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BEFORE THE PATENT TRIAL AND APPEAL BOARD

ASUSTeK COMPUTER INC.; ASUS GLOBAL PTE. LTD.;
DELL TECHNOLOGIES INC.; DELL INC.; AND HP INC.,
Petitioners

v.

LiTL LLC,
Patent Owner

Case IPR2024-00532
U.S. Patent No. 8,289,688

**DECLARATION OF ANDREW WOLFE, Ph.D. IN SUPPORT OF
PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT NO. 8,289,688
CLAIMS 1-10 and 23**

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TABLE OF CONTENTS

	Page
I. Introduction.....	8
A. Education, Experience, and Qualifications	8
B. Materials Considered.....	12
II. Summary of Opinions on the '688 Patent	13
III. Legal Bases of Opinions Formed	13
A. Level of Ordinary Skill in the Art	14
B. Claim Interpretation	16
C. Obviousness.....	17
D. Burden of Proof.....	20
IV. The '688 Patent.....	21
A. Overview of the '688 Patent.....	21
B. File History of the '688 Patent	23
1. Original Claims 1 & 13, Issued as Claims 1 & 12 Respectively	23
2. Original Claim 12, Issued as Claim 11	29
3. Original Claims 19 & 21, Issued as Claims 17 & 19 Respectively	31
4. Original Claim 32, Issued as Claim 29	39
C. <i>Ex Parte</i> Reexamination of the '688 Patent.....	40
V. Scope & Content of the Prior Art as of the Earliest Priority Date of the '688 Patent	42
A. Hinges and Display Modes	42

1.	Shimano (Exh. 1005)	42
2.	Kamikakai (Exh. 1014).....	43
3.	Choi (Exh. 1015).....	43
4.	Misawa (Exh. 1016).....	44
5.	Single-Pivot vs. Dual-Pivot Hinges	44
B.	Sensors and Display Orientations	46
1.	Lane (Exh. 1017).....	46
2.	Hisano (Exh. 1018)	49
VI.	Challenged Claims & Statutory Grounds for Unpatentability	52
A.	Claim 1 of the '688 Patent Would Have Been Obvious in View of Lane and Misawa.....	52
1.	Motivation to Combine Lane and Misawa	52
2.	[Preamble] A portable computer configurable between a plurality of display modes including a closed mode, a laptop mode and an easel mode, the portable computer comprising:..	53
3.	[Element 1.a] a single display component including a display screen;.....	53
4.	[Element 1.b] a base including a keyboard;.....	53
5.	[Element 1.c.i] a hinge assembly at least partially housed within the base and the display component configured to pivotably couple the display component to the base, ...	54
6.	[Element 1.c.ii] wherein the hinge assembly defines a single longitudinal axis running along an interface between the display component and the base, ...	54
a.	Claim construction.....	54
b.	Misawa discloses a single longitudinal axis that is defined by the hinge assembly and runs along the	

	interface between the display component and the base.	55
7.	[Element 1.c.iii] and wherein the display component and the base are rotatable about the single longitudinal axis;	55
8.	[Element 1.d] wherein, in the closed mode, the display screen is disposed substantially against the base;	56
9.	[Element 1.e.i] wherein rotating either the single display component or the base by an operator about the single longitudinal axis up to approximately 180 degrees from the closed mode configures the portable computer into the laptop mode, ...	56
10.	[Element 1.e.ii] wherein in the laptop mode the single display component is oriented towards the operator and the keyboard is oriented to receive input from the operator;	57
11.	[Element 1.f] wherein rotating either the single display component or the base by the operator about the single longitudinal axis beyond approximately 180 degrees from the closed mode configures the portable computer into the easel mode; and	57
12.	[Element 1.g] wherein in the easel mode the single display component is oriented facing the operator with the keyboard oriented away from the operator.	58
B.	Claim 2 of the '688 Patent Would Have Been Obvious in View of Lane and Misawa.....	58
1.	[Preamble] The portable computer of claim 1, ...	58
2.	[Element 2.a] wherein the single display component is rotatable about the single longitudinal axis up to approximately 320 degrees from the closed mode.	58
C.	Claim 3 of the '688 Patent Would Have Been Obvious in View of (a) Lane and Misawa; or (b) Lane, Hisano, and Misawa	59
1.	Motivation to Combine Hisano with Lane and Misawa	59

2.	[Preamble] The portable computer of claim 1,.....	60
3.	[Element 3.a] further comprising a display orientation module that displays content on the display screen in one of a plurality of content orientations relative to the single longitudinal axis.....	60
a.	Lane and Misawa.....	60
b.	Lane, Hisano, and Misawa	61
D.	Claim 4 of the '688 Patent Would Have Been Obvious in View of Lane, Hisano, and Misawa	62
1.	[Preamble] The portable computer of claim 3,.....	62
2.	[Element 4.a] further comprising a mode sensor which detects a current display mode of the portable computer; and.....	62
a.	Claim construction.....	62
b.	Hisano Discloses a Display Mode Sensor	64
3.	[Element 4.b] wherein the display orientation module displays content on the display screen in the one of the plurality of content orientations dependent on the current display mode detected by the mode sensor.....	66
E.	Claim 5 of the '688 Patent Would Have Been Obvious in View of (a) Lane and Misawa; or (b) Lane, Hisano, and Misawa	67
1.	[Preamble] The portable computer of claim 3,.....	67
2.	[Element 5.a] wherein the display orientation module is configured to display the content in a first content orientation relative to the single longitudinal axis when the portable computer is configured into the laptop mode and in a second content orientation relative to the single longitudinal axis when the portable computer is configured into the easel mode.....	67

F.	Claim 6 of the '688 Patent Would Have Been Obvious in View of (a) Lane and Misawa; or (b) Lane, Hisano, and Misawa	68
1.	[Preamble] The portable computer of claim 5, ...	68
2.	[Element 6.a] wherein the second content orientation is 180 degrees relative to the first orientation.	68
G.	Claim 7 of the '688 Patent Would Have Been Obvious in View of (a) Lane and Misawa; or (b) Lane, Hisano, and Misawa	68
1.	[Preamble] The portable computer of claim 3, ...	68
2.	[Element 7.a] wherein the plurality of display modes further comprises a flat mode in which the single display component is disposed at an angle of approximately 180 degrees, measured about the single longitudinal axis, relative to the base.....	68
H.	Claim 8 of the '688 Patent Would Have Been Obvious in View of (a) Lane, Misawa, and (Dunko or Forstall); or (b) Lane, Hisano, Misawa, and (Dunko or Forstall)	69
1.	Motivation to Combine Either Dunko or Forstall with Lane, Hisano, and Misawa.....	69
2.	[Preamble] The portable computer of claim 7, ...	71
3.	[Element 8.a] wherein the plurality of content orientations comprises a first content orientation relative to the single longitudinal axis, a second content orientation relative to the single longitudinal axis, and a third content orientation relative to the single longitudinal axis; and	71
4.	[Element 8.b] wherein, in the flat mode, the content displayed on the display screen is configurable among the first, second and third content orientations responsive to a user input.....	71
I.	Claim 9 of the '688 Patent Would Have Been Obvious in View of (a) Lane, Misawa, and (Dunko or Forstall); or (b) Lane, Hisano, Misawa, and (Dunko or Forstall)	73

1.	[Preamble] The portable computer of claim 8,.....	73
2.	[Element 9.a] wherein the second content orientation is 90 degrees relative to the first content orientation; and.....	73
3.	[Element 9.b] wherein the third content orientation is 180 degrees relative to the first content orientation.....	73
J.	Claim 10 of the '688 Patent Would Have Been Obvious in View of Lane, Misawa, and Nako	74
1.	Motivation to Combine Nako with Lane and Misawa.....	74
2.	[Preamble] The portable computer of claim 1,.....	74
3.	[Element 10.a] further comprising: a foot disposed along at least a portion of the base and configured to support the portable computer when in the easel mode.....	75
a.	Claim construction: “foot”.....	75
b.	Nako Teaches a Foot Along the Edge of the Base of a Portable Computer Deployed in Easel Mode	75
K.	Claim 23 of the '688 Patent Would Have Been Obvious in View of Lane, Hisano, and Misawa.....	76
1.	[Preamble] The portable computer of claim 1,.....	76
2.	[Element 23.a] further comprising at least one integrated navigation hardware control, ...	76
a.	Claim construction: “at least one integrated navigation hardware control, ... wherein the integrated hardware control can be operated by a user to control features and manipulate content displayed on the portable computer,”	76
b.	The Combination of Hisano with Lane and Misawa Includes an Integrated Navigation Hardware Control....	77

3.	[Element 23.b] wherein at least one of the at least one integrated navigation hardware control is accessible in at least the laptop and easel modes, ...	78
4.	[Element 23.c] and wherein the integrated navigation hardware can be operated by a user to control features and manipulate content displayed on the portable computer, ...	78
5.	[Element 23.d] including any mode wherein the keyboard is inaccessible or oriented away from the user.	79
VII.	Secondary Considerations	79
VIII.	Right to Supplement	79
IX.	Conclusion	80

I, Andrew Wolfe, declare as follows:

1. I have been retained by Procopio, Cory, Hargreaves and Savitch, LLP, counsel for Petitioners ASUSTeK Computer Inc. and ASUS Global Pte. Ltd. (collectively, “ASUSTeK”), to analyze and offer my expert opinions in support of ASUSTeK’s Petition for *Inter Partes* Review of Claims 1-10 and 23 of U.S. Patent No. 8,289,688 (“the ’688 Patent”). I am being compensated for my work on this matter at my standard hourly billing rate of \$650. My compensation does not depend in any way on my opinion or the outcome of this matter.

I. INTRODUCTION

A. Education, Experience, and Qualifications

2. I am the founder and sole employee of Wolfe Consulting. Through Wolfe Consulting, I provide technical and business analytics to businesses on processor technology, computer systems, consumer electronics, software, design tools, data security, cryptography, and intellectual property issues. I have more than thirty-five years of experience developing products, researching, consulting, and teaching in those fields. During that time, I have worked as a computer architect, computer system designer, and as an executive in the PC and electronics business. I have also taught at some of the world’s leading institutions in those fields, including Stanford University, Princeton University, Carnegie Mellon University, and Santa Clara University.

3. In 1985, I earned the B.S.E.E. degree in Electrical Engineering and Computer Science from the Johns Hopkins University. In 1987, I received the M.S. degree in Electrical and Computer Engineering from Carnegie Mellon University and in 1992, I received the Ph.D. degree in Computer Engineering from Carnegie Mellon University. My doctoral dissertation proposed a new approach for the architecture of a computer processor.

4. I have more than 35 years of experience as a computer architect, computer system designer, personal computer graphics designer, educator, and executive in the electronics industry.

5. I have extensive experience in the design, development, and analysis of portable computing devices including portable PCs. In the mid-late 1980s, I worked as part of the development team for the Linus Write-Top, which is commonly acknowledged to be the first commercial tablet computer. I later worked on screen technology for many handheld computing devices including the Motorola Envoy and prototypes for the Apple Newton. In 1997, I was hired to run the research efforts at S3, Inc. At the time S3 produced the 3D graphics hardware and driver software for more than half of new PCs, worldwide. I managed S3's display technology group, and led the development of components for laptop computers including the IBM Thinkpad and for desktop computers as well. I also worked with the teams that

developed the FrontPath wireless tablet PC and the Diamond Mako handheld computer.

6. In these roles, I managed relationships with numerous laptop computer companies including IBM, Toshiba, and Compaq as well as key software providers such as Microsoft.

7. I have consulted, formally and informally, for a number of fabless semiconductor companies. In particular, I have served on the technology advisory boards for two media processor design companies: BOPS, Inc., where I chaired the board, and Siroyan Ltd., where I served in a similar role; for three networking chip companies: Intellon, Inc., Comsilica, Inc., and Entridia, Inc.; and for one 3D game accelerator company, Ageria, Inc.

8. I have also served as a technology advisor to Motorola and to several venture capital funds in the U.S. and Europe. Currently, I am a director at Turtle Beach Corporation, providing guidance in its development of commercial electronic products primarily related to video gaming.

9. From 1991 through 1997, I served on the Faculty of Princeton University as an Assistant Professor of Electrical Engineering. At Princeton, I taught undergraduate and graduate-level courses in Computer Architecture, Advanced Computer Architecture, Display Technology, and Microprocessor Systems, and I conducted sponsored research in the area of computer systems and related topics.

From 1999 through 2002, I taught a Computer Architecture course to both undergraduate and graduate students at Stanford University multiple times as a Consulting Professor. At Princeton, I received several teaching awards, both from students and from the School of Engineering. I have also taught advanced microprocessor architecture to industry professionals in IEEE and ACM sponsored seminars. I am currently a lecturer at Santa Clara University teaching courses on Microprocessor Systems, Advanced Logic Design, Real-Time Computing, and Mechatronics. Among other things, I teach about the operation and use of accelerometers for determining spatial orientation.

10. I have published more than fifty peer-reviewed papers in computer architecture and computer systems. I have also chaired IEEE and ACM conferences in microarchitecture and integrated circuit design and served as an associate editor for IEEE and ACM journals. I served on the IEEE Computer Society Awards committee. I am an IEEE Fellow and an IEEE Computer Society Distinguished Contributor. I am a named inventor on at least fifty-seven U.S. patents and thirty-seven foreign patents, including patents related to display technology.

11. I have been the invited keynote speaker at the ACM/IEEE International Symposium on Microarchitecture and at the International Conference on Multimedia. I have also been invited to speak on various aspects of technology or the PC industry at numerous industry events including the Intel Developer's Forum,

Microsoft Windows Hardware Engineering Conference, Microprocessor Forum, Embedded Systems Conference, Comdex, and Consumer Electronics Show as well as at the Harvard Business School and the University Illinois Law School. I have been interviewed on subjects related to technology and the electronics industry by publications such as the Wall Street Journal, New York Times, LA Times, Time, Newsweek, Forbes, and Fortune as well as CNN, NPR, and the BBC. I have also spoken at dozens of universities including MIT, Stanford, University of Texas, Carnegie Mellon, UCLA, University of Michigan, Rice University, and Duke University.

12. A more detailed description of my educational and professional background, qualifications, achievements, and publications in the past 30+ years is set forth in my *curriculum vitae*, attached hereto as Appendix A.

B. Materials Considered

13. In undertaking the analysis and forming the opinions on the '688 Patent set forth in this declaration, I have drawn upon my knowledge and experience, and considered materials relating to the '688 Patent and two related patents: U.S. Patent Nos. 8,624,844 and 9,563,229. My analyses and opinions on the two related patents are set forth in other, separate declarations. I have endeavored to enumerate the materials particularly related to the '688 Patent that are referenced throughout this declaration in a list attached hereto as Appendix B.

