

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VALVE CORPORATION,
Petitioner,

v.

IMMERSION CORPORATION,
Patent Owner.

Case No. IPR2024-00478
Patent No. 9,430,042

REPLY DECLARATION OF JEAN RENARD WARD

Valve Exhibit 1090 Valve v. Immersion IPR2024-00478

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I. Introduction

1. My name is Jean Renard Ward. I have been retained by Wolf, Greenfield & Sacks, P.C., counsel for Petitioner Valve Corp. to assess Claims 1-7 (“the challenged claims”) of U.S. Patent No. 9,430,042 (“the ’042 Patent”) (EX1001). I am being compensated for my time at the rate of \$500 per hour, plus actual expenses. This is consistent with the rate I generally charge for this sort of work. My compensation is not dependent in any way upon the outcome of the *inter partes* review of the ’042 Patent, nor on the outcome of any related litigation.

2. I expect to make myself available for deposition in this matter. This Declaration is based on information currently available to me. I reserve the right to continue my investigation and study, which may include a review of documents and information that may be produced, as well as a review of deposition testimony from depositions for which transcripts are not yet available or that may yet have taken place in this matter. Therefore, I expressly reserve the right to expand or modify my opinions as my investigation and study continue, and to supplement my opinions in response to any additional information that becomes available to me, any matters raised by Immersion or the Patent Office, and/or other opinions provided by Immersion’s experts, or in light of any relevant orders by an appropriate authoritative body.

II. Materials Reviewed and Considered

3. My findings, as explained below, are based on my years of education, research, experience, and background in the fields of software engineering, haptics programming, human-computer interaction and/or pen and touch computing, as well as my investigation and study of relevant materials for this declaration. When developing the opinions set forth in this declaration, unless noted otherwise, I have assumed the point of view of a person having ordinary skill in the art (“POSITA”), as set forth in Section V of my original declaration (EX1003, “Ward-Opening”).

4. In forming my opinions, I have studied and considered the materials identified in the list below.

Exhibit	Description
1001	U.S. Patent No. 9,430,042 (“the ’042 patent”)
1002	Prosecution History of U.S. Patent No. 9,430,042
1003	Declaration of Jean Renard Ward (“Ward-Opening Decl.”)
1004	CV of Jean Renard Ward
1005	U.S. Provisional Application No. 60/877,333
1006	European Patent No. 2126667
1007	U.S. Patent No. 6,636,197 (“Goldenberg”)
1008	U.S. Patent Application Publication No. US 2006/0038781
1009	U.S. Patent No. 6,429,846 (“Rosenberg-I”)
1010	U.S. Patent No. 5,734,373
1011	U.S. Patent No. 6,243,078
1012	U.S. Patent Application Publication No. US 2006/0119573
1013	U.S. Patent No. 5,977,867
1014	U.S. Patent No. 6,128,006
1015	U.S. Patent No. 6,819,990 (“Ichinose”)
1016	U.S. Patent No. 6,686,911 (“Levin”)
1017	U.S. Patent No. 6,917,867
1018	U.S. Patent Application Publication No. US 2007/0222765

Exhibit	Description
1019	Plaintiff's Preliminary Infringement Contentions, <i>Immersion Corp. v. Valve Corp.</i> , 2:23-cv-00712 (W.D. Wash.) (served Oct. 20, 2023)
1020	Amended Joint Status Report and Discovery Plan, <i>Immersion Corp. v. Valve Corp.</i> , 2:23-cv-00712, Dkt No. 45 (W.D. Wash.) (filed Nov. 2, 2023)
1021	Exhibit C to Plaintiff's Preliminary Infringement Contentions, <i>Immersion Corp. v. Valve Corp.</i> , 2:23-cv-00712 (W.D. Wash.) (served Oct. 20, 2023)
1022	International Application Publication Number WO 02/102616 ("Wang")
1023	U.S. Patent Application Publication No. US 2006/0047386
1024	U.S. Patent Application Publication No. US 2007/0120830
1025	U.S. Patent No. 6,157,372
1026	U.S. Patent No. 6,418,362
1027	International Application Publication Number WO 97/25821
1028	International Application Publication Number WO 00/65553
1029	Negroponte, "HUNCH An Experiment in Sketch Recognition" in UCLA, Environmental Design: Research and Practice, Proceedings of the EDRA 3/ar 8 Conference (1972)
1030	Foley, "Fundamentals of Interactive Computer Graphics" (1982) (excerpts)
1031	Buxton, "There's More to Interaction than Meets the Eye" in Norman, ed., User Centered Systems Design (1986)
1032	Rosch, "Alternative Input--Digitizing Tablets-Pointing the Way to Easier Input," PC Magazine p. 227 (Nov. 28, 1989)
1033	U.S. Patent No. 5,491,495
1034	Buxton, "Issues and Techniques in Touch-Sensitive Tablet Input," SIGGRAPH '85, 19:3, 215 (1985)
1035	U.S. Patent No. 4,202,041
1036	Evans, "Tablet-Based Valuator That Provide One, Two, or Three Degrees of Freedom," Computer Graphics, 15:3 (Aug. 1981)
1037	U.S. Patent No. 5,903,229
1038	U.S. Patent Appl. 2006/0291666A1
1039	WO2006020305
1040	U.S. Patent Appl. 2007/0222765A1
1041	U.S. Patent No. 494,562

Exhibit	Description
1042	Davis, “The RAND Tablet: A Man-Machine Graphical Communication Device” in Proceedings-Fall Joint Computer Conference (1964)
1043	U.S. Patent No. 3,482,241
1044	U.S. Patent No. 5,708,460
1045	U.S. Patent No. 6,492,979
1046	U.S. Patent No. 5,510,813
1047	Buxton, “Touch Gesture and Marking,” ch. 7 in Baecker, ed., Readings in Human-Computer Interaction (1995)
1048	U.S. Patent No. 6,160,489
1049	Strong, “An Electrotactile Display,” IEEE, Trans. On Man-Machine Sys., mms-11:1 (Mar. 1970)
1050	Massie, “Initial Haptic Explorations with the Phantom: Virtual Touch Through Point Interaction” MIT Thesis (1996)
1051	Bliss, “Optical-to-Tactile Image Conversion for the Blind,” IEEE, Trans. On Man-Machine Sys., mms-11:1 (Mar. 1970)
1052	European Patent Publication No. EP0265011A1
1053	U.S. Patent No. 5,388,992
1054	IBM, “Mouse Ball-Actuating Device with Force and Tactile Feedback,” IBM Technical Disclosure Bulletin 32:9B (Feb. 1990)
1055	Fukumoto, “Active Click Tactile Feedback for Touch Panels,” CHI 2001 Interactive Posters (2001)
1056	WO9200559A1
1057	U.S. Patent Appl. No. 2006/0241864A1
1058	U.S. Patent No. 5,782,639
1059	U.S. Patent Appl. No. 2006/0049010
1060	WO2004042693
1061	U.S. Patent Appl. No. 2003/0030619
1062	U.S. Patent No. 6,424,333
1063	EP0799597A1
1064	U.S. Patent No. 5,719,561
1065	U.S. Patent No. 5,973,441
1066	Minsky, “Computational Haptics” MIT Thesis (1995)
1067	U.S. Patent No. 5,451,924

