

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
U.S. Patent No. 9,430,042

EXHIBIT 2001

**DECLARATION OF CRAIG ROSENBERG, Ph.D.
IN SUPPORT OF IMMERSION CORPORATION'S
PATENT OWNER PRELIMINARY RESPONSE**

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I, Craig Rosenberg, declare as follows:

1. I have been retained by Folio Law Group PLLC, counsel for Patent Owner Immersion Corporation (“Immersion”) to assess the challenged claims of U.S. Patent No. 9,430,042 (“the ’042 Patent”) in connection with this case which is the Petition for Inter Partes Review of the ’042 Patent (“the Petition”).

2. I am being compensated for my work on this case and my fee is not contingent on the outcome of this case or on any of my opinions or the technical positions I explain in this report. In addition, I have no financial interest in the outcome of this case or any of the parties involved in this case.

3. I believe I am qualified to serve as a technical expert in this proceeding based on my educational and work experience, including my 30+ years of experience in human factors, user interface design, user interaction design, human-computer interaction, and software engineering from 1988 through today.

4. This declaration sets forth my opinions, which I formed based on my study of the evidence; my understanding as an expert in the field; and my training, education, research, knowledge, and personal and professional experience. All of my opinions stated in this declaration are based on my own personal knowledge, expertise, training, education, and professional judgment. In forming my opinions, I have relied on my knowledge and experience in human factors, user interface

design, user interaction design, human-computer interaction, and software engineering.

5. If I am called upon to do so, I would be competent to testify to the matters set forth herein. My qualifications to testify about the technical subject matter in this case and the relevant technology are outlined in my curriculum vitae and this section of this declaration. A copy of my current curriculum vitae is provided for this proceeding as Exhibit 2002.

6. This declaration is based on the information currently available to me. If additional information becomes available to me, I reserve the right to continue my analysis, which may include a review of documents and information that may be provided to me, as well as testimony from depositions that have not yet been taken at this time.

I. BACKGROUND AND QUALIFICATIONS

7. I earned my Bachelor of Science degree in Industrial Engineering, my Master of Science degree in Human Factors, and Doctor of Philosophy in Human Factors from the University of Washington School of Engineering. For over 30 years, I have worked in human factors, user interface design, software development, software architecture, systems engineering, and modeling and simulation across various application areas, including aerospace, communications, entertainment, and healthcare.

8. I graduated from the University of Washington in 1988 with a Bachelor of Science in Industrial Engineering. After graduation, I continued my studies at the University of Washington College of Engineering. In 1990, I obtained a Master of Science degree in Human Factors. Human Factors is an engineering discipline that studies the design of products, processes, equipment, and systems to work more efficiently with humans. Human factors is concerned with reducing human error, increasing productivity and efficiency, and enhancing safety and comfort with a specific focus on the interactions and interfaces between humans and the products, processes, or systems with which they interact. In 1994, I graduated with a Doctor of Philosophy in Human Factors, focusing on advanced interface design. My Bachelor of Science, Master of Science, and Doctor of Philosophy degrees were all obtained at the University of Washington College of Engineering.

9. During my doctoral studies, I worked as an Associate Assistant Human Factors Professor at the University of Washington Industrial Engineering Department. My duties included teaching, writing research proposals, designing and conducting funded human factors experiments for the National Science Foundation, and hiring and supervising students. While studying at the University of Washington, I also worked as a human factors researcher. I designed and performed advanced human factors experiments relating to virtual environments and interface design, stereoscopic displays, and advanced visualization research, which the

National Science Foundation funded. My duties included user interface design, systems design, software development, graphics programming, experimental design, and hardware and software interfacing.

10. I have published twenty-one research papers in professional journals and proceedings in user interface design, computer graphics, and the design of spatial, stereographic, and auditory displays. I also authored a book chapter on augmented reality displays in the book “Virtual Environments and Advanced Interface Design” (Oxford University Press, 1995). In addition, I created one of the first virtual spatial musical instruments called the MIDIBIRD that, utilized the MIDI protocol, two six-dimensional spatial trackers, a music synthesizer, and a computer graphics workstation to create an advanced and novel musical instrument.

11. For the past 21 years, I have been a consultant for Global Technica, Sunny Day Software, Stanley Associates, Techrizon, CDI Corporation, and the Barr Group. In this capacity, I have provided advanced engineering services for many companies.

12. I consulted for the Boeing Company for 15 years as a senior human factors engineer, user interface designer, and software architect for various advanced commercial and military programs. Many of the projects that I was involved with at Boeing involved advanced software development, user interface design, agent-based software, and modeling and simulations in the areas of missile defense,

homeland security, battle command management, computer-aided design, networking and communications, air traffic control, location-based services, flight simulation, and Unmanned Aerial Vehicle (“UAV”) command and control. Additionally, I was the lead system architect developing advanced air traffic controller workstations and air traffic control analysis applications, toolsets, and trade study simulations for Boeing Air Traffic Management.

13. I was also the architect of the Boeing Human Agent Model. The Boeing Human Agent Model is an advanced model for the simulation of human sensory, cognitive, and motor performance as applied to the roles of air traffic controllers, pilots, and UAV operators. In another project, I was the lead human factors engineer and user interface designer for Boeing’s primary vector and raster computer-aided drafting and editing system that produces the maintenance manuals, shop floor illustrations, and service bulletins for aircraft produced by the Boeing Commercial Aircraft Company. Additional responsibilities in my time as a consultant include system engineering, requirements analysis, functional specification, use case development, user stories, application prototyping, modeling and simulation, object-oriented software architecture, graphical user interface analysis, and design, as well as UML, C++, C#, and Java software development.

14. In 1995 and 1996, I was hired as the lead human factors engineer and user interface designer for the first two-way pager produced by AT&T. Before this

technology, individuals could receive pages but had no way to respond utilizing their pager. This new technology allowed users to use a small handheld device to receive and send canned or custom text messages, access and update an address book, and access and update a personal calendar. This high-profile project involved designing the entire feature set, user interface/user interaction design and specification, and all graphical design standards. In addition, I designed the notification alerts for the pager associated with receiving messages, timers, alarms, etc.

15. From 1999 to 2001, I was the lead human factors engineer and user interface designer for a company called Eyematic Interfaces, where I was responsible for all user interface design and development activities associated with real-time mobile handheld three-dimensional facial tracking, animation, avatar creation, and editing software for a product for Mattel. My work involved user interface design, human factors analysis, requirements gathering and analysis, and functional specifications.

16. I was the lead user interface designer for a company called ObjectSpeed, which developed a portable handheld telephone for use in homes and businesses with many of the same capabilities we take for granted in mobile cellular phones. This portable multifunction device supports voice, email, chat, video conferencing, internet radio, streaming media, Microsoft Outlook integration, photo taking, sharing, notifications, etc. I designed all the user interface elements for this

device. The ObjectSpeed device was specifically designed and developed as a portable handheld device.

17. I was the lead user interface designer for Ahaza, which was building IPv6 routers. I designed the user interfaces to configure and control these advanced network hardware devices. My responsibilities included requirements analysis, functional specification, user interface design, user experience design, and human factors analysis.

18. I am the founder, inventor, user interface designer, and software architect of WhereWuz. WhereWuz is a company that produces advanced mobile software running on GPS-enabled smartphones and handheld devices. WhereWuz allows users to record exactly where they have been and query this data for subsequent retrieval based on time or location. WhereWuz was designed and developed to run on handheld devices.

19. I am the co-founder of a medical technology company called Healium. Healium developed advanced wearable and handheld user interface technology to allow physicians to interact more effectively with electronic medical records.

20. I am the co-founder of a medical technology company called StratoScientific. StratoScientific is developing an innovative case for a smartphone that turns a standard handheld smartphone into a full-featured digital stethoscope

that incorporates visualization and machine learning for telemedicine and automated diagnosis.

21. I designed and developed a large software project for Disney World called xVR that allowed the operational employees of Disney World to utilize a handheld device to view the current and historical status of all of the guests of Disney World within multiple attractions and one of their restaurants. The application could run in a real-time/live mode where it would display data collected from sensors that showed the location and status of all guests within the attraction; the application could also be run in a fast-time/simulated mode. The application was developed on a laptop computer and designed to run on various devices, including laptops, personal computers, smartphones, and tablets. In addition, I investigated the use of notifications for MagicBand.

22. I have worked on multiple user interface projects involving haptics for AT&T, Boeing, Disney, and ObjectSpeed. For AT&T, I designed and developed the entire user interface for AT&T's first two-way pager, including vibratory alerts associated with new messages. For Boeing, I worked on improving realism of flight simulators, including the fidelity of vibratory alerts associated with their stick shakers. For Disney, I investigated the use of vibrotactile alerting for MagicBand users. For ObjectSpeed, I designed the vibratory alerting associated with notifications.

23. I have worked on many projects that utilized touchscreen interfaces, including projects for ObjectSpeed, WhereWuz, Disney, US ARMY, Healium, and StratoScientific.

24. I have received several awards for my engineering work relating to interface design, computer graphics, and the design of spatial, stereographic, and auditory displays, including a \$10,000 scholarship from the I/ITSEC for advancing the field of interactive computer graphics for flight simulation and a Link Foundation award for furthering the field of flight simulation and virtual interface design. I have also created computer graphic illustrations for several popular book covers and animations for a movie produced by MIRAMAR.

25. More information about my educational and professional background can be found in my curriculum vitae, Exhibit 2003.

26. The combination of my education, research, training, and work experience in software development, human factors, user interface design, user interaction design, and human-computer interaction enables me to provide analysis and opinions on the subject matter of this litigation.