II. SUMMARY OF OPINIONS ON THE '688 PATENT

14. Claims 1-3 and 5-7 would have been obvious in view of Lane (Exh. 1017) and Misawa (Exh. 1016);

15. Claims 3-7 would have been obvious in view of Lane, Hisano (Exh. 1018), and Misawa;

16. Claims 8-9 would have been obvious in view of Lane, Misawa, and (Dunko (Exh. 1019) or Forstall (Exh. 1020));

17. Claims 8-9 would have been obvious in view of Lane, Hisano, Misawa, and (Dunko or Forstall);

18. Claim 10 would have been obvious in view of Lane, Misawa, and Nako (Exh. 1021);

19. And Claim 23 would have been obvious in view of Lane, Hisano, and Misawa.

III. LEGAL BASES OF OPINIONS FORMED

20. The legal bases of my opinions are set forth in this section of my declaration, which is not intended to be an exhaustive summary of such bases. Rather, such bases may also be set forth in the other sections of this declaration.

21. I am not an attorney, but counsel for Petitioners has informed me of the following legal principles regarding claim construction and patentability, which I have followed for my analysis.

A. Level of Ordinary Skill in the Art

22. I have been informed that both the '688 Patent and the prior art are to be understood from the perspective of a hypothetical "Person of Ordinary Skill in the Art" at the time of the purported inventions claimed in the '688 Patent ("POSA"). The '688 Patent claims priority to a provisional patent application filed on April 1, 2008. I have been asked to treat this date as the time of the purported inventions claimed in the '688 Patent.

23. I understand that the factors that may be considered to determine the level of ordinary skill in the art include: (a) the type of problems encountered in the art; (b) prior art solutions to those problems; (c) the complexity or sophistication of the technology in the art; (d) the education level and experience of active workers in the field of art; and (e) the pace of change, development, and innovation in the field of art. I have been informed that not every factor would be present in every case, and that a review of the prior art would shed light on factors (a), (b), (c), and (e). I have also been informed that a POSA is further presumed to have been aware of all relevant prior art.

24. As discussed in further detail below, the '688 Patent is directed to portable computers that can be deployed by users in multiple display modes, including: a laptop mode, an easel mode, and a frame mode. In each display mode, the relative spatial orientations of the screen and the base of the portable computer

are different, and the display orientation (*i.e.*, the orientation of content visually presented on the screen) may be adjusted accordingly. The relevant prior art relates to portable computers and other portable electronic devices that can also be deployed in multiple display modes. I am familiar with the state of the art in this field at the time of the purported inventions claimed in the '688 Patent.

25. In my opinion, a POSA would have had a bachelor's degree (or equivalent) in electrical engineering, computer engineering, computer science, or a comparable subject, and would have had two to three years of work experience in the design and architecture of laptop computers and other portable electronic devices. Alternatively, a POSA would have had an advanced degree (or equivalent) in electrical engineering, computer engineering, computer science, or a comparable subject and would have had one year of post-graduate research or work experience in the design and architecture of laptop computers and other portable electronic devices. A POSA would have been familiar with the structural hardware aspects of laptop computers and other portable electronic devices, as well as designs of user interfaces employed and displayed by computer operating systems and their organization of content and functionality. A POSA could have acquired similar skills and knowledge by other means.

26. In view of my educational background and my decades of academic and professional experience (as discussed above), I was a person of more than the

ordinary level of skill in the art in the early 2008 timeframe. My opinions expressed in this declaration were formed, however, from the perspective of a person of ordinary skill in the art as of April 1, 2008. I was, and am, well acquainted with the level of knowledge of a POSA under this definition. As noted above, I have worked with many individuals during my time in the industry and taught many who would have met the definition of a POSA. Thus, I am comfortable applying this viewpoint in assessing the '688 Patent and the state of the art in the relevant timeframe, including the prior art references I discuss below.

27. I have also considered whether my opinions expressed in this declaration would change if the level of ordinary skill in the art was varied by a few years or varied somewhat with respect to subject matter. My opinions would not change in light of such minor variations.

B. Claim Interpretation

28. I have been informed that patent claims are to be interpreted from the perspective of a hypothetical "Person of Ordinary Skill in the Art" at the time of the purported inventions claimed in the patent ("POSA"). I have also been informed that the words of a patent claim are generally given their ordinary and customary meaning to a POSA in view of the context of the claims and the intrinsic evidence, *i.e.*, the patent specification and the prosecution history of the '688 Patent. I have read and analyzed the claims of the '688 Patent from this perspective.

29. I have been further informed that extrinsic evidence, *e.g.*, prior art publications and expert testimony, may be considered to understand a patent claim, but cannot be used to contradict an interpretation thereof which is unambiguous in view of the intrinsic evidence.

C. Obviousness

30. As discussed above, the '688 Patent claims priority to a provisional patent application filed on April 1, 2008, and I have been asked to treat this date as the time of the purported inventions claimed in the '688 Patent.

31. I have been informed that a claimed invention is obvious — and thus unpatentable — if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious to a POSA at the time of the claimed invention.

32. I have also been informed that the determination of whether a claimed invention is obvious in view of the prior art cannot rely on hindsight, *i.e.*, using the patent claim as a roadmap or template to select components from the prior art to reconstruct the claimed invention.

33. I have been informed that a POSA is presumed to have been aware of all relevant prior art. I have also been informed that a POSA is someone of ordinary creativity in the field who is presumed to have understood and considered design

needs and/or market forces which would have motivated or prompted them to seek variations of a product having utility in their field.

34. I have been informed that the determination of whether a claimed invention was obvious in view of the prior art is a legal question which involves an objective analysis of these factual factors:

- (a) The scope and content of the prior art;
- (b) The differences between the prior art and the claimed invention;
- (c) The level of ordinary skill in the pertinent art; and
- (d) Any secondary consideration(s) having a nexus to the claimed invention, for example: [i] its commercial success (or the lack thereof), [ii] whether the claimed invention satisfied a long felt but unmet need, [iii] unexpected results achieved by the claimed invention, or [iv] skepticism or failure by others.

35. I have also been informed that the above factors define an expansive and flexible framework to determine whether a claimed invention would have been obvious in view of the prior art. For example:

36. When a prior art reference was available in one field, design incentives and other market forces could prompt variations of the reference by a POSA, either in the same field or a different field. If the POSA could implement a predictable

variation that meets the elements of a patent claim, then the claimed invention was obvious.

37. Likewise, if a technique had been used to improve one device in the prior art, and a POSA would recognize that the technique could also be used to improve similar devices in the same way, using that technique was obvious unless its actual application was beyond the capability of the POSA.

38. The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. If an invention is no more than the predictable use of prior art elements according to their established functions, the combination was obvious unless its implementation was beyond the capability of the POSA.

39. To determine whether there was an apparent reason to combine elements known in the prior art as claimed, it is often necessary to examine the interrelated teachings of multiple prior art references, the effects of demands known to the field or present in the market, and the background knowledge of a POSA. This determination is not a rigid test. Rather, it must consider the inferences and creative steps that a POSA would employ, because the POSA is not an automaton.

40. Common sense teaches that familiar items may have obvious uses beyond their primary purposes, and in many cases a POSA would be able to fit the teachings of multiple patents together like pieces of a puzzle.

41. A motivation to combine the teachings of multiple prior art references may be suggested in one or more of the references, or found in the nature of the problem to be solved, in the trends or direction of the field and/or market, or come from the common sense and ordinary skill of the POSA.

42. When there was a design need or market pressure to solve a problem and there were a finite number of identified, predictable solutions, a POSA would have good reason to pursue the known options within his or her technical grasp. If this would have led to reasonably anticipated success, it was likely the product not of innovation but of ordinary skill and common sense, in which case the fact that a combination of known elements was obvious to try would show that the claimed invention was obvious.

43. Certain aspects of the purported inventions claimed in the '688 Patent, for example, hinges and orientation sensors, pertain to the mechanical arts. I have been informed that the mechanical arts have long been recognized as a predictable art, one where the combination of elements known in the prior art typically yields predictable results.

D. Burden of Proof

44. I have been informed that a petitioner must demonstrate unpatentability by a preponderance of the evidence. I understand preponderance means more likely than not in this context.

IV. THE '688 PATENT

A. Overview of the '688 Patent

45. The '688 Patent is entitled Portable Computer with Multiple Display Configurations. It claims priority to provisional patent application no. 61/041,365, filed on April 1, 2008, which is the earliest priority date claimed for the '885 Patent. The '688 Patent is assigned to LiTL, LLC ("LiTL").

46. The '688 Patent describes portable computers that can be deployed by users in multiple configurations or display modes, including: a laptop mode (Fig. 1), an easel mode (Fig. 4), a frame mode (Fig. 26), and a flat mode (Fig. 27). (Exh. 1001, 2:19-22.) In each display mode, the relative spatial orientations of the screen and the base of the portable computer are different, and the display orientation (*i.e.*, the orientation of content visually presented on the screen) would be adjusted based on the display mode or by the user. (*Id.* at 2:42-44.)

47. The '688 Patent mentions "an orientation (or mode) sensor that is configured to detect whether the portable computer is in the laptop mode or the easel mode, and to adjust the display accordingly." (Exh. 1001, 8:17-20.) The sensor "may be used to determine a precise relative orientation of the base component 104 with respect to the display component 102, or vice versa, for example, to determine whether the device is in the laptop mode, easel mode, or some point in between the two modes." (*Id.* at 8:26-31.) For example, it "may be used to detect ... the angle

134 [between display component 102 and base component 104] and to provide the information to the computer operating system.” (*Id.* at 8:58-61; Figs. 5 & 6A-6C.)

48. According to the '688 Patent, the orientation sensor may include an accelerometer. (Exh. 1001, 8:31-34.) The sensor “may be incorporated into the base component 104, ... or into the display component [102].” (*Id.* at 8:20-23.) The latter “may provide more robust detection and therefore, may be presently preferred in some embodiments.” (*Id.* at 8:23-26.) Alternatively, the orientation sensor may be incorporated into the hinge assembly and used to detect and translate the movement of the hinge assembly into information about the relative orientation of the display component 102 and the base component 104, for example, the angle 134 between the two components. (*Id.* at 9:36-41.)

49. The figures in the '688 Patent depict a single-pivot hinge between the display component 102 and the base component 104. (Exh. 1001, Figs. 1-5, 7A-7B, 8-10, 15-18, and 23-27.) However, the '688 Patent also mentions that the hinge assembly of the portable computer may comprise multiple parallel axes. (*Id.* at 2:49-54.) An example of such a hinge assembly is illustrated in U.S. Patent No. 6,771,494 (Exh. 1005, “Shimano”), cited in the “Background / Discussion of Related Art” section of the '688 Patent. (*Id.* at 1:37-46.) Shimano teaches a dual-pivot hinge that allows the screen to be rotated 360° to the base, such that the back of the screen can

be folded flat against the bottom of the base to deploy the portable computer in a tablet mode. (Exh. 1005, Figs. 2(a)-(c) and 4(a)-(c).)

B. File History of the '688 Patent

50. This is not intended to be an exhaustive summary of the file history of the '688 Patent, but merely to highlight certain claim rejections and amendments during prosecution.

1. Original Claims 1 & 13, Issued as Claims 1 & 12 Respectively

51. Original Claim 1 recites, in relevant part:

... a hinge assembly at least partially housed within the base and configured to pivotably couple the display component to the base;

wherein the display component is rotatable about a longitudinal axis running along an interface between the display component and the base; ...

(Exh. 1002, 26:7-10.)

52. Original Claim 13 recites, in relevant part:

... a hinge assembly configured to rotatably couple the display component to the base;

wherein the hinge assembly is configured to permit rotation of the display component about a single axis to configure the portable computer between the laptop mode and the easel mode.

(Exh. 1002, 28:15-18.)

53. The 7/9/2010 Office Action rejected Claims 1 and 13 under 35 U.S.C. § 102(b) as anticipated by U.S. Patent Appl. Pub. No. 2006/0264243 A1 (Exh. 1006, “Aarras”). (Exh. 1002 at 158, ¶ 3.)

54. Regarding Claim 1, the Examiner explained that “Aarras discloses a portable computer ... wherein the display component 12 is rotatable about a longitudinal axis running along an interface between the component 12 and the base 14.” (*Id.* at 158, ¶ 4 (citing Exh. 1006, Figs. 1-3).)

55. As for Claim 13, the Examiner explained that in Aarras, “the hinge 16 is configured to permit rotation of the component 12 about a single axis to configure the computer between the laptop mode and easel mode.” (*Id.* at 159, ¶ 6.)

56. In response, LiTL amended Claim 1 as follows:

... wherein the display component and the base are is rotatable about a longitudinal axis running along an interface between the display component and the base; ...

(Exh. 1002 at 190.) To distinguish Claim 1 from Aarras, LiTL argued that “Aarras teaches a dual axis hinge about which the two sections of the portable electronic device rotate.” (*Id.* at 197 (emphasis added).)

57. LiTL also amended Claim 13 as follows:

... a hinge assembly configured to rotatably couple the display component to the base, wherein the hinge assembly is at least partially housed within the base;

wherein the hinge assembly is configured to permit rotation of the display component about a single axis to configure the portable computer between the laptop mode and the easel mode.

(Exh. 1002 at 192.) To distinguish Claim 13 from Aarras, LiTL argued that “the hinge 16 in Aarras employs a dual axis hinge, and therefore cannot teach or suggest the claimed rotation about a single axis to configure the portable computer between the laptop mode and the easel mode.” (*Id.* at 198-199 (emphasis added).)

58. The 1/31/2011 Office Action maintained the rejection of Claims 1 and 13 over Aarras. (Exh. 1002 at 259, ¶¶ 9-11.) The Examiner explained:

The fact that the hinge 16 in Aarras has two axes of rotation is immaterial in this instance because either axis can be “the longitudinal axis” as claimed in applicant’s Claim 1. Also, since an “axis” is an arbitrary point or line in space about which something rotates, it is not necessary associated with any of the physical parts of the portable computer. All that the claim requires is for the display component and base to rotate “about a longitudinal axis running along an interface between the display component

and the base.” Either of the axes of rotation disclosed in Aarras satisfies this limitation.

(*Id.* at 269-270, ¶¶ 38-39; *see also* Exh. 1006, Figs. 1-3.)

59. Thereafter, LiTL held an interview with the Examiner about the above rejections over Aarras. (Exh. 1002 at 293.) The Interview Summary notes:

The examiner agrees that more specifically claiming the longitudinal axis of rotation in Claims 1 and 13 would help to distinguish those claims from the Aarras reference.