Exhibit	Description
1068	Patrick, “Design Construction and Testing of a Fingertip Tactile Display for Interaction with Virtual and Remote Environments,” MIT Thesis (1990)
1069	Massie, “The Phantom Haptic Interface—A Device for Probing Virtual Objects” in ASME, Dynamic Systems and Control (1994)
1070	U.S. Patent No. 5,982,352
1071	U.S. Patent No. 6,131,097
1072	U.S. Patent No. 6,337,678
1073	U.S. Patent No. 6,219,034
1074	U.S. Patent No. 6,219,032
1075	U.S. Patent No. 4,885,565
1076	U.S. Patent No. 6,031,518
1077	U.S. Patent No. 7,084,859
1078	U.S. Patent No. 6,848,263
1079	U.S. Patent No. 6,275,231
1080	West, “Developing High Quality Data Models,” EPISTLE (1996)
1081	U.S. Patent Appl. No. 2003/0122779
1082	Leonard, “Windows XP Hacks and Mods For Dummies” (2005)
2007	Declaration of Robert Akl Ph. D (“Akl Decl.”)
Paper No. 14	Patent Owner’s Response to Petition (“POR”)
Paper No. 11	Decision Granting Institution of <i>Inter Partes</i> Review
1086	Prosecution History for European Patent 2,126,667
1089	Transcript of December 18, 2024 Deposition of Dr. Robert Akl
1091	WO 01/24158A1
1092	U.S. Patent No. 6,906,697
1093	The New Oxford American Dictionary (2001)
1094	U.S. Patent Appl. Publ. No. 2006/0192760A1

III. My Understanding of the Relevant Law

5. I am not an attorney. My knowledge of the law is that of a lay person. As I am not a legal expert, I offer no opinions on the law. Unless noted otherwise, wherever I may use a term which has some special meaning in a legal context, I

imply no such special legal meaning should be assigned to use of that term. Further, as I have no special expertise in the law, I am likely unaware whether a term even might or might not have some special legal meaning, nor what any such meaning might be.

6. In developing my opinions, Petitioner's attorneys ("Counsel" for short) discussed various relevant legal principles with me. When I have thought that my understanding could be based inadvertently in some part on my experience elsewhere, I have sought to confirm or correct that understanding with Counsel. I understood these principles when they were explained to me and have relied upon such legal principles, as explained to me, in the course of forming the opinions set forth in this declaration. I summarized my understanding of the law in my opening declaration and provide an additional summary below.

A. The Doctrine of Analogous Prior Art

7. I have been informed that for a prior-art reference to be considered as part of an obviousness challenge to a patent claim, the reference must be analogous to the challenged patent.

8. I have been informed that there are two separate ways by which a prior-art reference can be considered to be analogous to a challenged patent: (1) the reference is considered analogous if the reference is in the same field of endeavor as the challenged patent, or (2) the reference is considered analogous if the reference's

teachings are reasonably pertinent to at least one of the problems being solved by the challenged patent.

9. I have been informed that determining the field of endeavor requires considering explanations of the invention's subject matter in the patent specification, including the embodiments, function, and structure of the claimed invention. I have also been informed that the field of endeavor is not limited to the specific point of novelty, the narrowest possible conception of the field, or the particular focus within a given field. I have also been informed that, unlike the reasonable-pertinence test, the field-of-endeavor test does not look to the problems that the patent purports to address.

10. I have been informed further that in determining whether a prior-art reference is reasonably pertinent to a problem addressed by the challenged patent, one should consider a problem faced by the inventor, as reflected either explicitly or implicitly, in the specification.

11. I have been informed further that the scope of analogous art should be interpreted broadly because POSITAs understand that familiar items may have obvious uses beyond their primary purposes, and POSITAs often will be able to fit the teaching of multiple references together like pieces of a puzzle.

B. Claim Construction Principles

12. I understand that claims term should be given the plain and ordinary meaning that a POSITA would have given the terms at the time of the invention. I further understand that the plain and ordinary meaning of a claim term is determined by reference to the claim language itself, the specification, and the prosecution history of the patent.

13. I understand, however, that claim terms are generally not limited by the embodiments described in the specification. In other words, it is generally not appropriate to limit the claims to specific embodiments described in the specification unless the patentee expresses a clear intent to do so. On that latter point, I understand that the scope of claim terms may be limited by statements in the specification or prosecution history where the applicant unambiguously disavows or disclaims subject matter. I have applied this understanding in this declaration.

IV. My Response to Immersion's Non-Analogous Prior-Art Argument

14. I have reviewed Immersion's Patent Owner Response ("POR") and the Declaration of Robert Akl (EX2007, "Akl Decl."). Based on that review, it is my understanding that Immersion and Dr. Akl argue that the prior-art Levin, Wang, and Goldenberg references are not analogous to the '042 patent. I disagree with Immersion and Dr. Akl.

15. Immersion and Dr. Akl contend that the field of endeavor for the '042 patent is providing virtual detents through vibrotactile feedback. POR at 19-20; Akl Decl. at ¶¶87-89. In my opinion, that description too narrowly defines the field of endeavor, inconsistent with my understanding of the legal principles explained above.

16. Although the '042 patent relates to providing virtual detents through vibrotactile feedback, a POSITA reading the '042 patent would in no way consider it limited to that very narrow field of endeavor. Instead, a POSITA would consider the '042 patent to be within the broader field of providing haptic feedback to an input device. On this point, I call attention to my opening declaration provided a detailed “Overview of Haptics.” Ward-Opening at ¶¶67-74.

17. Although the challenged claims are limited to virtual detents and vibrotactile feedback, the specification has broader teachings. For example, the Detailed Description of the '042 patent is explicit that the '042 patent sets forth “Illustrative Devices for Enhanced Haptic Feedback.” EX1001 at 2:57. The '042 patent likewise says in several passages that the feedback provided to an input device can be “vibrotactile or other haptic effects.” EX1001 at 5:13-16; *see also* EX1001 at 6:40-45.

18. The word “haptic” or the phrase “haptic feedback” is also found in several prior-art references cited in the '042 patent’s list of “References Cited.” For

example, page 3 of the '042 patent lists the following prior-art publications: “**Haptic** Interfaces for Virtual Environment and Teleoperator Systems,” “Designing with **Haptic Feedback**,” “Computational **Haptics**,” “Synergistic Visual/**Haptic** Computer Interfaces,” “Combining **Haptic** and Braille Technologies,” “The **Haptic** Display of Complex Graphical Environments,” and “Advances in Robotics, Mechatronics, and **Haptic** Interfaces.”

19. Additionally, the titles of several prior-art patents or patent applications identified in the '042 patent's list of “References Cited” also include “haptic” in their titles: U.S. Patent No. 5,625,576 (“Force reflecting **haptic** interface.”), U.S. Patent No. 5,816,823 (“Input device and method for interacting with motion pictures incorporating content-based **haptic** feedback.”); U.S. Patent No. 5,844,392 (“**Haptic** browsing.”), U.S. Patent No. 6,131,097 (“**Haptic** authoring”), WO2001/091100 (“**Haptic** device using electroactive polymers”), U.S. Patent No. WO2002/073587 (“**Haptic** interface for laptop computers and other portable devices.”), U.S. Patent Appl. Publ. 2003/0030619 (“**Haptic** feedback for directional control pads.”), U.S. Patent No. 6,650,338 (“**Haptic** interaction with video and image data.”), U.S. Patent Appl. Publ. No. 2006/0038781 (“Systems and methods for providing **haptic** effects.”).

20. The presence of such haptics-related prior-art references in the '042 patent's list of references cited—**references Immersion itself cited as relevant**—

is consistent with my opinion that a POSITA would consider the '042 patent's field of endeavor to be providing haptic feedback to an input device.

21. Although the '042 patent's "Field of the Invention" says it relates to a particular form of haptic feedback, *i.e.*, "vibrotactile feedback" (EX1001,1:14-15), the provisional application more broadly (and more accurately) describes the "Field of the Invention" as "input devices that provide haptic feedback." EX1005, [001].

22. I also note that both Dr. Akl and I agree that the hypothetical POSITA in the **relevant art** would be an engineer familiar with "haptics programming" (Ward-Opening at ¶40) or "providing haptic feedback effects to a user" (Akl Decl. at ¶30). In other words, we both recognize that the "art" to which the '042 patent is directed is haptics, generally.

23. Indeed, Dr. Akl actually defines the **relevant "field"** even more broadly as "human-computer interaction." Akl Decl. at ¶30. The "field" of human-computer interaction is quite broad and certainly includes providing haptic feedback to an input device. In my opinion, Dr. Akl's own definition of a POSITA thus reinforces that the '042 patent is related to a field of endeavor broader than providing virtual detents through vibrotactile feedback.

