

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 2007

**DECLARATION OF ROBERT AKL, D.SC.
IN SUPPORT OF IMMERSION CORPORATION'S
PATENT OWNER RESPONSE**

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I, Dr. Robert Akl, 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 at my standard rate of \$995 per hour (plus reimbursement for expenses) in connection with my preparation of this declaration, as well as for each hour spent providing deposition testimony. My fee is not contingent on my performance, the outcome of this case, any issues involved in or related to 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 haptic feedback effects, user interface design, user interaction design, human-computer interaction, software engineering from 1990 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 2009.

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 two Bachelor of Science degrees in Electrical Engineering and Computer Science *summa cum laude* with a grade point average of 4.0/4.0 and a ranking of first in my undergraduate class from Washington University in St. Louis in 1994. In 1996, I earned my Master of Science degree in Electrical Engineering from Washington University in St. Louis with a grade point average of 4.0/4.0. I

earned my Doctor of Science in Electrical Engineering from Washington University in St. Louis in 2000, again with a grade point average of 4.0/4.0, with my dissertation being on “Cell Design to Maximize Capacity in Cellular Code Division Multiple Access (CDMA) Networks.”

8. While a graduate student, from 1997 through 1999, I worked at MinMax Corporation in St. Louis, where I designed software packages that provided tools to flexibly allocate capacity in a CDMA communications network and maximize the number of subscribers. I also validated the hardware architecture for an Asynchronous Transfer Mode (ATM) switch capable of channel group switching, as well as performed logical and timing simulations, and developed the hardware architecture for the ATM switch. I also worked with Teleware Corporation in Seoul, South Korea, where I designed and developed algorithms that were commercially deployed in a software package suite for analyzing the capacity in a CDMA network implementing the IS-95 standard to maximize the number of subscribers.

9. After obtaining my Doctor of Science degree, I worked as a Senior Systems Engineer at Comspace Corporation from October of 2000 to December of 2001. At Comspace, I designed and developed advanced data coding and modulation methods for improving the reliability and increasing the available data rates for cellular communications. I coded and simulated different encoding

schemes (including Turbo coding, Viterbi decoding, trellis coded modulation, and Reed-Muller codes) and modulation techniques using amplitude and phase characteristics and multi-level star constellations. This work further entailed the optimization of soft decision parameters and interleavers for additive white Gaussian and Rayleigh faded channels. In addition, I also extended the control and trunking of Logic Trunked Radio (LTR) to include one-to-one and one-to-many voice and data messaging.

10. In January of 2002, I joined the faculty of the University of New Orleans in Louisiana as an Assistant Professor in the Department of Electrical Engineering. While in this position, I designed and taught two new courses called “Computer Systems Design I and II.” I also developed a Computer Engineering Curriculum with a strong hardware-design emphasis, formed a wireless research group, and advised graduate and undergraduate students.

11. In September of 2002, I received an appointment as an Assistant Professor in the Department of Computer Science and Engineering at the University of North Texas (UNT), in Denton, Texas. In May of 2008, I earned tenure and was promoted to the rank of Associate Professor. As a faculty member, I have taught courses and directed research in networking and telecommunications, including 2G, 3G, 4G, 5G, CDMA/WCDMA, GPS, GSM, UMTS, LTE, ad-hoc networks, antenna design and beamforming, Bluetooth, call admission control, channel

coding, channel estimation, communication interfaces and standards, compression, computer architecture, MIMO systems, multi-cell network optimization, network security, packet-networks, telephony, VoIP, Wi-Fi (802.11), 802.15.4, Zigbee, wireless communication, and wireless sensors. Between January of 2015 and August of 2022, I was appointed to Associate Chair of Graduate Studies in the Department of Computer Science and Engineering. In May of 2023, I was promoted to the rank of Professor.

12. I am also the director of the Wireless Sensor Lab (“WiSL”) at UNT. I am a member of the Center for Information and Cyber Security (CICS). It is the only program in the U.S. to be federally certified by the National Security Agency as a Center of Academic Excellence in Information Assurance Education and Research *and* Cyber Defense Research. I was also a member of the NSF Net-Centric & Cloud Software & Systems: Industry-University Cooperative Research Center (I/UCRC). Several of my research projects are funded by industry and the National Science Foundation and published in *IEEE* conference proceedings and journals.

13. Between 2011 and 2013, I was director of the Bio-Com Project that was funded by Raytheon. The project evaluated the feasibility study using Surface Electromyography (EMG) and bend resistive sensors, that are attached to each of the five fingers of the hand, for hand gesture recognition. This approach is

sometimes known as a “data glove.” A prototype was developed and demonstrated at Raytheon, to help soldiers in close-combat situations communicate with hand gestures and hand signals that would be recognized and transmitted to other soldiers’ Head Up Display (HUD) without breaking radio silence. This work also resulted in a published paper describing the prototype and analysis “Evaluating the Feasibility of EMG and Bend Sensors for Classifying Hand Gestures” and a masters’ thesis “An Accelerometer-Based Gesture Recognition System For A Tactical Communications Application.”

14. In addition to advising and mentoring students at UNT, I was asked to join the faculty of the University of Arkansas in Little Rock as an Adjunct Assistant Professor from 2004 to 2008 in order to supervise the research of two Ph.D. graduate students who were doing research in wireless communications. At UNT, I have advised and supervised more than 250 undergraduate and graduate students, several of whom received a master’s or doctorate degree under my guidance.

15. Further, between 2005 and 2017, I have received over a million dollars in funding from the State of Texas, Texas Higher Education Coordination Board, the National Science Foundation, and industry to design and conduct robotics, video, and mobile gaming (e.g., Xbox, PC, mobile device) programming summer camps for middle and high school students at UNT. By using video and mobile gaming as the backdrop, participants have learned coding and programming

principles and developed an understanding of the role of physics and mathematics in video game design. I have used competitive gaming projects in programming courses as a way to motivate and retain students in computer science. This work also resulted in two published papers “Motivating and Retaining CS2 Students with a Competitive Game Programming Project” and “Intra-Class Competitive Assignments in CS2: A One-Year Study.”

16. In addition to teaching and studying gaming, I am also an avid fan of video games. I have been playing video games for over 30 years. I have had different generations of consoles, including the PlayStation, the Xbox, and Nintendo. My first portable video game console was by Nintendo. I’ve played video games on PCs and handheld devices, and more recently, on my iPad and cell phone. I enjoy playing video games and it is the reason I sought degrees in computer science and electrical engineering.

17. In addition to my academic work, I have remained active in the communication industry through my consulting work. In 2002, I consulted for Input/Output Inc. and designed and implemented algorithms for optimizing the frequency selection process used by sonar for scanning the bottom of the ocean. In 2004, I worked with Allegiant Integrated Solutions in Ft. Worth, Texas to design and develop an integrated set of tools for fast deployment of wireless networks, using the 802.11 standard. Among other features, these tools optimize the

placement of Access Points and determine their respective channel allocations to minimize interference and maximize capacity. I also assisted the Collin County Sheriff's Office (Texas) in a double homicide investigation, analyzing cellular record data to determine user location.

18. I have authored and co-authored over 100 journal publications, conference proceedings, technical papers, book chapters, and technical presentations in a broad array of communications-related technologies, including networking and wireless communication. I have also developed and taught over 100 courses related to communications and computer systems, including several courses on signals and systems, 4G/LTE and 5G/NR, OFDM, VoIP, Wi-Fi (802.11), 802.15.4, Zigbee, wireless communication, antenna design and beamforming, communications systems, communication interfaces and standards, channel estimation, location management, sensor networks, source coding and compression, network security, computer systems design, game and app design, and computer architecture. These courses have included introductory courses on communication networks and signals and systems, as well as more advanced courses on wireless communications. A complete list of my publications and the courses I have developed and/or taught is also contained in my *curriculum vitae*.

19. My professional affiliations include services in various professional organizations and serving as a reviewer for a number of technical publications,

journals, and conferences. I have also received a number of awards and recognitions, including the IEEE Professionalism Award (2008), UNT College of Engineering Outstanding Teacher Award (2008), and Tech Titan of the Future (2010) among others, which are listed in my *curriculum vitae*.

20. I have also served as an expert in certain legal proceedings. A list of cases in which I have testified at trial, hearing, or by deposition (including those during the past four years) is provided in my curriculum vitae. Over the years, I have been retained by both patent owners and petitioners, as well as plaintiffs and defendants.

II. BASES OF OPINIONS

21. In the course of performing my analysis and forming my opinions, I have reviewed the Petition and its Exhibits 1001–1084 including, but not limited to, the materials listed below:

- IPR Petition, IPR2024-00478
- Institution Decision, 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 6,819,990 (“Ichinose”) (Ex. 1015)
- US Patent 6,686,911 (“Levin”) (Ex. 1016)

- WO 02/102616 (“Wang”) (Ex. 1022)
- US Patent 6,429,846 (“Rosenberg-I”) (Ex.1009)
- US Patent 5,734,373 (“Rosenberg-II”) (Ex. 1010)
- US Patent 6,636,197 (“Goldenberg”) (Ex. 1007)
- US 2006/0119573 (“Grant”) (Ex. 2009)
- US 2007/0222765 (“Nyyssonen”) (Ex. 2010)
- Joint Claim Construction Statement in WDWA (Ex. 2003)
- Declaration of Craig Rosenberg, Ph.D. (EX2001).

I have reviewed and agree with the opinions expressed in the Declaration of Craig Rosenberg, Ph.D., and have incorporated relevant parts of that declaration into my present Declaration. When citing from these references, all emphasis is added unless otherwise noted. My opinions are also based upon my education, training, research, knowledge, and personal and professional experience.

III. SUMMARY OF OPINIONS

22. The Petition raises four grounds of invalidity. Ground 1 of the Petition alleges that claims 1-19 are rendered obvious by Ichinose (Ex. 1015) and Levin (Ex. 1016). Ground 2 alleges that claims 1-19 are rendered obvious by Wang (Ex. 1022) and Ichinose (Ex. 1015). Ground 3 alleges that claims 1-19 are anticipated by Rosenberg-I (Ex. 1009). Ground 4 alleges that claims 19 are rendered obvious by Rosenberg-I (Ex. 1009) and Goldenberg (Ex. 1007).

23. 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 renders claims 1-19 of the '042 Patent anticipated or obvious.

IV. OVERVIEW OF THE '042 PATENT

24. The '042 Patent describes techniques for simulating the experience of physical input devices such as knobs, sliders, and levers on input devices such as touchpads. EX1001, 2:59-63. Physical input devices typically have mechanical detents such as click-stops that gave users feedback on the extent of their manipulation. *Id.*, 1:22-29. The inventors of the '042 Patent recognized that modern electronic input devices 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.*, 1:33-37.

