Ex. 1001 at 7:8-11.	"After all charges for each backside dispersion were added and thoroughly mixed, each dispersion was coated onto a support which was passed through an oven at a temperature of approximately 180° F." Ex. 1004 at 8:23-26.
Calendering	"According to one embodiment, called compliant-on-steel (COS), in-line calendering uses one or more in-line nip stations…." Ex. 1001 at 7:31-33. "Alternatively, the in-line calendering is 'steel-on-steel' (SOS)…" Ex. 1001 at 7:43-44.	"The tape was then calendered at a temperature of between 85° and 110° F., and a pressure of between 950 and 1200 pli." Ex. 1004 at 8:30-32.

To the extent that any other manufacturing method could have affected surface roughness, the '774 Patent provides no details as to any particular methods. Therefore, Law discloses identical manufacturing methods to the extent any methods play a role in the invention.

A. Law Anticipates Claim 1

129. The preamble of claim 1 recites "A magnetic recording medium". To the extent the preamble is a limitation, it is taught by Law. Law discloses "***a***

magnetic recording medium having a support with two major surfaces[.]" Ex. 1004 at 2:47-52.

130. With respect to the recited "substrate defining a first surface and a second surface opposite the first surface," Law discloses this element as well. Law discloses that the substrate ("support material") of the magnetic recording medium has "a support with two major surfaces[.]" Ex. 1004 at 2:48. Furthermore, the substrate ("support materials") disclosed by Law is composed of the same materials as the '774 Patent. *See* Ex. 1004 at 2:67-3:3 ("Examples of suitable support materials are polymers such as polyethylene terephthalate (PET), polyimide, and polyethylene naphthalate (PEN); or any other suitable material."); Ex. 1001 at 3:66-4:6 ("Examples of substrate materials useful for the magnetic recording medium 30 include polyesters such as polyethylene terephthalate (PET), polyethylene naphthalate (PEN), a mixture of polyethylene terephthalate and polyethylene naphthalate; polyolefins (e.g., polypropylene); cellulose derivatives; polyamides; and polyimides. In one example, polyethylene terephthalate or polyethylene naphthalate is preferably employed as the substrate 32").

131. The next element of claim 1 recites "a magnetic side formed over the first surface of the substrate and defining a recording surface". Law discloses this claim element. Law discloses that "[o]ne major surface of the support is coated with a magnetic layer." Ex. 1004 at 2:61-64. For magnetic tape, the magnetic layer

is the recording surface, and a person of ordinary skill in the art would have understood that to be true. *See* Ex. 1004 at 1:16-19 ("Magnetic recording media such as audio and video magnetic recording tapes and computer cartridge tapes are constructed of a magnetic recording layer provided on a nonmagnetic support.").

132. The last element of claim 1 recites "a backside coated on the second surface of the substrate and configured to decrease embossment of the recording surface, the backside defining a backside surface opposite the substrate, the backside surface having a skew less than about 0.5 and a kurtosis less than about 4.0." Law discloses this claim element. Law discloses that the magnetic recording medium has "a backside coating provided on the other major surface of the support." Ex. 1004 at 2:50-51. Law addresses improved running properties of magnetic tape. *See* Ex. 1004 at 1:21-31. Law teaches a reduction in the protrusions from the backside coating that could cause embossment. *See* Ex. 1004 at 6:37-39 ("The protruding particles can cause embossing of a magnetic recording tape's magnetic coating, or can transfer to the magnetic coating"). Thus, Law's backside coating is configured to prevent embossment of the recording surface. Moreover, Law's backside coating is configured to prevent embossment by the same structure described in the '774 Patent of "substantially uniform" carbon black particles that are within the range of "from about 10 nm to about 30 nm." *See* Ex. 1001 at 5:21-26; Ex. 1004 at 7:33-10:42 (Table 1).

133. While Law does not expressly disclose skew or kurtosis values for its backside surface roughness, the magnetic tape disclosed in Law is substantially identical to that of the '774 Patent, and must inherently include identical roughness properties. Law discloses a substantially identical structure for a backcoat layer made using a substantially identical method as that of the '774 Patent. *See supra* ¶¶124-128. Moreover, Law discloses that the structure is composed of the same material (small-sized carbon black particles) that provides the purportedly inventive property according to the '774 Patent. *See id*. Therefore, Law inherently discloses "a backside surface with a skew less than about 0.5 and a kurtosis less than about 4.0."

134. For at least these reasons, claim 1 is anticipated by Law.

B. Law Anticipates Claim 2

135. Claim 2 of the '774 Patent recites: "The magnetic recording medium of claim 1, wherein the magnetic side includes at least one layer, and the at least one layer includes a magnetic recording layer." As discussed above, Law anticipates claim 1. Law further discloses the limitations of claim 2. Law discloses that the support has two major surfaces. Ex. 1004 at 2:48. "One major surface of the support is coated with a magnetic layer and the other major surface is coated with a backside coating." Ex. 1004 at 2:61-64. Therefore, the magnetic side includes the magnetic layer. This satisfies the element of "the magnetic side

includ[ing] at least one layer." Furthermore, the magnetic layer would have been understood to be a magnetic recording layer. *See* Ex. 1004 at 1:16-19 ("Magnetic recording media such as audio and video magnetic recording tapes and computer cartridge tapes are constructed of a magnetic recording layer provided on a nonmagnetic support."). Additionally, a person of ordinary skill in the art would have understood that the magnetic layer of a magnetic tape is necessarily used as a recording surface. *See supra* ¶¶66-67. Therefore, Law anticipates claim 2.

C. Law Anticipates Claims 3-7

136. Claims 3-7 of the '774 Patent each recite: "The magnetic recording medium of claim 1" and recite additional measurements of the backside surface: "a peak height mean less than about 200 nm" (claim 3), "a peak-to-valley roughness less than about 325 nm" (claim 4), "a peak-to-valley roughness less than 300 nm" (claim 5), "a plateau ratio less than or equal to about 0.65" (claim 6), and "a kurtosis value less than or equal to about 3.7" (claim 7).

137. As discussed above, Law anticipates claim 1. While Law does not expressly disclose peak height mean, peak-to-valley roughness, or plateau ratio for its backside surface, Law discloses all elements of claim 1 (*see supra* ¶¶129-134) and a substantially identical structure made using a substantially identical method composed of substantially identical materials as the embodiments of the '774 Patent that allegedly possess the claimed measurements (*see supra* ¶¶124-128).

Therefore, Law provides a prima facie case for the inherent disclosure of the recited measurements of claims 3-7.

D. Law Anticipates Claims 8-11

138. Claims 8-11 of the '774 Patent each recite "The magnetic recording medium of claim 1" and a measurement of the recording properties of the magnetic recording medium. Claim 8 recites "wherein a skirt signal-to-noise ratio of greater than about 0.2 relative dB along a substantial entirety of a total length of the magnetic recording medium." Claim 9 recites "wherein a first skirt signal-to-noise ratio measured at any first location along a total length of the magnetic recording medium varies from a second skirt signal-to-noise ratio measured at any second location along the total length of the magnetic recording medium by less than about 0.5 dB." Claim 10 recites "wherein a small error rate of less than about 0.5 errors/m along a substantial entirety of a total length of the magnetic recording medium." Claim 11 recites "wherein a first small error rate measured at any first location along a total length of the magnetic recording medium varies from a second small error rate measured at any second location along the total length of the magnetic recording medium by less than about 0.25 error/m."

139. As discussed above, Law anticipates claim 1. A person of ordinary skill in the art would have understood, as basic principles of engineering that were widely known in the magnetic tape industry, that skirt signal-to-noise and small

error rate are measurements of the recording ability of magnetic tape, and improvements to both are a direct consequence of decreasing the number of protrusions on the backside surface. A person of ordinary skill in the art would have understood preventing embossment leads to an increase in the signal-to-noise ratio and a decrease in the small error rate. The '774 Patent confirms this fact: "Accordingly, by decreasing the number and/or prominence of pits or embossments, the signal-to-noise ratio, such as the skirt signal-to-noise ratio, is increased and errors, such as the small errors, are decreased with respect to other magnetic recording mediums.… Similarly, in one embodiment, variations in the skirt signal-to-noise ratio and small errors are also limited along the total length of the magnetic recording medium." Ex. 1001 at 9:29-37. The claimed skirt signal-to-noise ratio and small error rate, and the claimed reduced variation of the skirt signal-to-noise ratio and small error rate, are therefore merely the result of a backcoat layer with smoother surface characteristics. *See* Ex. 1001 at 9:28-33. This was commonly known in the prior art. *See* Ex. 1009 at 1:54-57 ("[w]hen the linear recording density is high and the track is narrow, this 'transfer' results not only in decreased output, but also in lost signal"); Ex. 1011 at 2:12-14 ("the characteristics, i.e., the video output or RF output, of the magnetic layer are seriously affected when the imprint is received from the backing layer"); Ex. 1013 at 2:22-25 ("if the surface of the backside coating layer is too rough, the backside

coating layer tends to damage the smooth surface of the magnetic layer … those electromagnetic properties of the tape which depend upon the smoothness of the magnetic layer, e.g., the signal to noise ratio, sensitivity, maximum output level, and the like, tend to deteriorate"). While Law does not expressly disclose skirt signal-to-noise ratio or small error rate values for its magnetic tape, Law discloses a backcoat layer with smoother surface characteristics. Law discloses all elements of claim 1 (*See supra* ¶¶129-134) and a substantially identical structure made using a substantially identical method as the embodiments of the '774 Patent that allegedly possess the claimed surface measurements (s*ee supra* ¶¶124-128). Therefore, Law provides a prima facie case for the inherent disclosure of the recited measurements of claims 8-11.