24. Once the field of endeavor for the '042 patent is properly characterized as providing haptic feedback to an input device, it is readily apparent that the prior-art Levin, Wang, and Goldenberg references are within that same field of endeavor.

Indeed, although Immersion and Dr. Akl both (wrongly) limit the teachings of Levin, Wang, and Goldenberg to providing resistive/assistive force-feedback to an input device, Dr. Akl nonetheless agreed at his deposition that force-feedback is a form of haptic feedback. EX1089 at 12:3-9. That is, Dr. Akl agrees that the prior-art Levin, Wang, and Goldenberg references all at least relate to providing haptic feedback to an input device. It follows therefore that if the Board were to define the field of endeavor as providing haptic feedback to an input device, then Levin, Wang, and Goldenberg are all in that same field.

25. Moreover, the seemingly agreed-upon fact that Levin, Wang, and Goldenberg are all in the field of providing haptic feedback to an input device further indicates that the '042 patent is related to that same field because at least Levin and Goldenberg were identified by patent examiners as relevant to the claims of the '042 patent.

26. Starting with Levin, during prosecution of the '042 patent, Immersion submitted an Information Disclosure Statement to the Patent Office that identified Levin. EX1002 at 406. I understand from counsel that an Information Disclosure Statement ("IDS") is a document filed with the Patent Office by a patent applicant and its purpose is to disclose any known prior art that may be relevant to the patentability of the applicant's invention. Immersion (or at least its patent counsel)

thus seemingly thought Levin was relevant to the claims of the '042 patent despite Immersion's current contention that Levin is not analogous prior art.

27. Moreover, the patent examiner agreed with Immersion that Levin was relevant because the examiner, after considering Immersion's IDS, explicitly said that Levin was "pertinent to applicant's disclosure." EX1002 at 513. I note that Immersion never objected to the examiner's characterization of Levin or argued that the reference was not analogous.

28. The fact that Levin—a reference related to the field of providing haptic feedback to an input device—was cited by Immersion during prosecution and was identified by the examiner as "pertinent" to the '042 patent underscores that Levin and the '042 share a common field of endeavor: providing haptic feedback to an input device.

29. Turning to Goldenberg, although it was not cited during prosecution of the '042 patent, it was a relevant reference during prosecution of the European counterpart to the '042 patent. During European prosecution, Goldenberg was identified by the European Patent Office (EX1086 at 125), and then was used as a basis for rejecting the then-pending claims (EX1086 at 127-128).¹ The applicant

¹ Levin was also cited by the European Patent Office as "particularly relevant" prior art. EX1086 at 124-127 (identifying Levin as "D5"), 161-163 (same).

subsequently described Goldenberg as “providing haptic effects to actual, physical rotary knobs.” EX1086 at 118.

30. Although the applicant argued it would not have been obvious to apply Goldenberg’s haptic effects to a touchpad, the applicant did not argue that Goldenberg was non-analogous or otherwise irrelevant to the alleged invention. In point of fact, Immersion subsequently amended the specification of its European counterpart to explicitly identify Goldenberg as relevant prior art. EX1006, [0005].

31. The fact that Goldenberg—a reference related to the field of providing haptic feedback to an input device—was identified by the European Patent Office as particularly relevant to the European counterpart of the ’042 patent underscores that Goldenberg and the ’042 patent share a common field of endeavor: providing haptic feedback to an input device. That Immersion never disputed Goldenberg’s relevance further underscores this same point. That Immersion subsequently also cited it in the patent specification, even more so.

32. Wang was not cited during European or U.S. prosecution of the ’042 patent, but its teachings plainly relate to providing haptic feedback to an input device. Indeed, the title of Wang is “HAPTIC RECONFIGURABLE DASHBOARD SYSTEM” (EX1022), and Wang’s system includes a “haptic device” and a “haptic feedback mechanism for providing a force effect to the haptic device” so a “user can feel a sense of touching or force through the haptic device

while controlling or monitoring the vehicle subsystems” (EX1022 at Abstract). Wang is thus in the same field of endeavor as Levin and Goldenberg, and all three references are in the same field of endeavor as the ’042 patent.

33. Immersion and Dr. Akl try to distinguish the teachings of Levin, Goldenberg, and Wang from the ’042 patent, but I disagree with the distinctions Immersion and Dr. Akl identified.

34. **Levin**. Immersion and Dr. Akl contend that Levin is “concerned with providing mechanical detents for physical input controls such as knobs and sliders.” POR at 22; Akl Decl. at ¶92. I agree that Levin teaches techniques for providing a detent-type sensation or feel onto a physical input control such as a knob or a slider. However, Immersion’s and Dr. Akl’s reference to “mechanical detent” is unclear, as it appears they are suggesting that Levin uses traditional mechanical components to create its detents. That is not correct. In point of fact, Levin repeatedly and explicitly ***distinguishes*** its teachings from such mechanical detents by teaching to ***simulate*** sensations of a detent, as I point out below.

35. Like the ’042 patent, Levin discloses techniques for outputting “feel sensations” onto a knob, including “detents.” EX1016 at 1:43-45. Levin does not use traditional mechanical components (*e.g.*, metal springs, latches, and pins) to provide a detent-like sensation, it uses an actuator coupled to a knob (or slider) to **simulate** that sensation. EX1016 at Abstract, 9:60-10:56. Levin is not thus

concerned with “providing mechanical detents” (to use Immersion’s incorrect wording) using mechanical components as Immersion argues (POR at 22), it is concerned with **simulating** such mechanical detents using an actuator—just like the ’042 patent. *See, e.g.*, EX1016 at 1:43-45 (“a variety of **programmable feel sensations** can be output on the knob, such as detents, spring forces, or the like”), 2:3-5 (“**An actuator is coupled to the knob to output a force** in the rotary degree of freedom about the axis, **thus providing force feedback.**”), 10:57-60 (“Another type of force sensation that can be output on knob 18 is a spring force. The spring force can provide resistance to rotational movement of the knob in either direction to **simulate a physical spring on the knob.**”), 11:54-56 (“Other force sensations that can be output on knob 18 include forces that **simulate ends of travel** for the knob 18 or inform the user that the end of travel has been reached.”), claim 33 (“simulated spring”).

36. Immersion and Dr. Akl also contend that Levin is limited to providing “force feedback” in a rotary degree of freedom, *i.e.*, an assistive or resistive force effect that assists rotation of a knob or resists rotation of a knob POR at 22; Akl Decl. at ¶92. They then contend that such feedback is not a vibrotactile effect. POR at 22; Akl Decl. at ¶92. In my opinion, Immersion and Dr. Akl read Levin more narrowly than a POSITA would read the reference.

37. Levin uses the term “force feedback” broadly to cover “physical sensations” provided to “the user manipulating [a] knob.” EX1016 at 1:37-38. Levin explains that “force feedback...can include a variety of different force sensations,” including “simple jolts.” EX1016 at 10:11-21; *see also* EX1016 at 14:26-29 (“Other **force effects include** damping forces, texture forces, **jolts**, obstruction forces, assistive forces, periodic forces **such as vibration forces**, and end-of-travel forces.”); 23:29-32 (“The force process can command distinct force sensations, **such as vibrations**, textures, **jolts**...”). Levin is thus explicit that its force feedback can come in many different forms including “vibrations” and “jolts,” which are both vibrotactile effects. (I explain in more detail why a “jolt” is a vibrotactile effect below at paragraphs 78-85.) A POSITA, reading Levin, would in no way consider Levin’s teachings to be limited to assistive and resistive force feedback.

38. **Wang**. Similarly to their treatment of Levin, Immersion and Dr. Akl wrongly attempt to interpret Wang’s teachings as limited to assistive and resistive force feedback. POR at 22-23; Akl Decl. at ¶93. Wang is broadly directed to a “haptic device” that allows a user to “feel a sense of **touching or force** through the haptic device while controlling or monitoring the vehicle subsystems.” EX1022 at Abstract; *see also* claim 1. Wang never says the “touching or force” that a user feels

through the haptic device is limited to assistive or resistive force feedback, and haptic feedback plainly includes vibrotactile feedback also.