25. To solve this problem, the '042 Patent introduced the concept of the virtual detent. *Id.*, 1:15-17. A virtual detent uses vibrotactile feedback to mimic a mechanic detent. *Id.* Understanding that mechanical detents come in a variety of forms corresponding to different physical input devices (*e.g.*, different systems), the inventors also introduced the concept of the “detent profile,” which defines “which of a plurality of simulated mechanical detents to generate.” *Id.*, 55-56. The '042 Patent discloses example detent profiles that define rotary detents (*id.*, 13:47-53),

hard stop detents (*id.*, 13:54-62), damper detent profiles (*id.*, 14:27-34), among others.

V. EXEMPLARY CLAIM OF THE '042 PATENT

26. 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 touch-pad;
- [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.

VI. APPLICABLE LEGAL STANDARDS

A. Ordinary Skill in the Art

27. 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.

28. 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 POSA that I set forth below.

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

POSAs would have 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 EX1003, ¶¶ 37-43).

30. In my opinion, the definition of a POSA should be defined as:

A person of ordinary skill in the art would have possessed 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, including implementation of computer-based systems and

software for providing haptic feedback effects to a user. A person could also have qualified as an ordinarily skilled artisan with more formal education and less practical or industry experience, or vice versa.

31. Consistent with either definition, I was at the time of the invention, and currently am, a POSA 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

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

33. I understand that, for the purposes of this Patent Owner’s Response, Patent Owner proposes the following claim term constructions:

Claim Term	Patent Owner’s Proposed Construction
“input device configured to control a plurality of systems” (Claim 1)	“input device configured to control a plurality of systems, where each system to be manipulated provides context for virtual detents”

34. I understand that the asserted Rosenberg reference in Grounds 3 and 4 do not disclose this claim limitation, specifically “a plurality of systems” under its plain and ordinary meaning, because Rosenberg only discloses a single system.

However, because Petitioner attempts to overcome this deficiency by assigning a special construction that is improperly based on an erroneous interpretation of Patent Owner’s infringement contentions in the co-pending district court case (Pet., 52), Patent Owner offers this construction in light of the intrinsic evidence in order to clarify the proper meaning of this claim term and distinguish it from Petitioner’s erroneous construction.

1. “plurality of systems to be manipulated”

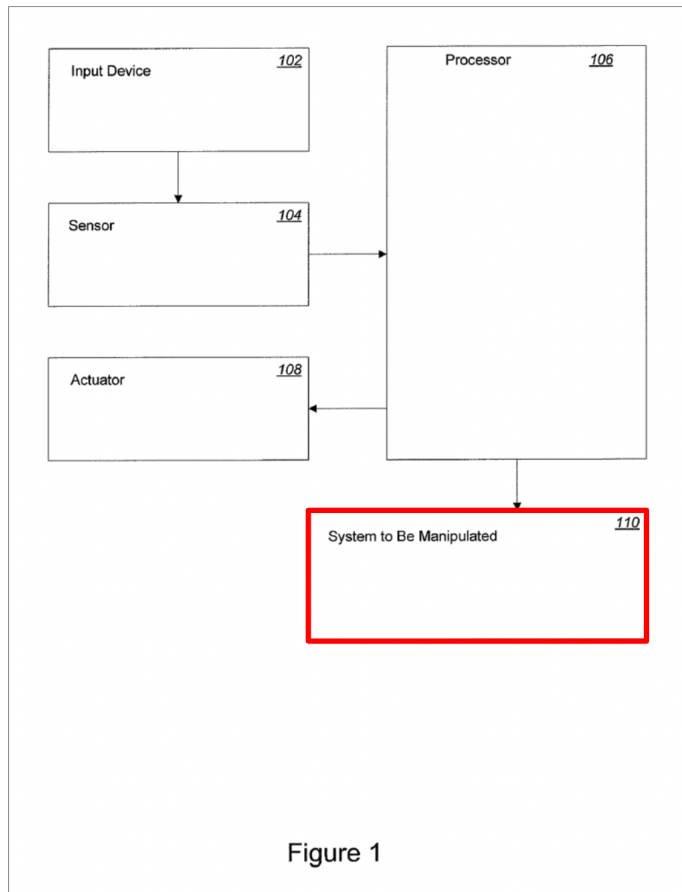
35. A POSA would understand that “a plurality of systems” means a plurality of systems to be manipulated as opposed to the containing system, *e.g.*, the host computer system. This understanding is based on the claim language “manipulation of an input device configured to control a plurality of systems”—in other words, the plurality of systems are systems to be manipulated. This understanding is also confirmed by Claim 15, which expressly recites the containing system—“A system comprising” “a plurality of subsystems” to be manipulated, where the containing system comprises “an input device configured to control one of a plurality of systems”. EX1001, cl. 15.

36. The ’042 Patent specification also confirms that the claimed “plurality of systems” are subsystems, which is distinct from and in addition to the containing system. For example, the specification repeatedly sets out a containing computer system with a processor and input device and distinct systems to be manipulated:

The processor 106 may be in **communication with a system to be manipulated** 110 or controlled. In some embodiments, the processor 106 may be configured to generate a system signal. The system signal may be provided to the system to be manipulated 110.

Ex. 1001, 4:61-65.

37. Figures 1 and 2 of the patent specification also illustrates subsystems to be manipulated in addition to the containing system as shown below, where Figure 1 shows a first containing system comprising a “system to be manipulated” (*i.e.*, a subsystem), and Figure 2 shows a second containing system with a plurality of subsystems to be manipulated.



Ex. 1001, FIG. 1.

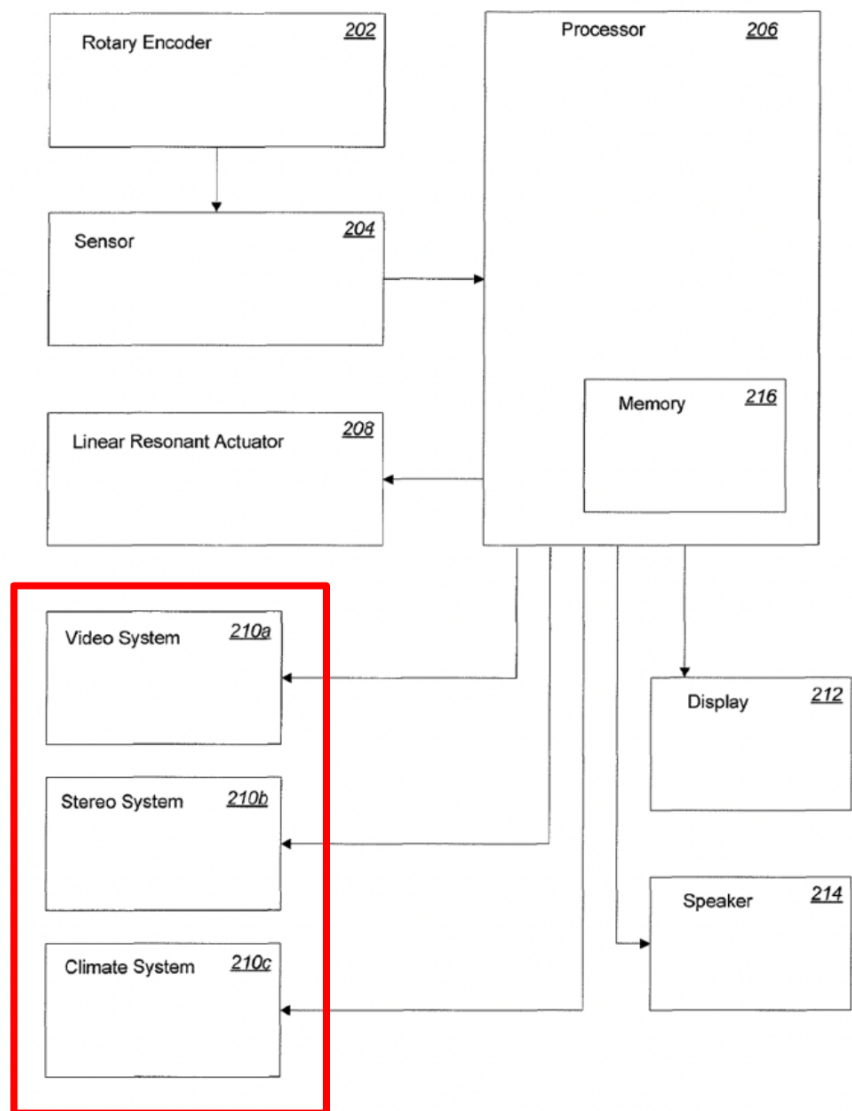


Figure 2

Ex. 1001, FIG. 2.

2. “each of the plurality of systems provide context for virtual detents”

38. In addition to the video, stereo, and climate systems shown above in Figure 2, which I understand as systems to be manipulated, the '042 Patent also contemplates that applications can be systems to be manipulated. The '042 Patent describes software applications can be systems to be manipulated when those **applications contain code that provide context for virtual detents:**

the processor 106 may process software code running as an application on the processor and utilize the input signal in the context of the software code to generate signals configured to cause virtual detents.

Ex. 1001, 4:30-34.

39. Therefore, in accordance with the '042 Patent specification, I understand software applications as systems to be manipulated similar to the video, stereo, and climate systems subsystems. In other words, I understand the claimed “plurality of systems” as systems to be manipulated distinct from the containing computer system. “Input device configured to control a plurality of systems” means “input device configured to control a plurality of systems, where each system to be manipulated provides context for virtual detents.” The claimed “plurality of systems” comprise subsystems “to be manipulated” that each provide context for virtual detents. For example, an air conditioner subsystem provides a different

context for virtual detents than the context for virtual detents provided by a stereo subsystem.

40. As I discussed above, claim 15 recites “a system comprising” “an input device configured to control one of a plurality of systems.” Thus, a preamble system (or containing computer system) is comprised of a plurality of subsystems, and the plurality of subsystems does not claim antecedent basis to the preamble system because those systems are distinct and separate from the computer system.