E. Law Anticipates Claim 12

140. Claim 12 of the '774 Patent recites "The magnetic recording medium of claim 1, wherein the backside includes a plurality of carbon black particles having an average size less than or equal to 30 nm." As discussed above, Law anticipates claim 1. Law also discloses the claim limitations of claim 6. Law teaches a backside including carbon black particles having an average size less than or equal to 30 nm. Ex. 1004 at 8:67-10:42 (Table 1) ("Vulcan XC-72 Carbon black from Cabot Corporation (30 nm)"). Therefore, Law anticipates claim 12.

F. Law Anticipates Claim 15

141. The preamble of claim 15 recites "A magnetic recording medium comprising". To the extent the preamble is a limitation, it is taught by Law. Law discloses an "***a magnetic recording medium*** having a support with two major surfaces[.]" Ex. 1004 at 2:47-52.

142. With respect to the recited "substrate defining a first surface and a second surface opposite the first surface," Law discloses this element as well. Law discloses that the substrate ("support material") of the magnetic recording medium has "a support with two major surfaces[.]" Ex. 1004 at 2:48. Furthermore, the substrate ("support materials") disclosed by Law is composed of the same materials as the '774 Patent. *See* 1004 at 2:67-3:3 ("Examples of suitable support materials are polymers such as polyethylene terephthalate (PET), polyimide, and polyethylene naphthalate (PEN); or any other suitable material."); Ex. 1001 at 3:66-4:6 ("Examples of substrate materials useful for the magnetic recording medium 30 include polyesters such as polyethylene terephthalate (PET), polyethylene naphthalate (PEN), a mixture of polyethylene terephthalate and polyethylene naphthalate; polyolefins (e.g., polypropylene); cellulose derivatives; polyamides; and polyimides. In one example, polyethylene terephthalate or polyethylene naphthalate is preferably employed as the substrate 32").

143. The next element of claim 1 recites "a magnetic side formed over the first surface of the substrate and defining a recording surface". Law discloses this claim element. Law discloses that "[o]ne major surface of the support is coated with a magnetic layer." Ex. 1004 at 3:61-64. For magnetic tape, the magnetic layer is the recording surface, and a person of ordinary skill in the art would have understood that to be true. *See* Ex. 1004 at 1:16-19 ("Magnetic recording media such as audio and video magnetic recording tapes and computer cartridge tapes are constructed of a magnetic recording layer provided on a nonmagnetic support.").

144. The last element of claim 15 recites "a backside coated on the second surface of the substrate and configured to prevent embossment of the recording surface, wherein the backside defines a backside surface opposite the substrate, the backside surface having a peak height mean less than about 200 [nm] and a peak-to-valley roughness less than about 325 nm." Law discloses this claim element. Law discloses that the magnetic recording medium has "a backside coating provided on the other major surface of the support." Ex. 1004 at 2:50-51. Law addresses improved running properties of magnetic tape. *See* Ex. 1004 at 1:21-31. Law teaches a reduction in the protrusions from the backside coating that could cause embossment. *See* Ex. 1004 at 6:37-39 ("The protruding particles can cause embossing of a magnetic recording tape's magnetic coating, or can transfer to the magnetic coating"). Thus, Law's backside coating is configured to prevent

embossment of the recording surface. Moreover, Law's backside coating is configured to prevent embossment by the same structure described in the '774 Patent of "substantially uniform" carbon black particles that are within the range of "from about 10 nm to about 30 nm." *See* Ex. 1001 at 5:21-26; Ex. 1004 at 7:33-10:42 (Table 1).

145. While Law does not expressly disclose peak height mean or peak-to-valley roughness values for its backside surface roughness, Law discloses a substantially identical structure made using a substantially identical method as that of the '774 Patent. *See supra* ¶¶124-128. Moreover, Law discloses that the structure is composed of the same material (small-sized carbon black particles) that provides the purportedly inventive property according to the '774 Patent. *See id.* Therefore, Law provides a prima facie case for the inherent disclosure of a "backside surface having a peak height mean less than about 200 [nm] and a peak-to-valley roughness less than about 325 nm."

146. For at least these reasons, claim 15 is anticipated by Law.

G. Law Anticipates Claims 16-17

147. Claims 16-17 of the '774 Patent each recite "The magnetic recording medium according to claim 15" and recite measurements of the backside surface of the magnetic recording medium including "wherein the backside surface has a

skew less than about 0.5" (claim 16) and "wherein the peak-to-valley roughness is less than about 300 nm" (claim 17).

148. As discussed above, Law anticipates claim 15. While Law does not expressly disclose skew or peak-to-valley roughness measurements for its backside surface, Law provides a prima facie case for the inherent disclosure of a skew less than about 0.5 and peak-to-valley roughness less than about 300 nm. *See supra* ¶¶124-128, 136-137.

H. Law Anticipates Claim 18-19

149. Claims 18-19 of the '774 Patent each recite "The magnetic recording medium according to claim 15" and recite measurements of the magnetic recording properties of the "magnetic recording medium". Claim 18 recites "wherein a first skirt signal-to-noise ratio measured at any first location along a total length of the magnetic recording medium varies from a second skirt signal-to-noise ratio measured at any second location along the total length of the magnetic recording medium by less than about 0.5 dB." Claim 19 recites "wherein a first small error rate measured at any first location along a total length of the magnetic recording medium varies from a second small error rate measured at any second location along the total length of the magnetic recording medium by less than about 0.25 error/m."

150. As discussed above, Law anticipates claim 15. As also discussed above, a reduced variation of the skirt signal-to-noise ratio and small error rate along the tape are merely the result of a backside surface with smoother surface characteristics; a person of ordinary skill in the art would have understood this fact, and the '774 Patent confirms this fact. Ex. 1001 at 9:29-37; *see supra* ¶139. While Law does not expressly disclose skirt signal-to-noise ratio or small error rate values for its magnetic tape, Law provides a prima facie case for the inherent disclosure of the recited skirt signal-to-noise and small error rate measurements. *See supra* ¶¶124-128, 138-139.

I. Law Anticipates Claim 20

151. The preamble of claim 20 recites "A magnetic recording medium comprising". To the extent the preamble is a limitation, it is taught by Law. Law discloses an "***a magnetic recording medium*** having a support with two major surfaces[.]" Ex. 1004 at 2:47-52.

152. With respect to the recited "substrate defining a first surface and a second surface opposite the first surface," Law discloses this element as well. Law discloses that the substrate ("support material") of the magnetic recording medium has "a support with two major surfaces[.]" Ex. 1004 at 2:48. Furthermore, the substrate ("support materials") disclosed by Law is composed of the same materials as the '774 Patent. *See* 1004 at 2:67-3:3 ("Examples of suitable support

materials are polymers such as polyethylene terephthalate (PET), polyimide, and polyethylene naphthalate (PEN); or any other suitable material."); Ex. 1001 at 3:66-4:6 ("Examples of substrate materials useful for the magnetic recording medium 30 include polyesters such as polyethylene terephthalate (PET), polyethylene naphthalate (PEN), a mixture of polyethylene terephthalate and polyethylene naphthalate; polyolefins (e.g., polypropylene); cellulose derivatives; polyamides; and polyimides. In one example, polyethylene terephthalate or polyethylene naphthalate is preferably employed as the substrate 32").

153. With respect to the recited "magnetic side formed over the first surface of the substrate and defining a recording surface". Law discloses this claim limitation. Law discloses that "[o]ne major surface of the support is coated with a magnetic layer." Ex. 1004 at 3:61-64. For magnetic tape, the magnetic layer is the recording surface, and a person of ordinary skill in the art would have understood that to be true. *See* Ex. 1004 at 1:16-19 ("Magnetic recording media such as audio and video magnetic recording tapes and computer cartridge tapes are constructed of a magnetic recording layer provided on a nonmagnetic support.").

154. The last element of claim 20 recites "a backside coated on the second surface of the substrate and configured to decrease the embossment of the recording surface, wherein the backside defines a backside surface opposite the substrate, the backside surface having a skew less than about 0.5, a kurtosis less

than about 4.0, a peak height mean of less than about 200 [nm], and a peak-to-valley roughness less than about 325 nm." Law discloses this claim element. Law discloses that the magnetic recording medium has "a backside coating provided on the other major surface of the support." Ex. 1004 at 2:50-51. Law addresses improved running properties of magnetic tape. *See* Ex. 1004 at 1:21-31. Law teaches a reduction in the protrusions from the backside coating that could cause embossment. *See* Ex. 1004 at 6:37-39 ("The protruding particles can cause embossing of a magnetic recording tape's magnetic coating, or can transfer to the magnetic coating"). Thus, Law's backside coating is configured to prevent embossment of the recording surface. Moreover, Law's backside coating is configured to prevent embossment by the same structure described in the '774 Patent of "substantially uniform" carbon black particles that are within the range of "from about 10 nm to about 30 nm." *See* Ex. 1001 at 5:21-26; Ex. 1004 at 7:33-10:42 (Table 1).

155. While Law does not expressly disclose skew, kurtosis, peak height mean or peak-to-valley roughness values for its backside surface roughness, Law discloses a substantially identical structure made using a substantially identical method as that of the '774 Patent. *See supra* ¶¶124-128. Moreover, Law discloses that the structure is composed of the same material (small-sized carbon black particles) that provides the purportedly inventive property according to the '774

Patent. See id. Therefore, Law provides a prima facie case for the inherent disclosure of a "a backside coated on the second surface of the substrate and configured to decrease the embossment of the recording surface, wherein the backside defines a backside surface opposite the substrate, the backside surface having a skew less than about 0.5, a kurtosis less than about 4.0, a peak height mean of less than about 200 [nm], and a peak-to-valley roughness less than about 325 nm." *See supra* ¶¶124-128, 133, 145.