II. BASES OF OPINIONS

27. In the course of performing my analysis and forming my opinions, I have reviewed the Petition and its Exhibits 1001–1084 including the materials listed below:

- IPR Petition IPR2024-00478
- U.S. Patent No. 9,430,042 (“the ’042 Patent”) (Ex. 1001)
- Prosecution History of the ’042 Patent. (Ex. 1002)
- Declaration of Jean R. Ward (Ex. 1003)
- US Patent No. 6,819,990 (“Ichinose”) (Ex. 1015)
- US Patent No. 6,686,911 (“Levin”) (Ex. 1016)
- International Application Publication Number WO 02/102616 (“Wang”) (Ex. 1022)
- US Patent No. 6,429,078 (“Rosenberg I”) (Ex. 1009)
- US Patent No. 5,734,373 (“Rosenberg II”) (Ex. 1010)
- US Patent No. 6,636,197 (“Goldenberg”) (Ex. 1007)

III. SUMMARY OF OPINIONS

28. The Petition raises four grounds of invalidity:

- Ground 1 of the Petition alleges that claims 1-19 are obvious over Ichinose and Levin.
- Ground 2 alleges that claims 1-19 are obvious over Wang in view of Ichinose.
- Ground 3 alleges that claims 1-19 are anticipated by Rosenberg I.
- Ground 4 alleges that claims 1-19 are obvious over Rosenberg I and Goldenberg.

- Based on my analysis of the Petition and the exhibits cited in the Petition, it is my opinion that none of Grounds 1 to 4 render claims 1-19 of the '042 Patent anticipated or obvious.

IV. APPLICABLE LEGAL STANDARDS

A. Ordinary Skill in the Art

29. My opinions in this declaration are based on the understandings of a person of ordinary skill in the art—sometimes referred to as an “ordinary artisan” or by the acronyms “POSA” or “POSITA” (person of ordinary skill in the art)—as of the time of the invention, which I understand to be the earliest priority date (December 27, 2006) of the '042 Patent. I understand that the person of ordinary skill in the art is a hypothetical person who is presumed to have known the art relevant to the challenged claims of the '042 Patent at the time of the invention.

30. I understand that, in assessing the level of skill of a person of ordinary skill in the art, one should consider the type of problems encountered in the art, the prior solutions to those problems found in the prior art references, the rapidity with which innovations are made, the sophistication of the technology, the level of education of active workers in the field, and my own experience working with those of skill in the art at the time of the invention. I have considered these factors in reaching my opinion as to the hypothetical POSITA that I set forth below.

31. I understand that the Petitioner has proposed that the level of skill in the art at the time of the '042 Patent as:

one who would have possessed a bachelor's degree in electrical engineering, computer science, or a related field, plus at least two years of industry or graduate level experience with software engineering, haptics programming, and/or human-computer interaction, including experience with user-interfaces and applications involving touchscreens, touchpads, and related technologies.

Pet. at 8 (citing Ex. 1003, ¶¶ 37-43).

32. In my opinion, the definition of a POSITA should be one with:

a bachelor's degree in electrical engineering or computer science (or an equivalent degree), and two years of practical or industry experience in the field of human-computer interaction (HCI), including implementation of computer-based systems and software for providing haptic feedback effects to a user.

33. Consistent with either definition, I was at the time of invention, and am, a POSITA through my education, research experience and work experience. As of the date of the invention, I was familiar with the types of problems encountered in systems that use haptic feedback and the rapidity at which innovations are made.

B. Claim Construction

34. I understand that Petitioner believes none of the claim terms in the challenged claims require express construction at this time. Pet. at 10. I also

understand that Patent Owner submits that all claim terms in the challenged claims should be given their plain and ordinary meaning as Patent Owner has submitted in the current parallel litigation in the Western District of Washington.

35. Therefore, in my analysis of the challenged claims throughout this Declaration, I apply the plain and ordinary meaning of each claim term as understood by a POSITA in the context of the '042 Patent specification.

36. A POSITA would understand that a virtual detent includes a simulated or virtualized version of a mechanical detent created through vibrotactile feedback. Additionally, a POSITA would understand the differences between a mechanical detent and a “virtual detent.” Specifically, a mechanical detent is a physical feature that uses force feedback to mechanically resist or arrest movement of some 3-dimensional input object (e.g., knob, slider, lever, etc.). For example, a mechanical detent may exert torque or resistance on a rotatable knob to provide the user with a resistive feel. In contrast, a virtual detent uses haptic (touch-based) feedback to mimic the sensation of a mechanical detent without the use of mechanical force feedback components.

37. The patent specification and file history confirm my understanding of these differences between a detent and a virtual detent. *See* Ex. 1001 at 3:6-14 (“Such simulated mechanical detents, or virtual detents, may provide useful feedback to a user.”); 5:54-6:31 (“Specifically, in some embodiments the actuator 108 may be

configured to provide the perception of a detent (i.e. a virtual detent) without the traditional means necessary for a mechanical detent”), 7:66–8:4, 8:38-46, 9:33-38, 9:59-10:49, 11:55-63, 12:33-38, 12:45-55, 13:35-14:57, Abstract; Ex. 1002 (02/01/2016 Patent Board Decision) at 590 (“As explained by Appellant, a detent provides a sense of mechanical resistance while operating a virtual control for a virtual device (Spec., 4; *see* Figures 9A-9H).”).

38. As for the term “detent profile,” a POSITA would also understand that “detent profile” should be associated with “vibrotactile effect” because it defines the “vibrotactile effect.” That is, a POSITA would understand the plain meaning of a “detent profile” as comprising the specific characteristics or parameters that define how virtual detents behave in an input device . . . for simulating the tactile feedback that one might feel when using mechanical controls, such as the clicks felt when turning a knob or pushing a button that physically moves into discrete positions through **vibrotactile feedback**.

39. I understand that in interpreting the claims of the ’042 Patent in this IPR according to their plain and ordinary meaning, one must take into consideration the so-called “intrinsic evidence” of the patent consisting of (1) the claim language; (2) the specification; and (3) the prosecution history.

40. I understand that claim terms may be explicitly defined in the patent specification or they may be implicitly defined through consistent usage in the

specification. I also 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.

C. Anticipation

41. Counsel has informed me, and I understand, that a showing of anticipation involves a comparison of the construed claims to the alleged prior art and, to anticipate a patent claim, a single prior art reference must disclose each element of the claimed invention, either expressly or inherently. The prior art reference must also have disclosed each element prior to disclosure of the claimed invention.

42. Further, a party claiming inherency must prove that the alleged inherent element or feature necessarily is present by clear and convincing evidence. The fact that the feature is likely to have existed is not sufficient. It must be shown that the feature was necessarily present in the reference to show inherency.

D. Obviousness

43. Counsel has informed me, and I understand, that an issued patent claim is invalid as obvious if it can be shown that the differences between the patented subject matter and the prior art are such that the subject matter as a whole would have been obvious, at the time the invention was made, to a person having ordinary skill in the art. Relevant considerations include the level of ordinary skill in the art;

the scope and content of the prior art; differences between the prior art and the claims at issue; and the objective indicia, or secondary considerations, of nonobviousness.

44. In this regard, I am informed and I understand that the secondary considerations of nonobviousness could include factors such as commercial success, long felt but unresolved needs, the failure of others, skepticism by experts, praise by others, award and accolades, and copying.

45. Counsel has informed me, and I understand, that in order to evaluate the obviousness of any claim of the '042 Patent over a given prior art combination, I should analyze whether the prior art references, included collectively in the combination, disclose each and every element of the allegedly invalid claim as those references are read by the person of ordinary skill in the art at the time of the invention.

46. Counsel has informed me, and I understand, that even where all of the claim limitations are expressly disclosed in the prior art references, there must be some showing that a person of ordinary skill in the art would have been motivated to combine such prior art references, and explanation of how the combination would be achieved, and that there would have been a reasonable expectation of successfully achieving the claimed invention from such combination.

47. Counsel has informed me, and I understand, that absent some additional reasoning, mere routine optimization for a person of ordinary skill in the art to arrive

at the claimed invention through the combination of prior art references is insufficient to support a conclusion of obviousness.

48. Counsel has informed me, and I understand, that to rely on a reference it must be analogous prior art. Counsel has informed me and I understand that a reference is considered analogous prior art: (1) if the reference is from the same field of endeavor as the claimed subject matter, or (2) if the reference “is reasonably pertinent to the particular problem with which the inventor is involved,” even though the reference is not within the field of the inventor’s endeavor.

49. Counsel has informed me, and I understand, in considering the obviousness of a claimed invention, one should not view the invention and the prior art with the benefit of hindsight. In an obviousness analysis, one must be aware of the distortion caused by hindsight bias and must be cautious of arguments reliant upon ex post reasoning. Counsel has instructed me, and I understand that when considering obviousness, I should not consider what is known today what was learned from the invention of the ’042 Patent itself. Instead, obviousness is assessed by the person of ordinary skill in the art at the time the invention of the ’042 Patent was made, but without the knowledge of the invention.

50. In this regard, I am informed and I understand that the ’042 Patent may not be used as a guide or roadmap to select, understand, and combine or modify the prior art, because such an approach would improperly apply hindsight bias to the

obviousness analysis. Also, at a minimum, this approach discounts the value of combining various existing features or principles in the prior art in an inventive way so as to achieve a novel result.

51. Counsel has informed me, and I understand, that obviousness cannot be predicated on what was unknown at the time of the invention, even if the inherency of a certain feature is later established. Counsel has also informed me, and I understand, that unknown or undisclosed properties of the prior art (such as features in the prior art that the obviousness combination or rationale to combine might rely on, but are not disclosed or taught by the reference) may not be relied upon to provide the rationale for modifying or combining the prior art to reach the claimed subject matter.

52. Counsel has informed me, and I understand, that a reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant of the '042 Patent.