(*Id.* at 294.)

60. After the interview, LiTL further amended Claim 1 as follows:

... a hinge assembly at least partially housed within the base and the display component and configured to pivotably couple the display component to the base,

wherein the hinge assembly defines a single longitudinal axis running along an interface between the display component and the base,

and wherein the display component and the base are rotatable about a the single longitudinal axis ~~running along an interface between the display component and the base;~~

...

(Exh. 1002 at 311.) LiTL also further amended Claim 13 as follows:

a hinge assembly configured to rotatably couple the display component to the base, wherein the hinge

assembly is at least partially housed within the base and the display component, and defines a single longitudinal axis running along an interface between the display component and the base;

wherein the hinge assembly is configured to permit rotation of the display component and the base about a the single axis to configure the portable computer between the laptop mode and the easel mode.

(*Id.* at 313-314.)

61. LiTL again distinguished amended Claims 1 and 13 from the “dual axis hinge” of Aarras. (Exh. 1002 at 318-319.) Thus, these amendments and arguments make clear that LiTL limited each of Claims 1 and 13 to a single axis of rotation defined by the hinge assembly coupling the display component to the base.

62. The above interpretation of “single longitudinal axis” in Claims 1 and 13 was confirmed by the Examiner in the Notice of Allowance. “However, relating to Claim 1, Aarras does not disclose wherein the single display and base rotate about a single axis running along an interface between the display and the base ... Also, in addition to above and relating to Claim 13, ...” (Exh. 1002 at 402-403.)

63. The 9/8/2011 Office Action rejected Claims 1 and 13 under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 7,061,472 (Exh. 1007, “Schweizer”). (Exh. 1002 at 331, ¶ 8.)

64. Regarding Claim 1, the Examiner explained that in Schweizer, “the hinge assembly 3 defines a single axis of rotation along an interface between the display 2 and the base 4, and wherein the display 2 and the base 4 are rotatable about a single longitudinal axis.” (Exh. 1002 at 331, ¶ 9; *see also* Exh. 1007, Figs. 1-2.)

65. Regarding Claim 13, the Examiner explained that in Schweizer, “a hinge assembly 3 configured to rotatably couple the base 4 and the display 2, wherein the hinge assembly 3 is at least partially housed within the base 4 and the display component 2, and defines a single longitudinal axis running along an interface between the display component 2 and the base 4.” (Exh. 1002 at 331-332.)

66. In response, LiTL further amended Claims 1 and 13 to limit each of these claims to a single display component, to add a keyboard, and to further define the easel mode. Amended Claim 1 recites, in relevant part:

... a single display component including a display screen;
a base including a keyboard; ...

wherein in the easel mode the single display component is oriented facing the operator with the keyboard oriented away from the operator.

(Exh. 1002 at 360.) Amended Claim 13 recites, in relevant part:

... a single display component;
a base including an integrated keyboard; ...

wherein in the easel mode the single display component is oriented facing the operator with the keyboard oriented away from the operator; ...

(*Id.* at 363.) LiTL distinguished amended Claims 1 and 13 from Schweizer, arguing that it “discloses a dual display laptop configured for presenting the main display to a second viewer (e.g., a customer) while the operator interacts with the laptop using a secondary display and the detachable keyboard.” (*Id.* at 371; *see also* Exh. 1007, Fig. 2.)

67. Claims 1 and 13 were allowed thereafter. (Exh. 1002 at 391-395.) Claim 13 was later renumbered as Claim 12 for the issuance of the '688 Patent. (*Id.* at 411.)

2. Original Claim 12, Issued as Claim 11

68. Original Claim 12 recites, in relevant part:

... means for rotating the display component in a single direction relative to the base to configure the portable computer between a laptop mode and an easel mode.

(Exh. 1002, 28:8-9.)

69. The 7/9/2010 Office Action rejected Claim 12 under 35 U.S.C. § 102(b) as anticipated by Aarras. (Exh. 1002 at 158, ¶ 3.)

70. In response, LiTL argued that “the Examiner has not identified the structure(s) in the specification that corresponds to the means plus function element

recited in claim 12, nor the corresponding structure(s) in the Aarras reference that would anticipate or render obvious the identified structure.” (Exh. 1002 at 198.)

71. LiTL also added the following limitations to Claim 12:

a display orientation module configured to automatically orient content displayed on the display component responsive to at least a transition between the laptop mode and the easel mode, wherein the display orientation module is further configured to orient the content displayed between a first display orientation and a second display orientation, the first and second display orientations being 180 degrees relative to each other; and means for detecting an orientation of the base relative to the display component, wherein the means for detecting is further configured to identify the transition between the laptop mode and the easel mode based on a stored threshold orientation.

(Exh. 1002 at 192.) LiTL argued that these limitations distinguish Claim 12 from Aarras because:

Aarras discloses changing a display orientation from a first portrait type orientation to a second landscape type orientation in response to a second portion 94 of section 90 changing orientation from a first position to a second position relative to the first portion 92 of the same section 90. ... Thus, the positional/orientation change is 90

degrees (portrait to landscape) and not 180 degrees as claimed.

(*Id.* at 198 (citing Exh. 1006, ¶ [0059]).)

72. In the 1/31/2011 Office Action, the Examiner identified the structures corresponding to the two means-plus-function claim limitations in Claim 12, with apparent reference to the published version of the patent application (Exh. 1003), as follows:

- “means for rotating”: hinge assembly 138 and all associated parts (housing 142, shaft 154, springs 156, member 158, bracket 140), as disclosed in paragraphs 0067-0068 and Figures 7a-10; and
- “means for detecting”: sensor which ... is described in paragraphs 0011, 0015, 0059-0061 and 0063.

(Exh. 1002 at 258-259, ¶¶ 6-7.)

73. Claim 12 was allowed. (Exh. 1002 at 273, ¶ 43.) Claim 12 was later renumbered as Claim 11 for the issuance of the '688 Patent. (*Id.* at 411.)

3. Original Claims 19 & 21, Issued as Claims 17 & 19 Respectively

74. Original Claim 19 recites, in relevant part:

... detecting a degree of rotation of the display component relative to the base;

providing a signal representative of the degree of rotation of the display component; and

automatically configuring an orientation, relative to the longitudinal axis, of the content displayed on the portable computer responsive to the signal.

(Exh. 1002 at 29:19-28.)

75. Original Claim 21 recites, in relevant part:

... an orientation sensor which detects an orientation of the display unit relative to the base unit; and

a display orientation module which orients the content displayed on the display screen responsive to the orientation detected by the orientation sensor.

(Exh. 1002 at 30:14-17.)

76. The 7/9/2010 Office Action rejected Claims 19 and 21 under 35 U.S.C. § 102(b) as anticipated by Aarras. (Exh. 1002 at 158, ¶ 3.)

77. Regarding Claim 19, the Examiner explained that “Aarras discloses a method of automatically orienting content displayed on a portable computer ... comprising: ... detecting (via sensor 46) a degree of rotation of the component 12 relative to the base 14; providing a signal ... representative of the degree of rotation (i.e. depending on which mode you are in) of the component 12 and automatically configuring an orientation, relative to the axis, of the content displayed on the

computer responsive to the signal.” (Exh. 1002 at 159, ¶ 7 (citing Exh. 1006, ¶¶ [0033] & [0038].)

78. As for Claim 21, the Examiner explained that in Aarras, “an orientation sensor 46 which orients the content displayed ... on the display screen 30 responsive to the orientation detected by the sensor 46.” (Exh. 1002 at 160, ¶ 8 (citing Exh. 1006, ¶ [0038].)

79. In response, LiTL amended Claim 19 as follows:

... detecting a degree of rotation of the display component relative to the base;

providing a signal representative of the degree of rotation of the display component;

comparing the degree of rotation with respect to a threshold degree of rotation; and

automatically configuring an orientation, relative to the longitudinal axis, of the content displayed on the portable computer responsive to the signal wherein the act of automatically configuring includes acts of:

displaying a first orientation of the content for the degree of rotation that is less than the threshold degree of rotation, and

displaying a second orientation of the content for the degree of rotation that is greater than the threshold degree

of rotation, the second orientation being at 180 degrees relative to the first orientation.

(Exh. 1002 at 193-194.)

80. LiTL also amended Claim 21 as follows:

... an orientation sensor which detects an orientation of the display unit relative to the base unit; and

a display orientation module which orients the content displayed on the display screen responsive to the orientation detected by the orientation sensor between at least a first display orientation and a second display orientation, the second display orientation being 180 degrees relative to the first display orientation;

wherein the display orientation module is further configured to detect a change between a laptop mode and an easel mode based on the detected orientation,

and wherein the display orientation module is further configured to trigger a display inversion from one of the first and second display orientations to the other of the first and second display orientation responsive to the orientation sensor detecting the change between the laptop mode and the easel mode.

(Exh. 1002 at 194.)

81. Similar to the argument LiTL made to distinguish amended Claim 12 from Aarras, LiTL argued that the amendments to Claims 19 and 21 distinguish Aarras because:

Aarras teaches changing a display orientation from a first portrait type orientation to a second landscape type orientation in response to a second portion 94 of section 90 changing orientation from a first position to a second position relative to the first portion 92 of the same section 90. ... Thus, the positional/orientation change is 90 degrees and not 180 degrees as claimed.

(Exh. 1002 at 199-200 (citing Exh. 1006, ¶ [0059]).)

82. As noted above, the amendments to Claims 19 and 21 are directed to the switch from a first to a second display orientation upon either (a) a threshold degree of rotation of the display component relative to the base (in Claim 19) or (b) a change between the laptop mode and the easel mode (in Claim 21). Claims 19 and 21 also require the first and second display orientations to be 180° relative to each other.

83. The 1/31/2011 Office Action maintained the rejection of Claims 19 and 21 over Aarras. (Exh. 1002 at 259-262, ¶¶ 9, 12, and 13.) The Examiner explained that:

the Aarras reference teaches, to a person having ordinary skill in the art of portable electronics, a portable computer

that has the ability, through the use of a sensor 46, to vary the image displayed on a display 30 or 32 based on the rotation of a display component 12 in relation to a base 14. It is also inherent that there must be some threshold rotation limit that triggered the sensor 46 to initiate the computer controller 24 to change the image on the display 30, 32.

(*Id.* at 270-272, ¶¶ 41-42.)

84. The Examiner also added an alternative rejection of Claims 19 and 21 under 35 U.S.C. § 103(a) as obvious in view of Aarras and U.S. Patent No. 6,343,006 (Exh. 1008, “Moscovitch”). (*Id.* at 266, ¶ 35.)

85. The Examiner explained that, to the extent that Aarras does not disclose inverting the display orientation upon either a threshold degree of rotation (as recited in Claim 19) or a change between the laptop mode and the easel mode (as recited in Claim 21), “it would have been obvious to incorporate such a function with a portable computer,” because:

[In] Figures 26 and 27, Moscovitch discloses a portable computer comprising a display component 12B and a base C, wherein when the display component 12B rotates beyond the threshold of 180 degrees relative the base C the image on the component 12B is inverted. It would have been obvious to one having ordinary skill in the art of portable electronics at the time the invention was made to

provide an invertible image as taught by Moscovitch, since Aarras suggests that a sensor 46 may be used to vary an image on a display 30, 32 based on the level of rotation of a display component 12 in relation to a base 14.

(Exh. 1002 at 266-268, ¶¶ 36-37 (citing Exh. 1008, 10:19-33; Figs. 26-27).)

86. In response, LiTL further amended Claims 19 and 21 to limit the recited display component / unit to having “a single display screen” and to require the recited base / base unit to have “an integrated keyboard.” (Exh. 1002 at 315-316.)

87. LiTL argued that Aarras teaches a device with two displays “connected by a dual axis hinge” which enables each display to rotate completely around and behind the other display, like flipping pages in “a top wirebound steno book or memo book.” (Exh. 1002 at 317.) “Pursuant to the disclosed book metaphor,” the display orientation does not change when the displays are rotated. (*Id.* at 318 (citing Exh. 1006, ¶¶ [0038], [0043], [0047]-[0049]); *see also id.* at 320-322.) Otherwise, “[i]f one were to modify Aarras to invert the image as alleged, when the flipping operation was completed, a user of the Aarras device would be viewing an image upside down when the user next flipped a page.” (*Id.* at 324.)

88. The 9/8/2011 Office Action rejected Claims 19 and 21 under 35 U.S.C. § 102(b) as anticipated by Schweizer (Exh. 1007). (Exh. 1002 at 331, ¶ 8.)

89. In response, LiTL amended Claim 19 to limit the claimed method to a “single display component including a display screen” which is oriented toward the operator of the portable computer in each display mode:

... orienting the visual display shown on the display screen of the single display component towards an operator for operation of the portable computer in each of the plurality of display modes,

wherein the plurality of display modes includes a laptop mode with the integrated keyboard and display oriented towards the operation and an easel mode with the display oriented towards the operator and the keyboard oriented away from the operator; ...

(Exh. 1002 at 364-365.)

90. LiTL also amended Claim 21 to similarly limit the claim to “a single display unit,” and to add limitations directed to an additional display mode, *i.e.*, a frame mode:

... wherein the display orientation module is further configured to detect a change between a laptop mode, ~~and~~ an easel mode, and a frame mode based on the detected physical orientation of the single display unit relative to the base unit, and wherein the display orientation module is further configured to:

trigger a display inversion from one of the first and second content display orientations to the other of the first and second content display orientations responsive to the orientation sensor detecting the change between the laptop mode and the easel mode;

trigger a display inversion from one of the first and second content display orientations to the other of the first and second content display orientations responsive to the orientation sensor detecting the change between the easel mode and the frame mode.

(Exh. 102 at 365-366.)

91. LiTL distinguished amended Claims 1, 13, 19 and 21 from Schweizer by arguing that it “discloses a dual display laptop configured for presenting the main display to a second viewer (e.g., a customer) while the operator interacts with the laptop using a secondary display and the detachable keyboard.” (*Id.* at 371; *see also* Exh. 1007, Fig. 2.)

92. Claims 19 and 21 were allowed thereafter. (Exh. 1002 at 391-395.) For the issuance of the '688 Patent, Claim 19 was renumbered as Claim 17, and Claim 21 was renumbered as Claim 19. (*Id.* at 411.)

4. Original Claim 32, Issued as Claim 29

93. Only Original Claims 1-25 were at issue in the 9/8/2011 Office Action. (Exh. 1002 at 328 & 355.)

94. In its 3/7/2012 response to the above Office Action, LiTL added ten new claims: Original Claims 26-35. (Exh. 1002 at 366-369.) LiTL did not address any of these newly-added claims in the Remarks section of its response except for Claim 32, which LiTL distinguished from Schweizer by making a similar argument to its argument to distinguish Original Claim 1 from Schweizer. (*Id.* at 373-374.)