156. For at least these reasons, claim 20 is anticipated by Law.

X. GROUND 2: Law in View of Sasaki Render Claims 1-13, and 15-20 of the '774 Patent Obvious

157. To the extent Law does not inherently disclose the surface roughness measurements claimed by the '774 Patent, those elements would have been obvious to a person of ordinary skill in the art based on the combination of Law and Sasaki. Law teaches a magnetic tape with the same structure that the '774 Patent alleges to result in the claimed properties. *See supra* ¶¶124-128. Sasaki further teaches that the use of fine-grain, uniformly-sized carbon black particles in the backside coating would prevent embossment by removing the large backside particles that created protrusions on the surface. Ex. 1005 at [0130] ("For examples 1, 2, 3, and 4 where the backing layer used a fine carbon black with a mean particle size of 20 to 70nm, the backing layer's protrusion distribution was: 20 to 40nm – 1.2/μm²[;] 40 to 80nm – 0.4/μm²[;] 80 to 100nm – 0.02/μm²[;] Over 100nm –

None. In these samples there was almost no sign of backing layer protrusions imprinting on to the magnetic layer after storage"). Thus, a person of ordinary skill in the art would have found it obvious to produce the magnetic tape taught by Law and recognize, based on Sasaki's teachings, that the resulting tape would have had the claimed measurements of the '774 Patent that allegedly prevent embossment in the same way.

158. According to the '774 Patent, the use of carbon black with particle size of less than 30 nm results in the claimed statistical measurements in the embodiments of the alleged invention. *See supra* ¶¶86-93; Ex. 1001 at 10:1-11:20 (comparing Examples 1 and 2 with Comparative Example 1). Law and Sasaki teach the use of fine-grain particles of relatively uniform size for the backside coating. Indeed, Law teaches a substantially identical formulation for producing magnetic tape as the '774 Patent Examples 1 and 2, which allegedly results in the physical characteristics claimed by the '774 Patent. *See supra* ¶¶124-128. Sasaki further teaches that fine-grain carbon black can prevent embossment. Ex. 1005 at [0130] ("[i]n [samples with 20-70 nm carbon black] there was almost no sign of backing layer protrusions imprinting on to the magnetic layer after storage"). To that end, Sasaki teaches the use of 20 nm carbon black powder in the backcoat layer, which reduces size and prevalence of protrusions in the backcoat layer. Ex. 1005 at [0092], [0129] (Table 1). Therefore, a person of ordinary skill in the art

would have found it obvious, following the teachings of Law and Sasaki, to produce a magnetic tape with the claimed physical characteristics.

159. Moreover, a person of ordinary skill in the art would have understood that the claimed measurements are based on the size and distribution of projections on the backside coating, which could be controlled at least partly through controlling the size of carbon black particles. *See, e.g.,* Ex. 1009 at 6:38-42 (controlling the height of protrusions as one step of controlling the "biting" effect); Ex. 1010 at 6:1-5 (controlling mean roughness by controlling size of particles, especially carbon black); Ex. 1013 at 3:25-28. Notably, the '774 Patent does not teach any particular manufacturing steps are necessary to enable its claims, other than the use of fine-grain carbon black. *See supra* ¶¶88-90.

160. To the extent Law and Sasaki do not disclose the measurements recited by the '774 Patent, a person of ordinary skill in the art would have found it obvious to produce a tape with the claimed characteristics based on the combined teachings of Law and Sasaki because they teach the same problem as the '774 Patent, the same solution proposed by the '774 Patent, and the same formulation for producing the tape that the '774 Patent alleges has the claimed characteristics.

A. Motivations to Combine

161. A person of ordinary skill in the art would have been motivated to combine Law with Sasaki because (1) both references dealt with the same problem

in magnetic tape, namely backside protrusions embossing/transferring depressions to the front-side magnetic surface, and (2) both references taught the use of fine-grain, uniformly-sized carbon black particles. *See* Ex. 1004 at 9:1-10:42 (Table 1 teaching backside coating containing only 30 nm carbon black particles); Ex. 1005 at [0092].

162. Both Sasaki and Law are directed to methods of manufacturing magnetic tape, and in particular discuss methods of producing a backside coating. Ex. 1005 at [0001], [0021]; Ex. 1004 at 1:9-12. Law notes that "[t]he roughness of a backside coating has been found to be a major factor in affecting the frictional and running properties of a magnetic recording medium." Ex. 1004 at 5:49-51. Similarly, Sasaki notes "[i]nvestigation into the causes of [scratch shaped damage to the magnetic layer's surface] revealed that excessively large protrusions on the surface of the back coat applied to the non-magnetic substrate were responsible." Ex. 1005 at [0013].

163. Both Law and Sasaki discuss the need to ensure that the backside coating is not too rough in order to prevent embossing on the magnetic layer or otherwise causing damage. *See* Ex. 1004 at 5:51-58 ("too rough of a backside coating can cause a new set of problems. For instance, a rough backside might cause defects in the magnetic side of the medium due to embossing"); Ex 1005 at [0008] ("a rough non-magnetic substrate surface means a rough magnetic layer

surface which causes spacing loss that degrades electromagnetic conversion properties"), [0014]-[0015] ("if there are excessively large protrusions on the back coat surface, the protrusion shape can imprint itself on the magnetic layer during the heat treatment phase of magnetic tape production or during long-term storage wound up around a tape reel, causing electromagnetic transfer properties to fall."). Each reference teaches the use of fine-grain, uniformly-sized carbon black as a way to avoid too rough a backside coating. Ex. 1005 at [0092], [0129] (Table 1) (Example 1); Ex. 1004 at 7:67-10:7 (Table 1) (Sample 5).

164. Therefore, a person of ordinary skill in the art would have been motivated to create a backside coating using the composition in Law, with the reinforcing teaching from Sasaki that the use of uniformly-sized fine-grain carbon black particles would reduce the prevalence of large peaks on the backside surface. Such a combination would result in a magnetic tape having the structure made using a substantially identical method similar to the embodiments described in the '774 Patent as meeting the claim requirements, meaning that the magnetic tape would have the claimed properties. *See supra* ¶¶124-128, 132-133, 154-155.

165. The alleged invention is a combination of familiar elements (backside coating on a magnetic tape using single-size carbon black particles) according to known methods (adding small-sized carbon black particles to a binder medium and coating the resulting mixture onto the substrate) to yield predictable results

(reducing the prevalence of large protrusions on the backside surface). *See* Ex. 1005 at [0058] ("Carbon black may be a combination of fine particle carbon black with a mean particle size of 10 to 50nm, and medium particle carbon black with a mean particle size of 60 to 100nm, or, *preferably made up entirely of the fine particle carbon black*.") (emphasis supplied); Ex. 1005 at [0025] ("Invention related magnetic recording medium 100 and its non-magnetic substrate 101 is coated on the opposite surface of the surface described above with a back coat coating mixture of carbon black, binder, and solvent to form back coat 104."); Ex. 1004 at 9:1-10:42 (Table 1) (showing use of only 30 nm carbon black); Ex. 1005 at [0019]-[0020] ("non-magnetic back coat applied to the opposite side, and said back coat surface has protrusion sizes and distribution matching the following specifications: Protrusions of 20nm to 40nm: 1.2 protrusions per μm²[;] Protrusions of 40nm to 80nm: 0.4 protrusions per μm²[;] Protrusions of 80nm to 100nm: 0.02 protrusions per μm²[;] Protrusions over 100nm: None").

166. Adding carbon black in the backside coating of a magnetic tape was well-known in the art, and the use of single-size carbon black particles less than 30 nm in diameter to help control the size and number of backside peaks was also well-known by 2005. *See supra* ¶¶72-78. The results of this combination, the alleged novelty of the invention—improved surface characteristics due to controlled size and number of backside peaks—was similarly well-known in the

art. *See e.g.,* Ex. 1013 at 3:21-23; Ex. 1011 at 8:12-9:44; Ex. 1006 at [0010]; Ex. 1005 at [0129]-[0133]; Ex. 1004 at 5:59-67. In short, the problem and solution of the '774 Patent were known in the art, and there is nothing novel or non-obvious about claiming measurements that result from known processes.

B. Law in View of Sasaki Renders Obvious Claim 1

167. The preamble of claim 1 recites "A magnetic recording medium." To the extent the preamble is a limitation, Law discloses this element. *See supra* ¶129. It is further obvious based on Sasaki's teachings. Ex. 1005 at [0001] ("The present invention relates to magnetic recording mediums such as magnetic tape.").

168. The next element of claim 1 recites "a substrate defining a first surface and a second surface opposite the first surface". Law also discloses this element. *See supra* ¶130. It is further obvious based on Sasaki's teachings. Ex. 1005 at [Abstract] ("On a magnetic recording medium composed of a non-magnetic substrate, with a magnetic layer applied over a non-magnetic layer on one surface, and a back coat on the opposite surface[.]")."

169. The next element of claim 1 recites "a magnetic side formed over the first surface of the substrate and defining a recording surface". Law also discloses this element. *See supra* ¶131. It is further obvious based on Sasaki's teachings. Ex. 1005 at [Abstract] ("a non-magnetic substrate, with a magnetic layer applied over a non-magnetic layer on one surface"), [0024] ("The surface with upper magnetic

layer 103, the recording layer is a multi-layer coating film layer."). A person of ordinary skill in the art would have understood that the magnetic layer would include the recording surface of the magnetic tape.

170. The last element of claim 1 recites "a backside coated on the second surface of the substrate and configured to decrease embossment of the recording surface, the backside defining a backside surface opposite the substrate, the backside surface having a skew less than about 0.5 and a kurtosis less than about 4.0." Law discloses this element. *See supra* ¶¶132-133. It is further obvious based on Sasaki's teachings. Sasaki teaches the reduction of protrusions, i.e., peaks, on the backside. *See* Ex. 1005 at [0016] ("[T]o improve the quality of magnetic tape used in linear format read and write systems … it is necessary to create a back coat that reduces protrusion imprinting upon the magnetic layer"), [0019] ("Created to achieve the objectives articulated above, this invention is a magnetic recording medium consisting of … a non-magnetic back coat applied to the opposite side, and said back coat surface has protrusion sizes and distribution matching the following specifications…"). As would have been understood by a person of ordinary skill in the art, a reduction of protrusions would have naturally led to a backside surface having a skew less than about 0.5 and a kurtosis less than about 4.0, and a person of ordinary skill in the art would have found it obvious, when applying Sasaki's teachings to Law, to create a tape with such measurements.