41. The specification further illustrates this architecture of a “first system” depicted in FIG. 1 with a subsystem or “System to Be Manipulated 110” as shown below:

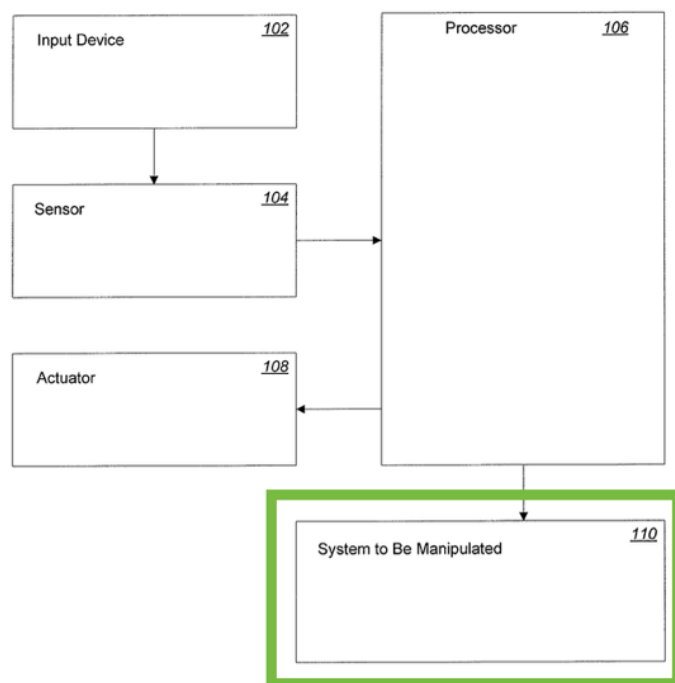


Figure 1

42. The specification further illustrates the claimed “plurality of systems,” where there are a plurality of “systems to be manipulated” *e.g.*, video, stereo, and climate subsystems as shown below:

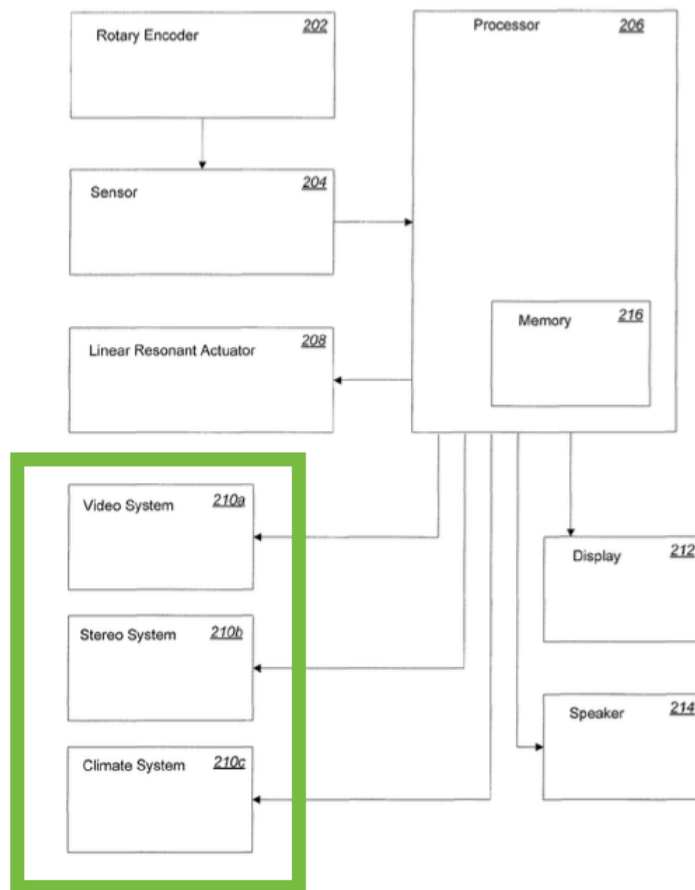


Figure 2

Ex. 1001, FIG. 2 (annotated). For example, the processor 206 of FIG. 2’s “second system” can be in communication with one or a plurality of separate “systems to be controlled.” *Id.*, 8:13-15, 8:29-37. The patent specification also confirms that the controlled sub-system provides the context for virtual detents:

The processor 206 can be configured to determine a specific detent signal to generate. The detent signal may be based at least in part on the system which is actively being controlled. For example, if the video system 210a is being

controlled, the processor 206 may generate one type of detent signal. Such as a click effect. Alternatively, if the stereo system 210b is being controlled, the processor 206 may generate a second type of detent signal. Such as a hard stop virtual detent.

Ex. 1001, 8:38-46.

43. In addition to the separate video, stereo, and climate subsystems, as I mentioned above, the '042 Patent also discloses that sub-systems may include applications running on the containing computer system. In these embodiments, the specification is clear that, just like for external sub-systems, application sub-systems should also provide the context for providing virtual detents when controlling the sub-system:

the processor 106 may process software code running as an application on the processor and utilize the input signal in the context of the software code to generate signals configured to cause virtual detents.

Ex. 1001, 4:30-34.

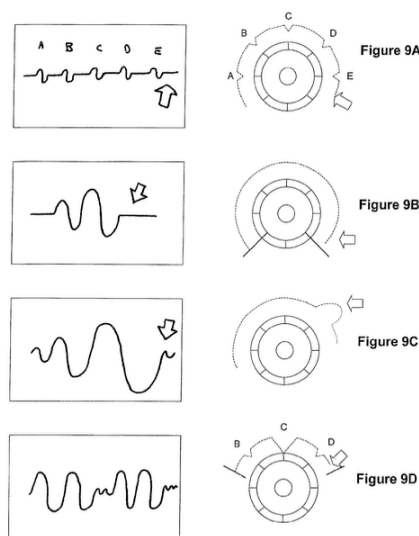
44. The specification teaches that in order to provide these contexts, detent profiles are stored in memory, which the processor selectively accesses once it determines which sub-system is being manipulated:

As shown in FIG. 2, the processor 206 comprises memory 216. The memory 216 can be a high-speed cache memory, and configured to store vibrotactile

feedback effects, such as virtual detent profiles. In one embodiment, the **processor can access an effect profile stored in memory 216** after the processor 206 has determined what type of vibrotactile effect to generate.

Id., 8:47-53.

45. Figure 9 of the '042 Patent illustrates examples of such virtual detent profiles:



46. Therefore, the fact that the patent specification teaches that the processor in the containing computer system accesses a specific profile from memory confirms that sub-systems associated with those profiles provide the context for virtual detents rather than the containing system providing such context.

47. I have also reviewed the prosecution history of the '042 Patent and found that it also supports my understanding. In relevant parts of the prosecution history, both Applicant of the '042 Patent and the Patent Board understood that

controlled sub-systems correspond to respective detent profiles, thereby supporting Patent Owner’s proposed construction. For example, the Board characterized the invention as a detent profile “corresponding to *one of the systems*”:

Appellant’s Invention

The invention at issue on appeal concerns vibrotactile feedback systems, computer-readable media, and methods for generating a vibrotactile signal. The method includes the steps of receiving an input signal responsive to manipulation of an input device (touch pad) configured to control various systems, receiving a detent profile comprising haptic data associated with a virtual detent and corresponding to one of the systems, and generating a vibrotactile signal. (Spec. ¶¶ 2, 5–7; Abstract.)

Ex. 1002, 588 (highlighting added).

48. I understand that the Applicant distinguished the invention over the prior art by arguing that different sub-systems provide the context for detent profiles:

disclosed could be associated with only that one system. Instead, claim 1 recites in part,

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US2000 11969806.1

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Attorney Docket IMM253 (51851/339922)

“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.

Ex. 1002, 214 (highlighting added).

49. The Patent Board agreed with Applicant that the general disclosure of vibrotactile feedback and a virtual knob, did not sufficiently describe detent profiles for a *particular* system/device:

However, we agree with Appellant that merely providing a general disclosure of vibrotactile feedback (Grant and Nyyssonen) and a virtual knob (Nyyssonen) does not sufficiently describe detent profiles for a particular system/device. As explained by Appellant, a detent provides a

Ex. 1002, 590 (highlighting added). Therefore, I understand the term “input device configured to control a plurality of systems” means “input device configured to

control a plurality of systems, where each system to be manipulated provides context for virtual detents.”

3. Other Claim Terms with Plain and Ordinary Meaning

50. I also understand that, except for the term listed in the table above, Patent Owner submits that all other 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 (Ex. 2003).

51. For example, under the ordinary meaning of this term in the context of the patent specification, a POSA would understand the differences between the meanings of a “[mechanical] detent” and a “virtual detent.” A “detent” is a physical feature that uses force feedback to “mechanically resist or arrest” movement. In contrast, a “virtual detent” includes a simulated mechanical detent created through vibrotactile feedback. Thus, I understand that the claim term “a virtual detent” uses haptic (touch-based) feedback to simulate the sensation of a mechanical detent without the need for actual mechanical components.

52. The specification and file history confirm this fundamental difference between a detent and a “virtual detent.” EX1001 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; EX1002 (02/01/2016 Patent Board Decision), 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).”).

53. Moreover, in the co-pending district court litigation, Petitioner agreed with Patent Owner such that a “virtual detent” must be vibrotactile by which Petitioner proposed the construction: “vibrotactile feedback that simulates a mechanical detent.” EX2003, 19.

54. Also, under the ordinary meaning of the claim term “detent profile,” in the context of the patent specification, I understand that “detent profile” is tied to “vibrotactile effect” because it defines the nature of the “vibrotactile effect.” I understand the plain meaning of a “detent profile” as including 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**.

55. I also understand that the claims require the “detent profile” to comprise “haptic data.” Ex. 1001, 15:7-8. The specification discloses examples of such haptic data including: the type of vibrotactile effect felt by the user (*e.g.*, sine wave, square

wave, triangular wave, spring effect, damper effect), the magnitude of the effect, and its duration. Ex. 1001, 14:51-54. Accordingly, the “detent profile” must comprise haptic data relating to vibrotactile effects.

56. I note that in the district court case, Petitioner proposed “detent profile” to be construed as “computer code or actuator characteristics that represent a virtual detent.” EX2003, 28. I understand this as Petitioner agreeing that “detent profile” represents a vibrotactile effect, because Petitioner defines “virtual detent” as “vibrotactile feedback that simulates a mechanical detent.”

57. Therefore, in my analysis of the challenged claims throughout this Declaration, I apply the construction set forth in the table above. For all other claim terms, I apply the plain and ordinary meaning of each claim term as understood by a POSA in the context of the '042 Patent specification (such as for “virtual detent” and “detent profile”).

58. 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.

59. 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

60. 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.

61. 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

62. 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.

63. 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.

64. 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.

65. 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.

66. 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.

67. 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.

68. 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 or 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.

69. 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.

70. 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.

71. 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.