V. OVERVIEW OF THE '042 Patent

53. The '042 Patent describes systems and methods for simulating the feeling of physical input controls (such as knobs, sliders, and levers) on input devices with virtual controls such as touchpads. Ex. 1001 at 2:59-63. Physical input controls such as knobs and dials often have mechanical detents (e.g., click-stops) that give

users palpable feedback as to the extent of their manipulation. *Id.* at 1:22-29. The '042 Patent's inventors recognized that modern electronic input devices, which often include planar touch-sensitive input devices like tablets or touchpads, were less intuitive to use because they did not have "click-stops or 'detents,' or otherwise a sense of mechanical resistance" which made it "difficult [for users] to obtain a similar experience from an electronic substitute for a traditional mechanical control device" *Id.* at 1:33-37.

54. To address these shortcomings, the '042 Patent introduced the virtual detent. *Id.* at 1:15-17. A virtual detent employs vibrotactile feedback (e.g., vibrational haptics) to give the user the feeling of using a mechanical detent. *Id.* Recognizing that mechanical detents may vary in terms of user experience, the inventors also came up with the "detent profile," which defines "which of a plurality of simulated mechanical detents to generate." *Id.* at 55-56. The '042 Patent discloses example detent profiles that define rotary detents (*id.* at 13:47-53), hard stop detents (*id.* at 13:54-62), damper detent profiles (*id.* at 14:27-34), among others.

VI. EXEMPLARY CLAIM OF THE '042 Patent

55. Independent claim 1 is recited below:

1[pre]. A method comprising:

[1a] receiving an input signal comprising information associated with a manipulation of an input device configured to control a plurality of systems, wherein the input device comprises a touchpad;

- [1b] receiving a detent profile associated with one of the systems, the detent profile comprising haptic data associated with a virtual detent; and
- [1c] generating a vibrotactile signal configured to cause an actuator to produce a vibrotactile effect to the input device, the vibrotactile effect comprising the virtual detent.

Ex. 1001, cl. 1.

VII. GROUND 1: ICHINOSE + LEVIN

A. Overview of Ichinose (Ex. 1015)

56. Ichinose (U.S. Patent No. 6,819,990) is directed to touchpad input device for vehicles. Ex. 1015 at Abstract. The following figure illustrates this two-dimensional surface, i.e., a touchpad as shown in Fig. 1B, which is mounted to a steering wheel as shown in Fig. 1A:

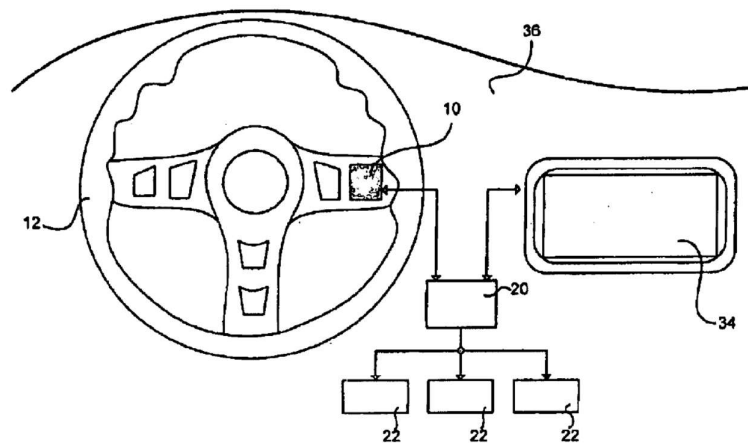


FIG. 1A

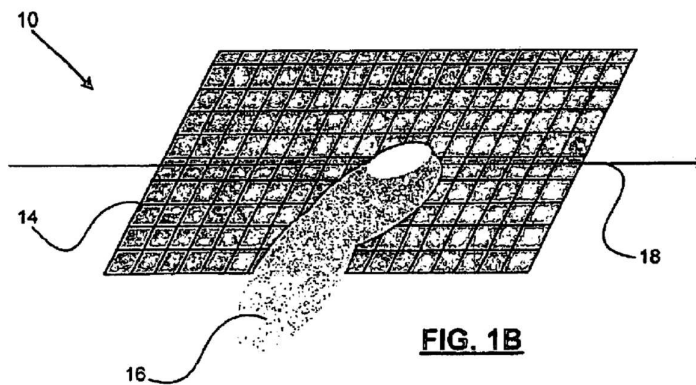


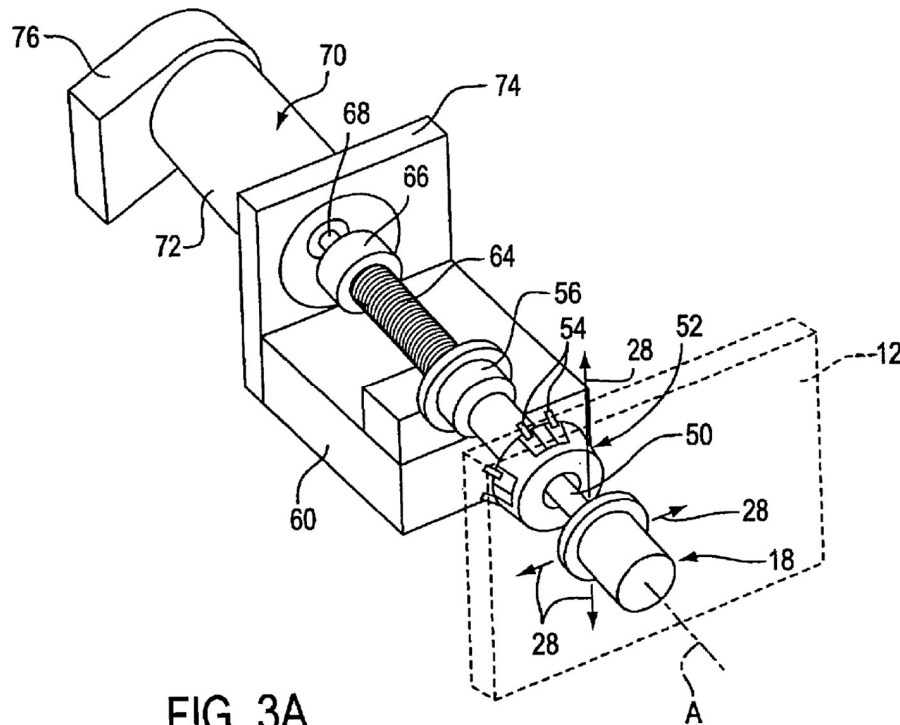
FIG. 1B

Id. at FIGS. 1A-B.

57. According to Ichinose, the user may control a cursor on a display screen by using the touchpad mounted on the steering wheel, which can provide feedback when the user “traverses a boundary of the display region on the display.” *Id.*

B. Overview of Levin (Ex. 1016)

58. Levin (U.S. Patent No. 6,686,911) is directed to a physical, 3-dimensional “control knob on a device that allows a user to control functions of the device.” EX. 1016 at Abstract. This is also illustrated below:



59. As shown above, knob 18 is a physical knob that the user physically moves in the transverse directions depicted by the arrows 28 (*id.* at 13:13-17) or pushed and pulled along axis A (*id.* at 13:5-17). Levin employs this force feedback mechanism on three-dimensional physical devices to provide mechanical detents.

60. While Levin does not employ vibration or oscillating forces exerted through the physical knob for the purpose of mechanical detents, it does employ

vibration forces that “correlate with the magnitude” of, for example, fan rotation speed in a specific use case for fan adjustment controls. Ex. 1016 at 8:11-26. This helps a user to adjust a rotating knob to control the fan speed in a car’s climate system. *Id.* In this case, force feedback is provided to the user to provide mechanical detents, and then another layer of vibrational feedback is superimposed with the force feedback detents. *Id.* A faster vibration is provided for higher fan speed such that a user can feel both the force feedback detents as well as the vibrations signifying the fan speed. In this way, the user can better select fan speed based on tactile feel as the detent indicates each discrete fan setting and the vibration provides a sense of the increasing fan speed. *Id.*

61. More generally, Levin teaches the augmentation of additional forces such as vibrations and jolts to force feedback detents, but does not teach that these vibrations and jolts simulate the force feedback detent itself. As in the fan speed example above, the vibration indicates a fan speed level but the force feedback simulates the detent. *Id.* The same is true of jolts, which is similarly not disclosed to be a detent itself. A jolt is typically a short, sharp shock or movement used to quickly inform the user of a specific event without influencing the movement direction or position of the input device. *Id.* at 11:59-67.

62. Levin teaches combining jolts with an underlying force feedback detent. *Id.* at 11:37-53; 11:62-65, 12:12-18. For example, in the context of a rotary

knob or a slider, the underlying force feedback detents are output at particular rotational or linear positions of the knob or slider to inform the user how much the knob has rotated. *Id.* To enhance the tactile feedback or make the detent's position more noticeable, Levin teaches that a jolt or bump force can be added on top of the underlying force feedback. *Id.* at 7:63-67, 10:11-32, 11:62-65. This combination of force feedback and jolts can make selection easier for the user by providing more pronounced physical feedback when the knob reaches a detent position. *Id.* Consequently, Levin's vibrations and jolts are not taught to simulate the force feedback detents itself, but rather augment the force feedback to provide information.

63. According to Levin, force feedback in the rotary degree of freedom (*id.* at 5:48-50) and in the transverse degree of freedom are exerted on the knob so that the user can experience the sensation of the mechanical detents (*id.* at 7:10-11).