171. The '774 Patent admits that skew and kurtosis are measures of the degree to which the prevalence of peaks on the backside surface are reduced. Ex. 1001 at 8:20-23 ("[w]ith regard to magnetic recording medium 30, it is generally desirable to decrease positive skew by decreasing the predominance of high peaks, and, consequently, decreasing the number and/or size of pits or embossments"). The prevalence of peaks on the backside surface (and therefore skew) can be reduced by using only uniformly-sized, fine carbon black particles. *Id.* at 5:22-38 ("since the large particles are generally not utilized in the backside 36, the backside surface 42 generally decreases the number and/or predominance of any pits or embossments formed in recording surface 56"). By reducing the number of peaks, the overall surface may become closer to a Gaussian distribution, which by definition has a skew of zero. *See, e.g.*, Ex. 1014 at 5:35-36; Fig. 2A:

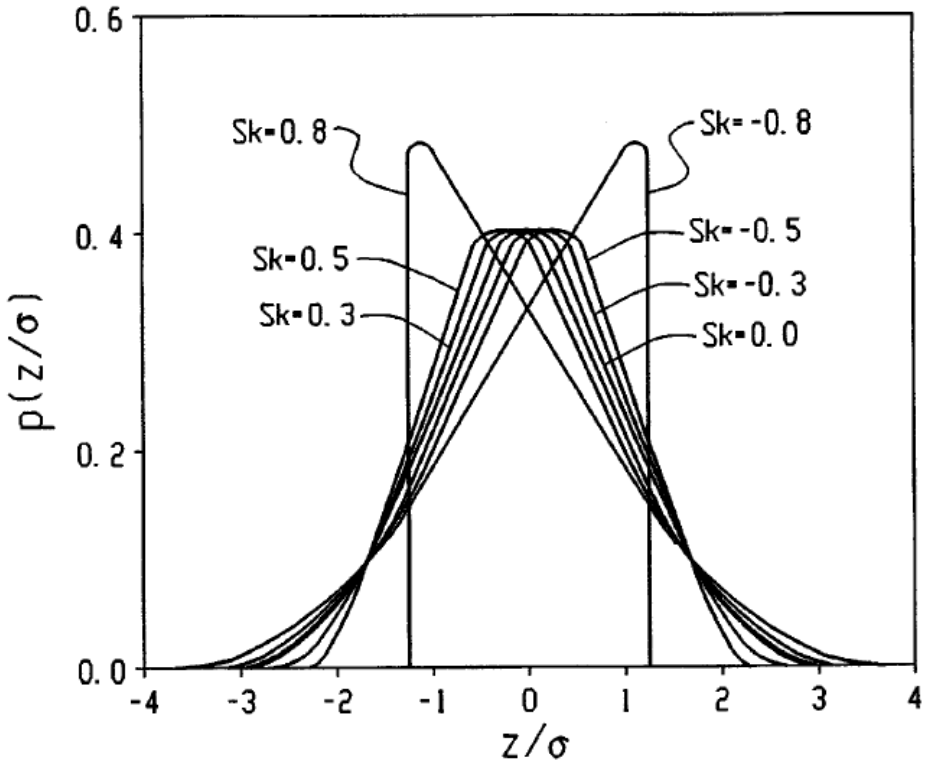

Fig. 2A

A greater prevalence of peaks would cause the distribution to shift to the left (as there are more points below the mean due to the relatively higher number of peaks relative to the surface that raise the mean), and increase skew. *See* Ex. 1014 at Fig. 2A.

172. Likewise, the '774 Patent admits that the claimed kurtosis measurement is merely the result of removing large protrusions from the backside surface. As admitted by the '774 Patent, kurtosis is "a measure of the distribution of spikes above and below the mean line of the backside surface 42 and generally indicates the randomness of the surface." Ex. 1001 at 8:65-67. "[F]or relatively

spiky surfaces, kurtosis is greater than three; for wavy surfaces, kurtosis is less than three; and for perfectly random surfaces, kurtosis is generally equal to three." Ex. 1001 at 9:2-5. Because a random surface would contain less extreme peaks and valleys, a surface approaching a "truly Gaussian surface" is desired. Ex. 1001 at 9:6-10; *see also* Ex. 1014 at 4:17-32. As demonstrated by the example figure below, a higher kurtosis indicates a narrower distribution curve, meaning that there are relatively fewer values near the mean (and therefore, more values that are peaks or valleys):

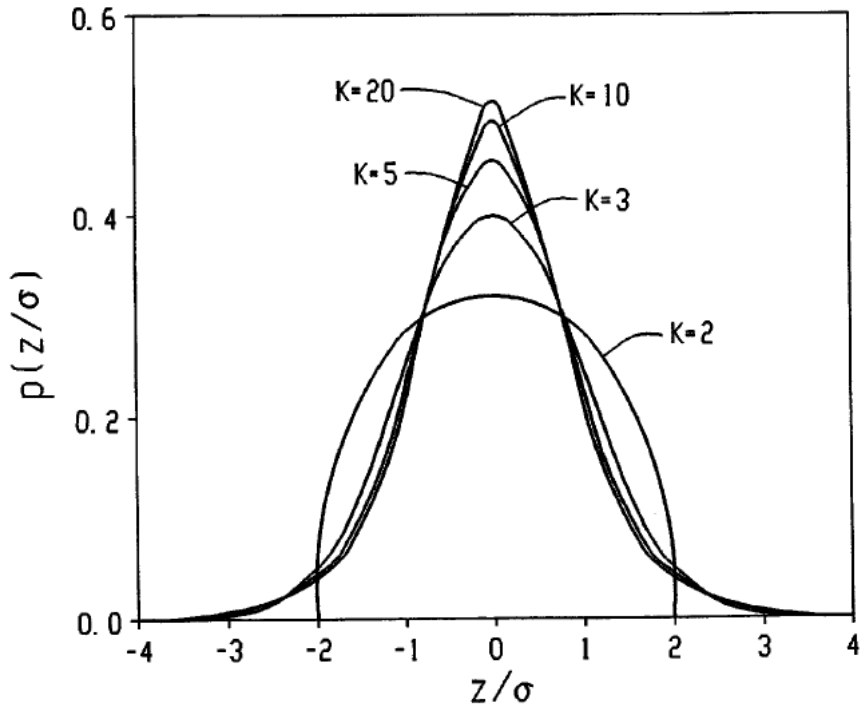

Fig. 2B

Ex. 1014 at Fig. 2B. Therefore, the '774 Patent admits that a reduction of backside protrusions would naturally result in a kurtosis of less than 4.0. Ex. 1014 at 5:35-

36.

173. Furthermore, a person of ordinary skill in the art would have understood that Sasaki's teachings of 20 nm carbon black for the backcoat, when applied to the magnetic tape taught by Law, would have eliminated large protrusions (caused by larger particles).[9] The combination of Sasaki and Law would have thus led to a backside coating with a surface roughness following a Gaussian distribution, i.e., a backside coating with a "Gaussian surface roughness." When relatively large and relatively small particles are both used for the backside coating, the result will have a bi-modal surface roughness distribution reflecting the two different particle sizes. *See supra* ¶¶74-75; *See* Ex. 1001 at 5:18-23; Ex. 1005 at [0129] (Table 1) (comparative examples with two different-size carbon black particles); Ex. 1013 at 6:5-55 (Table 2). However, when only fine-grain, uniformly-sized particles are used, the result will have an approximately Gaussian distribution, i.e., normal distribution, because (a) the surface roughness would reflect the distribution of a single-sized particle, and (b) the probability distribution of a ***random*** variable will generally be Gaussian. *See supra* ¶¶79-81. By definition,

[9] As noted *supra* ¶128, the '774 Patent admits that no other difference in composition or manufacturing method has a role in affecting its surface roughness, as the other factors are simply not mentioned in the '774 Patent.

a Gaussian distribution has a skew of 0 and a kurtosis of 3. *See supra* ¶81; Ex. 1001 at 9:5-7; Ex. 1014 at 5:35-36, Figs. 2A, 2B.

174. As the frequency of large protrusions is reduced, the skew of the backcoat surface approaches 0 and the kurtosis becomes closer to 3. Thus, a person of ordinary skill in the art would have found it obvious to create magnetic tape according to Law's formulation, and reducing the prevalence of backside peaks and embossment per Sasaki's teachings, resulting in a magnetic tape with a backside surface roughness with skew less than about 0.5 and a kurtosis less than 4.0.

175. For at least these reasons, claim 1 is obvious over Law in view of Sasaki.

C. Law in View of Sasaki Renders Obvious Claim 2

176. Claim 2 of the '774 Patent recites: "The magnetic recording medium of claim 1, wherein the magnetic side includes at least one layer, and the at least one layer includes a magnetic recording layer." As discussed above, claim 1 is obvious over the combination of Law and Sasaki. *Supra* ¶¶167-175. Law discloses this element. *See supra* ¶135. It is further obvious based on Sasaki's teachings. Ex. 1005 at [Abstract] ("On a magnetic recording medium composed of a non-magnetic substrate, with a magnetic layer applied over a non-magnetic layer on one surface, and a back coat on the opposite surface[.]").

D. Law in View of Sasaki Renders Obvious Claim 3

177. Claim 3 of the '774 Patent recites: "The magnetic recording medium of claim 1, wherein the backside surface has a peak height mean less than about 200 nm." Law discloses this element. *See supra* ¶¶136-137. Furthermore, the combination of Law and Sasaki discloses all elements of claim 1. *See supra* ¶¶167-175. The claimed value for peak height mean is a further consequence of reducing the number of relatively large peaks. "Peak Height Mean (R_{pm}) refers to the mean height of the peaks 42 extending above a standard plane of backside surface 42 over the length of the magnetic recording medium 30. In this respect, a low peak height mean indicates that few large peaks are present, which generally translates to fewer embossments being formed in the recording surface[.]" Ex. 1001 at 8:30-35.