VII. THE ASSERTED PRIOR ART

A. The Ichinose Reference (EX1015)

72. Ichinose (U.S. 6,819,990) describes a touch-pad for vehicle applications. Ex. 1015, Abstract. Ichinose's touch-pad is disclosed to be a 2-dimensional surface mounted to a steering wheel:

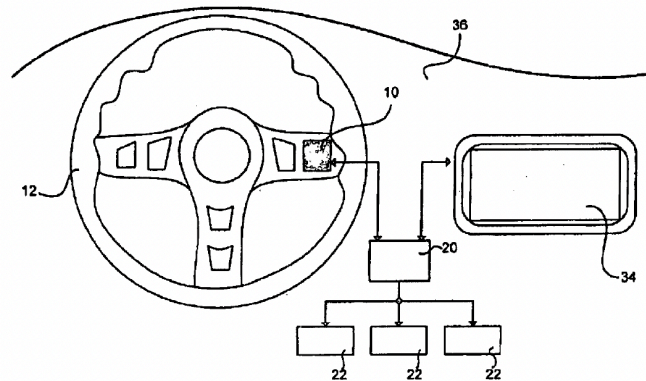


FIG. 1A

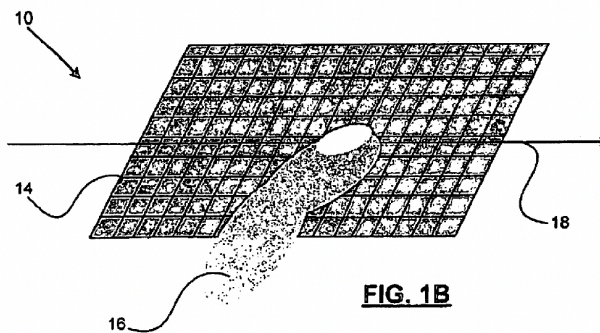


FIG. 1B

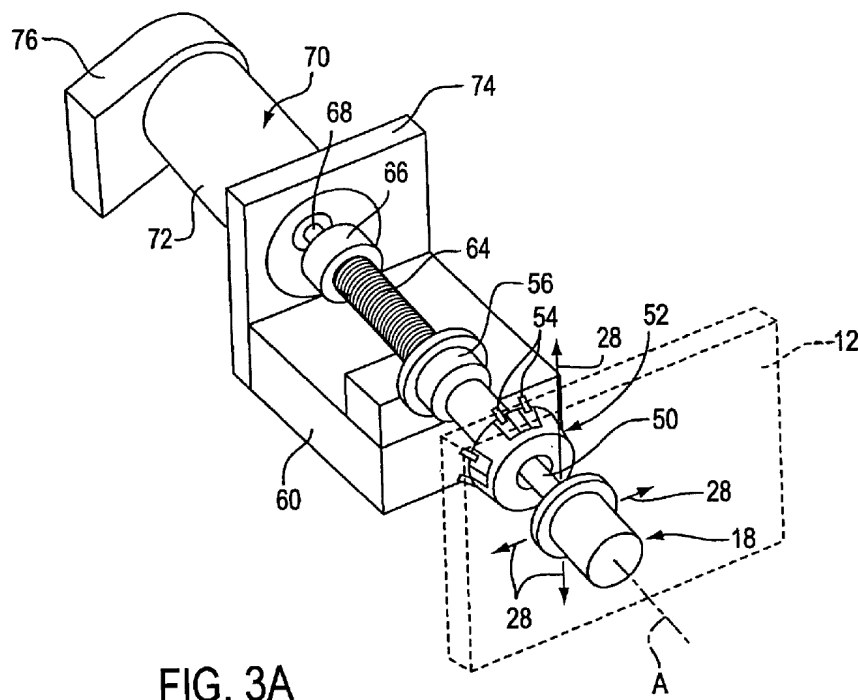
Id., FIGS. 1A-B.

73. Ichinose describes that a user may control a cursor of a display interface. *Id.* Ichinose's system is taught to output a feedback signal when the user "traverses a boundary of the display region on the display." *Id.* As described,

Ichinose system includes a software module that generates a feedback signal, which the feedback device outputs as a feedback signal. *Id.*, 1:45-51.

B. The Levin Reference (EX1016)

74. Levin (U.S. 6,686,911) describes a “control knob on a device that allows a user to control functions of the device.” Ex. 1016, Abstract. The control knob is described to be “rotatable in a rotary degree of freedom and moveable in at least one transverse direction approximately perpendicular to the axis.” This is also illustrated below:



75. As shown, the knob 18 is a physical knob—not a virtual one—that the user physically moves in the transverse directions 28 (*id.*, 13:5-17). FIG. 3B further

illustrates that knob 18 has a cylindrical shape with grooved surfaces for the user to manipulate in 3-dimensions:

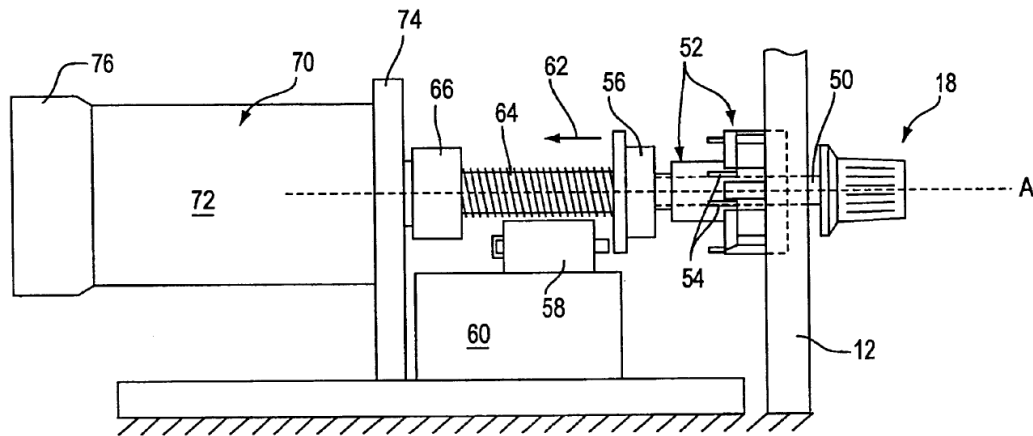


FIG. 3B

Id., FIG. 3B. According to Levin, detent forces are provided to the control knob. EX1016, 3:9-12. This force feedback is taught to be in the rotary degree of freedom for knobs (*id.*, 5:48-50) and in the linear degree of freedom for sliders (*id.*, 7:10-11).

76. Levin does not employ vibration forces exerted through the physical knob for the purpose of mechanical detents. The only vibration Levin discloses is for using vibration forces that “correlate with the magnitude” of, for example, fan rotation speed in a specific use case for fan adjustment controls. EX1016, 8:11-26. This is not used for the underlying detent effects. Instead, this helps a user to adjust a rotating knob to control the fan speed in a car’s climate system along with detents. *Id.* In this case, force feedback is provided to the user to provide mechanical detents, and then another layer of vibrational feedback (indicating fan speed) 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.*

77. 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. 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. *Id.*, 11:59-67.

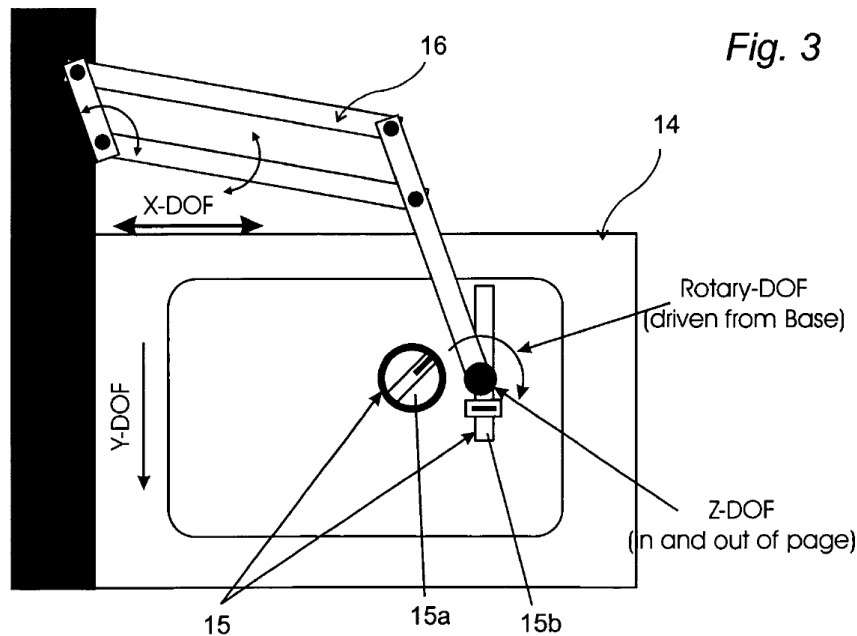
78. Levin teaches combining jolts with an underlying force feedback detent. *Id.*, 11:37-53; 11:62-65; 12:12-18. For example, in the context of a rotary knob or a slider, the underlying force feedback detents are output at particular rotational or linear positions of the knob or slider to inform the user how much the knob has rotated. *Id.* To enhance the 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.

C. The Wang Reference (EX1022)

79. Wang (WO 02/102616) describes a “haptic reconfigurable dashboard system for controlling and monitoring various subsystems and hardware in a vehicle.” Ex. 1022, 1:3-5. Wang discloses replacing “conventional physical knobs, levers and controls [] with virtual knobs, levers, control and haptic technology.” *Id.*, 2:5-7. Wang's “virtual knobs” are implemented using **a physical control appendage (haptic device 16) overlaid** on a “picture of dial (a virtual control device) on the virtual device panel.” *Id.*, 6:15-18. The haptic device 16 is a 3-dimensional object, which “feels solid” and is physically rotatable. *Id.*, 6:18-20.

80. The haptic device 16 is taught to have a rotary, X, Y, and Z degrees of freedom. *Id.*, FIG. 3. This is shown below:



Id.

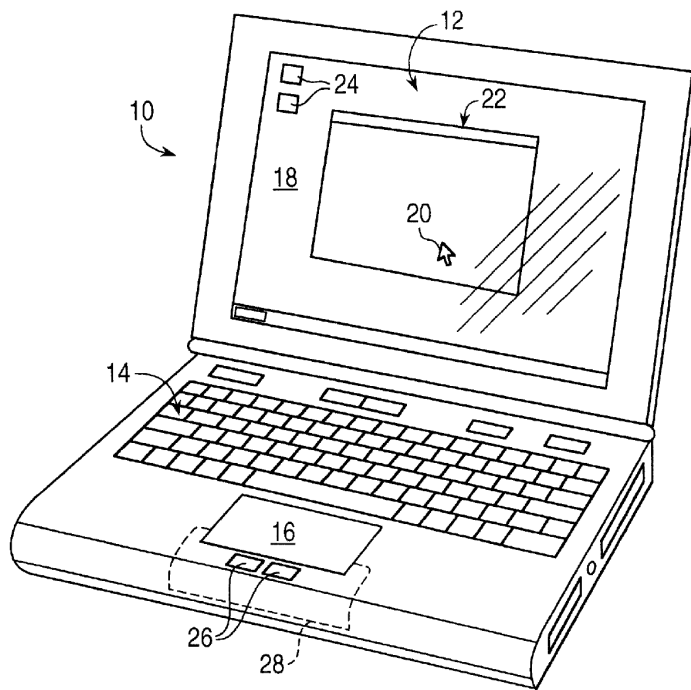
81. In Wang, the control knob is provided with “a haptic feedback mechanism for providing a force effect to the haptic device when it manipulates the virtual control device or indicator.” *Id.*, 2:15-17.