95. Claim 32 was allowed thereafter. (Exh. 1002 at 395; 400-401; 403-404.) Claim 32 was later renumbered as Claim 29 for the issuance of the '688 Patent. (*Id.* at 411.)

96. On June 17, 2021, LiTL filed a terminal disclaimer disclaiming Claim 29 in response to a petition for *Inter Partes* Review of the '688 Patent (IPR2021-00681) filed by Lenovo (U.S.), Inc. (Exh. 1002 at 486 & 494 fn. 1.)

C. *Ex Parte* Reexamination of the '688 Patent

97. The Patent Trial & Appeal Board ("PTAB") denied Lenovo's petition for *Inter Partes* Review of the '688 Patent. (Exh. 1002 at 492.)

98. Thereafter, Lenovo filed a request for *ex parte* reexamination of Claims 11-22 and 24-32 of the '688 Patent, which was granted. (Exh. 1009 at 45.)

99. The Non-Final Office Action dated December 28, 2022 stated that Claim 29 would not be reexamined because of the terminal disclaimer. (Exh. 1010 at 4.) It rejected Claims 11-22, 24-28, and 30-32 under 35 U.S.C. § 103(a) as obvious in view of the following prior art combinations:

Section	Claims	Prior Art References
6.1	12-14, 16, 19-20, 24-26, 30-32	Lane
6.2	26, 32	Lane and Kamikakai
6.3	12-14, 16-20, 24-28, 30-32	Lane and Hisano
6.4	21-22	Lane, Hisano, and Ayazi
6.5	11	Lane, Hisano, and Choi
6.6	15	Lane, Hisano, and Clapper
6.7	12-14, 16-22, 24-28, 30-32	Kamikakai, Shimura, and Hisano
6.8	11	Kamikakai, Shimura, Hisano, and Choi
6.9	15	Kamikakai, Shimura, Hisano, and Clapper
6.10	21-22	Kamikakai, Shimura, Hisano, and Ayazi
6.11	11	CN '170, Misawa, and Shigeo
6.12	11	CN '170, Hisano, and Choi

(*Id.* at 2.)

100. The Final Office Action dated May 18, 2023 maintained the above rejections. (Exh. 1011 at 2.) Thereafter, LiTL canceled Claims 12-16, 20, and 24-26 of the '688 Patent. (Exh. 1012 at 2.) The Examiner later issued an Advisory Action withdrawing the obviousness rejection of Claim 19 over Lane alone. (*Id.*) Claims 11, 17-19, 21-22, 27-28, and 30-32 remain rejected. (*Id.*)

101. On November 14, 2023, LiTL filed its appeal brief. (Exh. 1013.)

V. SCOPE & CONTENT OF THE PRIOR ART AS OF THE EARLIEST PRIORITY DATE OF THE '688 PATENT

102. The '688 Patent claims priority to a provisional patent application filed on April 1, 2008. Here is an overview of the state of the art as of that date.

A. Hinges and Display Modes

1. Shimano (Exh. 1005)

103. The '688 Patent cites Shimano as an example of “a hybrid tablet-type portable computer that is capable of operating either as a normal laptop computer receiving user input via a keyboard ('laptop mode'), or as a tablet computer receiving user input via a touch screen.” (Exh. 1001, 1:37-41 (describing Exh. 1005).)

104. Shimano discloses a dual-pivot hinge assembly 13 coupling the display unit 10 and the base unit 12 of the portable computer. (Exh. 1005, 4:45-47.) The hinge assembly 13 comprises an A hinge 32, a B hinge 30, and an armature 33. (*Id.* at 4:52-55.) The B hinge couples the display unit 10 to the armature 33; the A hinge couples the base unit 12 to the armature 33. (*Id.* at 4:55-60; Figs. 2(a)-2(c).) As shown in Figs. 2(a)-2(c) and Figs. 4(a) to 4(c), the dual-pivot hinge assembly 13 enables the display unit 10 to be rotated 360° relative to the base 12, such that the back of the display unit 10 can be folded flat against the bottom of the base unit 12 to deploy the portable computer in a tablet mode, as illustrated in Figs. 2(c) and 4(c).

2. Kamikakai (Exh. 1014)

105. U.S. Patent No. 6,154,359 (“Kamikakai”) teaches a portable computer with a similar dual-pivot hinge. (Exh. 1014, Figs. 5-8.) The dual-pivot hinge allows the display part 3 to be rotated from the main body 2 to an angle in the “range of 270° to 360°.” (*Id.* at 6:28-31.)

106. Kamikakai depicts an exemplary “prior art” or “conventional” portable computer having a single-pivot hinge in Figs. 1-2 and identifies the shortcoming of the depicted single-pivot hinge as its inability to let the display part 53 open beyond 180° from the main body 55 of a portable computer. (Exh. 1014, 6:19-23.)

3. Choi (Exh. 1015)

107. U.S. Patent No. 6,918,159 (“Choi”) discloses a single-pivot hinge for a laptop computer. (Exh. 1015, 1:11-24; Figs. 2-7.) Choi teaches a hinge mechanism which, upon the release of a locking device, automatically opens the display panel 11 by a predetermined angle (e.g., 45°) from the body 10. (*Id.* at 5:59-62; Fig. 5.) The hinge mechanism thereafter allows a user to further open the display panel 11 to an adjustable angle beyond 45°. (*Id.* at 6:21-25 & 6:32-39.) A locking projection 15e engages locking portion 33e to restrict the maximum opening angle of the hinge mechanism to about 210°. (*Id.* at 6:26-29; Fig. 7.)

4. Misawa (Exh. 1016)

108. U.S. Patent Appl. Pub. No. 2005/0134717 A1 (“Misawa”) discloses a mobile phone comprising a first casing body 14 (with a keypad 12) and a second casing body 18 (with a screen 16) “joined by a uni-axial hinge portion” which can open “by more than 180°.” (Exh. 1016, Abstract; Fig. 1.)

109. As shown in Figs. 8-9, the hinge 20 “is opened by 300° from the closed state,” where cams within the hinge 20 maintains the opening angle, such that the first casing body 14 and second casing body 18 form an inverted “V” on a surface G to hold a camera unit 22 (disposed inline with the axis of the hinge 20) above the surface G. (*Id.* at [0054].)

110. A POSA would have recognized that the hinge 20 depicted in Fig. 9 can open beyond the stated 300° (but less than 360°) if one was not concerned about blocking the lens 26 of the inline camera unit 22. (*Id.* at Fig. 9.)

5. Single-Pivot vs. Dual-Pivot Hinges

111. Thus, a POSA would have recognized that a single-pivot hinge allows the display to open well beyond 180° relative to the base.

112. A POSA would have understood that the maximum opening angle for a single-pivot hinge depends the structure of the hinge, including factors such as the hinge diameter relative to the respective thicknesses of the display and the base,

whether their respective cross-sections taper toward the hinge, and the distance and location of the hinge axis relative to main bodies of the display and the base.

113. As Misawa noted, a “bi-axial” or dual-pivot hinge is necessarily more mechanically complex than a “uni-axial” or single-pivot hinge. (Exh. 1016, [0009].) Thus, a POSA would have known that a single-pivot hinge would likely be more reliable over the countless opening and closing cycles during the service life of a portable computer. A POSA would have understood that a dual-pivot hinge is also more expensive than a single-pivot hinge.

114. However, a POSA would have recognized that the use of a dual-pivot hinge would make it easier to design a portable computer having a display that can rotate far enough to fold flat against the bottom of the base to deploy the portable computer in a tablet mode, and would result in a more compact hinge to improve portability of such a portable computer. Thus, the selection between a single-pivot hinge and a double-pivot hinge by a POSA would have been a design choice that largely turned on whether there was a need or desire to enable the portable computer to be deployed in a tablet mode.

B. Sensors and Display Orientations

1. Lane (Exh. 1017)

115. PCT Patent Pub. No. WO 95/24007 (“Lane”) discloses a portable computer 10 comprising a first module 14 (with a keyboard 36) and a second module 18 (with a display 35). (Exh. 1017, 5:4-6; Fig. 1.) The two modules 14 and 18 are connected by a dual-pivot hinge 54 that enables the portable computer 10 to be opened from a closed position (Fig. 5) to a laptop mode (Fig. 6), a flat mode (Fig. 7), an easel mode (Fig. 8), a tablet mode (Fig. 9), or a frame mode (Fig. 25).

116. Lane also discloses an orientation sensor 38 to detect the spatial orientation of a module:

Mechanism 38 includes a moveable conductor 42 (such as liquid mercury) in a spherical cavity 46 having contacts 50 spaced about its periphery. Conductor 42 responds via gravitational forces to spatial reorientation of mechanism 38 by moving relative to contacts 50 (to contact at least one contact 50 to close its respective circuit). Including mechanism 38 as a component of either first or second modules 14 or 18 would thus permit it to indicate the spatial orientation of that module.

(Exh. 1017, 5:25-35; Fig. 29.) A POSA would have understood mechanism 38 to be an orientation sensor because it “responds via gravitational forces to spatial reorientation” in a measurable way.

117. Lane also provides examples of functionalities enabled by the inclusion of an orientation sensor 38:

Doing so would also allow mechanism 38 to assist device 10 (and its associated software) in determining, for example, whether the information to appear on visual display 35 should be in “landscape” or “portrait” position as the visual display 35 is spatially configured, ..., or whether to render keys 36 of first module 14 inoperable when unused.

(Exh. 1017, 5:35-6:6.)

118. As discussed above, Lane teaches that the display 35 is housed within the second module 18 of the portable computer 10. (Exh. 1017, 5:4-6; Fig. 1.) Thus, a POSA would have understood that Lane teaches adjusting the display orientation between “landscape” and “portrait” based on the input from an orientation sensor 38 incorporated within the second module 18.

119. A POSA would have further recognized that Lane does not suggest that the display orientation adjustment is limited to switching between the “landscape” and “portrait” orientations referenced in the first example. Rather, common sense would have informed a POSA to configure the portable computer 10 to adjust the display orientation properly relative to a user according to the spatial orientation of the second module 18 (which houses the display 35), especially in view of Lane’s express disclosure of an easel mode. (Exh. 1017, 8:12-15; Fig. 8) Thus, a POSA

would have recognized that the display orientation in the easel mode would be inverted (i.e., rotated 180°) compared to the display orientation in the laptop mode. (Cf. *id.* at Figs 6 & 8.)

120. As discussed above, Lane teaches that the keyboard 36 is housed within the first module 14 of the portable computer 10. (Exh. 1017, 5:4-6; Fig. 1.) Thus, a POSA would have understood that Lane teaches disabling the keyboard 36 when it is unused — e.g., tablet mode (Fig. 9) or frame mode (Fig. 25) — based on the input from an orientation sensor 38 incorporated within the first module 14.

121. A POSA would have recognized that the display orientation adjustment and the keyboard lockout functionalities taught in Lane are not mutually exclusive. Rather, a POSA would have realized that it would be advantageous for a portable computer — especially one capable of the variety of display modes taught in Lane — to provide both functionalities. Thus, a POSA would have incorporated a spatial orientation sensor 38 in each of the first and second modules 14 and 18.

122. While not expressly stated in Lane, a POSA would also have realized that including an orientation sensor 38 in each of the first and second modules 14 and 18 enables the portable computer 10 to determine the angle between the two modules. The angle of each module relative to the ground is measured by its own orientation sensor 38, and the respective orientation angles of the two modules can be used to calculate the angle between them.

2. Hisano (Exh. 1018)

123. U.S. Patent Appl. Pub. No. 2006/0034042 A1 (“Hisano”) discloses a portable computer comprising a first housing 2 and a second housing 4, each with its own LCD panel (8 and 18, respectively). (Exh. 1018, Fig. 1.) An LCD panel (e.g., 18 in Fig. 1) may display a virtual keyboard 20 to receive touch input. (*Id.* at [0058]; Fig. 1.) A pair of dual-pivot hinges (i.e., “two-rotating-shaft hinges”) 130A and 130B join the two housings 2 and 4. (*Id.* at [0098]; Fig. 9.)

124. The portable computer of Hisano can be deployed in a laptop mode, where “[t]he user can operate the personal computer on one of the LCD panels 8 and 18 while checking the state of the operation on the other LCD panel.” (Exh. 1018, [0098]; Fig. 1.) In Fig. 9, the hinges 130A and 130B further open to deploy the portable computer in an easel mode, where the maximum opening angle between the two housings 2 and 4 is “at least 180°; for example, 270°” to “form the character Λ (capital lambda)” such that “LCD panels 8 and 18 both face outward.” (*Id.*) In the easel mode, the portable computer “can be used for ... presentations for a small number of people, [where] the operator views information including detailed data relating to the presentation, while the viewers see only slides.” (*Id.* at [0099].)

125. In connection with the transition between laptop mode and easel mode, Hisano teaches inverting the display orientation — i.e., switching between a first display orientation, where the edge of the screen closer to the hinges is the top of the

display, and a second display orientation, where the edge of the screen farther from the hinges is the top of the display — based upon the opening angle of the hinges 130A and 130B. (Exh. 1018, [0099].)

126. Hisano also teaches incorporating an orientation sensor “that senses the direction of gravity so as to automatically switch the top and bottom of the display screen regardless of the angle of the hinges 130A and 130B or the placement of the personal computer.” (*Id.*) Based on the input from the orientation sensor, an LCD panel that is “almost parallel to the desk surface is switched to the input interface 133,” e.g., virtual keyboard 20, whereas an LCD panel that is “standing from the desk surface is switched to the display surface.” (*Id.* at [0100].)

127. As noted above, the hinges 130A and 130B have a “maximum opening angle [of] for example, 270°” in the easel mode. (*Id.* at [0098].) Given the range of rotation between the two housings 2 and 4 to enable the deployment of the portable computer from closed mode to laptop mode and further to easel mode, i.e., 0°-270°, a POSA would have recognized that the spatial orientation of one housing does not determine the spatial orientation of the other housing. Thus, a POSA would have further recognized that Hisano teaches the incorporation of an orientation sensor in each of the two housings 2 and 4 to detect whether an LCD panel is “almost parallel to the desk surface” and switch it to the input interface, and whether an LCD panel is “standing from the desk surface” and switch it to the display surface.

128. As discussed above, a POSA would have recognized that incorporating an orientation sensor in each of the first and second housings 2 and 4 would enable the portable computer to determine the opening angle of the hinges 130A and 130B.