178. A person of ordinary skill in the art reading Law in view of Sasaki would have understood that the magnetic tape of Law with 30 nm carbon black particles would result in reduced large protrusions on the backside surface, resulting in the claimed characteristics. *See supra* ¶¶170-174. Furthermore, Sasaki teaches that large protrusions result in unwanted embossment (imprints). Ex. 1005 at [0015]. Sasaki also teaches a backcoat surface with ***zero*** protrusions over 100nm. Ex. 1005 at [0020]. Thus, a person of ordinary skill in the art would have found it obvious to have a magnetic tape following the teachings of Law and

Sasaki with a reduced peak height mean of less than 200 nm because Sasaki teaches the reduction of surface protrusions.

E. Law in View of Sasaki Renders Obvious Claim 4-5

179. Claims 4-5 of the '774 Patent recite measurements of the "peak-to valley roughness" of the "backside surface" of the "magnetic recording medium of claim 1." Claim 4 recites a "peak-to-valley roughness less than about 325 nm" and claim 5 recites a "peak-to-valley roughness less than about 300 nm." Law discloses these elements. *See supra* ¶¶136-137.

180. Furthermore, the combination of Law and Sasaki discloses all elements of claim 1. *See supra* ¶¶167-175. The claimed values for peak-to-valley roughness are further consequences of reducing the number of relatively large peaks. Peak-to-valley roughness describes a measure of the height difference between a peak and an adjacent valley. Ex. 1001 at 8:38-42. The '774 Patent is clear that the claimed values of peak-to-valley roughness are a direct consequence of the smaller, less extreme peaks. Ex. 1001 at 8:47-51 ("Since the peaks 64 defined by the magnetic recording medium 30 generally are smaller than prior art peaks, the magnetic recording medium 30 generally decreases the peak-to-valley roughness of the magnetic recording medium 30.").

181. A person of ordinary skill in the art would have understood that the magnetic tape of Law with 30 nm carbon black particles would result in reduced

large protrusions on the backside surface, which would result in the claimed characteristics. *See supra* ¶¶170-174. Furthermore, Sasaki teaches that large protrusions result in unwanted embossment (imprints). Ex. 1005 at [0015]. Sasaki also teaches that preventing embossment would improve the overall quality of magnetic tape. *See* Ex. 1005 at [0016]. Peak-to-valley roughness is a measure of the difference between a peak and an adjacent valley. *See* Ex. 1001 at 8:46-51. Reducing the height of peaks (protrusions) would reduce this characteristic. *See Id.* Thus, a person of ordinary skill in the art would have found it obvious that the magnetic tape of Law, combined with Sasaki's teachings, would have a reduced peak-to-valley roughness of less than 300 nm.

F. Law in View of Sasaki Renders Obvious Claim 6

182. Claim 6 of the '774 Patent recites "The magnetic recording medium of claim 1, wherein the backside surface has a plateau ratio of less than or equal to about 0.65." The combination of Law and Sasaki discloses all elements of claim 1. *See supra* ¶¶167-175. The additional elements of claim 6 are disclosed by Law (*see supra* ¶¶136-137) and further rendered obvious by Law in view of Sasaki's teachings (*see* Ex. 1005 at [0016], [0019]). Sasaki teaches that large protrusions on the backcoat can be reduced by removing the large particles that cause them. *See* Ex. 1005 at [0016], [0019], [0129].

183. The '774 Patent admits that "a low plateau ratio generally indicates that the peaks 64 are more rounded or plateau-like as opposed to high plateau ratio, which generally indicates that the peaks 64 are more spike-like in appearance." Ex. 1001 at 8:57-61. Therefore, a person of ordinary skill in the art would have understood that removing spikes, i.e., large protrusions, from the backcoat surface, as Law and Sasaki teach, would have reduced the plateau ratio. In particular, Sasaki teaches that protrusions of 80 nm and higher can be eliminated by using a backcoat with uniformly-sized 20 nm carbon black particles. *See* Ex. 1005 at [0129] (Table 1). As a person of ordinary skill in the art would have understood, eliminating the sharper protrusions results in a backcoat with more rounded, plateau-like peaks, compared to the spikes of 80 nm and taller seen with Sasaki's comparative examples. *See id.*

184. Using the magnetic tape disclosed in Law would have inherently resulted in a plateau ratio less than or equal to 0.65. *See supra* ¶¶136-137. To the extent it is not inherent, a person of ordinary skill in the art would have found it obvious according to the teachings of Law and Sasaki.

G. Law in View of Sasaki Renders Obvious Claim 7

185. Claim 7 of the '774 Patent recites "The magnetic recording medium of claim 1, wherein the kurtosis value is less than or equal to about 3.7." Law discloses this element. *See supra* ¶¶136-137. It is further obvious based on Sasaki's

teachings. Ex. 1005 at [0016], [0019]. The combination of Law and Sasaki discloses all elements of claim 1. *See supra* ¶¶167-175. A person of ordinary skill in the art reading Law in view of Sasaki would have understood that the magnetic tape of Law with 30 nm carbon black particles would result in reduced large protrusions on the backside surface, which would result in the claimed characteristics. *See supra* ¶¶170-176.

186. A person of ordinary skill in the art would have known that a Gaussian surface roughness is characterized by a kurtosis of 3, and that as the frequency of large protrusions is reduced, the kurtosis of the backcoat surface becomes closer to 3. *See supra* ¶¶79-81; Ex. 1014 at 5:17-22. Sasaki teaches the reduction of protrusions through the use of fine-grain, uniformly-sized carbon black. *See* ¶157. Thus, a person of ordinary skill in the art would have found it obvious to produce a magnetic tape according to Law and Sasaki with an approximately Gaussian surface roughness distribution having a kurtosis measurement less than or equal to about 3.7.

H. Law in View of Sasaki Renders Obvious Claim 8-11

187. These claims recite measurements of the recording properties of the "magnetic recording medium," including skirt signal-to-noise ratio (claim 8), a limit to the variance of skirt signal-to-noise ratio along the length of the tape (claim

9), small error rate (claim 10), and a limit to the variance of the small error rate along the length of the tape (claim 11).

188. Law discloses all of these elements. *See supra* ¶¶138-139. They are further obvious based on Sasaki's teachings. Ex. 1005 at [0016], [0019]. Furthermore, the combination of Law and Sasaki discloses all elements of claim 1. *See supra* ¶¶137-175. A person of ordinary skill in the art reading Law in view of Sasaki would have understood that the magnetic tape of Law with 30 nm carbon black particles would result in reduced large protrusions on the backside surface, which would result in the claimed characteristics. *See supra* ¶¶170-176. Therefore, Law in view of Sasaki provides a prima facie case for the inherent disclosure of a magnetic recording medium with a skirt signal-to-noise ratio greater than about 0.2 dB/m, a maximum variance between skirt signal-to-noise ratio measurements less than about 0.5 dB, a small error rate less than about 0.5 errors/m, and a maximum variance between small error rate measurements less than about 0.25 errors/m.

189. A person of ordinary skill in the art would have known that excessive protrusions can damage the magnetic layer of tape, negatively affecting the magnetic tape's recording abilities. *See* Ex. 1005 at [0014]. A person of ordinary skill in the art would have understood, as basic principles of engineering that were widely known in the magnetic tape industry, that skirt signal-to-noise and small error rate are measurements of the recording ability of magnetic tape, and

improvements to both are a direct consequence of decreasing the number of protrusions on the backside surface. A person of ordinary skill in the art would have understood preventing embossment leads to an increase in the signal-to-noise ratio and a decrease in the small error rate. *See id.* The '774 Patent confirms this fact: "Accordingly, by decreasing the number and/or prominence of pits or embossments, the signal-to-noise ratio, such as the skirt signal-to-noise ratio, is increased and errors, such as the small errors, are decreased with respect to other magnetic recording mediums…. Similarly, in one embodiment, variations in the skirt signal-to-noise ratio and small errors are also limited along the total length of the magnetic recording medium." Ex. 1001 at 9:29-37. The claimed skirt signal-to-noise ratio and small error rate, and the claimed reduced variation of the skirt signal-to-noise ratio and small error rate, are therefore merely the result of a backcoat layer with smoother surface characteristics. *See* Ex. 1001 at 9:28-33. This was commonly known in the prior art. *See* Ex. 1009 at 1:54-57 ("[w]hen the linear recording density is high and the track is narrow, this 'transfer' results not only in decreased output, but also in lost signal"); Ex. 1011 at 2:12-14 ("the characteristics, i.e., the video output or RF output, of the magnetic layer are seriously affected when the imprint is received from the backing layer"); Ex. 1013 at 2:22-25 ("if the surface of the backside coating layer is too rough, the backside coating layer tends to damage the smooth surface of the magnetic layer … those

electromagnetic properties of the tape which depend upon the smoothness of the magnetic layer, e.g., the signal to noise ratio, sensitivity, maximum output level, and the like, tend to deteriorate"). Therefore, a person of ordinary skill in the art would have known that by reducing large protrusions on the backcoat, the skirt signal-to-noise ratio and small error rates could be improved. Furthermore, because reducing large protrusions causes the backcoat surface to more closely approximate a Gaussian surface, and because a Gaussian surface would be more consistent along its length, a person of ordinary skill in the art would have understood that the variance between measurements along the tape would also be reduced. *See supra* ¶¶79-81, 139; *see* Ex. 1014 at 4:55-5:10. A person of ordinary skill in the art would have found it obvious that the magnetic recording medium of Law in view of Sasaki would have a skirt signal-to-noise ratio greater than about 0.2 dB/m, a maximum variance between skirt signal-to-noise ratio measurements less than about 0.5 dB, a small error rate less than about 0.5 errors/m, and a maximum variance between small error rate measurements less than about 0.25 errors/m.