39. The only support Immersion and Dr. Akl attempt to provide to justify limiting Wang to assistive or resistive force feedback is 5:18-22 and Figures 2-4. Starting with column 5, lines 18 to 22, those lines simply say that the “preconfigured layout” for a vehicle can be downloaded via the Internet. Immersion and Dr. Akl apparently meant column 3 (which is on page 5 of Wang), lines 18 to 22, but that passage only briefly describes Figures 2-4.

40. As for the figures themselves, Immersion and Dr. Akl seem most focused on Figures 2-3 which depict the haptic device as a physical knob and slider. But Figure 4 depicts another embodiment in which haptic device is “a thumb-actuated device” that controls a cursor shown on a “virtual device panel.” EX1022 at 9:20-29; *see also* EX1022 at 16:1-14 (“The haptic device may include a small ‘mouse’, which the driver can grab on to or actuate with their thumbs/fingers, thereby allowing him or her to ‘feel’ the virtual controls on the virtual device panel.”); claim 13 (“wherein said haptic devices are installed on a steering wheel such that a user can handle easily the haptic devices with his or her hand, finger, or thumb”). Although a finger- or thumb-actuated device could conceivably employ assistive or resistive force feedback, a POSITA would readily appreciate that other haptic effects, like vibrations, would also be suitable for such a device. This is why

my opening declaration focused on Wang's Figure 4 embodiment, not the embodiments shown in Wang's Figures 2 and 3 (indeed, I did not discuss those embodiments at all). That Immersion did not discuss Wang's Figure 4 embodiment speaks volumes to me.

41. As they did with Levin, Immersion seems to imply that Wang is concerned with "mechanical detents." POR at 22-23. But, like Levin, Wang is concerned with simulating or, as Wang calls it, "emulating" mechanical detents. EX1022 at 6:24 ("images feel real"); 7:15 ("emulating any touch sensation"), 7:21-22 ("emulate friction or detent effects encountered while rotating the dial"), 8:6 ("Force effects to emulate the feel of a mechanical rotary knob or a slider..."), 8:29 ("emulate a series of detents").

42. Goldenberg. Similarly to their treatment of Levin and Wang, Immersion and Dr. Akl wrongly attempt to limit Goldenberg to assistive and resistive force feedback. POR at 23; Akl Decl. at ¶94. But Goldenberg broadly teaches "haptic feedback" for "knobs and other interface devices." EX1007 at Title. As Goldenberg explains, "force (kinesthetic) feedback" and "tactile feedback" are both forms of "haptic feedback" that "can provide physical sensations to [a] user manipulating [a] knob." EX1007 at 1:47-51.

43. Goldenberg's various forms of haptic feedback include "springs, dampers, textures, vibrations, detents, jolts or pulses, textures, inertia, friction,

obstructions (barriers), or dynamic force effects.” EX1007 at 13:1-3. Goldenberg is therefore similar to Levin in that each teaches assistive and resistive force feedback, but they each also disclose other forms of feedback including vibrotactile feedback such as a jolt. (Again, I explain in more detail why a “jolt” is a vibrotactile effect below at paragraphs 78-85.).

44. Finally, Immersion contends that Levin, Wang, and Goldenberg are not within the field of endeavor of the ’042 patent because each provides haptic feedback on a physical input device such as a knob. But the ’042 patent likewise provides haptic feedback on a physical knob. EX1001 at 2:41-42 (“In one illustrative embodiment, a rotary knob input device is rotated.”); 3:40-42 (“The input device 102 can be, for example, a mechanical input device. Examples of mechanical input devices include a rotary knob coupled to an encoder.”); 4:67-5:2 (“an input device 102 in the form of a rotary knob”); 10:25-26 (“The device in FIG. 4 comprises a mechanical device, specifically a rotary knob 400.”); 10:55-64 (describing various designs for “rotary knob 400”); 13:39-42 (“In FIGS. 9A-9H, the rotary knob 202 is shown on the right...”); FIGS 4, 9A-9H.

45. Although the challenged claims may be limited to input devices that take the form of touchpads, the ’042 patent itself has broader teachings and includes physical knobs that are provided with haptic feedback in the form of vibrations. As I explained above, Levin and Goldenberg likewise disclose physical knobs that are

provided with haptic feedback in the form of vibrations, including simple vibrational jolts. EX1016 at 7:12-14, 7:63-64, 10:17-19, 11:62-65, 14:26-29, 23:29-33; EX1007 at 2:42-44, 12:1-3, 13:1-3, 13:18-19. Levin and Goldenberg also explicitly teach that their respective inventions can be used with a “touch-sensitive” device that a user touches to select “images and associated setting or function.” EX1007 at 5:1-5; EX1016 at 5:18-21. The similarities between the teachings of the ’042 patent and the teachings of Levin and Goldenberg are striking.

46. As explained above in paragraphs 14-45, it is my opinion that the ’042 patent, Levin, Wang, and Goldenberg all relate to the same field of endeavor: **providing haptic feedback to input devices**. Based on this analysis, it is my opinion that Levin, Wang, and Goldenberg are analogous prior art and can properly be considered in an obviousness challenge to the claims of the ’042 patent.

47. However, even if the Board were to disagree with my opinion as to the field of endeavor, Levin, Wang, and Goldenberg are **nonetheless** analogous prior art because they are each reasonably pertinent to a problem that the ’042 patent sought to address.

48. The Background section of the ’042 patent observes that traditional mechanical devices provided feedback to users such as “click-stops or ‘detents,’ or otherwise a sense of mechanical resistance.” EX1001 at 1:30-37. The ’042 patent then explains that with “many traditionally mechanical functions being replaced by

electronics, operation of electronic controls has been made less intuitive to user” because they lack the feedback of traditional mechanical devices. EX1001 at 1:30-37. The ’042 patent is thus directed toward the problem of providing users of electronic controls with a virtual or simulated feel of a mechanical detent as a substitution for an actual mechanical detent. Each of Levin, Wang, and Goldenberg are directed to that same problem.

49. Levin provides its various “force feedback” effects onto a knob so as to “provide physical sensations to the user manipulating the knob.” EX1016 at 1:37-38. “[A]s the user moves [a] knob [], **force sensations** such as a spring force, a damping force, **jolts**, detents, textures, **or other forces** can be output and felt by the user.” EX1016 at 7:12-13. Rather than using traditional mechanical components to create its force sensations, Levin teaches the use of an actuator under the control of a processor or other controller. EX1016 at 11:37-40; 21:5-9; claim 1 (reciting “an actuator operative to provide forces” and “one microprocessor operative to control said actuator”); claim 56 (“an actuator operable to output a processor-controlled force sensation to said manipulandum”).

50. Put simply, Levin teaches techniques for mimicking or simulating a mechanical detent, which is the problem to which the ’042 patent is directed. *See also* EX1016 at 1:43-45 (“a variety of **programmable feel sensations** can be output on the knob, such as detents, spring forces, or the like”), 2:3-5 (“**An actuator is**

coupled to the knob to output a force in the rotary degree of freedom about the axis, thus providing force feedback.”), 10:57-60 (“Another type of force sensation that can be output on knob 18 is a spring force. The spring force can provide resistance to rotational movement of the knob in either direction to simulate a physical spring on the knob.”), 11:54-56 (“Other force sensations that can be output on knob 18 include forces that simulate ends of travel for the knob 18 or inform the user that the end of travel has been reached.”), claim 33 (“simulated spring”).

51. Wang likewise teaches the use of a “haptic device” so that “a user can feel a sense of touching or force through the haptic device while controlling or monitoring the vehicle subsystems.” EX1022 at Abstract; *see also* EX1022 at 4:4-5 (“The user (driver) uses the haptic device to ‘feel’ these virtual control devices...”); 6:22-26 (“Similarly, the haptic device can be used to operate sliders, push knobs, rocker switches and other common mechanical devices. In all cases, the objective is to use a multi degree of freedom haptic device to create forces on the user to make the images feel real so as to make the user think they are interfacing to an actual mechanical control device as opposed to an image of a control device.”).