129. Hisano also teaches rotating the content displayed on LCD panels 8 and 18 between landscape and portrait display orientations based on the input from an orientation sensor.

The LCD panels 8 and 18 may be arranged either vertically or horizontally in parallel. Preferably, the personal computer comprises a sensor that senses gravity so that information displayed on the screen including the virtual keyboard can be appropriately rotated depending on the sensed direction. This enables images to be always displayed in the correct direction with respect to the user.

(Exh. 1018, [0103].)

VI. CHALLENGED CLAIMS & STATUTORY GROUNDS FOR UNPATENTABILITY

A. Claim 1 of the '688 Patent Would Have Been Obvious in View of Lane and Misawa

1. Motivation to Combine Lane and Misawa

130. Both Lane and Misawa disclose portable electronic devices which are deployable in multiple configurations. These portable electronic devices each has a base and a display component pivotably coupled by a hinge assembly. A POSA designing a hinge assembly for a portable computer would not have constrained oneself to only prior art portable computers, but would have also considered other prior art portable electronic devices.

131. Lane discloses a double-pivot hinge 54, whereas Misawa discloses a single-pivot hinge 20. As discussed above (in ¶¶ 113-114), a POSA would have recognized that (a) a single-pivot hinge is less mechanically complex than a dual-pivot hinge, and thus less expensive and likely more reliable over the service life of a portable computer; and (b) a dual-pivot hinge is generally unnecessary except to allow the display component to rotate far enough to fold flat against the bottom of the base to deploy the portable computer in tablet mode. Thus, a POSA would have been motivated and able to adapt the portable computer 10 of Lane to use a single-pivot hinge like the hinge 20 taught in Misawa.

2. **[Preamble] A portable computer configurable between a plurality of display modes including a closed mode, a laptop mode and an easel mode, the portable computer comprising:**

132. To the extent that the preamble of Claim 1 is limiting, Lane discloses a “reconfigurable portable computer.” (Exh. 1017, 1:3-5; Fig. 1.)

133. The portable computer 10 of Lane can be deployed in a closed mode. (*Id.* at 5:17-18 (“nominally ‘closed’ position”); Figs. 2 & 5.)

134. The portable computer 10 can also be deployed in a laptop mode in which both its display 35 and its keyboard 36 are accessible. (*Id.* at 5:15-17; Fig. 1.)

135. The portable computer 10 can also be deployed in an easel mode, in which its second module 18 (with the display 35) has opened from, or rotated relative to, its first module 14 (with the keyboard 36) by more than 270°, such that only the display 35 is accessible. (*Id.* at 8:12-15; Fig. 8.)

3. **[Element 1.a] a single display component including a display screen;**

136. The portable computer 10 in Lane has a second module 18 with a visual display 35. (Exh. 1017, 5:4-6; Fig. 1.)

4. **[Element 1.b] a base including a keyboard;**

137. The portable computer 10 in Lane has a first module 14 with a keyboard 36. (Exh. 1017, 5:4-6; Fig. 1.)

5. [Element 1.c.i] a hinge assembly at least partially housed within the base and the display component configured to pivotably couple the display component to the base,

138. In Lane, the hinge 54 of the portable computer 10 is partially housed within its first module 14 (having a keyboard 36) and its second module (having a display 35). (Exh. 1017, Fig. 1.) Likewise, the hinge 20 of the mobile phone 10 in Misawa is partially housed within its first casing body 14 (having a keypad 12) and its second casing body 18 (having a screen 16). (Exh. 1016, Fig. 1.)

139. As discussed above in Section VI.A.1, a POSA would have been motivated and able to adapt the portable computer 10 of Lane to use a single-pivot hinge like the hinge 20 taught in Misawa. The resulting hinge of the modified portable computer would pivotably couple and be partially housed within its first module 14 (having a keyboard 36) and its second module (having a display 35).

6. [Element 1.c.ii] wherein the hinge assembly defines a single longitudinal axis running along an interface between the display component and the base,

a. Claim construction

140. As discussed above (in ¶¶ 53-62), LiTL added the above language to Claim 1 during prosecution to distinguish Aarras (Exh. 1006), which discloses a dual-pivot hinge. Thus, “the hinge assembly defines a single longitudinal axis running along an interface between the display component and the base” is limited to a single-pivot hinge.

- b. Misawa discloses a single longitudinal axis that is defined by the hinge assembly and runs along the interface between the display component and the base.**

141. The single-pivot hinge 20 of Misawa defines a single axis — i.e., the common cylindrical axis of its components — that runs along the interface between the first casing body 14 and second casing body 18. (Exh. 1016, Figs. 2 & 4.) If one takes the view that the length of an object must be greater than its width, the single-pivot hinge 20 defines a “transverse” rather than a “longitudinal” axis with respect to the mobile phone 10. However, with respect to the portable computer 10 of Lane modified to implement a single-pivot hinge like the hinge 20 of Misawa, the hinge would define a “single longitudinal axis”.

7. [Element 1.c.iii] and wherein the display component and the base are rotatable about the single longitudinal axis;

142. As discussed above (in ¶¶ 53-62), LiTL amended the above language in Claim 1 to distinguish Aarras (Exh. 1006) by limiting Claim 1 to a single axis of rotation defined by the hinge assembly, i.e., a single-pivot hinge.

143. In Misawa, the second casing body 18 and the first casing body 14 of the mobile phone 10 are rotatable about the single axis defined by its single-pivot hinge 20. (Exh. 1016, Fig. 12.) In the portable computer 10 of Lane modified to implement a single-pivot hinge like the hinge 20 of Misawa, the display component

and base of the computer would likewise be rotatable about the single longitudinal axis defined by the hinge.

8. **[Element 1.d] wherein, in the closed mode, the display screen is disposed substantially against the base;**

144. The portable computer 10 of Lane can be deployed in a closed mode, wherein its second module 18 (with a display 35) is disposed substantially against its first module 14 (with a keyboard 36). (Exh. 1017, 7:32-8:2; Fig. 5.)

145. The portable computer 10 of Lane modified to implement a single-pivot hinge like the hinge 20 of Misawa could likewise be deployed in a closed mode, wherein its display screen would be disposed substantially against its base.

9. **[Element 1.e.i] wherein rotating either the single display component or the base by an operator about the single longitudinal axis up to approximately 180 degrees from the closed mode configures the portable computer into the laptop mode,**

146. The portable computer 10 of Lane can be deployed in a laptop mode by a user opening the hinge 54 up to about 180°. “Fig. 6 ... illustrates second module 18 orated about axis 62 to form an obtuse angle relative to first module 14.” (Exh. 1017, 8:2-5 (emphasis added); Figs. 1 & 6.)

147. The portable computer 10 of Lane modified to implement a single-pivot hinge like the hinge 20 of Misawa could likewise be deployed in a laptop mode by opening the hinge up to about 180°.

10. **[Element 1.e.ii] wherein in the laptop mode the single display component is oriented towards the operator and the keyboard is oriented to receive input from the operator;**

148. The portable computer 10 of Lane can be deployed in a laptop mode in which both its display 35 and its keyboard 36 are accessible. (Exh. 1017, 5:15-17; Figs. 1 & 6.)

11. **[Element 1.f] wherein rotating either the single display component or the base by the operator about the single longitudinal axis beyond approximately 180 degrees from the closed mode configures the portable computer into the easel mode; and**

149. The portable computer 10 of Lane can be deployed in an easel mode, in which its second module 18 (with the display 35) has opened from, or rotated relative to, its first module 14 (with the keyboard 36) by more than 270°. (Exh. 1017, 8:12-15; Fig. 8.)

150. The portable computer 10 of Lane modified to implement a single-pivot hinge like the hinge 20 of Misawa could likewise be deployed in an easel mode by opening the hinge up beyond 180°. For example, as shown in Figs. 8-9, the hinge 20 of the mobile phone 10 in Misawa “is opened by 300° from the closed state” such that its first casing body 14 and second casing body 18 form an inverted “V”. (Exh. 1016, [0054].)

12. **[Element 1.g] wherein in the easel mode the single display component is oriented facing the operator with the keyboard oriented away from the operator.**

151. Lane notes that the easel mode is “useful particularly when only visual display 35 need[s] to be accessible” to a user. (Exh. 1017, 8:12-15; Fig. 8.)

B. Claim 2 of the '688 Patent Would Have Been Obvious in View of Lane and Misawa

1. **[Preamble] The portable computer of claim 1,**

152. See Section VI.A above.

2. **[Element 2.a] wherein the single display component is rotatable about the single longitudinal axis up to approximately 320 degrees from the closed mode.**

153. In Misawa, as shown in Figs. 8-9, the hinge 20 of the mobile phone 10 “is opened by 300° from the closed state” such that its first and second casing bodies 14 and 18 form an inverted “V”. (Exh. 1016, [0054].)

154. A POSA would have recognized that the hinge 20 depicted in Fig. 9 can open beyond the stated 300° (but less than 360°) if one was not concerned about blocking the lens 26 of the inline camera unit 22. (*Id.* at Fig. 9.)

155. In Lane, the camera 34 is mounted within the left bezel of the second module 18 which also houses the display 35. (Exh. 1017, Fig. 1.) Thus, a POSA would have had no concern about blocking the lens of the camera 34 of the portable computer 10 of Lane modified to implement a single-pivot hinge like the hinge 20 of Misawa when opening its hinge beyond 300°.

156. A POSA would also have understood that the maximum opening angle of a single-pivot hinge is a basic engineering design choice that depends the structure of the hinge, including factors such as the hinge diameter relative to the respective thicknesses of the display and the base, whether their respective cross-sections taper toward the hinge, and the distance and location of the hinge axis relative to main bodies of the display and the base.

157. For example, to increase the maximum opening angle of a single-pivot hinge for a portable computer, a POSA would have known to increase (a) the hinge diameter relative to the respective thicknesses of the display and the base, and/or (b) the distance of the hinge axis from the main bodies of the display and the base. Thus, it would have been well within the capability of a POSA to design and implement a single-pivot hinge for the portable computer 10 of Lane to open to 320°.

C. Claim 3 of the '688 Patent Would Have Been Obvious in View of (a) Lane and Misawa; or (b) Lane, Hisano, and Misawa

1. Motivation to Combine Hisano with Lane and Misawa

158. Both Lane and Hisano are directed to a portable computer comprising two housings joined by a dual-pivot hinge. As discussed above in (¶¶ 115 & 123-124), each reference discloses a portable computer that can be deployed in both a laptop mode and an easel mode. And, as discussed above (in ¶¶ 117-121 & 127), both references disclose (or at least clearly suggest) including an orientation sensor in each of the two housings of the portable computer. Based on the structural

similarities between the respective portable computers of Lane and Hisano, a POSA would have recognized that the teachings in one reference would apply to the other. A POSA would also have been capable of applying the teachings in Hisano to the portable computer 10 of Lane modified to implement a single-pivot hinge like the hinge 20 of Misawa.

2. [Preamble] The portable computer of claim 1,

159. See Section VI.A above.

3. [Element 3.a] further comprising a display orientation module that displays content on the display screen in one of a plurality of content orientations relative to the single longitudinal axis.

a. Lane and Misawa

160. Lane discloses a portable computer 10 having “associated software” that determines, based on input from its spatial orientation sensor 38, “whether the information to appear on visual display 35 should be in ‘landscape’ or ‘portrait’ position as the visual display 35 is spatially configured.” (Exh. 1017, 5:32-6:5.)

161. As discussed above in ¶ 119, a POSA would have recognized that Lane does not suggest that the display orientation adjustment is limited to switching between the “landscape” and “portrait” orientations. Rather, common sense would have informed a POSA to configure the portable computer 10 to adjust the display orientation properly relative to a user according to the spatial orientation of the second module 18 which houses the display 35, especially in view of Lane’s express

disclosure of an easel mode. (*Id.* at 8:12-15; Fig. 8.) Thus, a POSA would have understood Lane to suggest a third display orientation for the easel mode which would be inverted (i.e., rotated 180°) relative to the display orientation in the laptop mode. (*Cf. id.* at Figs 6 & 8.)

162. Thus, the portable computer 10 of Lane modified to implement a single-pivot hinge like the hinge 20 of Misawa would have a display orientation module that displays content on the display 35 in multiple display orientations relative to the single longitudinal axis, including: (a) landscape, (b) portrait, and (c) inverted relative to landscape.

b. Lane, Hisano, and Misawa

163. Section VI.C.3.a above is incorporated by reference.

164. To the extent that LiTL contends that Lane does not teach or suggest an inverted display orientation for the easel mode, Hisano expressly does so.

165. In connection with the transition between laptop mode and easel mode, Hisano teaches inverting the display orientation — i.e., switching between a first display orientation, where the edge of the screen closer to the hinges is the top of the display, and a second display orientation, where the edge of the screen farther from the hinges is the top of the display — based upon a change in the display mode as reflected by the opening angle of the hinges 130A and 130B or by the relative orientations of the two housings 2 and 4. (Exh. 1018, [0098]-[0100].)

166. As discussed above (in ¶¶ 117 & 129), both Lane and Hisano teach switching between landscape and portrait display orientations.

167. A POSA would have recognized that the display orientation module of the portable computer 10 of Lane modified to implement a single-pivot hinge like the hinge 20 of Misawa can incorporate Hisano's teachings regarding inverting the display orientation, such that it could display content on the display 35 in multiple display orientations relative to the single longitudinal axis, including: (a) landscape, (b) portrait, and (c) inverted relative to landscape.

D. Claim 4 of the '688 Patent Would Have Been Obvious in View of Lane, Hisano, and Misawa

1. [Preamble] The portable computer of claim 3,

168. See Section VI.C above.

2. [Element 4.a] further comprising a mode sensor which detects a current display mode of the portable computer; and

a. Claim construction

169. According to the '688 Patent, a mode sensor detects the current display orientation of the portable computer by determining the orientation of the display component relative to the base component.

... In one embodiment, the portable computer 100 includes an orientation (or mode) sensor that is configured to detect whether the portable computer is in the laptop mode or the

easel mode, and to adjust the display accordingly. ... The orientation sensor may be used to determine a precise relative orientation of the base component 104 with respect to the display component 102, or vice versa, for example, to determine whether the device is in the laptop mode, easel mode, or some point in between the two modes. In one example, the orientation sensor includes an accelerometer ... to detect a configuration of the portable computer 100 (e.g., laptop mode or easel mode), particularly, to detect an orientation of the display component 102 relative to the base component 104.

(Exh. 1001, 8:17-20; 8:26-44.)

170. The '688 Patent further explains that one example of determining the orientation of the display component relative to the base component is to determine the angle between the two components.