I. Law in View of Sasaki Renders Obvious Claim 12

190. Claim 12 of the '774 Patent recites "The magnetic recording medium of claim 1, wherein the backside includes a plurality of carbon black particles having an average size less than or equal to 30 nm." Law discloses this element.

See supra ¶140. Furthermore, the combination of Law and Sasaki discloses all elements of claim 1. *See supra* ¶¶167-175. Sasaki discloses carbon black particles of 20 nm. Ex. 1005 at [0092]. Law discloses carbon black particles of 30 nm. Ex. 1004 at Table 1. Therefore the combination of Law and Sasaki renders obvious all elements of Claim 12.

J. Law in View of Sasaki Renders Obvious Claim 13

191. Claim 13 of the '774 Patent recites "The magnetic recording medium of claim 12, wherein the plurality of carbon black particles have an average size less than or equal to 25 nm." The combination of Law and Sasaki discloses all elements of claim 1. *See supra* ¶¶167-175. Sasaki discloses carbon black particles of 20 nm. Ex. 1005 at [0092]. A person of ordinary skill in the art would have recognized that Sasaki's use of 20 nm carbon black particles would have led to the desirable outcome of reducing large protrusions; indeed, Sasaki teaches that its 20 nm particles provide improved reduction of large protrusions compared to the use of larger carbon black particles. *See* Ex. 1005 at [0129] (Table 1) (comparing outcomes with 20 nm, 35 nm, 70 nm, and a mixture of 20/60 nm carbon black particles). Thus it would have been obvious for a person of ordinary skill in the art to use the 20 nm carbon black particles found in Sasaki in a magnetic tape backcoat as described in Law, to further improve the reduction in large protrusions.

K. Law in View of Sasaki Renders Obvious Claim 15

192. The preamble of claim 15 recites "A magnetic recording medium." To the extent the preamble is a limitation, Law discloses this element. *See supra* ¶141. It is further obvious based on Sasaki's teachings. Ex. 1005 at [0001] ("The present invention relates to magnetic recording mediums such as magnetic tape.").

193. The next element of claim 15 recites "a substrate defining a first surface and a second surface opposite the first surface". Law also discloses this element. *See supra* ¶142. It is further obvious based on Sasaki's teachings. Ex. 1005 at [Abstract] ("On a magnetic recording medium composed of a non-magnetic substrate, with a magnetic layer applied over a non-magnetic layer on one surface, and a back coat on the opposite surface[.]").

194. The next element of claim 15 recites "a magnetic side formed over the first surface of the substrate and defining a recording surface". Law also discloses this element. *See supra* ¶143. It is further obvious based on Sasaki's teachings. Ex. 1005 at [Abstract] ("a non-magnetic substrate, with a magnetic layer applied over a non-magnetic layer on one surface"), Ex. 1005 at [0024] ("The surface with upper magnetic layer 103, the recording layer is a multi-layer coating film layer."). A person of ordinary skill in the art would have understood that the magnetic layer would include the recording surface of the magnetic tape.

195. The last element of claim 15 recites "a backside coated on the second surface of the substrate and configured to decrease the embossment of the recording surface, the backside defining a backside surface opposite the substrate, the backside surface having a skew less than about 0.5 and a kurtosis less than about 4.0." Law discloses this element. *See supra* ¶¶144-145. It is further obvious based on Sasaki's teachings. *See supra* ¶170. Sasaki teaches the reduction of protrusions, i.e., peaks on the backside. *See* Ex. 1005 at [0016], [0019]. Thus, a person of ordinary skill in the art would have found it obvious to create magnetic tape according to Law's formulation, and to further reduce the prevalence of peaks on the backside per the teachings of Sasaki. Reducing the size and frequency of peaks would reduce the peak height mean and peak-to-valley roughness of the backside surface. *See supra* ¶¶177-181.

196. A person of ordinary skill in the art reading Law in view of Sasaki would have understood that the magnetic tape structure of Law with 30 nm carbon black particles would result in reduced large protrusions on the backside surface, which would result in the claimed characteristics. *See supra* ¶¶170-173.

197. Furthermore, a person of ordinary skill in the art would have found it obvious that the magnetic tape according to the teaching of Law and Sasaki would have a peak height mean of less than 200 nm, and a peak-to-valley roughness less

than about 325 nm because Sasaki teaches reduction of protrusions, creating a Gaussian surface roughness. *Supra* ¶¶177-181.

198. For at least these reasons, claim 15 is obvious over Law in view of Sasaki.

L. Law in View of Sasaki Renders Obvious Claim 16

199. Claim 16 of the '774 Patent recites "The magnetic recording medium of claim 15, wherein the backside surface has a skew less than about 0.5." Law discloses this element. *See supra* ¶¶147-148. The combination of Law and Sasaki discloses all elements of claim 15. *See supra* ¶¶192-198. Claim 16 is further obvious based on Sasaki's teachings. Ex. 1005 at [0016], [0019]; *see supra* ¶¶170-184.

M. Law in View of Sasaki Renders Obvious Claim 17

200. Claim 17 of the '774 Patent recites "The magnetic recording medium of claim 15, wherein the peak-to-valley roughness is less than about 300 nm." Law discloses this element. *See supra* ¶¶147-148. Furthermore, the combination of Law and Sasaki discloses all elements of claim 15. *See supra* ¶¶192-198. Claim 17 is further obvious based on Sasaki's teachings. Ex. 1005 at [0016], [0019]; *supra* ¶¶179-181.

N. Law in View of Sasaki Renders Obvious Claims 18-19

201. Claims 18-19 of the '774 Patent each recite "The magnetic recording medium according to claim 15" and recite measurements of the magnetic recording

properties of the magnetic recording medium. Claim 18 recites "wherein a first skirt signal-to-noise ratio measured at any first location along a total length of the magnetic recording medium varies from a second skirt signal-to-noise ratio measured at any second location along the total length of the magnetic recording medium by less than about 0.5 dB." Claim 19 recites "wherein a first small error rate measured at any first location along a total length of the magnetic recording medium varies from a second small error rate measured at any second location along the total length of the magnetic recording medium by less than about 0.25 error/m."

202. Law discloses these elements. *See supra* ¶¶149-150. The combination of Law and Sasaki discloses all elements of claim 15. *See supra* ¶¶192-198. A reduced variation of the skirt signal-to-noise ratio and small error rate along the tape are merely the result of a backside surface with smoother surface characteristics; a person of ordinary skill in the art would have understood, and the '774 Patent confirms, this fact. Ex. 1001 at 9:29-37; *see supra* ¶139. Claims 18-19 are further obvious based on Sasaki's teachings. Ex. 1005 at [0016], [0019]; *supra* ¶¶174-176.

O. Law in View of Sasaki Renders Obvious Claim 20

203. The preamble of claim 20 recites "A magnetic recording medium." To the extent the preamble is a limitation, Law discloses this element. *See supra* ¶151.

It is further obvious based on Sasaki's teachings. Ex. 1005 at [0001] ("The present invention relates to magnetic recording mediums such as magnetic tape.").

204. The next element of claim 20 recites "a substrate defining a first surface and a second surface opposite the first surface". Law also discloses this element. *See supra* ¶152. It is further obvious based on Sasaki's teachings. Ex. 1005 at [Abstract] ("On a magnetic recording medium composed of a non-magnetic substrate, with a magnetic layer applied over a non-magnetic layer on one surface, and a back coat on the opposite surface[.]")."

205. The next element of claim 20 recites "a magnetic side formed over the first surface of the substrate and defining a recording surface". Law also this element. *See supra* ¶153. It is further obvious based on Sasaki's teachings. Ex. 1005 at [Abstract] ("a non-magnetic substrate, with a magnetic layer applied over a non-magnetic layer on one surface"), Ex. 1005 at [0024] ("The surface with upper magnetic layer 103, the recording layer is a multi-layer coating film layer."). A person of ordinary skill in the art would have understood that the magnetic layer would include the recording surface of the magnetic tape.

206. The last element of claim 20 recites "a backside coated on the second surface of the substrate and configured to decrease the embossment of the recording surface, wherein the backside defines a backside surface opposite the substrate, the backside surface having a skew less than about 0.5, a kurtosis less

than about 4.0, a peak height mean of less than about 200 [nm], and a peak-to-valley roughness less than about 325 nm." Law discloses this element. *See supra* ¶¶154-155. It is further obvious based on Sasaki's teachings. *See supra* ¶¶170-174. Sasaki teaches the reduction of protrusions, i.e., peaks on the backside. *See* Ex. 1005 at [0016], [0019]. A person of ordinary skill in the art would have found it obvious to create magnetic tape according to the formulation disclosed by Law, and to further reduce the prevalence of peaks on the backside per the teachings of Sasaki. *See supra* ¶¶170-174. Thus a person of ordinary skill in the art would have found it obvious to have a backside surface with skew less than about 0.5, a kurtosis less than about 4.0, a peak height mean of less than 200 nm, and a peak-to-valley roughness less than about 325 nm because Sasaki teaches the reduction of protrusions, creating a Gaussian surface roughness. *Supra* ¶¶170-174, 179-181.

207. A person of ordinary skill in the art reading Law in view of Sasaki would have understood that the magnetic tape structure of Law with 30 nm carbon black particles would result in reduced large protrusions on the backside surface, which would result in the claimed characteristics. *See supra* ¶¶157-159. Therefore, a person of ordinary skill in the art would have found it obvious that the magnetic tape of Law in view of Sasaki has surface characteristics including a skew "less than about 0.5", kurtosis "less than about 4.0", peak height mean "less than about 200 [nm]", and peak-to-valley roughness "less than about 325 nm." Furthermore, a

person of ordinary skill in the art would have found it obvious that the magnetic tape according to the teaching of Law and Sasaki would have a peak height mean of less than 200 nm, and a peak-to-valley roughness less than about 325 nm because Sasaki teaches reduction of protrusions, creating a Gaussian surface roughness.