D. The Rosenberg Reference

1. Rosenberg-I (Ex. 1009)

82. Rosenberg-I (U.S. 6,429,846) describes “a haptic feedback planar touch control used to provide input to a computer.” Ex. 1009, Abstract. The planar touch control is described to control a “cursor in a displayed graphical environment.” *Id.*

This is shown below:

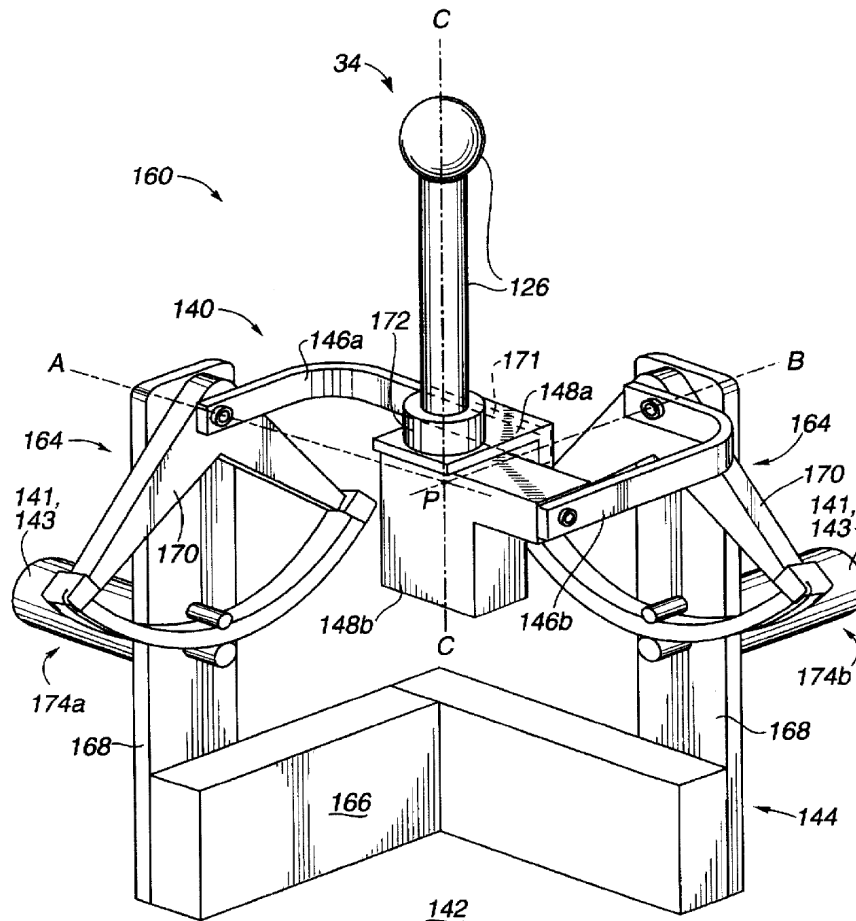


Id., FIG. 1.

83. Rosenberg-I describes 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.*, 2:14-19. The haptic feedback is described to “assist and inform the user of interactions and events within a graphical user interface.” *Id.*, 2:56-58. According to Rosenberg-I, the haptic sensations are associated with user interaction with interface elements: “haptic sensation, such as a pulse, vibration, or spatial texture, are preferably output in accordance with a interaction of a controlled cursor with a graphical object in the graphical environment.” *Id.*, 2:41-44.

2. Rosenberg-II (Ex. 1010)

84. Rosenberg-II (U.S. 5,734,373) describes a physical, 3-dimensional control object such as a joystick for interfacing with a computer. Ex. 1010, Abstract. I understand that Petitioner contends that Rosenberg-I incorporates by reference Rosenberg-II. Rosenberg-II's "host computer updates a host application process, such as a simulation or video game, in response to the input control signal [and a] microprocessor local to the interface apparatus and separate from the host computer receives the host command and provides a processor output control signal." *Id.*, 3:35-40 Rosenberg-II 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.*, 40-44. An example joystick is shown below:



Id., FIG. 7.

85. As shown, Rosenberg-II's joystick comprises 3-dimensional surfaces for “providing a mechanical input and output” *Id.*, 26:62-63. According to Rosenberg-II, the force feedback is associated with events such as interactions with displayed objects: “Forces are preferably associated with the interactions of the cursor with displayed graphical objects.” *Id.*, 11:28-29.

VIII. NONE OF THE “KNOB PRIOR ART” (LEVIN, WANG, OR GOLDENBERG) ARE ANALOGOUS ART

86. Counsel has informed me, and I understand that the following two-part test is used to determine whether a prior art reference is analogous: (1) whether the art is from the same field of endeavor, regardless of the problem addressed or, (2) if the reference is not within the field of the inventor’s endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.

A. None of the Knob Prior Art are From the Same Field of Endeavor as the ’042 Patent

87. I note that the ’042 Patent’s “field of endeavor” is expressly stated in the patent as follows:

“Field of Invention”: “The present invention generally relates to *vibrotactile feedback*. More particularly, the present invention relates to methods and systems for providing *virtual detents through vibrotactile feedback*.”

Ex. 1001, 1:14-17.

88. The claim of the patent is also directed to providing virtual detents through vibrotactile feedback as recited below:

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
touch-pad;

receiving a detent profile associated with one of the systems, the
detent profile comprising haptic data associated with a
virtual detent; and

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.

EX1001, cl. 1.

89. The “Summary” of the ’042 Patent also confirms that the invention is
directed to “methods and systems for *providing virtual detents through vibrotactile
feedback*.” Ex. 1001, 1:48-49.

90. I also note that Petitioner confirmed this by proposing to construe
“virtual detent” in the district court as “*vibrotactile feedback that simulates a
mechanical detent*.” Ex. 2003, 19. I further note that the Patent Board has also twice
already confirmed this understanding:

Appellant’s Invention

The invention at issue on appeal concerns vibrotactile feedback
systems, computer-readable media, and methods for generating a vibrotactile
signal. The method includes the steps of receiving an input signal
responsive to manipulation of an input device (touch pad) configured to
control various systems, receiving a detent profile comprising haptic data
associated with a *virtual detent* and corresponding to one of the systems, and
generating a *vibrotactile signal*. (Spec. ¶¶ 2, 5–7; Abstract.)

EX1002 (Decision on Appeal), 588 (highlighting added).

C. The '042 Patent

The '042 patent, titled “Virtual Detents Through Vibrotactile Feedback,” issued on August 30, 2016, with claims 1–19. Ex. 1001, codes (45), (54), 15:2–16:54. According to the '042 patent, “[w]ith many traditionally mechanical functions being replaced by electronics, operation of electronic controls has been made less intuitive to users.” *Id.* at 1:30–32. In particular, the '042 patent notes that “without click-stops or ‘detents,’ or otherwise a sense of mechanical resistance, it may be difficult to obtain a similar experience from an electronic substitute for a traditional mechanical control device or even effectively and efficiently operate such a device.” *Id.* at 1:32–37. To address this issue, the '042 patent discloses methods and systems for providing virtual detents through vibrotactile feedback. *Id.* at 1:47–49.

Institution Decision, 3 (highlighting added).

91. Therefore, I understand that the field of endeavor for the '042 Patent is providing vibrotactile effects to simulate mechanical detents. The Knob Prior Art does not share “the same field of endeavor” as the '042 Patent because none of them relate to providing virtual detents through vibrotactile feedback.

92. **Levin** is concerned with providing mechanical detents for physical input controls such as knobs and sliders. For example, Levin explains in the Abstract 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, Abstract. Also, as described in § VII.B above, not only is Levin not concerned with simulating mechanical detents with virtual detents, but Levin also does not disclose the use of vibrotactile effects to simulate or replace force feedback detents. While Levin discloses a display in FIG. 2, it is only for the purpose of displaying visual icons and images rather than for accepting touch-based input such as with a touch-pad or touch-screen. Ex. 1016, 7:32-34 (“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”). Thus, a POSA would understand that the ’042 Patent and Levin are from different fields of endeavor.

93. **Wang** is directed to providing non-vibrational force feedback mechanical detents to physical objects, not virtual detents provided through vibrotactile effects. In fact, nowhere does Wang even mention vibrotactile effects, vibration, or similar concept. *See* Ex. 1022. Instead, Wang teaches providing force feedback only:

That is, the *outside of the dial feels solid and, through the generation of proper forces exerted by the haptic device, the user is able to 20 rotate the dial.* In parallel, the image

of the dial is updated to show that the dial is being rotated.

Similarly, *the haptic device can be used to operate sliders, push knobs, rocker switches and other common mechanical devices.*

Ex. 1022, 5:18-22. Every embodiment Wang describes relates to force feedback provided to a physical input device. *See id*, FIG. 2 (force feedback provided to physically rotatable knob and slider), FIG. 3, FIG. 4. Thus, Wang's field of endeavor relates to force feedback on physical control knobs rather than providing virtual detents through vibrotactile effects.

94. As with Levin and Wang, Goldenberg teaches providing force feedback to objects that can be physically gripped rather than provide virtual detents through vibrotactile effects. For example, Goldenberg states that "the present invention provides haptic sensations for a rotational haptic feedback device such as a knob." Ex. 1007, 2:6-10; *see also, e.g., id*, 6:21-25 ("user preferably grips or contacts the circumferential surface of the knob"). As with Levin and Wang, Goldenberg is concerned with a physical input device rather than a virtual device as in the '042 Patent. Thus, I understand that Wang is not in the same field of endeavor as the '042 Patent.