... when the portable computer 100 is in the easel mode, the base 104 is disposed at an angle 134 to the display component 102. ... As discussed above, in one example, the orientation sensor (not shown) may be used to detect, either approximately or precisely, the angle 134 and to provide the information to the computer operating system.

(Exh. 1001, 8:49-61.)

... the orientation sensor may be incorporated into the hinge assembly 138 and may be used to detect movement

of the hinge assembly, and to translate that movement into an information about the relative orientation of the display component 102 and the base component 104 (for example, a size of the angle 134).

(Exh. 1001, 9:36-41.)

171. Thus, this claim limitation should be construed as “a mode sensor that determines the current relative orientation of the display component to the base component”, which covers a sensor that determines the angle between the two components.

b. Hisano Discloses a Display Mode Sensor

172. Hisano teaches switching the display orientations of the LCD panels 8 and 18 based on the relative spatial orientation of the two housings 2 and 4, including the opening angle of hinges 130A and 130B between the two housings.

173. The portable computer of Hisano has two touchscreen displays, LCD panels 8 and 18, respectively installed within housings 2 and 4, which are joined by hinges 130A and 130B. (Exh. 1018, Fig. 9.)

174. As discussed above (in ¶ 125), Hisano teaches inverting (i.e., rotating by 180°) the display orientation of an LCD panel based on the opening angle of the hinges 130A and 130B in connection with the transition between the laptop mode and easel mode. (Exh. 1018, [0099].) Thus, Hisano teaches detecting the display mode of the portable computer based on the opening angle of its two hinges.

175. As discussed above (in ¶¶ 126-127), Hisano also teaches inverting the display orientation of an LCD panel based on the input of an orientation sensor in the corresponding housing. (*Id.*) The orientation sensor in each housing (2 or 4) detects whether the corresponding LCD panel (8 or 18, respectively) is either:

- “almost parallel to the desk surface,” and switches that LCD panel “to the input interface 133,” or
- “standing from the desk surface,” and switches that LCD panel “to the display surface.” (*Id.* at [0100].)

176. A POSA would have recognized that the portable computer can detect a laptop mode (e.g., Fig. 10) when the orientation sensors indicate that one LCD panel is “almost parallel to the desk surface” while the other LCD panel is “standing from the desk surface,” so that a user can operate the portable computer on the former while checking the state of the operation on the latter. (*Id.* at [0100] & [0098].) In addition to switching the LCD panels between serving as an “input interface 133” and a “display surface”, a POSA would have understood that the respective display orientations of both LCD panels would be set properly relative to the user using the portable computer in its laptop mode.

177. A POSA would have recognized that the portable computer can also detect an easel mode (e.g., Fig. 9) when the orientation sensors indicate that both LCD panels are “standing from the desk surface,” so that it “can be used for ...

presentations for a small number of people, [where] the operator views information including detailed data relating to the presentation, while the viewers see only slides.” (*Id.* at [0100] & [0099].) In addition to switching both LCD panels to serve as respective display surfaces for the operator and the viewers, a POSA would have understood that the respective display orientations of each LCD panel would be set properly to display the detailed data to the operator and to display the slides to the viewers..

3. [Element 4.b] wherein the display orientation module displays content on the display screen in the one of the plurality of content orientations dependent on the current display mode detected by the mode sensor.

178. As discussed above (in ¶ 125), Hisano teaches inverting the display orientation of an LCD panel based on the opening angle of the hinges 130A and 130B joining the two housings 2 and 4 of the portable computer in connection with its transition between the laptop mode and easel mode. (Exh. 1018, [0098]-[0099].)

179. Thus, Hisano teaches the display of content on the LCD panel in one of at least two display orientations, e.g., landscape (in laptop mode) and inverted (in easel mode, based on the display mode of the portable computer as determined by the opening angle of its hinges 130A and 130B.

180. As discussed above in (in ¶¶ 175-177), the portable computer of Hisano also detects its display mode based on orientation sensors incorporated in each of its two housings 2 and 4, which provide information on the relative spatial orientation

of the two housings. In Hisano, the goal of adjusting display orientation based on the input of these orientation sensors is “to automatically switch the top and bottom of the display screen regardless of the angle of the hinges 130A and 130B or the placement of the personal computer,” so as “to always provide a fixed input and display environment for the user regardless of the installation of the personal computer.” (Exh. 1018, [0099]-[0100].) Thus, a POSA would have also understood that the portable computer of Hisano is capable of switching between at least two display orientations (i.e., landscape and inverted) based on the current display mode.

E. Claim 5 of the '688 Patent Would Have Been Obvious in View of (a) Lane and Misawa; or (b) Lane, Hisano, and Misawa

1. [Preamble] The portable computer of claim 3,

181. See Section VI.C above.

2. [Element 5.a] wherein the display orientation module is configured to display the content in a first content orientation relative to the single longitudinal axis when the portable computer is configured into the laptop mode and in a second content orientation relative to the single longitudinal axis when the portable computer is configured into the easel mode.

182. As discussed above in Sections VI.C.3, a portable computer according to either (a) the combination of Lane and Misawa or (b) the combination of Lane, Hisano, and Misawa would have a display orientation module that displays content on the display 35 in (1) a landscape display orientation when deployed in the laptop

mode and (2) an inverted (relative to landscape) display orientation when deployed in the easel mode.

F. Claim 6 of the '688 Patent Would Have Been Obvious in View of (a) Lane and Misawa; or (b) Lane, Hisano, and Misawa

1. [Preamble] The portable computer of claim 5,

183. See Section VI.E above.

2. [Element 6.a] wherein the second content orientation is 180 degrees relative to the first orientation.

184. With respect to the two display orientations discussed above in Section VI.E.2, the latter is rotated 180° relative to the former.

G. Claim 7 of the '688 Patent Would Have Been Obvious in View of (a) Lane and Misawa; or (b) Lane, Hisano, and Misawa

1. [Preamble] The portable computer of claim 3,

185. See Section VI.C above.

2. [Element 7.a] wherein the plurality of display modes further comprises a flat mode in which the single display component is disposed at an angle of approximately 180 degrees, measured about the single longitudinal axis, relative to the base.

186. Lane discloses a flat mode for the portable computer 10 “in which second module 18 has been rotated approximately 180° relative to first module 14 to expose visual display 35.” (Exh. 1017, 8:9-12; Fig. 7.) Hisano likewise discloses a flat mode. (Exh. 1018, [0087]; Fig. 8.)

187. The single-pivot hinge 20 of Misawa can open to 180°, deploying the mobile phone 10 in “a state in which the second casing body 18 has opened a further 30° to 180° (another rotation position).” (Exh. 1016, [0053]; Figs. 2 & 12.)

188. Thus, the portable computer 10 of Lane modified to implement a single-pivot hinge like the hinge 20 of Misawa can be deployed in a flat mode in which its second module 18 (having display 35) is disposed at an angle of 180° relative to its first module 14, as measured about the single longitudinal axis defined by its hinge.

189. Likewise, the portable computer 10 of Lane modified to implement a single-pivot hinge like the hinge 20 of Misawa and further incorporating Hisano’s teachings on adjusting display orientation can be deployed in a flat mode in which its second module 18 (having display 35) is disposed at an angle of 180° relative to its first module 14, as measured about the single longitudinal axis defined by its hinge.

H. Claim 8 of the '688 Patent Would Have Been Obvious in View of (a) Lane, Misawa, and (Dunko or Forstall); or (b) Lane, Hisano, Misawa, and (Dunko or Forstall)

1. Motivation to Combine Either Dunko or Forstall with Lane, Hisano, and Misawa

190. As discussed above, each of Lane and Hisano discloses an orientation sensor that detects the direction of gravity, and changes the display orientation based on the input from the orientation sensor such that content is displayed the correct

way up, i.e., the top of the displayed content is further from the ground than the bottom of the displayed content. (Exh. 1017, 5:25-6:5; Exh. 1018, [0090]-[0100].)

191. Each reference also discloses a portable computer that can be deployed in a flat mode, where the display is substantially parallel to the ground. (Exh. 1017, 8:9-12; Fig. 7; Exh. 1018, [0087]; Fig. 8.) A POSA would have recognized that when the display is substantially parallel to the ground, the orientation sensor may be unable to determine the correct way up. Thus, a POSA would have also realized that it would be advantageous to enable a user to select the display orientation when the portable computer is deployed in the flat mode, depending on the use case.

192. For example, the user may view the screen while using the keyboard housed in the base, in which case the top of the content displayed should be further away from the keyboard, resulting in the same display orientation (i.e., landscape) as the laptop mode.

193. In another example, the user may review a document one full page at a time, in which case the portrait display orientation may be advantageous to use more of the screen to display the document at a higher zoom level.

194. In yet another example, the user may use the keyboard while showing the screen to a viewer sitting across from the user, in which case the inverted display orientation may be advantageous to accommodate the viewer, resulting in the same display orientation (i.e., inverted) as the easel mode.

195. Thus, a POSA would have been motivated to add a user-selectable display orientation function — for example, as suggested by Dunko or Forstall — to the portable computer taught by (a) the combination of Lane and Misawa, and (b) the combination of Lane, Hisano, and Misawa, when it is deployed in a flat mode, as discussed in further detail below in Section VI.H.4.

2. **[Preamble] The portable computer of claim 7,**

196. See Section VI.G above.

3. **[Element 8.a] wherein the plurality of content orientations comprises a first content orientation relative to the single longitudinal axis, a second content orientation relative to the single longitudinal axis, and a third content orientation relative to the single longitudinal axis; and**

197. See Sections VI.C.3 and VI.H.1 above.

4. **[Element 8.b] wherein, in the flat mode, the content displayed on the display screen is configurable among the first, second and third content orientations responsive to a user input.**

198. As discussed above, Lane discloses a portable computer 10 having “associated software” that determines, based on input from its spatial orientation sensor 38, the proper display orientation for the content visually presented on its display. A POSA would have been motivated and able to add a user-selectable display orientation function to such software.

199. U.S. Patent No. 7,791,594 (“Dunko”) discloses a portable mobile communications device 100 having an orientation sensing mechanism 110 (e.g., an

accelerometer or a gyroscopic device) and an orientation sensing application 130. (Exh. 1019, 3:49-59; Fig. 1.) The orientation sensing application 130 operates in either automatic or manual mode. (*Id.* at 5:65-6:1.) In the automatic mode, the user can override the default display orientation determined by the sensor by shaking the device or pressing a preconfigured virtual button on its surface. (*Id.* at 6:7-24; Fig. 9.) In the manual mode, the user can cycle through all available display orientations via the same input. (*Id.* at 6:34-40; Fig. 9.)

200. U.S. Patent No. 7,978,176 (“Forstall”) likewise discloses a portable device with a screen for which the display orientation is determined by one or more accelerometers, which a user can override via a user gesture. (Exh. 1020, 2:17; 20:28-30; Fig. 5B.)

201. A POSA designing a user-selectable display orientation function to a portable computer would not have constrained oneself to only prior art portable computers, but would have also considered other prior art portable electronic devices. For example, Dunko notes that its disclosure is “described in the context of fully functioning computers and computer systems.” (Exh. 1019, 7:4-6.) Forstall notes that “some of the user interfaces and associated processes [disclosed therein] may be applied to other devices, such as personal computers and laptop computers.” (Exh. 1020, 8:20-26.)

I. Claim 9 of the '688 Patent Would Have Been Obvious in View of (a) Lane, Misawa, and (Dunko or Forstall); or (b) Lane, Hisano, Misawa, and (Dunko or Forstall)

1. [Preamble] The portable computer of claim 8,

202. See Section VI.H above.

2. [Element 9.a] wherein the second content orientation is 90 degrees relative to the first content orientation; and

203. As discussed above in Sections VI.C.3, a portable computer according to either (a) the combination of Lane and Misawa or (b) the combination of Lane, Hisano, and Misawa would have a display orientation module that displays content on the display 35 in three display orientations relative to the single longitudinal axis, including: (a) landscape, (b) portrait, and (c) inverted relative to landscape.

204. The portrait display orientation is 90° relative to the landscape display orientation.

3. [Element 9.b] wherein the third content orientation is 180 degrees relative to the first content orientation.

205. As discussed above in Sections VI.C.3, a portable computer according to either (a) the combination of Lane and Misawa or (b) the combination of Lane, Hisano, and Misawa would have a display orientation module that displays content on the display 35 in three display orientations relative to the single longitudinal axis, including: (a) landscape, (b) portrait, and (c) inverted relative to landscape.

206. The inverted display orientation is 180° relative to the landscape display orientation.

J. Claim 10 of the '688 Patent Would Have Been Obvious in View of Lane, Misawa, and Nako

1. Motivation to Combine Nako with Lane and Misawa

207. A POSA would have known that portable computers are generally equipped with rubber feet or strips on the underside of the base to deter them from sliding when placed on a desk or another surface.

208. A POSA would have further recognized that the rubber feet or strips underneath the base may not contact the desk (sufficiently or at all) when a portable computer is deployed in an easel mode, in which the reduced contact area between the edges of its housings and the desk makes it even more prone to sliding. Thus, a POSA would have been motivated to modify the housing edges contacting the desk to reduce sliding when the portable computer is deployed in an easel mode, as taught by Nako, discussed in further detail below in Section VI.J.3.b.

2. [Preamble] The portable computer of claim 1,

209. See Section VI.A above.

3. **[Element 10.a] further comprising: a foot disposed along at least a portion of the base and configured to support the portable computer when in the easel mode.**

a. **Claim construction: “foot”**

210. According to the '688 Patent, “a cushioning strip 130 disposed along an edge of the base 104 opposite to the [hinge] between the display component 102 and the base [104], ... which may comprise rubber, a polymer, or another suitable material, may serve as a ‘foot’ when the portable computer is configured into the easel mode.” (Exh. 1001, 7:37-43; Fig. 3.)

b. **Nako Teaches a Foot Along the Edge of the Base of a Portable Computer Deployed in Easel Mode**

211. U.S. Patent Appl. Pub. No. 2004/0212602 A1 (“Nako”) discloses a portable display device having two flat displays 4A and 4B joined by a hinge 51 having an axis 53. (Exh. 1021, [0134]; Fig. 19.) The device may be deployed in an easel mode, where “flat displays 4A and 4B are stood on a flat surface for use.” (*Id.* at [0192]; Fig. 46.) Nako teaches that the respective edges of the two flat displays 4A and 4B which are “in contact with the flat surface” are “coated with a material having a great friction coefficient such as a rubber 120 for preventing slipping of the display device.” (*Id.*)

K. Claim 23 of the '688 Patent Would Have Been Obvious in View of Lane, Hisano, and Misawa

1. [Preamble] The portable computer of claim 1,

212. See Section VI.A above.

2. [Element 23.a] further comprising at least one integrated navigation hardware control,

a. Claim construction: “at least one integrated navigation hardware control, ... wherein the integrated hardware control can be operated by a user to control features and manipulate content displayed on the portable computer,”

213. Claim elements 23.a and 23.c (in Section VI.K.4 below) should be considered together for claim construction purposes.