208. For at least these reasons, claim 20 is obvious over Law in view of Sasaki.

XI-XIII. (Reserved)

209-297. (Reserved)

XIV. Reservation of Rights

298. My opinions are based upon the information that I have considered to date. I am unaware of any evidence of secondary considerations with respect to the '774 Patent that would render any of the challenged claims non-obvious. I reserve the right, however, to supplement my opinions in the future to respond to any arguments raised by the owner of the '774 Patent and to take into account new information that becomes available to me.

Declaration

I hereby declare that all statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true. I further understand that willful false statements and the like are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code. I declare under penalty of perjury that the foregoing is true and correct.

Executed on April 10, 2017.

Ryosuke Isobe

APPENDIX A
CURRICULUM VITAE OF RYOSUKE ISOBE

RYOSUKE ISOBE

SENIOR ENGINEER - PROJECT MANAGER - PATENT STRATEGIST

CONTACT INFORMATION

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EXECUTIVE SUMMARY

I am an accomplished RD&E/manufacturing operation/project leader specialized in data storage industry and coating technology with global experience in both United States and Japan as an English-Japanese bilingual. I have a broad range of hands-on business/technical expertise coupled with highly effective communication and interpersonal business skills. I also have a working understanding of the cultural, operational and technical differences between companies in the United States and those in Japan and other Asian countries.

My notable achievements include:

- New product launches with innovative technology development and a product life-cycle
- Established new OEM business ($100M/year sales) marketed to competitors
- Developed *de facto* standard technology (dual-layer coating technology) for high area density magnetic tape
- Intellectual property (IP) monetization including patent license and technology transfer to global competitors
- Evaluated technical due diligence of U.S. start-up companies for Japanese company's M&A as a technical consultant
- Experience in data storage industry (tape, hard disk and optical disk), audio/video recording system industry (broadcasting and audio recording studio), optical film for touch screen and Li-ion battery coating process
- Strengthened/Protected companies' IP position

My proven project and personnel management skills include:

- New business development (such as OEM business, B2B), business strategy development, product design, R&D, scale-up to manufacturing and mass production
- Project leader for technology transfer to partners, joint product/technology development with partners, product development management, cost reduction/stable production management
- R&D/mass production management including human resource management
- Business/technical liaison between U.S. and Japanese companies

My core technical skills include:

- Specialty in coating technology using roll-to-roll process
- Ink/slurry formulation and process development including nano-particle dispersion with polymer/dispersant/additives, pigment dispersion (compounding/kneading/milling), surface chemistry control for adhesion and adsorption, and slurry rheology control for coating process
- Coating slurry/deposition on thin flexible substrate using roll-to-roll coating process with simultaneous dual-slot-die coating and roll coating processes (reverse roll/gravure roll), drying and calendaring process
- PVD/CVD/sputter (metal evaporated tape, DLC) on flexible substrate/roll to roll process
- Material science: raw material design including nano-particle (Fe-Co particle, barium ferrite, iron-oxide, alumina, sliver nanowire); substrate-film (PEN, PET, Aramid, copper); polymer design (polyurethane,

poly-vinyl-chloride=PVC, nitrocellulose etc.)

- Scale-up process from pilot scale to various type of production lines including contracted manufacturers' lines (Japan, US)
- Problem solving of technical performance issues (coating defects, equipment related issues)
- Tribology (magnetic head-media interface, especially tribo-chemical reaction, lubricant adsorption control/characterization) for reliability improvement and corrosion resistance
- Applications include hard disc drive, data storage tape drive, magnetic tape (magnetic layer containing Fe/Co and barium ferrite nano-particle, Co-O magnetic layer by PVD, sub-layer, back-coating layer containing carbon black), transparent conductive film (silver nano-wire), optical-servo system, Li-ion battery (anode/cathode/ separator) and print circuit (silver nano-particle)

My patent related skills include:

- Strategic patent writing and evaluation in English and Japanese along with strong legal positions (inventor of 25 US patents, 44 Japanese patents, and 8 European patents frequently referenced by competitors)
- Analysis of patent infringement/legal strength/patentability for patent litigation by analyzing prior arts of English and Japanese documents
- Patent licensing negotiation and technology transfer

PROFESSIONAL EXPERIENCE

Panasonic of North America (Cupertino, CA, USA) **2016 to Present**

Senior Project Manager, Optical Data Storage System (freeze-ray)

- Project management of Freeze-ray product development including customer interface (facebook, etc.) and running Japan/US Panasonic teams, total ~100 people.

Independent Technical Consultant (Boulder, CO, USA) **2007 to Present**

- Consult technology development: Coating technology industry, magnetic tape industry, patent litigation, technical due diligence

Western Digital (San Jose, CA, USA) **2013 to 2015**

Senior Engineering Manager, Tribology Programs

- Managed tribology group (head-disk interface) for hard disk drive development for all of WD products with angstrom order head-media spacing tribology control
- Managed technology roadmap

Carestream Health, Advanced Material (Oakdale, MN, USA) **2013 to 2013**

Senior Scientist

- Developed transparent conductive film for touch screen/OLED market using roll-to-roll process using silver nano-wire coating on PET
- Developed new coating process and managed its scale-up to production phase

Imation Corporation (Oakdale, MN, USA) **2009 to 2013**

Project Manager/Senior Principal Engineer

- Managed and led joint development and production transfer of magnetic tape products to contracted manufacturer in Japan
- Developed advanced tape using new magnetic material (Barium ferrite) for high capacity data storage formats
- Managed technology roadmap and patent analysis
- Awarded 3 US patents

Quantum Corporation (Boulder, CO, USA) **2003 to 2009**

RYOSUKE ISOBE

SENIOR ENGINEER - PROJECT MANAGER - PATENT STRATEGIST

Principal Media Engineer/Principal Chemist

- Developed advanced magnetic tape for Quantum's data storage tape drives (DLT and LTO)
- Acted as media development leader for joint technology/product development with HP
- Worked closely with media suppliers (Fujifilm, Maxell, Imation, SONY, and TDK) and led media development to meet Quantum's system requirement
- LTO consortium (IBM/HP/Quantum): worked as Quantum's media representative including establishment of LTO4/5 media spec and on-going LTO media business improvement

AMPEX ~ QUANTEGY INC. (Opelika, AL, USA) **1995 to 2003**

Senior R&D Manager, Principal Chemist, Pilot Plant Manager, Product Manager

- Established OEM business including business planning and data storage tape development
- Led technology transfer to Imation and joint product development with Imation
- Awarded 2 U.S. patents

KONICA Corporation (Hino, Tokyo, Japan) **1983 to 1995**

R&D Manager / Senior Research Staff

- Developed dual-layer coating technology, the *de facto* standard technology for magnetic tape industry
- IP monetization by technology transfer (dual-layer coating technology) to two competitors
- Awarded 21 U.S. patents including 10 dual-layer patents

PATENT EXPERIENCE

Awarded 25 U.S. patents, 8 European patents, 44 Japanese patents: Most patents have been referenced as a competitive technology by magnetic recording media manufacturers (Fujifilm, Hitachi Maxell, SONY, TDK, Imation). 4 U.S. patents pending.

EDUCATION

Bachelor of Engineering in Environmental Chemistry, Chiba University, Chiba, Japan 1983.

LANGUAGE SKILLS

Japanese-English bilingual with particular expertise in technical patent writing, due diligence and translation

REFERENCES (Comments Excerpt from LinkedIn)

Phil Ritti, VP & GM Media Storage Solutions, Quantum Corp and VP, Ampex, currently Principal, Excede Ventures
"I have known Ryosuke for many years and helped recruit him from Japan to the U.S. with Ampex and then from Ampex to Quantum. He has broad and deep technical knowledge that can easily translate into new, high tech industries including physics, chemistry, rheology, tribology, material sciences and associated process technologies. He is a strong project manager and is especially adept in Japanese to American liaison roles. He also maintains a practical business perspective in applying various technologies to products. He is a unique talent and I recommend him highly."

Richard Lindenmuth, Chairman and CEO, Quantegy Inc, currently Vetro Parners Founder/ Interim CEO at Styrotek
"Ryosuke is by far the best chemist and R&D manager that I have ever worked with. He is consistent in his quest to improve quality and reduce costs. Ryosuke keeps up with the current data in his field and is truly an expert. I recommend Ryosuke to anyone considering him for their team."

Joe Jurneke, Manager Advanced Development, Quantum Corp, currently President Applied Engineering Science, Inc.
"Ryosuke is a hard working, diligent development engineer. He was a key member of our team, contributed much to department success, and did it with a terrific can do attitude. I would be pleased to have Ryosuke on my team at anytime. His attention to detail and knowledge of polymer chemistry is outstanding."

RYOSUKE ISOBE

Senior Engineer - Project Manager - Patent Strategist

Mark LeClair, Executive Director Quality and Technical Operations, Imation, currently Director Program Management CyberOptics

"Ryosuke has excellent technical capabilities and has achieved the results to back this statement up. Over the past 10 years that I have known Ryosuke he has continually demonstrated his passion for both process development and the related technologies. Ryosuke has effectively worked with external partners and vendors, his multi-language capabilities have proven to be very valuable. Ryosuke utilizes both his traditional engineering skill sets, while also pushing the technology to be very innovative in solving problems. Ryosuke has been a true asset to our corporation."

Dennis Gladen, Mag. RD&E and Manufacturing Director, Imation, currently VP Administrative Affairs, North Dakota State College of Science

"Ryosuke is a dedicated engineer who is very knowledgeable. He is a key member in our tape development team. He has a tremendous work ethic and capable of handling multiple development projects simultaneously.