52. Similarly to the ’042 patent, Wang’s Background identifies as a disadvantage to modern electronic controls the inability for a user to “feel” changes in device settings. EX1022 at 1:8-2:2. To solve that problem, Wang teaches the use

of its “haptic device” which “is capable of **emulating** any touch sensation,” including the capability to “**emulate** friction or detent effects encountered while rotating [a] dial.” EX1022 at 7:14-22; *see also* EX1022 at 8:6-9 (“Force effects to **emulate** the feel of a mechanical rotary knob or a slider...”); 8:29-31 (“programmed to **emulate** a series of detents as the knob rotates”). Wang thus explicitly teaches techniques for mimicking or simulating the feel of a mechanical detent, which is the problem to which the ’042 patent is directed.

53. Goldenberg teaches “haptic feedback” for “knobs and other interface devices.” EX1007 at Abstract, Title. As Immersion admitted in its European counterpart to the ’042 patent, Goldenberg “provid[es] haptic feedback **simulating** detents.” EX1006, [0005]; *see also* EX1007 at 13:36-38 (“The spring force can provide resistance to rotational movement of the knob in either direction to **simulate** a physical spring on the knob.”), 14:42-43 (“**simulate** stiff barriers”), 19:25-27 (“**simulate** ends of travel for the knob”), 6:65-67 (“For example, some interface modes may have the tactile **feel** of detents, while other modes may have the spring centered feel of a jog-shuttle. By providing familiar haptic **metaphors**, this variable feedback affords a cleaner, richer user experience.”). Goldenberg, as Immersion conceded before (EX1006, [0005]), thus explicitly teaches techniques for simulating a mechanical detent, which is the problem to which the ’042 patent is directed.

54. To the extent Immersion and Dr. Akl suggest that Levin, Wang and Goldenberg are not reasonably pertinent to the problem(s) that the '042 patent addresses because those three prior-art references primarily output haptic feedback onto physical knobs, I note my earlier explanation that the '042 patent **also** teaches providing haptic feedback to physical knobs. The problem the '042 patent sought to address in electronic controls extends beyond touchpads and includes physical input devices like knobs that lack the traditional mechanical components needed to generate mechanical feedback.

V. My Response to Immersion's Claim-Construction Argument

55. I understand that Immersion argues the claim limitation "*an input device configured to control a plurality of systems*" should be construed to mean "an input device configured to control a plurality of systems, where each system to be manipulated provides context for virtual detents." POR at 31. In my opinion, Immersion's proposed claim construction is inconsistent both with the plain language of the claims and with the specification.

56. Starting with the claim language, the phrase "*an input device configured to control a plurality of systems*" is straightforward. It simply means that the "*input device*"—a touchpad in the context of these claims—must be "*configured,*" i.e., designed in this context, "*to control a plurality of systems,*" i.e., two or more systems. There is nothing especially complex or technical about the

claim language, and its straightforward meaning would be readily apparent to a POSITA.

57. I understand that both Immersion and Dr. Akl contend that the word “*systems*” in the phrase “*a plurality of systems*” is broad enough to encompass both physical systems such as a computer system as well as software systems such as individual software applications running on a computer system. POR at 35 (“a POSA would understand the ‘plurality of systems’ to be systems (e.g., subsystems such as video, stereo and climate systems) or applications...”); Akl Decl. at ¶¶38-39, 43. For purposes of this declaration, I will accept Immersion and Dr. Akl’s contention on this point.

58. That “*systems*” broadly include software applications, however, does not otherwise change the plain meaning of the phrase “*an input device configured to control a plurality of systems.*” The phrase still simply means that the claimed touchpad can control two or more physical systems or software applications.

59. Immersion’s contention that “*an input device configured to control a plurality of systems*” should be construed to mean “an input device configured to control a plurality of systems, where each system to be manipulated provides context for virtual detents” has no support in the claim’s plain language. Indeed, Immersion’s construction does not actually construe any word in the phrase “*an input device configured to control a plurality of systems,*” it instead adds the

ambiguous language “**where each system to be manipulated provides context for virtual detents.**” The additional language Immersion seeks to add to the claims narrows the class of systems that the input device controls, but the claims’ plain language is not narrow and simply covers any “*plurality of systems.*”

60. Although Immersion’s and Dr. Akl’s language is vague, I understand Immersion’s position to be that the phrase “where each system to be manipulated provides context for virtual detents” would result in the claimed “*virtual detent[s]*” being system-specific or application-specific. POR at 55 (“per-application basis”). That is, the “*virtual detent*” that an actuator produces for the touchpad depends on the application or system being manipulated. I believe this narrowing language is inconsistent with the specification.

61. Immersion identifies two passages in the ’042 patent that suggest a “*virtual detent*” “**may**” be specific to a particular system or application. POR at 34-35 (citing EX1001 at 4:30-34 and 8:38-46). **However, this was not claimed.** The two passages, at best, suggest that the invention ***also encompasses*** system-specific “*virtual detents,*” but neither passage suggests the invention is **limited** to such “*virtual detents.*” Indeed, other passages in the specification describe the “*virtual detent*” as being generated based solely on an input signal without regard to the system or application being controlled.

62. For example, column 7, line 66 to column 8, line 4 says:

Once the processor 206 receives an input signal, the processor 206 can determine whether to generate a detent signal and/or a system signal. For example, **if the input signal indicates a rotation of a knob in more than 5 degrees of motion, the processor 206 may generate a system signal and a detent signal.**

63. In this embodiment, the system being controlled is not relevant to determining what detent signal is generated only the input signal is relevant. That is, the detent signal is generated when the knob is rotated 5 degrees regardless of what application or system the knob is being used to control.

64. The above-described embodiment is consistent with other embodiments such as the one described at column 4, lines 50 to 60:

The processor 106 may generate a signal by accessing a detent profile stored in a memory (not shown in FIG. 1). In one embodiment, the processor 106 may access a specific detent profile **based at least in part on the input signal.** In certain embodiments, the processor 106 may determine which of a plurality of simulated mechanical detents to generate. For example, **the processor 106 may analyze the input signal and determine that a hard stop is appropriate.** Further, the processor 106 may then access the hard stop virtual detent profile in a memory, and generate a detent signal based on the hard stop virtual detent profile.

65. It also consistent with the '042 patent's description of Figure 5's flow diagram:

In step 504, a signal is generated by the processor. The signal can be configured to cause an actuator to produce a vibrotactile effect to the input device, the vibrotactile effect comprising a simulated mechanical detent, and based at least in part on the detent signal. The signal comprises information relating to a specific virtual detent to be generated by an actuator. **The signal may be based at least in part on the input signal,** for instance, if the input signal indicates a fast

manipulation of the input device, then the detent signal may comprise a high frequency vibrotactile effect.

EX1001 at 11:39-49; FIG. 5.

66. It is also consistent with the '042 patent's description of Figure 6's flow diagram:

A processor 106 can generate the detent signal. The detent signal may be based at least in part on the manipulation or change in position of the input device. For example, **a first detent signal may correspond to a small change in position of the input device**, whereas **a second detent signal may correspond to a larger change in position of the input device**.

EX1001 at 12:33-38; FIG. 6.

67. The specification thus describes embodiments where the processor generates a detent signal (thus triggering a virtual detent) based **at least in part** on the input signal, thus encompassing embodiments where the processor generates a detent signal (and virtual detent) based on the input signal **alone**. Requiring that the system(s) being controlled “provide context for virtual detents,” as Immersion proposes, would read these system-agnostic embodiments out of the claims.

68. The claims do require that “*a detent profile be associated with one of the systems*,” but the claims do not require that the association between a profile and a system be unique. Therefore, “*a detent profile*” based on an input signal alone—*e.g.*, whenever a knob is turned 5 degrees—but which is used with (*i.e.*, “*associated*

with”) all the systems, is “*a detent profile be associated with one of the systems*” even though the profile is agnostic to the particular system with which it is used.