C. Levin is Not Analogous Art

64. I am told by counsel, and I understand, that for purposes of obviousness, a reference must qualify as analogous art. I am also told, and I further understand, that a reference is analogous art if the reference is from the same field of endeavor regardless of the problem to be solved. Otherwise, if the reference is not within the field of the inventor's endeavor, the reference may be analogous art if the reference still is reasonably pertinent to the particular problem with which the inventor is

involved. I note that Petitioner does not make any contention that Levin is analogous art, e.g., that it is from the same field of endeavor as, or reasonably pertinent to, the '042 Patent and the problem it solves. Moreover, I note that Mr. Ward also does not opine that Levin is analogous art. See generally Ex. 1003 (Ward Declaration) at 57-63. In any event, I have been asked to opine whether Levin is analogous art under the two-part inquiry mentioned above. As I explain below, Levin is neither from the same field of endeavor nor is Levin reasonably pertinent to the problem solved by the '042 Patent. Thus, Levin is not analogous art with respect to the '042 Patent.

1. Levin is not from the same field of endeavor

65. The field of endeavor of the '042 Patent relates to virtual controls that are implemented on modern touchpad input devices. Ex. 1001, cl. 1. The patent specification states: “One or more sensors 104 can be configured to detect pressure or movement on a touchpad. As an example, three sensors configured to detect changes in force may be coupled to a touchpad. The force sensors may detect input on the touchpad, such as when a user drags a finger across the surface of the touchpad.” *Id.* at 12:27-32.

66. The Field of Invention section of the '042 Patent further provides: “the present invention relates to methods and systems for providing virtual detents through vibrotactile feedback.” *Id.* at 1:14-17 (Field of the Invention). As a result,

the field of endeavor of the '042 Patent concerns virtual detents provided by virtual controls, which are implemented on touchpads.

67. Levin's field of endeavor, on the other hand, relates to providing force feedback on non-virtual physical knobs and sliders, which are comprised of three-dimensional physical appendages that two-dimensional touchpads do not have. For example, Levin teaches that "[t]he present invention provides a control knob on a device that allows a user to control functions of the device. In one embodiment, the knob is rotatable in a rotary degree of freedom and moveable in at least one transverse direction approximately perpendicular to the axis. An actuator is coupled to the knob to output a force in the rotary degree of freedom about the axis, thus providing force feedback." Ex. 1016 at Abstract. In fact, each of Levin's embodiments describe physical input devices. *See id.* at FIGS. 3A-B (physically rotatable knob), FIGS. 4A-C (same), FIG. 5 (physically slidable slider).

68. Additionally, unlike the '042 Patent, which deals with vibrational feedback, Levin is directed to actual force feedback: "This invention relates generally to knob control devices, and more particularly to control knob devices including force feedback and additional input functionality." *Id.* at 1:21-23 (Background of the Invention). Furthermore, Levin's display is not taught to be a touchpad or touchscreen to facilitate touch input, but rather only a display for visual output, such as displaying images and icons: "FIG. 2 is an example showing images

which can be displayed on display 14 to assist the user in selecting options with [physical] knobs 18 and/or slider control 32.” Ex. 1016 at 7:32-34.

69. Although Levin does not disclose the use of vibrational feedback for detents, Petitioner and its expert argues that a POSITA would have understood that Levin’s detent profile may include vibrations to simulate the detent. Pet., 20. To support this argument, Petitioner solely relies on Levin’s statement that “force detents can be simple jolts.” *Id.* (citing EX1016, 10:16-17); *see also* Pet., 15 (citing EX1016 at 7:65 (“detent force (e.g., jolt)”, i.e., a vibrotactile effect). The Petition somehow equates jolts to vibrations. But a closer review of Levin shows that its disclosures do not support, and in fact plainly contradict, Petitioner’s interpretation of jolt.

70. Levin discloses that jolts are a force feedback effect, and not vibrational effects. Petitioner’s citation to Levin at column 10, lines 16-17 is incomplete and cherry-picked out of context. The complete paragraph is reproduced below:

The **force feedback output on knob 18 can include a variety of different force sensations**. The force feedback can be integrally implemented with the control functions performed by the knob. **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. The position can correspond to a particular radio station frequency or other station (e.g., television station frequency), thus making selection easier for the user. Such detents can be provided for additional functions, such as volume control for sound speakers, fast forward or rewind of a video cassette recorder or computer-displayed movie (such as a DVD movie), scrolling a displayed document or web page, etc. 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 10:11-32 (emphasis added).

71. Thus, according to Levin, jolts are force feedback effects, not vibrational effects. Nowhere in Levin is there any disclosure that jolts are vibrations. Levin describes a jolt as a kind force feedback detent that is “stronger in magnitude than *normal detents*.” *Id.* at 11:62-63 (emphasis added). Levin is only concerned with providing mechanical detents, but not virtual detents. Thus, Levin does not disclose the use of vibration effects for mechanical detents. And as described above in ¶¶ 60-62, Levin only discloses the use of vibration effects to augment detent effects with a superimposed layer of vibration effects. But Levin does not disclose the use of vibration effects to simulate detents. Therefore, the Petition fails to show that Levin discloses vibrotactile effects used to simulate detent effects.

72. Accordingly, Levin's field of endeavor aligns with physical input devices that provide force feedback and not virtual controls that provide virtual detents as in the '042 Patent. A POSITA would thus understand that the '042 Patent and Levin are in different fields of endeavor.

2. Levin is not reasonably pertinent

73. Similarly, I believe the inventors of the '042 Patent would not find Levin's application of force feedback to physical input devices as reasonably pertinent to their problem related to virtualized controls and virtual detents provided by a touchpad. That is, the inventors would recognize that Levin's force feedback requires physical appendages to exert actual forces on actual three-dimensional physical devices. This would not lend itself to the problem of virtualized controls and detents that the inventors were solving. The inventors of the '042 patent would recognize that it was not possible to have a touchpad with a two-dimensional screen produce either Levin's transverse or Levin's rotary force feedback that Levin uses for its mechanical detent. Consequently, Levin is non-analogous art to the '042 Patent.

D. No Motivation to Combine Ichinose and Levin

1. No motivation to modify Ichinose with Levin

74. A POSITA would not be motivated to modify Ichinose's two-dimensional touchpad with Levin's three-dimensional input devices and corresponding force feedback. Upon my review of the Petition and the declaration

of Petitioner’s expert Mr. Ward, I have not seen any reasons articulated for why a POSITA would want to modify a two-dimensional touchscreen with rotary and linear or transverse force feedback, which require three-dimensional appendages (such as knobs or dials). For example, Mr. Ward’s motivation to combine analysis explains why Levin’s vibrotactile feedback is beneficial generally, but it does not address *why* or *how* it would have specifically benefitted Ichinose’s touchpad:

Levin itself would have motivated a POSITA to make the combination because Levin teaches that “force detents” beneficially allow a driver to “feel” a change in a vehicle setting without needing to look at a display “which is particularly useful” when the driver is actively driving a vehicle. Levin at 8:15-19; 10:17-42; see also Levin at 3:31-33 (“force feedback...provide[s] the user with greater control”). Levin’s teaching aligns with Ichinose’s system which provides vibrotactile feedback to a driver so he or she “can be confident that a function or device was properly selected without directing his or her attention away from the road.” Ichinose at 4:31-33. Although Ichinose already provides vibrotactile feedback, it explains that “[o]ther variations...are anticipated.” Ichinose at 4:33-35. A POSITA would have understood Levin’s “force detents” to be such a known variation.

Ex. 1003 at ¶ 117.

75. This does not explain *why* a POSITA would choose to modify Ichinose’s planar touchscreen with Levin’s rotary or transverse forces that require three-dimensional appendages, nor does it explain *how* such a combination is even

possible, as there is no way to impart rotary or transverse forces using a two-dimensional surface such as a touchpad. Moreover, I note Mr. Ward's opinion that Levin's force detents were "known variations" is unsupported by any cited evidence.

76. Moving to the next paragraph, Mr. Ward continues to assume that rotary and linear forces were "known techniques" for planar touchscreens:

Beyond Levin's explicit motivation, implementing Ichinose such that it used Levin's "force detents" would have been the use of a known technique (Levin's "force detents" to simulate mechanical detents) to improve similar devices (vehicle control systems) in the same way (providing user with tactile feedback that minimize distraction). The use of such a known technique would have been obvious.

Ex. 1003 at ¶ 118. Mr. Ward again presumes that Levin's rotary and linear forces were "known techniques" for planar touchscreens without providing any evidence. On the contrary, I am not aware of any techniques for applying such forces (that are typically applied to physical three-dimensional input controls such as knobs or dials) to two-dimensional touchscreens. Thus, a POSITA would not understand that Levin's rotary and linear force feedback were "known techniques" to be applied to touchscreens.

77. Continuing to the next paragraph, Mr. Ward again does not offer any reasons for why a POSITA would have been motivated to modify a two-dimensional touchscreen with rotary and linear transverse forces:

The Ichinose-Levin combination would have maintained Ichinose's system, and would have augmented that system so that it stored Levin's various "force detents" in a memory that Ichinose's "command processor" accesses to generate a feedback signal to Ichinose's feedback device. Ichinose at 4:46-61; FIG. 8; Levin at 14:30-35. Numerous uses of Levin's force detent profiles in Ichinose's system would have occurred readily to a POSITA.

Ex. 1003 at ¶ 119.

78. Here, I see no explanation for why a POSITA would or how a POSITA could modify a two-dimensional touchscreen user interface to instead produce rotary or transverse linear forces that are otherwise typically used for three-dimensional controls. For example, touchpads do not have the ability to exert a rotary force on the user's fingers. On the other hand, I believe a POSITA would not be motivated to implement Levin's mechanical detents on the two-dimensional surface of Ichinose's touchpad because the touchpad does not have any physical appendages through which to exert such force feedback.

79. Accordingly, I have not seen a sufficient motivation to combine set forth by the Petition. A POSITA would not have been motivated to combine the two references.