B. None of the Knob Prior Art are Reasonably Pertinent to the Problem Solved by the '042 Patent

95. I understand that the Knob Prior Art is not pertinent to the problem being solved because they relate to real detents (*i.e.*, force feedback) that the '042

Patent claim sought to *virtualize* on touchpads with virtual vibrotactile detents. Thus, the Knob Prior Art is directed to different purposes, and not reasonably pertinent to the problem solved by the '042 Patent. Each of the Knob Prior Art's teachings confirm that improvements to force feedback detents would not have been pertinent to simulating detents via virtual detents.

96. **Levin's** rotary force mechanisms that can only be implemented on physical control knobs are inapposite to the '042 Patent because Levin's force mechanism cannot produce virtual detents. Moreover, Levin's force mechanism cannot be implemented on virtual input devices with virtual controls such as on touchpads because there is no way to apply Levin's rotary force on a 2-dimensional touch-pad.

97. **Wang** is not reasonably pertinent to the problem the '042 Patent solves. A POSA would not find Wang's physical knob overlaid on a display surface reasonably pertinent to the problem of simulating detents for virtual controls on touch-pads as with the '042 Patent. The unidirectional rotary and linear force feedback disclosures of Wang can only be implemented on physical, 3-dimensional knobs and sliders. It is not possible to impart unidirectional rotary and linear forces through a touch-pad. Therefore, Wang's force feedback would not have been pertinent to the problem that '042 Patent's inventors aimed to solve because these types of forces in Wang would not be useful to the problem relating to touch-pads.

Instead suitable feedback sensations for touch-pads are vibrotactile feedback. Moreover, just like with Levin, Wang's purpose is to provide mechanical, non-vibrational detents rather than virtual, vibrational detents. Non-vibrational, force feedback mechanical detents would not be helpful to solving a problem relating to vibrational, virtual detents. Accordingly, Wang would not be reasonably pertinent to the problem solved by the '042 Patent.

98. **Goldenberg's** physical knob is not reasonably pertinent to the problem of simulating detents for virtual controls on touch-pads as with the '042 Patent. Goldenberg's feedback is specific to physical, 3-dimensional mechanical knobs such as a "thumb-stick" (Ex. 1007, FIG. 1) that a user can grip; it would not be applicable to 2-dimensional touch-pads. Therefore, Goldenberg's force effects on physical knobs would not be pertinent the '042 Patent because these forces would not be suitable for the problem to be solved on touchpads.

IX. GROUND 1: ICHINOSE+LEVIN DOES NOT RENDER OBVIOUS THE CLAIMS OF THE '042 PATENT

A. Levin is Not Analogous Art

99. Counsel has informed me, and I understand that the combination of non-analogous art cannot render a claim obvious. Here, as I have explained above in § VIII, Levin is not analogous art. Thus, I do not believe that the combination of Levin and Ichinose is obvious over the '042 Patent.

B. Neither of Ichinose nor Levin Discloses Vibrotactile Feedback

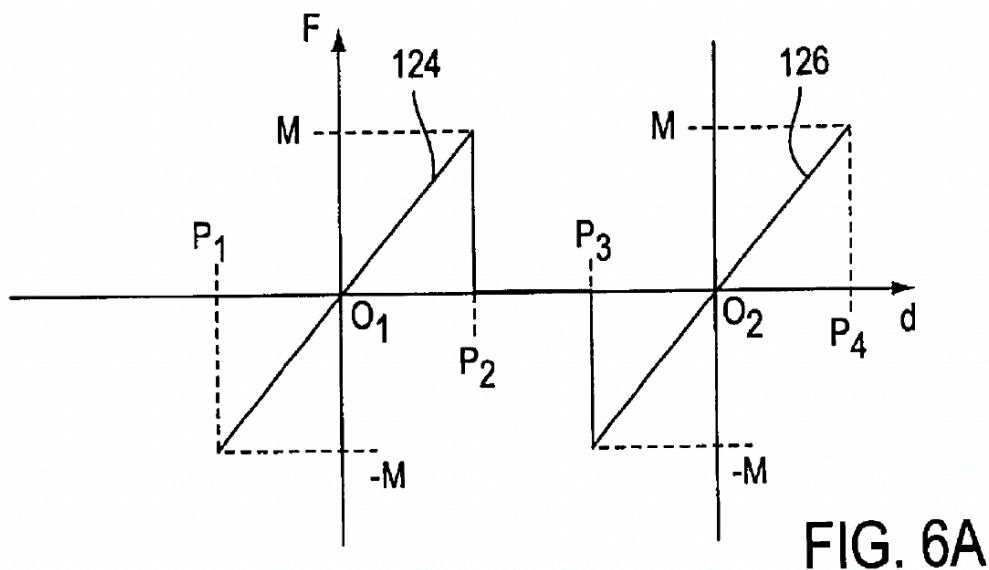
1. Levin Does Not Disclose “virtual detent” and Vibrotactile Feedback

100. I understand the plain and ordinary meaning of “virtual detent” to include a simulated mechanical detent created through *vibrotactile feedback*. See *supra* § VI.B.3. I understand that the Petition maps Levin’s force feedback to “virtual detent.” But I believe that force feedback does not include vibrotactile effect because they are entirely different types of feedback. Force feedback exerts a continual force or pressure against the user such as when a user presses a brake pedal and feels a continual, normal force exerted by the pedal mechanism. “Normal forces” are contact forces that a solid object exerts in a direction opposite to which a user pushes against. This force is not vibrational as it does not oscillate in direction (*e.g.*, forward and backward) and magnitude. In contrast, vibrotactile effects are by nature vibrational because the force or pressure exerted oscillates in different directions and magnitudes.

101. I understand that Petitioner and its expert ignore this fundamental distinction and equates Levin’s non-vibrational, force feedback to the vibrotactile effect required by “virtual detent,” by stating that: “Levin explains that its ‘detent force profiles’ include data that ‘represents the magnitude of force’ an actuator outputs based on ‘position’ of an input device.” Pet., 19 (citing Ex. 1016, 14:30-45); *see also* Pet., 20 (citing Ward, ¶¶135-136). However, continual force is not the

same as vibrotactile effect. To the contrary, Levin's force feedback comprises a normal, continual force rather than an oscillating or vibrational sensation.

102. Levin expressly confirms that its physical knob based detent force does not include vibrotactile feedback, for example, in FIG. 6A:



EX1016, FIG. 6A, 14:46-59 (detent force profile in which force assists user in moving knob clockwise and force resists motion in increasing manner until knob is moved to position P1). I understand this as Levin's detent force is not vibrational and that such continual assistive and resistive forces exerts a consistent pressure to assist or resist knob turning. *Id.* In other words, Levin's assistive or resistive forces do not include oscillating or vibrational effects.

103. I understand that Petitioner also contends that a POSA would have understood a similar detent profile *could* include the "magnitude of the vibration"

that the actuator outputs to simulate the detent. Pet., 20. But there is no disclosure in Levin that supports this argument. I understand that the only support Petitioner provides is Levin’s statement that “force detents can be simple jolts.” *Id.* (citing EX1016, 10:16-17); *see also* Pet., 15 (citing EX1016, 7:65 (“detent force (*e.g.*, jolt)”).

104. But Levin expressly discloses that jolts are a ***force feedback*** effect—not vibrational. Petitioner’s citation to Levin is incomplete and is taken out of context: “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.**” *Id.*, 10:14-18. The paragraph actually begins, however, by expressly stating that “[t]he **force feedback output** on knob 18 can include a variety of different force sensations,”—which is not vibrational. EX1016, 10:11-12.

105. Levin does not disclose that jolts are vibrations. Instead, Levin describes jolts as a kind of force feedback detent that simply are “stronger in magnitude than **normal detents**”—not as a virtual detent. *Id.*, 11:62-63. Levin does not contemplate or use the word “virtual.” Therefore, there is no disclosure in Levin for the use of vibration effects for mechanical detents. The only use of vibration remotely related to detents is where vibration effects can ***augment***—not simulate—detent effects to provide the user with more information. *See* §VII.B (where I

explain how vibrational effects superimposed on force feedback detents to indicate increase in fan speed adjustment). Thus, Levin does not disclose vibrotactile effects used to simulate detent effects.

2. Ichinose Does Not Disclose “virtual detent” and Vibrotactile Feedback

106. I understand that Petitioner also equates Ichinose’s vibration to “virtual detent.” Pet., 18. But, these vibrations are not used to **simulate a mechanical detent**. As I discussed above, “virtual detent” includes “vibrotactile feedback that **simulates a mechanical detent**.” *Supra* § VI.B.3. Ichinose’s vibration, however, is responsive to cursor interaction with interface elements, but not for simulating mechanical detents. Ex. 1015, 4:7-17 (Feedback device 80 provides vibration as the user interacts with touchpad 10 and moves the cursor with his finger). When a user experiences Ichinose’s vibration, they are not provided with a simulated experience of rotating a dial or sliding a slider with click stops. Ichinose does not disclose using vibrational effects for simulating a mechanical detent. It only discusses outputting vibrations in response to cursor interactions with icons and user interface elements, which does not disclose simulating a mechanical detent. In fact, Ichinose does not mention or contemplate detents at all.

C. Neither of Ichinose nor Levin Discloses “a detent profile comprising haptic data associated with a virtual detent”

107. Since Levin does not teach a virtual detent, it also does not teach a detent profile comprising haptic data associated with the virtual detent. Instead, Levin teaches a profile associated with force feedback—the type of force it uses for its physical knob based detent. Force feedback is not vibrotactile feedback. *See supra* § IX.B. Thus, any profile associated force feedback does not disclose a detent profile comprising haptic data associated with a virtual detent.

108. This is because “detent profile” must be tied to a “vibrotactile effect” since the “virtual detent” that the profile comprises is vibrotactile. *See supra* § V. B.3. I understand this based on the plain claim language itself because the virtual detent requires a vibrotactile effect: “the ***vibrotactile effect*** comprising the virtual detent.” *See* ’042 Patent, cl. 1. The patent specification also supports this understanding: “the present invention relates to methods and systems for providing virtual detents through ***vibrotactile feedback***.” *Id.*, 1:15-17. Thus, the claimed “detent profile” must comprise haptic data associated with vibrotactile effects. The force feedback profile in Levin cannot meet the claimed “detent profile” for the same reasons that force feedback cannot meet vibrotactile feedback—since Levin’s force feedback profile defines non-vibrational, continual normal forces whereas the “detent profile” defines oscillating, vibrational effect.

D. Neither of Ichinose nor Levin Discloses “generating a vibrotactile signal”

For the same reasons as I’ve explained above, Ichinose or Levin alone or in combination also do not disclose the claim element, “generating a vibrotactile signal configured to cause an actuator to produce a ... virtual detent.”