69. I understand that Immersion asserts the prosecution history for the '042 patent supports Immersion's claim-construction position. POR at 37-38. The various parts of the prosecution history that Immersion cites, however, would not be interpreted by a POSITA to limit the claims in the manner that Immersion proposes.

70. For example, Immersion points to the Board's description of the '042 patent. POR at 37. The cited passage, however, merely provides the Board's high-level overview of the '042 patent, and the Board appears to be summarizing the claim language which requires that the “*virtual detent*” be “*associated with one of the systems*.” EX1002 at 588.

71. The Board used the word “corresponding,” rather than “*associated with*,” but I do not understand there to be a substantive difference between the two words. And as the Board found in this matter, a “*virtual detent*” can be “*associated with one of the systems*” being controlled without being **specific** to that particular system. Paper No. 11 at 24-25 (“[T]here is no requirement that each one of the plurality of systems be associated with its own unique detent profile.”).

72. Moreover, the Board (during prosecution) also described claim 1 specifically and its description (reproduced below) lacks any language that would limit the claim to system-specific “*virtual detent[s]*.”

Appellant's claim 1 requires receiving specific data (a detent profile), which includes haptic data, and generating a vibrotactile signal to produce a vibrotactile effect (haptic feedback), which simulates (provides a sense of) mechanical resistance like a detent for an analog knob (the recited "virtual detent").

EX1002 at 590.

73. Immersion also points to its own description of the '042 patent (POR at 38), but that description merely suggests that a detent profile "**may**" be system specific. EX1002 at 214. The claims encompass system-specific detent profiles, but a POSITA would not consider the claims limited to such profiles given the intrinsic evidence I have discussed in this section.

VI. My Response to Immersion's Arguments Regarding The Ichinose-Levin Combination

74. Based on my review of Immersion's POR and Dr. Akl's declaration, I understand that Immersion and Dr. Akl argue a POSITA would neither have been motivated to implement nor able to implement the Ichinose-Levin combination that I identified in my opening declaration. In brief, Immersion and Dr. Akl contend that Levin's teachings are limited to assistive and resistive force feedback that are applicable to physical input devices like knobs, but which are inapplicable to touchpads. POR at 38-48; Akl Decl. at ¶¶100-114. I disagree with Immersion's and Dr. Akl's interpretation of Levin.

75. To put it simply, a POSITA would not reasonably read Levin as limited to assistive and resistive force feedback. As I explained above in paragraph 37, Levin uses the term “force feedback” to broadly cover “physical sensations” provided to “the user manipulating [a] knob.” EX1016 at 1:37-38. Levin explains that “force feedback...can include a variety of different force sensations,” including “simple jolts.” EX1016 at 10:11-21.

76. Levin is explicit that its various “force effects” can take many different forms including “damping forces, texture forces, **jolts**, obstruction forces, assistive forces, **periodic forces such as vibration forces**, and end-of-travel forces.” EX1016 at 14:26-29. Although certain identified forces—*e.g.*, “obstruction forces” and “assistive forces”—can be characterized as assistive and resistive force feedback, other identified forces are plainly vibrotactile² in nature—*e.g.*, “jolts” and “periodic forces such as vibration forces.” *See also* EX1016 at 23:29-32 (“The force process can command distinct force sensations, such as vibrations, textures, jolts...”).

² The plain meaning of “vibrotactile” does not appear to be in dispute, but for clarity it simply means “relating to or involving the perception of vibration through touch.” EX1093.

77. Levin is explicit that its force feedback can come in many forms including “vibrations” and “jolts,” which are both vibrotactile effects. A POSITA reading Levin, would not consider its teachings to be limited to assistive and resistive force feedback. *See also* EX1016 at claim 22 (“an actuator coupled to said rotary wheel and able to apply **tactile sensations** to said wheel”).

78. One of the several force sensations that Levin discloses is a **jolt**. As I explained in my opening declaration, a POSITA would understand a “jolt” in the context of Levin’s teachings (also referred to as a “pulse” in the art) to be a short burst of vibration. Ward-Opening at ¶¶71 at 120-121.³

79. Immersion says Levin does not disclose that its jolts are vibrations. POR at 41. Levin may not say that explicitly, but a POSITA would have known that a jolt (or pulse) is a vibrotactile effect because that was the conventional

³ As an aside, and to avoid potential confusion, I note that Levin and some other references may seemingly distinguish between jolts (jolt sensations) and vibrations (sensations of vibrations). However, in such context, the distinction between the two is simple. A jolt sensation is produced by a vibrational force of sufficient magnitude and short duration whereas a vibration sensation is produced by a vibrational force over a greater period of time. That is, a jolt is a particular type of vibrational sensation.

understanding in the art at the time. As I said before, “a POSITA would be aware that it was known in the art to produce vibrotactile jolt sensations with bursts of vibration.” Ward-Opening at ¶120. And, in my opening declaration, I identified multiple references that explicitly describe a jolt as a type of vibration. Ward-Opening at ¶71.

80. To the extent further corroboration of my testimony is needed, other references already in the record confirm a jolt is a vibration. For example, Rosenberg-I teaches that “a jolt or ‘pulse’ sensation can be output” onto a vibrotactile touchpad, and that such a sensation “is a single impulse of force that quickly rises to the desired magnitude and then is turned off or quickly decays back to zero or small magnitude.” EX1009 at 11:29-33. A POSITA would understand that the particular sensation Rosenberg-I is describing is a short duration vibration of a certain magnitude.

81. Rosenberg-I’s disclosure is consistent with the ’042 patent also, as it teaches that a “virtual detent may comprise a simulated click generated through a **single pulse**.” EX1001 at 6:16-17. That is, the ’042 patent teaches a POSITA that

a simple pulse (a.k.a. jolt⁴) is all that is needed to generate a virtual detent, *i.e.*, a vibrotactile effect. This teaching is also consistent with the provisional application which explicitly states that: “The perception of a virtual detent might be a **jolt** or bump.” EX1005, [0012].

82. Beyond the references already submitted in this trial, there are other prior-art references (**assigned to Immersion**) that explicitly confirm the fact that a jolt was known in the art to be a short vibration and therefore a vibrotactile effect. For example, International Publication No. WO 01/24158A1 is assigned to Immersion and was published five years before the '042 patent's provisional application was filed. The publication teaches that “**jolts can be output as a single period of a vibration or part of a period of a vibration.**” EX1091 at 16:28-29.

83. The reference likewise confirms that jolts are used with vibrotactile devices like the vibrating touchpad that Ichinose discloses⁵ and which would have been used in the hypothetical Ichinose-Levin combination. EX1091 at 22:20-21 (“In

⁴ Rosenberg-I confirms that a POSITA would understand a pulse and jolt to be interchangeable terms in the art. EX1009 at 8:58 (“pulses (jolts)”; 11:3 (“jolts or pulses”).

⁵ EX1015 at 4:7-9 (“When activated, the feedback device 80 actuates, causing the user to experience **a tangible vibration** through the touchpad 10.”).

most **vibrotactile devices**, a directional force cannot typically be output and must be approximated using vibrations or **jolts**.”), 25:4-5 (“In **vibrotactile** applications, an encounter with a wall or other object can be simulated **using a jolt** or low frequency vibration.”). The reference thus confirms a POSITA reading Levin would have recognize that Levin’s “jolts” were (i) a vibrotactile effect, and (ii) would have been suitable for use with Ichinose’s vibrating touchpad.⁶

84. U.S. Patent No. 6,906,697—assigned to Immersion and published five years before the ’042 patent’s provisional application—likewise explains that “The duration, or number of periods in the commanded wave, determines how long the vibration sensation is output. If a small number of **high frequency periods of a waveform are commanded, it typically feels like a single ‘pulse’ or jolt of force to the user.**” EX1092 at 8:47-52; *see also* EX1092 at 9:9-19 (“For example, a waveform having a frequency of 125 Hz and a duration of 14 milliseconds can

⁶ Although the reference says “kinesthetic (force) feedback” is different than “tactile (or vibrotactile) feedback” (EX1091 at 1:24-26), a POSITA would have considered vibrations and jolts to be—as the name implies—vibrotactile effects regardless of how a particular input device uses them or what type of input device is used. Put simply, a vibration/jolt felt on a knob is a vibrotactile effect regardless of whether force-feedback effects can also be provided to that knob.

convey this sensation. To the user, this feels like a small jolt or pulse on the mouse which indicates the graphical object has been engaged or interacted with the cursor. As another example, the sensation of an even smaller object, such as a radio button, can be conveyed by commanding a periodic wave form having a very high frequency and a very short duration, such as 300 Hz for 5 milliseconds. These vibrations are a high enough frequency as to feel like a single jolt or pulse to the user.”).