2. Petitioner improperly applies hindsight bias

80. I am told, and I understand, that hindsight reconstruction of a patent claim, which involves using the claim as a guide or roadmap to explain reasons for

combining references, is improper. Petitioner’s supposed motivation to combine rationale does precisely that: it uses the ’042 Patent and its claims as a blueprint to explain why a POSITA would modify Ichinose’s touchpad with Levin’s force detents. Specifically, the Petition alleges that “POSITAs had reasons to implement Ichinose’s system such that it used Levin’s ‘force detents’ to simulate common mechanical detents like a simple mechanical ‘click.’” Pet. at 13. But this alleged rationale comes from the ’042 Patent itself: “Such an illustrative embodiment may be advantageously employed to simulate mechanical detents through vibrotactile feedback. Such simulated mechanical detents, or virtual detents, may provide useful feedback to a user.” Ex. 1001 at 3:6-9.

81. Petitioner and Mr. Ward do not offer any rationale that does not use the claimed invention as a guide. That is, neither Petitioner nor Mr. Ward cite any passages from references themselves suggesting a need or desire to combine Ichinose’s touchpad with Levin’s rotary or linearly resistive forces. In ¶ 117 of his declaration, Mr. Ward explains that Ichinose contemplates “other variations.” Ex. 1003 at ¶ 117. However, Mr. Ward never explains why one of those variations should include implementing rotary and linear force feedback on a touchpad. Pet. at 14, Ex. 1003 at ¶ 117. Mr. Ward similarly also explains that Levin contemplates physical “force detents,” but does not explain why this suggests applying force detents to a planar touchpad surface or how this could even be accomplished. Mr.

Ward also does not explain why the POSITA's knowledge or skill would have supplied this missing motivation. *See generally* Ex. 1003 at ¶¶ 116-127. Thus, I have not seen a motivation to combine offered by Petitioner and Mr. Ward that is rooted in the references themselves or in the POSITA's knowledge.

3. No reasonable expectation of success

82. I am told, and I also understand, that a valid motivation to combine must be supported by a reasonable expectation of success in making the motivation from the perspective of a POSITA. Neither Petitioner nor Mr. Ward demonstrate a reasonable expectation of success in implementing Levin's linear and rotary detents on Ichinose's two-dimensional touchscreen. For example, Mr. Ward states: "A POSITA reasonably would have expected success in implementing any of the above implementations because Levin's 'force detents' are executed by a processor (Levin, 19:54-20:3), such as Ichinose's command processor, and can be output by 'any of a variety of different types of actuators' (Levin, 10:1-5), which Ichinose's system includes. Ichinose, 4:34-35 ('[a]ny suitable actuator')." Ex. 1003 at ¶ 126.

83. The fact that both systems use processors and actuators cannot by itself demonstrate a POSITA's reasonable expectation of success in making the combination. Importantly, I do not believe that this conclusory paragraph sufficiently explains why or how a POSITA would expect success when implementing Levin's rotary actuators ("DC motor, voice coil, pneumatic or

hydraulic actuator, magnetic particle brake, etc.” Ex. 1016 at 10:2-5) or linear actuators (“linear voice coil actuator 104.” *Id.* at 12:40-41) with Ichinose’s touchpad. To the contrary, a POSITA would not have expected success because a POSITA would understand that rotary and transverse forces cannot be exerted by a touchpad.

84. In the next paragraph, Dr. Ward addresses vibrations or jolts generally, but does not explain how a POSITA would apply rotary or linear forces on a touchpad:

Although Levin discloses outputting “force detents” on a physical knob or slider, a POSITA understood that similar detents, e.g., vibrations or jolts, could be output onto a touchpad, such as Ichinose’s touchpad, using conventional actuators. On this latter point, I note that the ’042 Patent itself provides no details on how its actuator provides virtual detents to a touchpad, underscoring that such implementations details were already well-known. EX1001 at 6:32-45.

Ex. 1003 at ¶ 127.

85. Here, Dr. Ward again fails to explain *how* a POSITA could achieve rotary and linearly resisting forces on a two-dimensional surface of a touchpad. Accordingly, I have not seen a sufficient explanation by Petitioner and its expert that a POSITA would have had a reasonable expectation of success in attempting to combine Ichinose and Levin in the manner proposed. A POSITA would not have had such a reasonable expectation in succeeding to combine the two references.

E. Claim [1B]: The Ichinose-Levin Combination Does Not Teach a “Detent Profile” Comprising Haptic Data Associated with a Virtual Detent”

86. As detailed below, even if Petitioner had shown a sufficient motivation to combine, it has not demonstrated that the alleged combination of Ichinose and Levin discloses a “virtual detent” or a “detent profile.”

1. “Virtual detent”

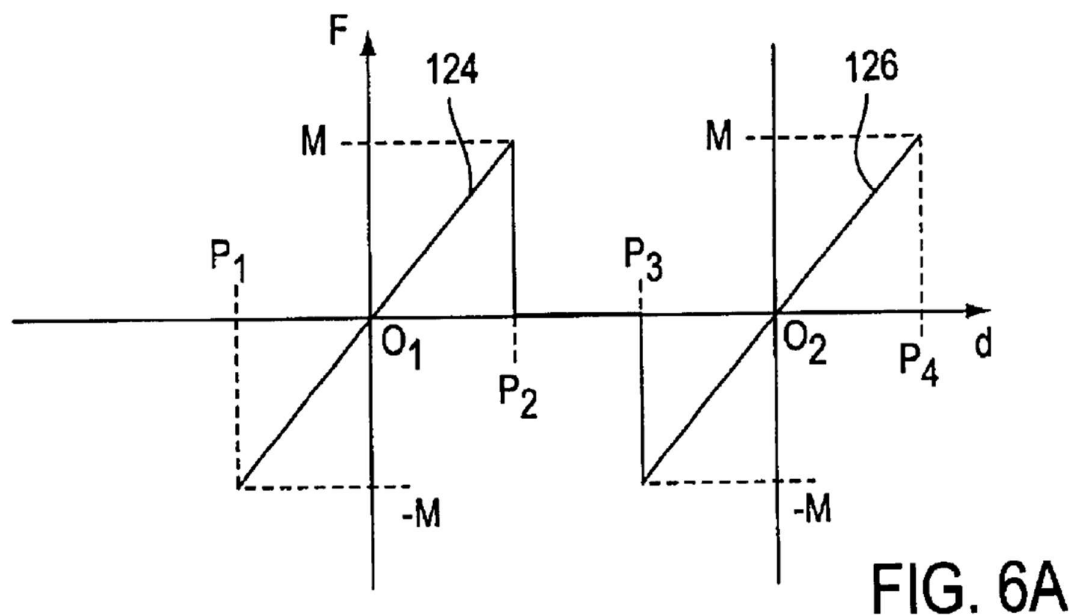
87. As I discussed above, the plain and ordinary meaning of “virtual detent” includes a virtualized or simulated version of a mechanical detent created through *vibrotactile feedback*. Petitioner maps Levin’s force feedback to “virtual detent.” But Levin’s force feedback implementation of its mechanical detents do not include or relate to vibrotactile effect as required to meet this term. Rather, Levin’s force feedback are different types of feedback—both physically and experientially. A force feedback includes a continual or resistive force applied against the user such as when the user presses down on a keyboard button. As the user presses down on the button, the user feels a continual, non-vibrational force pushing against his or her finger. This force is considered a “normal force,” which comprises contact forces that a solid object exerts in a direction perpendicular to the plane of the object on which a user presses or pushes against. This force is not vibrational because the force is not oscillating in direction (e.g., forward and backwards) or magnitude. On the other hand, vibrotactile effects are vibrational because the force or pressure exerted

oscillates in different directions (e.g., back and forth) and has an associated constant or variable magnitude. An example of this is vibrational feedback that a user feels when a user types on a touchscreen mobile phone. I believe a POSITA would understand this clear distinction.

88. Petitioner does not appear to appreciate this distinction and points to Levin's non-vibrational, force feedback as the vibrotactile effect aspect of "virtual detent." Pet. at 19 (citing Ex. 1016 at 14:30-45). But, a continual force is not the same thing as a vibrotactile effect, as I noted above. A POSITA would understand that Levin's force feedback is a normal, continual force, and not a vibrational effect.

89. Mr. Ward's opinions also do not show that Levin discloses a "virtual detent." See Ward at ¶ 135 (citing Levin's explanation for when the "user rotates the knob clockwise away from the detent origin position O1 [movement from left to right], an increasing magnitude of force is output until the knob reaches position P2" (Ex. 1016 at 14:59-64)). Here, Levin's force feedback does not meet the required vibrotactile effect because it is a non-vibrational, continual normal force.

90. In FIG. 6A, for example, Levin's force graph shows a continual, non-vibrational torque applied to the control knob:



Ex. 1016 at FIG. 6A. If Levin's force feedback implementation of its mechanical detents were vibrational, the force curve would not be linear as shown above. The corresponding specification passage likewise describes non-vibrational, continual (i.e., non-oscillating) rotary forces only rather than vibrotactile effects. *See* Ex. 1016 at 14:46-59 (emphasis added). A POSITA understand that Levin's assistive or resistive forces used in its mechanical detents do not include oscillating or vibrational effects. And although the Petition alleges that Levin discloses the possible use of vibration effects to simulate mechanical detents, such argument, is not supported by, and in fact contradicts, the express disclosure of Levin. As I've explained in ¶¶ 68-71 above, Levin only uses force feedback specifically for detents, and does not disclose the use of vibrations for this purpose.