RYOSUKE ISOBE

SENIOR ENGINEER - PROJECT MANAGER - PATENT STRATEGIST

Appendix:

1. RYOSUKE ISOBE's patent list (Magnetic recording media)

   a. US patent

	Patent #	Date of Patent			Content	Referenced by
		M	D	Y		
1	9324354	4	26	2016	Barium ferrite	
2	7364809	4	29	2008	Dual-layer patent	
3	7163714	1	16	2007	Dual-layer patent	7255908 **Quantum**
4	6818298	11	16	2004	Dual-layer patent	7563522/7208237/7157163 **TDK**, 7255908 **Quantum**, 7068464 **Sun**
5	6194058	2	27	2001	Dual-layer patent	7314467/7163714/6818298 **Quantegy/Imation,** 7088548 **Hitachi**, 6657813/6497989 **Fujifilm,** 6890631 **IBM,** 6776438 **HP,** 6815097 **Showa Denko**
6	5670245	9	23	1997	Dual-layer patent	6790522/5962125 **Fujifilm,** 6194058 **Quantegy**
7	5637390	6	10	1997	Dual-layer patent	6565964/6534168/6479131/6284361/6124030/6086986/6037051 **Fujifilm,** 6136410 **SONY**, 6797374/6607824 **TDK**, 6506264/6440545/5902676 **Dowa,** 7700204/7510790/7494728/7445585/7267896/7238439/6964811 /6517934 **Maxell,** 7361421 **Panasonic**, 6194058 **Quantegy,**
8	5527603	6	18	1996	Dual-layer patent	6506486/6037051/5922454/5795645 **Fujifilm,** , 6153295/5965248 **TDK**, 5935703 **JVC**, 6110581 **SONY**, 6248437 **Toda,** 6194058 **Quantegy**,
9	5496622	3	5	1996	Dual-layer patent	6124040/6086986/6074724/6030689/5922454/5955189 /5962125 **Fujifilm,** 6194058 **Quantegy**, 6506264/6440545 **Dowa**, 6248437/6117540/6087004/5750250 **Toda**
10	5480713	1	2	1996	Dual-layer patent	7449257/6893747 **Fujifilm,** 7547344 **Philip Morris** 6746508 **Chrysalis Technology,** 6857149 **Hoggatt,**
11	5458948	10	17	1995	Dual-layer patent	6579592/6444290/6432503/6316077/6291052/625496/6203934/6096406 /6025082/5955189/5922454/5876824/5804283/5747157 **Fujifilm**, 6936340 **Imation,** 5792548 **TDK**, 5705268 **Kao**, 7300535 **McCannel**
12	5455104	10	3	1995	Dual-layer patent	7086623/6667119/6579592/6444290/6432503/6316077/6291052/6254964 /6096406/6025082/5955189/6203934 **Fujifilm**, 5965248/5712028 **TDK**, 5993948/5776590**Kao**, 6440545 **Dowa**
13	5449527	9	12	1995		5702757 **SONY**, 5641891 **Sonplas**
14	5405679	4	11	1995	Dual-layer patent	6482506/5922454/5804283/5955189 **Fujifilm**, 5670245 **Konica**, 6274227/5840410/5612122 **Imation**,
15	5340635	8	23	1994	Dual-layer patent	7384700, 5728454 **Fujifilm**, 6033760 **Kao**, 5939170 **Hoya**, 5948522 **Verbatim**, 5532049 **Diafoil**,

						RE036220/5478626 **Konica**,
16	5324571	6	28	1994	Dual-layer patent	6420030/6352776/6287668 **Toda**, 6194058 **Quantegy**, 5948522 **Verbatim**, 8316724 **ABB**, 5532049 **Diafoil**, 8263685/7914617 **Yadav**
17	5242752	9	7	1993		5922824/5891578/5747630 **Morton**, 5712345/5674604/5501903 **3M**, 510607 **Sumitomo Chemical**, 6136428 **Imation**, 7449257/5480716 **Fujifilm**
18	5153079	10	6	1992		5622535/5594064/5534345/5446085 **IBM**, 5578376 **Fujifilm,** 5531914 **UCC**, 5451464 **TDK,** 5491029/5447682 **3M**
19	5094916	3	10	1992		5622535/5594064/5534345/5446085 **IBM**, 5531914 **UCC** 5578376 **Fujifilm**, 5433999/5618617 **Matsushita**
20	5084342	1	28	1992		5591512 **Maxell**
21	5061516	10	29	1991		6274227/5840410 **Imation**, 5449527 **Konica**
22	5045390	9	3	1991		5637390 **Konica**
23	4835049	5	30	1989		5635294 **Konica**, 5066539 **SONY**, 4933272 **Kodak**
24	4818606	4	6	1989		7124466 **Seagate**, 5635294 **Konica**, 5118565 **Kao**, 5407725/5112680/4992328 **Fujifilm**, 4937151 **Nissin Chemical**
25	4713293	12	15	1987		6124013/5091238/4970121/4959263 **Fujifilm**, 4853289 **Bayer**, 4803133 **Matsushita,** 5143637/4946613 **Nippon Seiko,** 7124466 **Seagate**, 6187439/6051060/5730893/5543219/5017784/7124466

b. Japanese patent

	Patent #	Date of Patent			Application			Content
		M	D	Y	M	D	Y	
1	3815675	6	16	06	8	26	02	Dual layer patent
2	3481684	10	10	03	7	26	94	Dual layer patent
3	3481680	10	10	03	6	8	94	Dual layer patent
4	3470154	9	12	03	11	16	92	Dual layer patent
5	3463174	8	22	03	2	2	93	
6	3452292	7	18	03	9	25	95	Dual layer patent
7	3451277	7	18	03	4	20	92	Dual layer patent
8	3448712	7	11	03	4	15	92	Dual layer patent
9	3429587	5	16	03	12	30	94	Dual layer patent
10	3419566	4	18	03	9	28	94	Dual layer patent
11	3416825	4	11	03	8	23	94	Dual layer patent
12	3396821	2	14	03	10	13	92	Dual layer patent
13	3395022	2	7	03	4	15	94	Dual layer patent

14	3385476	1	10	03	1	27	93	Dual layer patent
15	3370212	11	15	02	7	13	95	Dual layer patent
16	3359425	10	11	02	7	13	94	Dual layer patent
17	3335266	8	2	02	7	13	95	Dual layer patent
18	3333967	8	2	02	4	13	92	Dual layer patent
19	3261625	12	21	01	4	2	92	Dual layer patent
20	3252226	11	22	01	4	12	91	
21	3252225	11	22	01	3	22	91	
22	3230163	9	14	01	6	7	91	
23	3230161	9	14	01	4	12	92	
24	3045568	3	17	00	6	7	91	
25	3044673	3	17	00	4	12	91	
26	3041722	3	20	00	12	11	90	
27	2850028	11	13	98	12	28	89	
28	2802769	7	17	98	3	30	89	
29	2717586	11	14	97	12	28	89	
30	2696330	9	19	97	1	29	88	
31	2665671	6	27	97	4	28	88	
32	2649943	5	16	97	4	28	88	
33	2649942	5	16	97	4	28	88	
34	2649941	5	16	97	4	22	88	
35	2627635	4	18	97	1	29	88	
36	2538296	7	8	96	12	16	87	
37	2512315	4	16	96	12	30	87	
38	H07-40352	5	1	95	12	30	86	
39	H06-24067	3	30	94	4	1	85	
40	H05-65927	9	20	93	6	28	85	
41	H05-46614	7	14	93	7	17	85	
42	H05-39015	6	11	93	6	29	85	
43	H05-10731	2	10	93	12	5	83	
44	H05-09847	2	8	93	8	20	83	

c. European patent

	Patent #	Filing Date	Date of Patent	Content
		EPA	EPB	

		M	D	Y	M	D	Y	
1	602533	12	8	93	8	25	99	Dual-layer patent
2	592922	10	5	93	6	16	99	Dual-layer patent
3	566378	4	14	93	7	2	97	Dual-layer patent
4	493114	12	24	91	4	10	96	Dual-layer patent
5	339619	4	26	89	2	2	94	
6	338526	4	19	89	12	22	93	
7	337450	4	13	89	***	***	***	
8	273440	12	29	87	5	29	91	
9	270070	12	1	87	2	16	94	

2. Publications
    a. Studies on Heterogeneous Reaction of Ozone in Environment, III -Disappearance of Ozone on Metal Oxide, J. Japan Soc. Air Pollution, 18 (6) 539-543, (1983)
    b. Magnetic Recording Media Using Ferromagnetic Metal Powder, Konica Technical Report Vol.2, 102-111, (1989)
    c. Recording Media Technology, 2009-2019 International Magnetic Tape Storage Roadmap, 2009, INSIC
    d. Recording Media Technology, 2012-2022 International Magnetic Tape Storage Roadmap, May 2012, INSIC

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APPENDIX B
MATERIALS CONSIDERED IN THE PREPARATION OF THIS REPORT

Ex.	Description
1001	U.S. Patent No. 7,029,774 ("the '774 Patent")
1002	File History for U.S. Patent No. 7,029,774
1004	U.S. Patent No. 5,607,747
1005	Translation of Japanese Patent Publication No. 2003-317228 ("Sasaki"), titled "Magnetic Recording Medium"
1006	Translation of Japanese Patent Publication No. JPH10-214414 ("Naoe"), titled "Magnetic recording medium"
1007	U.S. Patent No. 5,686,013
1008	U.S. Patent No. 4,837,082
1009	U.S. Patent No. 7,056,607
1010	U.S. Patent No. 6,103,365
1011	U.S. Patent No. 5,208,091
1012	U.S. Patent Publication No. 2004/0089564
1013	EP Patent Application Publication No. 0494793A1
1014	U.S. Patent No. 6,007,896
1015	U.S. Patent Publication No. 2003/0054203