85. In summary, a POSITA would understand Levin’s “jolts” to be vibrotactile effects that are suitable for use in Ichinose’s vibrotactile touchpad.

86. Immersion argues Levin’s jolts are “a kind of force feedback.” POR at 41. I agree that Levin describes its “jolts” as a form of force feedback, but to the extent that Immersion means that Levin’s jolts are limited to assistive/resistive force feedback, then I disagree for the reasons provided above—a jolt is vibrotactile feedback. Indeed, the relevant passage that Immersion cites to support its argument is at column 11, lines 54-67. That passage **contradicts** Immersion’s argument because it identifies a “jolt” as an “**alternative[]**” to an obstruction, *i.e.*, resistive force feedback, force sensation. Far from characterizing a jolt as a resistive/assistive force, the cited Levin passage explicitly distinguishes the two.

87. The cited Levin passage's distinction between a jolt and assistive/resistive force feedback is consistent with other passages in Levin. For example, Levin discloses the following:

A basic force sensation is force detents that are output at particular rotational positions of the knob to inform the user how much the knob has rotated and/or to designate a particular position of the knob. The **force detents can be simple jolts or bump forces** to indicate the detent's position, **or the detents can include forces that attract the knob to the particular rotational detent position and resist movement of the knob away from that position**... Force feedback **“snap-to” detents can also be provided**, for example, for the favorite station frequencies preprogrammed by the user, where a small force biases the knob to the detent position when it is just outside the position.

EX1016 at 10:14-21.

88. The above-quoted passage is explicit that a “force detent” can be generated with “simple jolts...**or** the detents can include forces that attract the knob to the particular rotational detent position and resist movement of the knob away from that position.” Again, Levin explicitly distinguishes a “simple” vibrational jolt from assistive/resistive force feedback, and further, teaches “jolts” as distinct alternatives for assistive/resistive force-feedback based detents.

89. The above two disclosures also confirm that Immersion is wrong when it says (POR at 42) that Levin limits its use of jolts to augmenting assistive/resistive force feedback detents—Levin is explicit that force detents can be “simple jolts,” *i.e.*, vibrotactile effects without assistive/resistive force feedback effects.

90. Immersion also observes that Levin's Figure 6A depicts a force profile for a detent generated using assistive and resistive force feedback. POR at 40. The reason I relied on Figure 6A in my opening declaration, however, was **not** to suggest that a POSITA would use the **exact** effect that the particular figure illustrates. Instead, I presented Figure 6A as an easily understood illustration of the data that a force profile would have, *i.e.*, magnitude and duration of a force to be applied. A POSITA would readily appreciate that similar data would be used to generate a vibrotactile jolt.

91. The remainder of Immersion's and Dr. Akl's critique of the Ichinose-Levin combination depends on their mischaracterization of Levin as limited to assistive and resistive force feedback. They both contend that (i) a POSITA would not be motivated to use assistive and resistive force feedback in a touchpad, and (ii) a POSITA would not have had a reasonable expectation of success in using assistive and resistive force feedback in a touchpad.⁷ POR at 44-48.

⁷ Although it is ultimately irrelevant because Levin's teachings are not limited to assistive/resistive force feedback (and thus the critique is unrelated to any of my actual analysis), I do note that that Dr. Akl's statement that it "would not have been possible at the time of the patent (**or today**) to apply rotary and linear force feedback on a touch-pad" (Akl Decl. at ¶113) is simply wrong about the "[im]possibility" of

92. But, as I explained above, Levin is not limited to assistive and resistive force feedback, it explicitly teaches vibrotactile effects in the form of vibrational jolts. Immersion's and Dr. Akl's critiques thus are irrelevant because they do not take into account the entirety of Levin's teachings, and I understand from counsel that the law requires consideration of all that a prior-reference teaches.

93. A POSITA would readily appreciate that vibrotactile effects like Levin's jolt are suitable with touchpads—indeed, Ichinose already has a vibrational touchpad, so using a jolt in Ichinose would have required little more than programming Ichinose's actuator to output a short vibrational jolt rather than the generic vibrations it already outputs. Rosenberg-I likewise confirms that vibrational jolts (or pulses) are suitable in touchpads because Rosenberg-I discloses using such jolts/pulses with its touchpad. Implementing Ichinose such that it used Levin's vibrational jolts would have been routine engineering for a POSITA.

directional force feedback sensations on a touchpad. Before the filing date of the '042 patent (and certainly today), a POSITA would have known that asymmetric vibrations—stronger or faster in one direction than the other—provide directional sensation. *See, e.g.*, EX1094 at [0074] (describing techniques for providing directional vibrotactile sensations)

VII. My Response to Immersion's Arguments Regarding The Wang-Ichinose Combination

94. Immersion and Dr. Akl challenge my analysis regarding the Wang-Ichinose combination. POR at 48-52; Akl Decl. at ¶¶116-124. As they did with Levin, Immersion and Dr. Akl argue that Wang only teaches the use of assistive and resistive force feedback that is allegedly not applicable to touchpads. I disagree with how Immersion and Dr. Akl interpret Wang as this is not how a POSITA would understand its teachings.

95. As I explained above in paragraphs 38-41, Wang is broadly directed to a “haptic device” that allows a user to “feel a sense of **touching or force** through the haptic device while controlling or monitoring the vehicle subsystems.” EX1022 at Abstract; *see also* claim 1. Wang never says the “touching or force” that a user feels through the haptic device is limited to assistive or resistive force feedback, and a POSITA would not have interpreted “haptic” in Wang to be narrower than its ordinary meaning which encompasses both assistive and/or resistive force feedback as well as other tactile feedback like vibrations. Indeed, the fact that Wang distinguishes between “a sense of touching” and “a sense of...force” (EX1022 at Abstract) would have been interpreted by a POSITA to confirm that Wang’s haptic effects are not limited to assistive and resistive **force** feedback (as Dr. Akl suggest) and include tactile feedback like vibrations.

96. Immersion's argument concerns Figures 2 and 3 of Wang. These two figures depict the haptic device 16 as being a physical knob/slider. However, these two figures were **not** part of my analysis. My analysis focused on Figure 4, and Figure 4 does not limit the haptic device 16 to a physical knob/slider. (I note that none of Immersion's nor Dr. Akl's arguments address Figure 4, nor my analysis of it. Immersion and Dr. Akl only address Figures 2 and 3, and a fictive analysis I did not make. From this I conclude that neither Immersion nor Dr. Akl has voiced any disagreement concerning any of my actual analysis related to Figure 4; since they do not dispute it, I would conclude that they accept it.)

97. As I explained in my opening declaration, a POSITA would recognize that implementing the haptic device 16 in Wang's Figure 4 embodiment as a touchpad would be consistent with both Wang's disclosure and the state of the art in which haptic touchpads were known to be used on car steering wheels. *See* Ward-Opening at ¶¶215-220. Once the haptic device 16 in Wang's Figure 4 is understood to include a touchpad, a POSITA would readily appreciate that Wang's various haptic effects would take the form of vibrations, not assistive or resistive force feedback.