91. Petitioner’s mapping of Ichinose’s vibration (which Ichinose also refers to as “tangible feedback”) also fails to meet “virtual detent,” (Pet. at 18), because Ichinose’s vibrations are never taught to *simulate a mechanical detent*. Instead, Ichinose’s vibration is responsive to cursor interaction with interface elements, not for simulating mechanical detents. Ex. 1015 at 4:7-17 (“the feedback device 80 actuates when the cursor 54 is moved from the mode function 44 to the tuning function 42”). Ichinose teaches vibrations that are responsive to cursor movement rather than for simulating a mechanical detent. In other words, the user does not experience a simulated detent when they move the cursor between different functions.

2. “Detent profile comprising haptic data associated with a virtual detent”

92. Levin does not teach “a detent profile comprising haptic data associated with a virtual detent” as claimed in the ’042 Patent because, as I’ve explained above, Levin does not teach a virtual detent. Levin only teaches a mechanical detent profile associated with force feedback. As demonstrated above, force feedback is not the same type of feedback as vibrotactile feedback, nor is it the same type of sensation as vibrotactile feedback. A force feedback profile cannot meet the claimed “detent profile” for the same reasons force feedback cannot meet vibrotactile feedback: the force feedback profile defines non-vibrational, continual normal forces, whereas the “detent profile” defines oscillating, vibrational effect. Thus, a POSITA would

understand that any profile associated with force feedback (when using a three-dimensional physical and mechanical device) cannot disclose a detent profile comprising haptic data associated with a virtual detent (when using a two-dimensional device such as a touchpad.)

93. Just like with the term “virtual detent” above, Petitioner and Mr. Ward assert that Levin’s force feedback profile meets “detent profile.” It appears to me that Mr. Ward implicitly acknowledges that Levin’s force feedback mechanical detent profile does not disclose vibrational haptic data, opining instead that a POSITA would have understood that it would without explanation:

For the other implementations where a “click” virtual detent is provided each time the up/down virtual button is tapped, POSITAs would have understood that a similar ‘**detent force profile**’ **would** have been used that **included** at least the magnitude of **the vibration** that the actuator would need to output to simulate the ‘click.’

Ex. 1003 at ¶ 138 (emphasis added).

94. Here, Mr. Ward acknowledges that Levin’s force feedback mechanical detent profile is not expressly taught to include vibrational haptic data. Instead, Mr. Ward opines that a POSITA would have understood that such a profile includes vibration data to simulate a click. However, Levin does not teach that its mechanical detent “clicks” should be simulated using vibrations, presented as virtual detent controls on a touchscreen. In Levin, a “click” is only produced by non-vibrational,

force feedback. Given that Levin only teaches non-vibrational, force feedback, a POSITA would have understood that the corresponding force feedback profile producing it **does not** include vibrational haptic data.

95. In the concluding paragraph for this limitation, Mr. Ward again ignores the *vibrotactile* aspect of “detent profile,” stating:

Levin’s “detent force profiles” are thus a “detent profile comprising haptic data associated with a virtual detent,” as claimed, and the “command processor” of Ichinose-Levin receives a “detent force profile” from memory to simulate one of the mechanical detents, i.e., “a virtual detent,” discussed above.

Ex. 1003 at ¶ 139. Petitioner and Mr. Ward do not mention, nor am I aware of, any mechanical detent profiles comprising haptic data associated with *vibrotactile effects* provided by Levin. Therefore, a POSITA would understand Levin does not disclose or render obvious “detent profiles.”

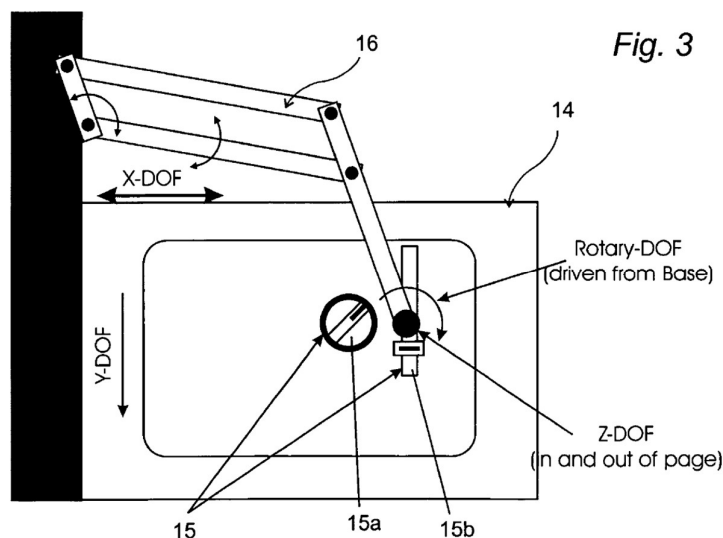
VIII. GROUND 2: WANG + ICHINOSE

A. Overview of Wang (Ex. 1022)

96. Wang (WO 02/102616) is directed to a user interface with virtual controls that appear as an image of a knob or dial on a display screen, and the virtual control is operated with a three-dimensional physical object manipulatable on top of the display surface with the image of the virtual control. Ex. 1022 at Abstract. In other words, Wang teaches a hybrid control mechanism that includes both a

touchscreen with virtualized display of, for example, a control knob that is operated with a physical knob or device. *Id.* at 6:15-18. The virtual controls are displayed on a screen and controlled via a physical appendage (which Wang refers to as “haptic device” 16), that is overlaid on top of the displayed image of the virtual control. *Id.* at 6:18-20. The haptic device 16 is three-dimensional object that is physically rotatable. *Id.* at 6:18-20. This haptic device outputs a force feedback or contact force effect in response to the user manipulating the physical knob overlaid on the virtual control display. *Id.* at 2:15-17.

97. An illustration of Wang’s mechanism is shown below in Figure 3, where the haptic device 16 has 3 degrees of rotary freedom (i.e., X, Y, and Z).



B. Wang is Not Analogous Art

98. Neither Petitioner nor Mr. Ward have demonstrated that Wang is analogous art. As with Levin, the Petition and Mr. Ward’s declaration does not

appear to address whether Wang is analogous art. *See generally* Pet. at 32-35; Ex. 1003 at ¶¶ 205-210, 212-221. Specifically, neither Petitioner or Mr. Ward say that the '042 Patent and Wang are within the same field of endeavor, nor that Wang was reasonably pertinent to the '042 Patent's inventors. Nevertheless, I have been asked by counsel to evaluate whether Wang is analogous art. I find that it is not analogous art because Wang deals with ***non-vibrational, force feedback*** detents for physical objects such as knobs and sliders (similar to Levin) rather than the vibrotactile virtual detents of the '042 Patent. As I will detail below, Wang's non-vibrational, force feedback is not in the same field of endeavor as, nor reasonably pertinent to, the problem solved by the '042 Patent.

1. Wang is not in the same field of endeavor.

99. Based on my review, Wang is not in the same field of endeavor as the '042 Patent. In fact, as with Levin, Wang is directed to providing ***non-vibrational detents*** to physical control devices (e.g., knobs and sliders) and never mentions anything about vibration. *See* EX. 1022 at 5:18-22; FIG. 2 (physically rotatable knob and slider); FIG. 3 (same); FIG. 4 (same).

100. Further, Wang's "virtual device panel 14" is not an input device. For example, the following passages from Wang describe panel 14 as only serving display functionality. *See* Ex. 1022 at 5:14-20, 6:3-5, 8:4-5. Thus, just like Levin, Wang's field of endeavor relates to physical control knobs (e.g., overlaid and

manipulated on top of a display panel surface) and their force feedback and not vibrational feedback on virtualized controls in touchpads. I believe a POSITA would understand that Wang is not in the same field of endeavor as the '042 Patent.

2. Wang is not reasonably pertinent

101. Wang's disclosure is not reasonably pertinent to the inventors' problem. I note that Petitioner and Mr. Ward do not address whether Wang is reasonably pertinent to the problem the inventors of the '042 Patent were attempting to solve. On the other hand, I believe the inventors would not find Wang's physical input device reasonably pertinent to their problem. This is because the unidirectional rotary and transverse force feedback in Wang require 3-dimensional knobs and sliders, e.g., knobs and sliders that are grip-able. A POSITA would recognize that it is not possible to impart unidirectional rotary and linear forces via a touchpad, e.g., in the rotational or linear directions. Therefore, Wang's force feedback would not lend itself to the inventors of the '042 Patent because these forces would not allow the inventors to solve their touchpad-based problem.

C. No Motivation to Combine Wang and Ichinose

1. No motivation to modify Wang with Ichinose

102. A POSITA would not be motivated to combine Wang and Ichinose. Specifically, I have not seen that Petitioner and Mr. Ward provide any reasoning for why a POSITA would want to add Wang's knob and slider to a touchpad. Specifically, the former are three-dimensional objects capable of exerting rotational

and transverse force and grip-able and manipulatable by a user, whereas the latter is a two-dimensional touchpad that can only accept input via a user's finger.

103. I have not seen any evidence or support for Mr. Ward's conclusions as shown in the following excerpts from his declaration: Ex. 1003 at ¶ 212 ("POSITAs would have understood that one obvious implementation of the haptic device would have been a touchpad because that is a known input device that is controlled by a finger."); *see also id.* at ¶ 213. These paragraphs do not address the incompatibility between physical knobs and sliders that can provide rotational and transverse (e.g., the X-DOF and Y-DOF) force feedback and a planar touchpad that cannot provide rotational and transverse force feedback.

104. Even if Petitioner and Mr. Ward could provide a reasonable explanation, this would require the use of the '042 Patent as a roadmap. The simulation or virtualization of otherwise mechanical detents within a touchpad environment so that the touchpad can provide virtual detents is the very innovation captured by the claims of the '042 Patent.