E. No Motivation to Combine Ichinose with Levin and No Reasonable Expectation of Success

1. No Showing That a POSA Would Have Been Motivated to Modify Ichinose with Levin

109. I understand that Petitioner argues that a POSA would have been motivated to modify Ichinose’s touchscreen, which is 2-dimensional, with Levin’s rotary and linear force feedback used for its detent, which require 3-dimensional input devices such as knobs and sliders. I disagree, however, as I would not have seen a need to modify a 2-dimensional touchscreen with rotary and linear force feedback requiring 3-dimensional appendages.

110. I understand that the only reasoning Petitioner provides is that vibrotactile feedback is beneficial to both Levin and Ichinose. Pet., 13-14. However, this only explains how feedback, in general, is beneficial, but there is no specific reason why a POSA would seek to modify Ichinose’s 2-dimensional touchscreen with Levin’s rotary or linear forces used for mechanical detent that require 3-dimensional knobs. The mere fact that Ichinose recognized the benefits of vibrotactile feedback—which it already employed—is not sufficient reasoning for

why a POSA would have further modified it with physical knob-based detents from Levin, much less modified it to incorporate detents at all.

111. I understand that Petitioner further argues that implementing rotary and linear forces in 2-dimensional touchscreens were “known techniques.” Pet., 14. But I have not seen, nor am I aware of, any evidence that Levin’s rotary and linear detent forces were “known techniques” for 2-dimensional touchscreens. In fact, I would understand the opposite to be true. For example, a POSA would not think to implement Levin’s force feedback mechanism in the form factor of a touchpad. Thus, I would not see any need to implement Levin’s detent profiles, which are for rotary and linear force feedback, on the 2-dimensional surface of Ichinose’s touchpad.

2. No Showing of a Reasonable Expectation of Success

112. I understand that Petitioner argues:

POSAs would have reasonably expected success in implementing any of the above implementations because Levin’s ‘force detents’ are executed by a processor (Levin, 19:54-20:3), like 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.”

Pet., 24. According to Petitioner, there is a reasonable expectation of success simply because both references use processors and actuators. But I do not see this as a

sufficient explanation for why a POSA would expect success when implementing Levin's rotary actuators ("DC motor, voice coil, pneumatic or hydraulic actuator, magnetic particle brake, etc." Ex. 1016, 10:2-5) or linear actuators ("linear voice coil actuator 104." *Id.*, 12:40-41) with Ichinose's touchpad.

113. I believe that a POSA would not have expected success because 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. In other words, a POSA would have understood that a 2-dimensional touch-pad cannot physically exert rotary or linearly resistant forces and would not expect to be able to do so.

114. Also, I understand that Petitioner's expert, Mr. Ward, contends that the force detents output on a physical knob or slider can include vibrations or jolts. Ex. 1003, ¶127. But as I have discussed above (*supra* § VII.B), according to Levin, vibrations or jolts are used to augment a force detent rather than be used as a force feedback detent itself. Ex. 1016, 8:11-26, 10:11-32, 11:37-65, 12:12-18; *see also supra* §VII.B, §IX.B.1. I note that Mr. Ward also fails to explain how a POSA could achieve rotary and linearly resisting forces on a 2-dimensional surface without undue experimentation. Therefore, I have not seen any showing of a reasonable expectation of success.

X. GROUND 2: WANG+ICHINOSE DOES NOT RENDER OBVIOUS THE CLAIMS OF THE '042 PATENT

A. Wang is Not Analogous Art

115. Counsel has informed me, and I understand that the combination of non-analogous art cannot render a claim obvious. Here, as I have explained above in § VIII, Wang is not analogous art. Thus, I do not believe that the combination of Wang and Ichinose is obvious over the '042 Patent.

B. Neither of Wang nor Ichinose Discloses Vibrotactile Feedback

1. Neither Wang nor Ichinose Discloses “virtual detent” and Vibrotactile Feedback

116. As I have discussed above in § IX.B.2, Ichinose does not disclose the claimed “virtual detent” and vibrotactile feedback. Wang also does not disclose it because the combination only teaches force feedback, which does not include vibrotactile feedback. The plain and ordinary meaning of “virtual detent” is a detent simulated using vibrotactile effects. *See supra* § VI.B.3. Ichinose does not disclose detent effects at all and Wang does not disclose vibrational detent effects.

117. Similar to how Petitioner treated Levin, I understand that Petitioner also equates Wang’s non-vibratory rotational and linear force feedback to the “virtual detent.” Pet., 37 (citing, *e.g.*, EX1022, 7:21-22; 8:6-9 (“Force effects to emulate the feel of a mechanical rotary knob or a slider...”), 8:29-31 (“emulate a series of detents as the knob rotates.”)). But, rotational and linear forces, are not the same thing as vibrotactile effects because the former exerts consistent unidirectional

forces while the latter provides oscillating forces. *supra* §IX.B. I understand that Petitioner describes Wang as providing “‘**a force effect**’ so the driver ‘can feel a sense of touching or force.’” Pet., 32. This confirms that Wang’s device provides non-vibratory “force effects” which do not include vibrotactile effects. (

118. Thus, Wang does not disclose the claimed virtual detent. Wang provides a sensation of resistance to the user by way of contact force effects that are exerted in the degrees of freedom that the overlaid haptic device (*i.e.*, physical control appendages) is moved around on the surface of the virtual device panel. Ex/ 1022, 7:23-26 (haptic feedback actuator generating force effects in each of the **active degrees-of-freedom**), 7:26-31. Therefore, Wang or Ichinose, alone or in combination, do not disclose the claim element for “virtual detent.”

C. Neither of Ichinose nor Wang Discloses “a detent profile comprising haptic data associated with a virtual detent”

119. For the same reasons as I’ve explained above, Ichinose or Wang, alone or in combination, also do not disclose the claim element, “a detent profile comprising haptic data associated with a virtual detent.”

D. Neither of Ichinose nor Wang Discloses “generating a vibrotactile signal”

120. For the same reasons as I’ve explained above, Ichinose or Wang, alone or in combination, also do not disclose the claim element, “generating a vibrotactile signal configured to cause an actuator to produce ... a virtual detent.”

E. No Motivation to Combine Wang and Ichinose and No Reasonable Expectation of Success

1. No Showing That a POSA Would Have Been Motivated to Modify Wang with Ichinose

121. I understand that Petitioner argues that a POSA would have used Ichinose's touchpad to implement Wang's haptic device as a substitution. Pet., 34. But it is not possible to implement physical knobs and sliders that provide rotational and linear force feedback on a touch-pad. To suggest otherwise would require hindsight bias because that is the very point of the invention of the '042 Patent, which is to provide a simulation of mechanical detents on a touch-pad using virtual detents.

122. I also understand that Petitioner argues that the modification would have been a simple substitution and a matter of design choice. For example, Petitioner alleges that using Ichinose's touchpad to implement Wang's haptic device would have been a substitution. Pet., 34-35 ("simple substitution of a known element (Wang's touch-sensitive [physical knob] haptic device) for another (Ichinose's touchpad 10)").

123. But in any event, these "simple substitutions" still do not arrive at the challenged claim of the '042 Patent. The substitution of Wang's physical rotary knob haptic device with Ichinose's touch-pad would actually result in a touch-pad without any ability to provide detents. To arrive at the challenged claim, Ichinose's

touch-pad and Wang's physical input object would require additional modification to enable virtual detents. Wang's physical knob haptic device and force feedback effect would need to be virtualized on Ichinose's touch-pad, *e.g.*, by representing them as virtual controls and virtual, vibrational effects. By definition, this is not a simple substitution. Moreover, this substitution is a hindsight reconstruction of the claimed invention. Therefore, I have not seen, nor am I aware, of any sufficient motivation to combine Wang and Ichinose.

2. No Showing of Reasonable Expectation of Success

124. As with how the Petitioner treated the Ichinose-Levin combination in Ground 1, here I also do not see a reasonable expectation of success in implementing Wang's physical knob with force feedback detents on Ichinose's 2-dimensional touch-pad. I understand that Petitioner's only reason for why there is a reasonable expectation of success is because touch-pads were known and share common components such as actuators. Pet., 35. I do not believe that this generic idea would have provided a POSA with a reasonable expectation of success in making the Ichinose-Levin combination.

XI. GROUND 3: ROSENBERG DOES NOT ANTICIPATE THE CLAIMS OF THE '042 PATENT

A. Rosenberg Does Not Disclose “receiving an input signal comprising information associated with a manipulation of an input device configured to control a plurality of systems, where in the input device comprises a touchpad

1. Rosenberg Does Not Disclose “an input device configured to control a plurality of systems”

a) Rosenberg does not disclose “a plurality of systems”

125. Rosenberg-I does not inherently or expressly disclose a “plurality of systems” under the plain and ordinary meaning of the term. Rosenberg-I only discloses a single “system,” which is a containing “computer system.” Ex. 1009, 1:20-21, 1:66-67, 3:47, 6:7-13, 7:8-9. Rosenberg-I simply does not disclose any other additional, plurality of systems. Counsel has informed me and I understand that for a prior art reference like Rosenberg to anticipate a challenged claim, the single prior art document must describe, within its four corners, every element of the claimed invention. Here, Rosenberg-I does not describe a plurality of systems, and therefore does not anticipate the claims of the '042 Patent.

126. To overcome this deficiency, however, I understand that Petitioner assigns a special construction to the term “a plurality of systems” to categorically cover all software applications running on the computer. Petitioner improperly bases this construction solely on an erroneous interpretation of Patent Owner’s infringement contentions in the co-pending district court case. Pet., 52. Petitioner

incorrectly alleges that this is how Patent Owner has interpreted “a plurality of systems.” Counsel has informed me and I understand that claims are not to be construed based on what is accused of infringement and that the claim construction analysis must be based on the time of the invention rather than in light of present day infringement. Counsel has also informed me and I understand that an infringement analysis must first be preceded by claim construction, rather than the other way around. For at least those reasons, I understand that Petitioner’s construction of “plurality of systems” is improper. Moreover, even if Petitioner’s approach to construing the claim was proper, which it is not, Petitioner nonetheless misinterprets Patent Owner’s infringement contentions and misunderstands Patent Owner’s reading of the claim term “a plurality of systems.” Thus the proper meaning of the term is understood by a POSA with the Patent Owner’s clarifying construction provided above in §§ VI.B.1-2 and further discussed here.