214. The '688 Patent describes “integrated navigation hardware that allows a user to easily and comfortable control various features and functions of the portable computer, and to manipulate content displayed on the portable computer.” (*Id.* at 10:54-58.) One example of such integrated navigation hardware controls is:

... a scroll wheel 132 that allows a user to control, adjust and/or select various functionality of the portable computer. ... [T]he the scroll wheel 132 may be used to provide “hardware navigation” through information, such as menus, icons, etc., displayed on the display screen 110.

(*Id.* at 10:58-64; Fig. 17.) The '688 Patent further notes that:

Navigation is conventionally performed using a mouse, touch pad or trackball, as known to those skilled in the art. ... navigation may be performed using either conventional tools, such as a touchpad 108, trackball (not shown) or peripheral, for example, a mouse, that is connected to the portable computer 100 via a port 164, or the scroll wheel 132, or a combination thereof.

(*Id.* at 11:2-10.)

215. A POSA would have understood mice, track pads, and trackballs as other examples of hardware that can be used to navigate through menus, icons and other content displayed on screen. Thus, a POSA would have understood the '688 Patent to distinguish between integrated (i.e., built in) hardware and peripheral (i.e., attached via a port) hardware, and that touch pads and trackballs are other examples of “integrated navigation hardware controls.”

216. Thus, claim elements 23.a and 23.c should be construed together as “built-in navigation hardware control which can be operated by a user to control features and manipulate content displayed on the portable computer.”

b. The Combination of Hisano with Lane and Misawa Includes an Integrated Navigation Hardware Control

217. A POSA’s motivation to combine Hisano with Lane and Misawa is discussed above in Section VI.C.1.

218. The display 35 of the portable computer 10 in Lane can receive pen-based input. (Exh. 1017, 3:7-14; 8:15-19; Fig. 9.) Hisano discloses built-in touch LCD panels 8 and 18 by which a user can control features and manipulate content displayed on screen. (Exh. 1018, e.g., [0059]; [0065]-[0067].) A POSA would have been motivated to further substitute the pen-based display 35 of Lane with a touch LCD panel to improve the portable computer's ease of use.

219. Thus, the portable computer taught by the combination of Hisano with Lane and Misawa would have a built-in navigation hardware control (i.e., a touch screen) by which a user can control features and manipulate content displayed on screen.

3. [Element 23.b] wherein at least one of the at least one integrated navigation hardware control is accessible in at least the laptop and easel modes,

220. The touch screen of the portable computer taught by the combination of Hisano with Lane and Misawa would be accessible in both the laptop and easel modes. (Exh. 1017, Fig. 6 (laptop mode) and Fig. 8 (easel mode).)

4. [Element 23.c] and wherein the integrated navigation hardware can be operated by a user to control features and manipulate content displayed on the portable computer,

221. See Section VI.K.2 above.

5. [Element 23.d] including any mode wherein the keyboard is inaccessible or oriented away from the user.

222. The touch screen of the portable computer taught by the combination of Hisano with Lane and Misawa would be accessible in both the easel and frame modes. (Exh. 1017, Fig. 8 (easel mode) and Fig. 25 (frame mode).)

VII. SECONDARY CONSIDERATIONS

223. As discussed above (in ¶ 34), I have been informed that secondary considerations are a factor in the determination of obviousness. I am not aware of any relevant information related to secondary considerations of obviousness. To the extent LiTL comes forward with any such information, I will consider it.

VIII. RIGHT TO SUPPLEMENT

224. This declaration represents the opinions on the '688 Patent that I have formed to date. I reserve the right to revise, supplement, and/or amend my opinions stated herein based on new information that becomes available to me and on my continuing analysis of the materials already provided. In connection with any arguments raised by LiTL, opinions by LiTL's expert(s), additional evidence and testimony, and/or judicial determinations, whether in this or a related proceeding, I reserve the right to supplement my opinions in the future to respond thereto.

225. In addition to the exhibits cited herein and/or listed in Appendix B, I reserve the right to prepare and use exhibits that summarize portions of my testimony

or key terms or concepts presented therein, or other demonstrative exhibits, at any hearing or trial in this proceeding.

IX. CONCLUSION

226. A summary of my opinions on the '688 Patent are set forth above in Section II.

I hereby declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct, that all statements made of my own knowledge are true, and that all statements made on information and belief are believed to be true. I understand that willful false statements are punishable by fine or imprisonment or both pursuant to 18 U.S.C. § 1004.

Date: 1/31/2024



Andrew Wolfe, Ph.D.

APPENDIX A: 2024 ANDREW WOLFE CV

Andrew Wolfe Ph.D.

2005 De La Cruz Blvd STE 142
Santa Clara, CA 95050
(408) 394-1096 (mobile)
Email: awolfe@awolfe.org

Education:

Ph.D. in Electrical and Computer Engineering, Carnegie Mellon University, 1992
Visiting Graduate Student, Center for Reliable Computing, Stanford University, 1988-1989
M.S. in Electrical and Computer Engineering, Carnegie Mellon University, 1987
B.S.E.E. in Electrical Engineering and Computer Science, The Johns Hopkins University, 1985

Recent Employment:

Lecturer, [September 2013-present]
Santa Clara University

Teaching graduate and undergraduate courses on embedded computing, mechatronics, real-time systems, computer architecture, design, and community service. Faculty Senate President 2023-24.

Consultant, [October 2002-present]
Wolfe Consulting

Consultant on processor technology, computer systems, consumer electronics, software, design tools, and intellectual property issues. Testifying and consulting expert for IP and other technology-related litigation matters.

Sample clients include:

Google	Apple	Samsung
Sony	Huawei	HTC
AT&T	Verizon Mobile	T-Mobile
IBM	Motorola/Lenovo	Nintendo
Activision	AMD	Western Digital
Sonos	Qualcomm	LG
Netflix	Roku	Tivo
Synaptics	Sawstop	3M
Medigus	TCL	ZTE
Egnyte	Acer	Waymo

Chief Technical Officer, [1999-2002]; Sr. VP of Business Development, [2001-2002]; VP, Systems Integration, S3 Fellow, [1998 – 1999]; Director of Technology, S3 Fellow, [1997 - 1998]
SONIC|blue, Inc., Santa Clara, CA (formerly S3 Inc.)

Strategic Business Development:

Developed and implemented strategy to reposition S3 from PC graphics into the leading networked consumer electronics company.

- Acquired Diamond Multimedia and coordinated integration of communications, Rio digital music, and workstation graphics divisions into S3.
- Identified and negotiated acquisitions to grow digital media businesses including Empeg, ReplayTV, and Sensory Science.
- Identified and negotiated strategic investments including Comsilica, Intellon, KBGear Interactive, Entridia, DataPlay and others.

- Developed strategy for integrated graphics/core-logic products and established a joint venture with Via Technologies to design and market these products.
- Negotiated divestiture of graphics chip business to Via and the workstation graphics division to ATI.

Product Planning and Development:

- Drove roadmap development within SONICblue product divisions.
- Managed Business Development for all product lines.
- Led New Product Development and Corporate Vision processes.
- Acting co-General Manager of Rio digital music business in 2nd half of 2001. Responsible for all areas of product development, business development, and cost management.
- Managed development of the Savage/MX and Savage/IX mobile 3D graphics accelerators and Savage/NB system logic products.

Public Relations, Public Policy and Investor Relations:

- Present company products and strategy at industry events such as CES, Comdex, and Microprocessor Forum.
- Discuss new products and initiatives with the press.
- Promote issues of interest to SONICblue to industry groups and in Washington.
- Brief analysts, and investors on company progress. Participate in quarterly conference calls.

IP Management and Licensing:

- Negotiated and managed partnership agreements including a critical cross-licensing agreement with Intel.
- Renegotiated technology-licensing agreements with IBM for workstation graphics products.
- Evaluated outside technology opportunities, managed video research and development, and managed corporate IP strategy with legal staff including patent filings, cross licensing, and litigation.

Consulting Professor, [1999-2002]

Stanford University, Stanford, CA

Teaching computer architecture and microprocessor design.

Assistant Professor [1991 - 1997]

Princeton University, Princeton, NJ

Teaching and research in the Electrical Engineering department. Research in embedded computing systems, multimedia, video signal processors, compiler optimization, and high performance computer architecture. Principal investigator or project manager for ~\$6M in funded research.

Visiting Assistant Professor, [1992]

Carnegie Mellon University, Pittsburgh, PA

Research and preparation of teaching materials on advanced microprocessor designs including new superscalar and superpipelined processor architectures.

Founder and Vice President and Consultant, [1989 - 1995]

The Graphics Technology Company, Inc., Austin, TX

Founded company to develop touch-sensitive components and systems for the first generation of PDA devices and interactive public systems. Obtained financing from Gunze Corp., Osaka, Japan. Company is now part of 3M.

Senior Electrical Engineer, [1989]

ESL - TRW, Advanced Technology Division, Sunnyvale, CA

Designed the architecture for an Intel i860-based multiple-processor digital signal processing system for advanced military applications. Designed several FPGA interface chips for VME-bus systems.

Design Consultant, [1986 -1987]

Carroll Touch Division, AMP Inc., Round Rock, TX

Developed several new technologies for touch-screen systems. Designed the first ASIC produced for AMP, a mixed-signal interface chip for controlling touch-screen sensors. Developed the system electronics, system firmware, and customer utility software for numerous products including those based on the new ASIC.

Senior Design Engineer, [1983 -1985]

Touch Technology Inc., Annapolis, MD

Advisory Boards:

Director, Turtle Beach Corporation (NASDAQ:HEAR) (formerly Parametric Sound Corporation), KBGear Interactive, Inc., Comsilica, Inc., Rioport.com, various S3 subsidiaries.

Technical Advisory Boards, Ageia, Inc., Intellon, Inc., Comsilica, Inc., Entridia, Inc., Siroyan, Ltd., BOPS, Inc, Quester Venture Funds

Carnegie Mellon University Silicon Valley Advisory Board; Johns Hopkins University Tech Transfer Advisory Board

Awards:

IEEE Fellow - for contributions in hardware code compression of embedded software, power consumption analysis, and optimization, 2022

IEEE Computer Society Distinguished Contributor - 2021

Micro Test-of-Time Award (in recognition of one of the ten most influential papers of the first 25 years of the symposium), 2014

Business 2.0 “20 Young Executives You Need to Know”, 2002

Walter C. Johnson Prize for Teaching Excellence, 1997.

Princeton University Engineering Council Excellence in Teaching Award, Spring 1996

AT&T/Lucent Foundation Research Award, 1996.

Walter C. Johnson Prize for Teaching Excellence, 1995

IEEE Certificate of Appreciation, 1995, 2001.

AT&T Foundation Research Award, 1993.

Semiconductor Research Corporation Fellow, 1986 - 1991.

Burroughs Corporation Fellowship in Engineering, 1985 - 1986.

Professional Activities:

Program Chair: Micro-24, 1991, Hot Chips 13, 2001.

General Chair: Micro-26, 1993, Micro-33, 2000.

Associate Editor: IEEE Computer Architecture Letters; ACM Transactions in Embedded Computing Systems

Speaker at CES, WinHec, Comdex, Intel Dev. Forum, Digital Media Summit, Microprocessor Forum, etc.

Keynote speaker at Micro-34, ICME 2002

IEEE B. Ramakrishna Rau Award committee – 2012-2016

IEEE Computer Society Awards Committee – 2015

CES Awards Judge – 2016

Entrepreneurship Mentor – Draper University

Over 50 refereed publications.**Publications since January 2006:**

Wolfe, A., “Retrospective on Code Compression and a Fresh Approach to Embedded Systems”, IEEE MICRO, July/Aug. 2016, Invited paper.

Patents:

- U.S. Pat. 5,041,701 – *Edge Linearization Device for a Contact Input System*, Aug. 20, 1991.
- U.S. Pat. 5,438,168 – *Touch Panel*, Aug. 1, 1995.
- U.S. Pat. 5,736,688 – *Curvilinear Linearization Device for Touch Systems*, Apr. 7, 1998.
- U.S. Pat. 6,037,930 – *Multimodal touch sensitive peripheral device*, March 14, 2000.
- U.S. Pat. 6,408,421 – *High-speed asynchronous decoder circuit for variable-length coded data*, June 18, 2002.
- U.S. Pat. 6,865,668 – *Variable-length, high-speed, asynchronous decoder circuit*, March 8, 2005
- U.S. Pat. 7,079,133 – *Superscalar 3D Graphics Engine*, July 18, 2006
- EP 1 661 131 B1 – *PORTABLE ENTERTAINMENT APPARATUS*, Jan. 21, 2009
- U.S. Pat. 7,555,006 – *Method and system for adaptive transcoding and transrating in a video network*, June 30, 2009
- U.S. Pat. 7,996,595 – *Interrupt Arbitration for Multiprocessors*, Aug. 9, 2011
- EP 2 241 979 B1 – *Interrupt Arbitration for Multiprocessors*, Oct. 10, 2011
- U.S. Pat. 8,131,970 – *Compiler Based Cache Allocation*, March 6, 2012
- U.S. Pat. 8,180,963 – *Hierarchical read-combining local memories*, May 15, 2012
- U.S. Pat. 8,193,941 – *Snoring Treatment*, June 5, 2012
- U.S. Pat. 8,203,541 – *OLED display and sensor*, June 19, 2012
- U.S. Pat. 8,243,045 – *Touch-sensitive display device and method*, August 14, 2012
- U.S. Pat. 8,244,982 – *Allocating processor cores with cache memory associativity*, August 14, 2012
- U.S. Pat. 8,260,996 – *Interrupt Optimization for Multiprocessors*, Sept. 4, 2012
- 101185761 (KR) – *Noise Cancellation for Phone Conversation*, Sept. 19, 2012
- 101200740 (KR) – *OLED display and sensor*, November 7, 2012
- 101200741 (KR) – *Touch-sensitive display device and method*, November 7, 2012
- U.S. Pat. 8,321,614 – *Dynamic scheduling interrupt controller for multiprocessors*, Nov. 27, 2012
- U.S. Pat. 8,352,679 – *Selectively securing data and/or erasing secure data caches responsive to security compromising conditions*, Jan. 8, 2013
- U.S. Pat. 8,355,541 – *Texture Sensing*, Jan. 15, 2013
- U.S. Pat. 8,370,307 – *Cloud Data Backup Storage Manager*, Feb. 5, 2013
- U.S. Pat. 8,398,451 – *Tactile Input Interaction*, March. 19, 2013
- JP 5241032 B2 – *Routing Across Multicore Network Using Real World or Modeled Data*, April 13, 2013
- ZL201010124820.3 – *Interrupt Optimization for Multiprocessors*, April 17, 2013
- U.S. Pat. 8,428,438 – *Apparatus for Viewing Television with Pause Capability*, April 23, 2013
- JP 5266197 B2 – *Data Centers Task Mapping*, May 10, 2013
- U.S. Pat. 8,508,498 – *Direction and Force Sensing Input Device*, August 13, 2013
- U.S. Pat. 8,547,457 – *Camera Flash Mitigation*, October 1, 2013
- U.S. Pat. 8,549,339 – *Processor core communication in multi-core processor*, October 1, 2013
- 101319048 (KR) – *Camera Flash Mitigation*, October 10, 2013
- U.S. Pat. 8,628,478 – *Microphone for remote health sensing*, January 14, 2014
- 101362017 (KR) – *Thread Shift: Allocating Threads to Cores*, Feb. 5, 2014
- 101361928 (KR) – *Cache Prefill on Thread Migration*, Feb. 5, 2014
- 101361945 (KR) – *Mapping Of Computer Threads onto Heterogeneous Resources*, Feb. 5, 2014
- JP 5487307 B2 – *Mapping Of Computer Threads onto Heterogeneous Resources*, Feb. 28, 2014
- JP 5484580 B2 – *Task Scheduling Based on Financial Impact*, Feb. 28, 2014
- JP 5487306 B2 – *Cache Prefill on Thread Migration*, Feb. 28, 2014
- 101372623 (KR) – *Power Management for Processor*, March. 4, 2014
- 101373925 (KR) – *Allocating Processor Cores with Cache Memory Associativity*, March 6, 2014
- U.S. Pat. 8,676,668 – *Method for the determination of a time, location, and quantity of goods to be made available based on mapped population activity*, March 18, 2014
- U.S. Pat. 8,687,533 – *Energy Reservation in Power Limited Networks*, April 1, 2014
- 101388735 (KR) – *Routing Across Multicore Networks Using Real World or Modeled Data*, April 17, 2014
- U.S. Pat. 8,725,697 – *Cloud Data Backup Storage*, May 13, 2014
- U.S. Pat. 8,726,043 – *Securing Backing Storage Data Passed Through a Network*, May 13, 2014
- ZL201010124826.0 – *Dynamic scheduling interrupt controller for multiprocessors*, May 14, 2014
- JP 5547820 B2 – *Processor core communication in multi-core processor*, May 23, 2014
- U.S. Pat. 8,738,949 – *Power Management for Processor*, May 27, 2014

U.S. Pat. 8,751,854 – *Processor Core Clock Rate Selection*, June 10, 2014
 JP 5559891 B2 – *Thermal Management in Multi-Core Processor*, June 13, 2014
 101414033 (KR) – *Dynamic Computation Allocation*, June 25, 2014
 JP 5571184 B2 – *Dynamic Computation Allocation*, July 4, 2014
 101426341 (KR) – *Processor core communication in multi-core processor*, May 23, 2014
 U.S. Pat. 8,799,671 – *Techniques for Detecting Encrypted Data*, Aug 5, 2014
 101433485 (KR) – *Task Scheduling Based on Financial Impact*, Aug. 18, 2014
 U.S. Pat. 8,824,666 – *Noise Cancellation for Phone Conversation*, Sept. 2, 2014
 U.S. Pat. 8,836,516 – *Snoring Treatment*, Sept. 16, 2014
 U.S. Pat. 8,838,370 – *Traffic flow model to provide traffic flow information*, Sept. 16, 2014
 U.S. Pat. 8,838,797 – *Dynamic Computation Allocation*, Sept. 16, 2014
 U.S. Pat. 8,854,379 – *Routing Across Multicore Networks Using Real World or Modeled Data*, Oct. 7, 2014
 JP 5615361 B2 – *Thread Shift: Allocating Threads to Cores*, Oct. 15, 2014
 U.S. Pat. 8,866,621 – *Sudden infant death prevention clothing*, Oct. 21, 2014
 U.S. Pat. 8,881,157 – *Allocating threads to cores based on threads falling behind threads*, Nov. 4, 2014
 ZL201080024755.5 – *Camera Flash Mitigation*, Nov 5, 2014
 U.S. Pat. 8,882,677 – *Microphone for remote health sensing*, Nov. 11, 2014
 U.S. Pat. 8,924,743 – *Securing Data Cache through Encryption*, December 30, 2014
 U.S. Pat. 8,994,857 – *Camera Flash Mitigation*, March 31, 2015
 JP 5699140 B2 – *Camera Flash Mitigation*, April 8, 2015
 ZL201080035189.8 – *Thread Shift: Allocating Threads to Cores*, June 10, 2015
 ZL201180005030.6 – *Processor core communication in multi-core processor*, June 10, 2015
 U.S. Pat. 9,143,814 – *Method and system for adaptive transcoding and transrating in a video network*, Sept 22, 2015
 ZL201080035177.5 – *Mapping Of Computer Threads onto Heterogeneous Resources*, Oct. 14, 2015
 U.S. Pat. 9,178,694 – *Securing Backing Storage Data Passed Through a Network*, November 3, 2015
 U.S. Pat. 9,189,282 – *Thread-to-core mapping based on thread deadline, thread demand, and hardware characteristics data collected by a performance counter*, November 17, 2015
 U.S. Pat. 9,189,448 – *Routing image data across on-chip networks*, November 17, 2015
 U.S. Pat. 9,208,093 – *Allocation of memory space to individual processor cores*, December 8, 2015
 U.S. Pat. 9,239,994 – *Data Centers Task Mapping*, January 19, 2016
 ZL201080036611.1 – *Allocating Processor Cores with Cache Memory Associativity*, January 20, 2016
 EP2228779 B1 – *Traffic flow model to provide traffic flow information*, Jan. 27, 2016
 U.S. Pat. 9,262,628 – *Operating System Sandbox*, February 16, 2016
 GB2485682 – *Mapping Of Computer Threads onto Heterogeneous Resources*, Sept. 28, 2016
 U.S. Pat. 9,330,137 – *Cloud Data Backup Storage Manager*, May. 3, 2016
 ZL201080035185.X – *Cache Prefill on Thread Migration*, Aug. 24, 2016
 U.S. Pat. 9,519,305 – *Processor Core Clock Rate Selection*, December 13, 2016
 U.S. Pat. 9,569,270 – *Mapping thread phases onto heterogeneous cores based on execution characteristics and cache line eviction count*, February 14, 2017
 GB2485683 – *Thread Shift: Allocating Threads to Cores*, Oct. 18, 2017
 U.S. Pat. 9,852,435 – *Telemetrics based location and tracking*, December 26, 2017.
 U.S. Pat. 9,915,994 – *Power management for processor*, March 13, 2018
 U.S. Pat. 9,927,254 – *Traffic flow model to provide traffic flow information*, March 27, 2018
 EP2254048 B1 – *Thread Mapping in Multi-Core Processors*, August 29, 2018
 U.S. Pat. 10,860,432 – *Cloud Data Backup Storage Manager*, December 8, 2020

Expert testimony by deposition or at trial – April 15, 2018 - -present

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Joe Andrew Salazar v HTC Corporation	E.D. Texas	2:16-cv-010986-JRG-RSP
Hitachi Maxell, Ltd. v. ZTE Corporation and ZTE (USA), Inc.	E.D. Texas	5:16-cv-00179 5:16-cv-00178
INTER PARTES REVIEW OF U.S. PATENT NO. 7,663,506 (Mediatek v AMD)	PTAB	IPR2017-00101 IPR2017-00102
Papst Licensing GmbH & Co. KG v. Samsung Electronics Co.,Ltd. and Samsung Electronics America, Inc.	E.D. Texas	6:15-CV-1102
HTC Corporation v. Telefonaktiebolaget LM Ericsson	E.D. Texas	6: 18-cv-00243-JRG
Seven Networks, LLC v ZTE (USA) Inc and ZTE Corporation	N. D. Texas - Dallas	3:17-CV-1495
AGIS Software Development, LLC v. HTC Corporation	E. D. Texas	2:17-cv-514
Barbaro Technologies, LLC v. Niantic, Inc	N.D. CA	3:18-cv-02955-RS
Immersion Corp. v. Samsung Electronics America, Inc. et al	E.D. Texas	2:17-cv-00572
INTER PARTES REVIEW OF U.S. PATENT NO. 7,171,526 (Northstar Innovations – Micron)	PTAB	IPR2018-01004 IPR2018-01005
CISCO SYSTEMS, INC., vs. UNILOC USA, INC., UNILOC 2017 LLC and UNILOC LICENSING USA LLC	N.D. CA	3:18-cv-04991-SI
INTER PARTES REVIEW OF U.S. PATENT NO. 8,020,014 (Intel/VLSI)	PTAB	IPR2018-01661 IPR2018-01312
INTER PARTES REVIEW OF U.S. PATENT NO Patent 9,294,799 (Comcast/Rovi)	PTAB	IPR2019-00299
Inter Partes Review of U.S. Patent No 7720929 (Unified Patents v Datascope)	PTAB	IPR2019-01115
Solas OLED Ltd., v. Samsung Display Co., Ltd., Samsung Electronics Co, Ltd., and Samsung Electronics America, Inc.,	PTAB	IPR2019-01668
INTER PARTES REVIEW OF U.S. PATENT NO Patent 8,973,069 (Comcast/Rovi)	PTAB	IPR2019-01434
U.S. Patent No. 8,448,215 IPR (Comcast v Rovi)	PTAB	IPR2019-01353
U.S. PATENT NO. 8,847,898 IPR filing (Samsung v Neodron)	PTAB	IPR2020-00234
U.S. PATENT NO. 8,610,009 IPR filing (Samsung v Neodron)	PTAB	IPR2020-00225
U.S. PATENT NO. 10,365,747 IPR filing (Samsung v Neodron)	PTAB	IPR2020-00308

AGIS Software Development LLC v. Google LLC, AGIS Software Development LLC v. WAZE Mobile Limited, and AGIS Software Development LLC v. Samsung Elecs. Co., Ltd. et al	E.D. Texas	2:19-cv-00361-JRG 2:19-cv-00359-JRG 2:19-cv-00362-JRG
Inter Partes Review of U.S. Patent No 8,112,670 (Sony)	PTAB	IPR2020-00726
U.S. Patent 8,819,505 IPR (Intel v PACT)	PTAB	IPR2020-00525
Inter Partes Review of U.S. Patent No 8,078,540 (Sony)	PTAB	IPR2020-00922
Inter Partes Review of U.S. Patent No 9,037,807 (Intel v PACT)	PTAB	IPR2020-00540
HONG KONG UCLOUDLINK NETWORK TECHNOLOGY LIMITED AND UCLOUDLINK (AMERICA), LTD., vs. SIMO HOLDINGS INC. AND SKYROAM, INC.,	N.D. CA	3:18-cv-05031-EMC
Joe Andrew Salazar v AT&T Mobility, LLC et al.	E.D. Texas	2:20-cv-00004-JRG
Innovative Memory Solutions Inc. v Micron, Inc	Delaware	14-1480 RGA
Inter Partes Review of U.S. Patent No. 6,411,941	PTAB	IPR2021-01338 IPR2021-01406
Maxell, Ltd. et al v. VIZIO, Inc	C.D. CA	2-21-cv-06758
Inter Partes Review of U.S. Patent No. 7,619,912	PTAB	IPR2022-00615
Inter Partes Review of U.S. Patent Nos. 11,016,918 and 11,232,054	PTAB	IPR2022-00996 IPR2022-00999
In the Matter of Certain Smart Televisions, - Maxell, Ltd. et al v. VIZIO, Inc	ITC	337-TA-1338
INTER PARTES REVIEW OF U.S. PATENT NOS. 8,787,060 and 9,318,160	PTAB	IPR2022-01427 IPR2022-01428
Sweat Equity Partners, LLC vs. Swoop Search, LLC, et al.,	San Francisco Superior Court	CGC-21-591702
Walter Kidde Portable Equipment, Inc. v. First Alert, Inc. and BRK Brands	W.D. Texas	6:22-cv-566-ADA
INTER PARTES REVIEW OF U.S. PATENT NO. 11,093,417	PTAB	IPR2023-00454
INTER PARTES REVIEW OF U.S. PATENT NO. 9,858,215	PTAB	IPR2023-00455

APPENDIX B: MATERIALS CONSIDERED

MATERIALS CONSIDERED

Exhibit No.	Title	Abbreviation
1001	U.S. Patent No. 8,289,688	The '688 Patent
1002	File History of U.S. Patent Appl. No. 12/170,939 (which issued as the '688 Patent)	The '688 File History
1003	U.S. Patent Appl. Pub. No. 2009/0244832 A1 (which issued as the '688 Patent)	
1005	U.S. Patent No. 6,771,494	Shimano
1006	U.S. Patent Appl. Pub. No. 2006/0264243 A1	Aarras
1007	U.S. Patent No. 7,061,472	Schweizer
1008	U.S. Patent No. 6,343,006	Moscovitch
1009	<i>Ex Parte</i> Reexamination No. 90/015,035: 7/5/2022 Order Granting Reexamination	
1010	<i>Ex Parte</i> Reexamination No. 90/015,035: 12/28/2022 Non-Final Office Action	
1011	<i>Ex Parte</i> Reexamination No. 90/015,035: 5/18/2023 Final Office Action	
1012	<i>Ex Parte</i> Reexamination No. 90/015,035: 8/21/2023 Advisory Action	
1013	<i>Ex Parte</i> Reexamination No. 90/015,035: 11/14/2023 LiTL Appeal Brief	LiTL Appeal Brief
1014	U.S. Patent No. 6,154,359	Kamikakai
1015	U.S. Patent No. 6,918,159	Choi

1016	U.S. Patent Appl. Pub. No. 2005/0134717 A1	Misawa
1017	PCT Patent Pub. No. WO 95/24007	Lane
1018	U.S. Patent Appl. Pub. No. 2006/0034042 A1	Hisano
1019	U.S. Patent No. 7,791,594	Dunko
1020	U.S. Patent No. 7,978,176	Forstall
1021	U.S. Patent Appl. Pub. No. 2004/0212602 A1	Nako