105. I also note that Petitioner and Mr. Ward assert that a simple substitution as a matter of design choice would have motivated the combination. However, even if true, the simple substitution does not arrive at the challenged claims of the '042 Patent. A POSITA would understand that substituting Wang's input device with Ichinose's touchpad would produce a combination having a touchpad and force

feedback profiles, **without any ability to implement such profiles** on the touchpad. The combination would not have physical appendages (such as knobs or sliders) through which to implement Wang's force profiles. Additional modification of the combination would be necessary to arrive at the challenged claim, e.g., enabling virtual detents that do not require physical appendages. More specifically, a POSITA would need to virtualize Wang's physical input device and associated force feedback by simulating the forces as vibrations, which would be the use of hindsight from the '042 patent to reconstruct the invention. Thus, I believe that Petitioner's and Mr. Ward's simple substitution would yield an incomplete and non-working solution and thus would not provide a motivation for a POSITA to combine the two references in that way.

106. For a proper substitution to yield a working solution, a POSITA would have to substitute Wang's detents exerted through physical input devices with virtual detents exerted through touchpads. However, I am not aware of any evidence that touchpads capable of providing virtual detents were off-the-shelf technology available for substitution at the time of the invention.

2. No reasonable expectation of success

107. A POSITA would not have a reasonable expectation of success implementing Wang's force feedback detents on Ichinose's two-dimensional touchpad. Petitioner's and Mr. Ward's rationale suggests that there is a reasonable

expectation of success because touchpads were known and share common components such as actuators. Pet. at 35 (“Moreover, Wang’s haptic device 16 already includes “actuators” to provide haptic feedback (Wang, 7:26-29), thus simplifying the process of incorporating Ichinose’s actuator-driven touchpad.”); Ex. 1003 at ¶ 221. But this does not address the POSITA’s expectation of succeeding in getting a touchpad to exert rotational and transverse forces. To the contrary, POSITAs would not have expected success in doing so as touchpads are not able to impart forces back to the user in rotary or linear directions.

D. Claim [1B]: The Wang-Ichinose Combination Does Not Teach, Suggest, or Disclose a “virtual detent”

108. The Wang-Ichinose combination fails to teach a “virtual detent” because the alleged combination only teaches force feedback, which does not include vibrotactile feedback. As I discuss above, the plain and ordinary meaning of “virtual detent” is a detent that is simulated using vibrotactile effects. It appears that Petitioner and Mr. Ward ignore this meaning of “virtual detent.” They do not demonstrate that Wang or Ichinose discloses simulating mechanical detents using vibrotactile effects. Neither the Wang nor the Ichinose reference teaches using vibrotactile feedback to mimic mechanical detent feedback effects. As with Levin, Petitioner points to Wang’s non-vibratory rotational and linear force feedback as the “virtual detent.” Pet. at 37. But, the rotational and linear forces provided by Wang

cannot meet the vibrotactile effects aspect of “virtual detent” as specified by the ’042 Patent.

109. A POSITA would understand that Wang does not disclose “virtual detent.” Indeed, Wang’s disclosure confirms its actuators are configured to generate non-vibrational forces, i.e., Wang’s haptic device 16 provides contact forces to offer a resistive sensation to the user in the active degrees of freedom that are coincident with the plane of the virtual device panel (e.g., X and Y degrees of freedom). Ex. 1022 at 7:23-26. Such forces do not include vibrational effects.

E. Claim [1C]: The Wang-Ichinose Combination Does Not Teach, Suggest, or Disclose “generating a vibrotactile signal configured to cause an actuator to produce a . . . virtual detent”

110. The Wang-Ichinose combination does not have a vibrotactile signal. The plain and ordinary meaning of “vibrotactile” must include vibration. Petitioner and Mr. Ward point to a signal associated with unidirectional force feedback, but I have not seen any evidence in the Petition, nor am I aware of any evidence that Wang’s unidirectional force feedback is vibrational. Pet. at 39.

111. Wang’s actuators do not produce vibrotactile effects, rather only continual force feedback. Wang’s haptic device 16 provides contact forces to offer a resistive sensation to the user in the active degrees of freedom that are transverse to the plane of the virtual device panel (e.g., X and Y degrees of freedom). Ex. 1022

at 7:23-26. Accordingly, a POSITA would understand that Wang does not teach actuators that are capable of producing vibrotactile effects.

112. Petitioner and Mr. Ward additionally point to signals that produce unidirectional force feedback to satisfy the “vibrotactile signals” claim limitation. Pet. at 39; Ex. 1003 at ¶ 237. More specifically, Petitioner and Mr. Ward point to “electronic signals” that Wang’s processor generates to “control the haptic device” rather than a signal configured to produce a virtual detent. Pet. at 39; Ex. 1003 at ¶ 237. However, I have not seen any evidence offered by the Petition nor am I aware of any evidence that Wang’s “electronic signals” are “vibrotactile signals,” for example, a signal that produces vibration. On the contrary, because Wang’s actuators are configured to generate force feedback, a POSITA would understand that such signals do not produce vibration. A POSITA would understand that Wang’s actuator is not capable of producing vibrotactile effects.

IX. GROUND 3: ROSENBERG I

A. Overview of Rosenberg I (Ex. 1009)

113. Rosenberg I (U.S. Patent No. 6,429,846) is directed to “a haptic feedback planar touch control,” which controls a “cursor in a displayed graphical environment.” The author of Rosenberg I as well as Rosenberg II (discussed below), has no relation to me. An example of the displayed graphical environment described in Rosenberg I can be the display screen of a laptop computer as shown in Figure 1.

See id. at Fig. 1. Rosenberg I discloses that an “actuator is coupled to the touch input device and outputs a force on the touch input device to provide a haptic sensation to the user contacting the touch surface,” (*id.* at 2:14-19), which is employed to “assist and inform the user of interactions and events within a graphical user interface.” *Id.* at 2:56-58. The haptic feedback corresponds to user interactions, e.g., controlled cursor interactions, with GUI (graphical user interface) elements. *Id.* at 2:41-44. The feedback can include sensations such as pulse, vibration, or spatial texture. *Id.*

B. Overview of Rosenberg II (Ex. 1010)

114. Rosenberg II (U.S. Patent No. 5,734,373) is directed to a three-dimensional joystick for interfacing with a computer. Ex. 1010 at Abstract. Rosenberg discloses that “[a]n actuator receives the processor output control signal and provides a force along a degree of freedom to a user-manipulated object, such as a joystick, in accordance with the processor output control signal.” *Id.* at 40-44. The force feedback is described to be associated with user interaction with the interface objects. *Id.* at 11:28-29.

C. Claim [1A]: Rosenberg I Does Not Teach “manipulation of an input device configured to control a plurality of systems”

115. It is my opinion that Rosenberg I does not teach a “manipulation of an input device configured to control a plurality of system.” According to the ’042 Patent, “the plurality of systems” are different systems with different virtual controls, as discussed in the specification. *See, e.g.*, Ex. 1001 at 8:13-15, 7:29-39.

Accordingly, each of the systems in the “plurality of systems” refers to a different type of system. A POSITA would understand that different systems will have different virtual controls, e.g., a first virtual control configured for a first system and a second virtual control configured for a second system. For example, a stereo system will have its own set of virtual controls that are different from a navigation system’s virtual controls.

116. The input device configuration would include any parameters associated with the input device that is also tied to the system being used, which would also include a unique detent profile for the system. Some other possible examples might include the movement gain of the input that maps the physical movement of the mouse, finger, or stylus to the movement of the cursor. Another example would be a configuration parameter specifying the cursor's look. A third example would be any constraints that are imposed around the movement of the cursor when interacting with a particular user interface element (e.g., a rotary knob).

117. The prosecution history of the ‘042 patent confirms this understanding of claim limitation 1A that the input device configuration is specific to a given system. The applicant of the ‘042 patent affirmatively contrasted the prior art system of Huang from the invention of the ‘042 by amending claim 1. The following is from PDF page 213 of prosecution history that says following:

But in order to advance prosecution, Applicants have further amended claim 1 to recite in part “an input device configured to control a plurality of systems . . . receiving a detent profile associated with one of the systems” Applicants respectfully assert that while Huang may disclose an input device configured to control a system, e.g. a brake controller, Huang does not teach an “an input device configured to control a plurality of systems” *See* Huang Col. 4:25-26. Furthermore, because this input device is configured to control only one system, the detent profile that the Office Action asserts is disclosed could be associated with only that one system. Instead, claim 1 recites in part, “receiving a detent profile associated with one of the systems” Such functionality enables the claimed device to receive one detent profile, and that profile may be associated with one system controlled by the input device (e.g. an audio system), and another type of profile may be used when a different system (e.g. a temperature system) is being controlled by the input device. See Paragraph [0074] of Applicants’ specification as filed. Such functionality is not disclosed or suggested by Huang.

EX1002 (Part 1) at 213.

118. This shows that claim 1A of the ’042 patent requires that the configuration of the input device must be “configured to control a plurality of systems.” In other words, the configuration of the input device must be associated with a given system out of a plurality of systems. In other words, to meet the claim limitation 1A, there needs to be the ability to have multiple input device configurations (each including its own detent profile), each corresponding to a

specific system. It is worth noting that claim limitation 1A is related to claim limitation 1B (since “the systems” in claim 1B refers back to “a plurality of systems” recited in claim 1A, thus finding its antecedent basis in claim 1A. Therefore, in claim limitation 1B, there needs to be the ability to have multiple detent profiles corresponding with multiple systems.