VIII. My Response to Immersion's Arguments Regarding Rosenberg

98. Immersion and Dr. Akl both argue that Rosenberg-I does not disclose "*a plurality of systems.*" POR at 52-57; Akl Decl. at ¶¶128-134. Their argument,

however, depends on interpreting “*an input device configured to control a plurality of systems*” to mean “an input device configured to control a plurality of systems, where each system to be manipulated provides context for virtual detents.” Because that interpretation is wrong, Immersion’s and Dr. Akl’s argument is wrong too.

99. Regardless, even if “*an input device configured to control a plurality of systems*” is construed to mean “an input device configured to control a plurality of systems, where each system to be manipulated provides context for virtual detents,” Rosenberg-I discloses such “*an input device.*”

100. At column 6, lines 7-23, Rosenberg-I (EX1009) discloses the following:

The host application program(s) and/or operating system preferably displays graphical images of the environment on display device 12. The software and environment running on the host computer 12 may be of a wide variety. For example, **the host application program can** be a word processor, spreadsheet, video or computer game, drawing program, operating system, graphical user interface, simulation, Web page or browser that implements HTML or VRML instructions, scientific analysis program, virtual reality training program or application, or other **application program that utilizes input from the touchpad 16 and outputs force feedback commands to the touchpad 16.** For example, many games and other application programs include force feedback functionality and may communicate with the touchpad 16 using a standard protocol/drivers such as I-Force®, FEELit®, or Touchsense™ available from Immersion Corporation of San Jose, Calif.

101. A POSITA would interpret the above disclosure in Rosenberg-I to mean that the application program—*e.g.*, a web browser or videogame—takes

coordinate input from Rosenberg-I's touchpad and then "outputs" a command to the touchpad's actuator to perform a particular type of force feedback such as a pulse. That is, the application determines which haptic feedback (*e.g.*, "virtual detents") to output and thus the haptic feedback is application-specific or—as Immersion would say—the application being manipulated "provides context for virtual detents."

102. This understanding of Rosenberg-I is consistent with a subsequent passage in Rosenberg-I that explains that "[t]he touchpad device also includes circuitry that receives signals from the host and outputs tactile sensations in accordance with the host signals using one or more actuators. In some embodiments, a separate, local microprocessor can be provided for the touchpad 16 to both report touchpad sensor data to the host and/or to carry out force commands received from the host, such commands including, for example, the type of haptic sensation and parameters describing the commanded haptic sensation." EX1009 at 6:29-37. A POSITA would have understood the "host" referred to in this passage as including a "host application program."

103. This understanding of Rosenberg-I is also consistent with Rosenberg-I's teaching that its haptic sensations are programmable such that a "user or [software] developer" can associate certain graphical objects in a software application program with certain haptic sensations. EX1009 at 13:18-20; *see also* EX1009 at 15:11-25 (describing how the functionality for Rosenberg-I's touchpad

“can change based on an active application program in the graphical environment and/or based on user preferences input to and/or stored on the computer 10”). The programmable nature of Rosenberg-I’s tactile sensations confirms that the particular sensation that is output depends at least in part on the application (software program) and its graphical user interface elements.

104. As Rosenberg-I explains, its computer displays a “graphical environment...based on application programs...that are running” on the computer. EX1009 at 3:46-48; FIG. 1. The applications then “display[] graphical images” within that environment (EX1009 at 6:7-9), and the user’s interaction with those images is what causes **the application** to output a force command to the touchpad to generate a vibrotactile feedback such as a pulse (EX1009 at 6:16-18, 13:6-21).

105. Rosenberg-I even details different types of force commands associated with different types of applications and their different graphic user interface elements. For example, column 12, lines 27 to 49 describe force commands for interacting with GUI elements in a menu system and separately describes force commands for interacting with GUI elements in a computer-aided drawing program. Likewise, column 13, lines 23 to 67 describe force commands for software programs ranging from email to videogames. That the force commands differ from application to application confirms that Rosenberg-I’s applications “provide context for virtual detents.”

106. Immersion and Dr. Akl also argue that Rosenberg-I does not disclose “a *virtual detent*.” Immersion and Dr. Akl contend that a “*virtual detent*” must provide a “sense of mechanical resistance,” and that Rosenberg-I’s “pulses” do not provide a sense of mechanical resistance. POR at 58-59; Akl Decl. at ¶¶135-140. I disagree.

107. As an initial matter, it is unclear what Immersion and Dr. Akl mean by a “sense of mechanical resistance.” The ’042 patent is explicit that a simple vibrational pulse is a “*virtual detent*.” EX1001 at 6:16-17. Therefore, either (i) a single vibrational pulse provides “a sense of mechanical resistance,” or (ii) such resistance is unnecessary for a pulse to be a “*virtual detent*.” In other words, because Rosenberg-I’s vibrational “pulse” is the same as the vibrational pulse that the ’042 patent says is a “*virtual detent*,” then Rosenberg-I’s vibrational “pulse” is a “*virtual detent*” no matter how the term is construed.

108. What Immersion and Dr. Akl seem to suggest is that the context in which a pulse is generated matters. That is, a pulse generated when a user would expect to feel a mechanical detent if operating a mechanical input device with traditional mechanical components is a “*virtual detent*,” but a pulse generated at some other time may not be. The ’042 patent does not limit “*virtual detents*” in this manner, but regardless, Rosenberg-I’s pulses are generated when a user would expect to feel a mechanical detent if operating a mechanical input device.

109. To start, Rosenberg-I is explicit that a “pulse” provides the “physical confirmation” that a user expects to feel “when pressing a physical button.” EX1009 at 13:41-54. In other words, Rosenberg-I’s pulse simulates the mechanical detent (*i.e.*, resistance) that a user would expect to feel if a mechanical button were being pressed rather than a virtual button being pressed via a touchpad.

110. This same type of mechanical simulation occurs when the pulse is used to “indicate the location of the ‘ticks’ for discrete values or settings in [an] adjusted range.”⁸ EX1009 at 12:56-58. A POSITA would understand that the “ticks” Rosenberg-I refers to are individual settings within a range such as discrete radio stations within the FM broadcast band (*e.g.*, 88.0 Mhz to 108 Mhz) or discrete temperature settings (*e.g.*, 63 degrees to 95 degrees). If a mechanical knob or knob with traditional mechanical components were used to adjust individual settings within a range, then the user would expect to feel a “click” (or “tick”) each time an individual setting is selected. When, as in Rosenberg-I, a vibrational touchpad is

⁸ Immersion implies Rosenberg-I’s “ticks” are different than its “pulses.” POR at 58. But Rosenberg-I’s pulses are what Rosenberg-I uses to generate “ticks.” EX1009 at 12:56-58. A POSITA would understand that Rosenberg-I’s “ticks” is merely another way to describe the “clicks” felt when a mechanical detent is engaged, and in Rosenberg-I that a “tick” (or click) effect is generated using a pulse.

used to control a virtual knob or slider, the pulse that is generated simulates the “click” (or “tick”) effect that a user would have expected to feel with a mechanical knob or slider. This is the same effect as depicted in Figure 9A of the ’042 patent.

111. Immersion and Dr. Akl contend that Rosenberg-I’s “pulses” are not “*virtual detents*” because Rosenberg-I uses them to “indicate information such as certain locations within a range.” POR at 58; Akl Decl. at ¶136. But indicating a location within a range is what a mechanical detent does with a mechanical input device such as a knob or slider when that device is used to adjust settings within the range. In fact, the ’042 patent teaches explicitly that “detent[s]” can divide a range “into discrete increments.” EX1001 at 1:38-41. In embodiments where Rosenberg-I’s pulses are used to “indicate the location...for discrete values or settings in [an] adjusted range” (EX1009 at 12:57-59), the pulses serve the same function as a mechanical detent—they allow the user to feel that an adjustment in a setting has occurred.

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

I declare under penalty of perjury that the foregoing is true and correct.

Dated: 15-Jan-2025
Jean Renard Ward

Jean Renard Ward