119. Rosenberg I does not teach an input device configured to control a plurality of systems via different virtual controls. For example, Rosenberg I does not teach a trackpad that mimics a plurality of different virtual controls, each for a different system. In other words, Rosenberg-I does not teach an input device that has system-specific configurations. Rosenberg I’s trackpad controls just a mouse cursor, a single virtual control with system-agnostic configurations, much less system-specific detent profiles. *See* Ex. 1009 at 11:23-29. Even in the context of a different application, the user interacts with the different applications through the same generic or system-agnostic virtual control, the cursor. Ex. 1009 at 13:41-45 (“A software designer may want to allow a user to be able to select options or a software function by positioning a cursor over an area on the screen using the touchpad, but not require pressing a physical button or tapping the touchpad to actually select the option.”). There is no teaching or suggestion in Rosenberg I that the trackpad should control anything other than a mouse cursor, and the mouse cursor of Rosenberg I

would not be a system-specific configuration that could be customized to a system among a plurality of systems.

120. Rosenberg I teaches that all applications are controlled via a mouse, which is a single virtual control, and not a plurality. *Id.* at 7:8-20. Therefore, in my opinion, Rosenberg I's trackpad only controls a single "system" and not a plurality.

D. Claim [1B]: Rosenberg Does Not Disclose "receiving a detent profile associated with one of the systems"

121. Neither Rosenberg I nor Rosenberg II (which Petitioner alleges Rosenberg I incorporates by reference) discloses "receiving a detent profile associated with one of the systems" because those profiles are associated with user interaction with UI (user interface) elements for a single system. Claim 1 requires the detent profile to be associated with one of the systems. Petitioner points to different applications as the claimed plurality of systems. Pet. at 52. Rosenberg I expressly states that the force's are associated with user interface interactions. Ex. 1009 at 11:23-29 ("The user moves a finger or other object within region 70 to correspondingly move the cursor 20. Forces are preferably associated with the interactions of the cursor with displayed graphical objects."). A POSITA would understand that Rosenberg I does not disclose a detent profile associated with one of the applications, i.e., an application-specific detent profile. Rosenberg I contemplates one static detent profile that governs all interactions and is not customized for any one of a plurality of systems. In other words, a POSITA would

understand that Rosenberg I does not configure its haptic feedback specific to the different applications associated with a given system, that Claim 1 of the '042 requires.

122. Rosenberg I also fails to disclose **force profiles** associated with one of the applications. Petitioner's and Mr. Ward's citations confirm that Rosenberg I teaches profiles **associated with events**, not one of a plurality of systems. Ex. 1009 at 11:28-29; 12:5-6; 12:27-49; 13:18-20; 15:19-23. Each of these citations to Rosenberg I state that forces are associated with user interaction with graphical objects, not with one of a plurality of systems.

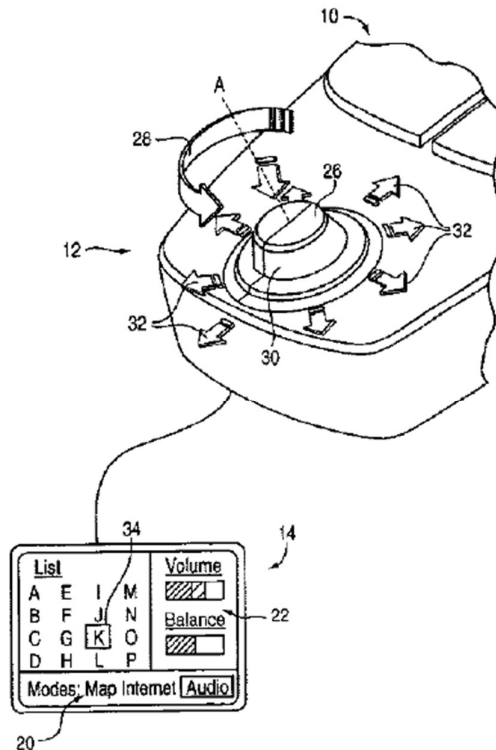
123. Similarly, Rosenberg II's profiles are also associated with events and not systems. Ex. 1010 at 23:16-26. A POSITA would understand that Rosenberg II's haptic feedback is associated with interactions with objects and not one of the systems.

X. GROUND 4: ROSENBERG I + GOLDENBERG

A. Overview of Goldenberg (Ex. 1007)

124. Goldenberg (U.S. Patent No. 6,636,197) is directed to a physical knob such as a thumb stick that a user can grip, and that is rotatable and manipulable in the transverse directions, as shown below in Figure 1. Ex. 1007 at Abstract, Fig. 1. The knob provides haptic feedback sensations. In Goldenberg, forces are associated with user interaction (i.e., user-controlled cursor interactions) with menu items on a

display. *Id.* at 2:40-42. Examples of the force feedback are those such as “hill force effect and “barrier force effect.” *Id.* at Abstract.



B. Goldenberg is Not Analogous Art

125. Goldenberg is not analogous art. As in Grounds 1 and 2 discussed above, Petitioner and Mr. Ward do address whether Goldenberg is analogous art. *See generally* Pet. at 67-70; Ex. 1003 at ¶¶ 379-89. In any event, I have been asked to opine whether Goldenberg is analogous art to the '042 Patent. As I explain below, the '042 Patent and Goldenberg are not from the same field of endeavor, nor is Goldenberg reasonably pertinent to the problem the inventors of the '042 faced.

126. Like Levin and Wang, Goldenberg teaches a three-dimensional object and not a virtual control device. *See, e.g.*, Ex. 1007 at 2:6-10; 6:21-25. Goldenberg is thus directed to a physical input device, as in Levin and Wang. As with Levin and Wang, Goldenberg's field of endeavor is different than the '042 Patent's for this very reason. A POSITA would similarly understand that Goldenberg is not in the same field of endeavor as the '042 Patent.

127. Likewise, the inventors of the '042 Patent would also not find Goldenberg's physical knob reasonably pertinent to their problem. This is because Goldenberg's feedback is specific to physical input devices, such as a knob that a user can grip, and would not be applicable to planar touchpads. Therefore, I believe that Goldenberg's feedback on physical knobs would not lend itself to the inventors of the '042 Patent because Goldenberg's forces would not help the inventors with their problem relating to virtual detents. Accordingly, Goldenberg would not be reasonably pertinent to the problem solved by the '042 Patent.

C. No Motivation to Combine

1. No motivation to modify Rosenberg I with Goldenberg

128. A POSITA would not be motivated to combine Rosenberg I and Goldenberg. Rosenberg I discloses a touchpad input device, and Goldenberg teaches a physical knob thumb stick. I have not seen any reasoning set forth in the Petition for why a POSITA would want to add Goldenberg's thumb stick to Rosenberg I's

touchpad. More specifically, I have not seen any reasons set forth in the Petition, nor am I aware of any reasons why Goldenberg's thumb stick and resistive and assistive forces were applicable to a touchpad. A POSITA would not be motivated to combine these two references because they would recognize that a two-dimensional planar touchpad is not capable of providing Goldenberg's forces.

2. No reasonable expectation of success

129. A POSITA would not have a reasonable expectation of success in combining Rosenberg I with Goldenberg. I understand that Petitioner and Mr. Ward do not offer any explanation, nor am I aware of any, as to how a POSITA would approach adding Goldenberg's resistive and assistive forces (which require 3-dimensional shapes such as a knob thumb stick that a user can grip) on Rosenberg I's touchpad. Petitioner and Mr. Ward state that a POSITA should expect success simply because both systems use computers, processors, and actuators. *See* Pet. at 69; *see also* Ex. 1003 at ¶ 388. The mere fact that both Rosenberg I and Goldenberg both employ processors and actuators does not suggest that a POSITA would have had a reasonable expectation of success. To the contrary, a POSITA would not have expected success in modifying Rosenberg I's two-dimensional touchpad to exert Goldenberg's force effects.

D. Claim [1A]: The Rosenberg-Goldenberg Combination Does Not Disclose a “manipulation of an input device configured to control a plurality of systems”

130. It is my opinion that the Rosenberg-Goldenberg combination does not disclose or render obvious “manipulation of an input device configured to control a plurality of systems.” As I discuss above for Ground 3, Rosenberg I does not disclose “manipulation of an input device configured to control a plurality of systems.” And Goldenberg does not disclose that limitation either. For similar reasons, the Rosenberg I-Goldberg combination does not render Claim 1A obvious.

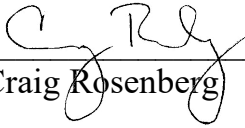
E. Claim [1B]: The Rosenberg-Goldenberg Combination Does Not Render Obvious “a detent profile associated with one of the systems”

131. The Rosenberg-Goldenberg combination does not disclose “a detent profile associated with one of the systems.” Specifically, Goldenberg’s profiles are associated with user interaction with objects and not one of the plurality of systems. For example, Goldenberg does not teach that profiles should be associated with those specific applications, only specific interactions within those applications. I understand that Petitioner and Mr. Ward argue that: “For example, when adjusting the volume in a videogame or scrolling through a menu list presented on an Internet browser, Rosenberg-I’s processor would receive from memory the Goldenberg ‘force detent profile’ associated with that *function*.” Pet. at 70; Ex. 1003 at ¶ 391. Thus, Petitioner and Mr. Ward associate Goldenberg’s profile with the menu

scrolling *function*, not one of the alleged *systems*, e.g., videogame or Internet browser. *Id.* That is because Goldenberg does not teach that its profiles are capable of being associated with the alleged systems. Instead, these alleged profiles would produce the same behavior irrespective of which application is being executed. Thus, a POSITA would understand that Goldenberg does not disclose this limitation “a detent profile associated with one of the systems.” Accordingly, I do not believe that the combination of Rosenberg I and Goldenberg render Claim 1 of the ’042 Patent obvious.

I declare under penalty of perjury that the foregoing is true and correct. I acknowledge that willful false statements and the like are punishable by fine and/or imprisonment, that all statements made of my own knowledge are true, and that all statements made on information and belief are believed to be true.

Executed April 29, 2024, in Shoreline, Washington.

By: 
Craig Rosenberg