127. As I explain in further detail in the next section, Rosenberg-I’s software applications do not satisfy the claim limitation “a plurality of systems” under its proper meaning in light of the intrinsic evidence. Therefore, under either a plain and ordinary meaning or under Patent Owner’s clarifying construction, Rosenberg-I does not disclose a plurality of systems.

b) Rosenberg does not disclose “a plurality of systems” under a proper clarifying construction in light of the intrinsic evidence

128. In addition to Rosenberg-I’s failure to disclose this claim term under its plain and ordinary meaning, Rosenberg-I also fails to disclose this claim element under a proper clarifying construction as understood by a POSA specifically in light of the intrinsic evidence. As I explained above in §§ VI.B.1-2, the proper construction of “an input device configured to control a plurality of systems” is “input device configured to control a plurality of systems, where each system to be manipulated provides context for virtual detents.” *Supra* §§ VI.B.1-2. The patent specification makes clear that whether the recited “plurality of systems” are hardware subsystems or software applications, they are subsystems to be manipulated and must provide the context for virtual detents, such that for example, the virtual detents can vary on a per-application basis (though I am not aware of any intrinsic evidence limiting or requiring each detent profile to be uniquely associated with an application, *i.e.*, two applications can have a common detent profile, but each application has an associated detent profile). In the case of hardware subsystems, the specification discloses specific detents that are determined **contextually** based on the external system being controlled:

The processor 206 can be configured to determine a specific detent signal to generate. The **detent signal may be based at least in part on the system which is actively being controlled.**

For example, if the **video system 210a is being controlled**, the processor 206 may generate **one type of detent signal**. Such as a click effect. Alternatively, if the **stereo system 210b is being controlled**, the processor 206 may generate **a second type of detent signal**. Such as a hard stop virtual detent.

EX1001, 8:38-46. Likewise, in the case of software applications, the specification also teaches using the **context** of the application's software code to generate virtual detents:

“the processor 106 may process software code running as an application on the processor and utilize the input **signal in the context of the software code** to generate signals configured to cause virtual detents.”

EX1001, 4:30-34.

129. This requirement that the plurality of subsystems to be manipulated provide respective context for its virtual detents is important to the objective of virtualizing controls, *i.e.*, detents, of differing systems or applications. Thus, a POSA would understand that each of the plurality of manipulated systems—not the containing computer system—provides context for virtual detents. This is why the software applications disclosed in the Rosenberg references do not constitute such systems under the proper construction of the claim.

130. I understand that the Petition fails to appreciate what I've explained above and instead maps Rosenberg-I's applications onto the claimed “plurality of

systems.” Pet., 52 (Rosenberg-I’s “‘touch pad 16’ is ‘configured to control a plurality of systems’ because computer 10 runs multiple different applications, including a web-browser and a gaming application, and the touchpad controls the user’s interaction with each application.”). However, Petitioner does not show that Rosenberg-I’s software applications provide *respective contexts* for virtual detents. *See generally id.*, 51-53. Although Rosenberg-I teaches software applications such as gaming and web-browsing applications, it does not disclose that each of the applications provide contexts for virtual detents. To the contrary, Rosenberg only discloses that every application program generically utilizes input from the touch pad and outputs force feedback commands to the touchpad. Ex. 1009, 6:7-23. Thus, Rosenberg-I teaches multiple software applications that outputs force feedback commands without disclosing that each application provides specific context for the force feedback commands, much less virtual detents. *See id.*

131. Another important reason Rosenberg-I does not disclose this limitation is that Rosenberg-I does not teach that its multiple applications should have detent profiles corresponding to them, which is critical to achieving system-specific (or application-specific) contexts for virtual detents. In the Institution Decision, the Board found that the plurality of systems need not have unique detent profiles corresponding to them—*i.e.*, multiple systems may share a detent profile. Institution Decision, 24 (“The detent profile is not required to have a unique association with

only *one* of the systems and not with any of the other systems; there is no requirement that each one of the plurality of systems be associated with its own unique detent profile. Rather, the detent profile need only be associated with at least one of the systems and could be associated with multiple systems.”). Nevertheless, each of the plurality systems must have a detent profile corresponding to it, whether unique or shared, which Rosenberg-I’s multiple software applications do not have. That is, not every detent profile needs to have a system, but every system has a detent profile in order for that system to be able to provide the context for the virtual detents.

132. Rosenberg-I confirms that its software applications do not have detent profiles corresponding to them. While Rosenberg-I teaches multiple software applications, it does not teach or suggest that they should each have detent profiles. Ex. 1009, 6:7-23. As mentioned above, Rosenberg-I only teaches multiple software applications that outputs force feedback commands but does not disclose that they have detent profiles corresponding to them such that the applications can each provide their own context for virtual detents. *See id.*

133. Furthermore, even if Rosenberg’s applications met the claimed “plurality of systems” limitation (which it does not), the Rosenberg references do not teach providing different vibrotactile feedback that simulates a mechanical detent in the context of the application being used, *e.g.*, a detent profile

corresponding to a particular application. Also, Petitioner has not identified how the *applications* provide a context for these virtual detents. Again, the '042 patent discloses different simulated mechanical detents based on the particular system, e.g., a video system versus a stereo system. Rosenberg does not disclose providing virtual detents in the context of a particular application. Rosenberg only discloses a computer system with a cursor to control GUI objects generically across all applications.

134. Rather, just like with the Grant and Nyysönen references (Ex. 2009 and Ex. 2010) that were considered and rejected by the Patent Office during prosecution, which I discuss in detail below in § XI.B.3, Rosenberg-I and II separately teach haptic effects and software applications without describing any relationship between them. I understand that Patent Board found that untethered teachings of vibrotactile effects and a system's knob in the Grant and Nyysönen references "does not sufficiently describe detent profiles for a particular system/device." EX1002, 590. The same is true here.

B. Rosenberg Does Not Disclose "receiving a detent profile associated with one of the systems, the detent profile comprising haptic data associated with a virtual detent"

1. Rosenberg Does Not Disclose "virtual detent"

135. As I've explained in this Declaration, I understand "virtual detent" to include a sense of mechanical resistance produced through vibrotactile feedback.

See, e.g., EX1001, 3:6-8. The Patent Board previously in a Decision on Appeal similarly understood that “a detent provides a sense of mechanical resistance while operating a virtual control for a virtual device.” Ex. 1002 (Decision on Appeal at 4), 590; *see also id* (a “mechanical detent” is a “means to resist or arrest movement of a device.”) In the co-pending district court case, Petitioner also agrees with this understanding by proposing to construe “virtual detent” as “vibrotactile feedback that simulates a mechanical detent.” Ex. 2003, 19.

136. The Rosenberg references do not disclose vibrotactile effects that simulate a mechanical detent, *i.e.*, a sense of mechanical resistance. I understand, however, that Petitioner points to Rosenberg-I’s “ticks” or “pulses.” Pet., 53. But Rosenberg-I never teaches that these ticks or pulses provide **a sense of mechanical resistance**. Instead, Rosenberg-I teaches pulses to indicate information such as certain locations within a range or events, but never as a way to simulate mechanical resistance vibrationally. For example, Rosenberg-I teaches:

When reaching the end of a numerical range that is being adjusted (such as volume), a pulse can be output to indicate that the end of the range has been reached. Pulse sensations can be used to indicate the location of the “ticks” for discrete values or settings in the adjusted range. A pulse can also be output to inform the user when the center of the range is reached.

Ex. 1009,12:53-59 (pulse indicates information).

A pulse sensation can be used to indicate that the function (the cut or paste) has been executed.

Id., 13:3-5 (pulse indicates occurrence of event).

A pulse sensation can be sent to indicate that the “thinking” is over.

Id., 13:39-40 (pulse indicates occurrence of event).

137. Thus, Rosenberg-I discloses that its pulses are used to indicate a location within a range and the occurrence of an event, **not to simulate the sense of mechanical resistance**.

138. Rosenberg-I’s ticks are even more distinguishable because they, unlike pulses, are not even physical effects or sensations. Rosenberg-I’s ticks are disclosed to be **visual** markers to which its pulses correspond:

Pulse sensations can be used to indicate the *location of the “ticks”* for discrete values or settings in the adjusted range. A pulse can also be output to inform the user when the center of the range is reached. Different strength pulses can also be used, larger strength indicating the more important ticks.

Ex. 1009, 12:56-58. A POSA would understand “ticks” in this context to be visual marks to which pulse sensations are synchronized with.

139. I understand that Petitioner also argues that Rosenberg-I’s variable “strength and/or frequency” vibrations corresponds to the ’042 Patent’s “hill virtual detent.” Pet., 54. But Rosenberg does not expressly or inherently teach varying the

“strength and/or frequency” of vibrotactile effects so as to simulate mechanical resistance. A POSA would understand that varying the strength and/or frequency of vibrations generically, without any more specificity or disclosure for how that generic functionality is used, does not disclose simulating mechanical resistance. This is because Rosenberg only teaches a computer with a trackpad and vibrotactile effects for generic computer GUI controls (such as scrolling, etc.), but does not disclose any concept of virtualizing detents.

140. Similarly, Petitioner argues that Rosenberg-I’s “pulses” corresponds to the ’042 Patent’s “click effect.” Pet., 53. But Rosenberg does not expressly or inherently teach that such “pulses” simulate mechanical resistance. A POSA would understand that generic “pulses,” without any more specificity or disclosure for how that generic functionality is used, does not disclose simulating mechanical resistance.

2. Rosenberg Does Not Disclose a “detent profile”

141. As explained above, Rosenberg-I does not teach a “virtual detent,” and therefore cannot teach a “detent profile” “comprising haptic data associated with” the “virtual detent” it does not disclose. For at least this reason, Rosenberg-I does not teach a “detent profile.”

142. Further, I understand that Petitioner relies on Rosenberg-II to disclose “detent profile.” Pet., 54. But Rosenberg-II’s “detent profile” does not comprise

haptic data associated with a virtual detent. Rosenberg-II makes clear that its “force profiles” only store data for *force* feedback—not *vibrotactile* feedback. Accordingly, the Rosenberg references do not disclose a “detent profile” for *virtual* detents, *i.e.*, a “virtual detent profile.”

143. I understand Petitioner also argues that “Rosenberg-I also discloses that its haptic feedback, *i.e.*, simulated detents, is generated using ‘force profiles’ stored in memory ... and each profile *would have* been associated with one of the mimicked mechanical detents.” Pet., 54. It is clear that this is not expressly disclosed in Rosenberg, which is confirmed by the fact that Petitioner uses the wording “*would have*” to describe the association between detents and profiles.

3. Rosenberg Does Not Disclose “receiving a detent profile associated with one of the systems”

144. Rosenberg fails to disclose this limitation. First, as I have explained above, the Rosenberg references do not teach “a detent profile” for virtual detents. For at least this reason, neither Rosenberg reference discloses “receiving a detent profile associated with one of the systems.”

145. Second, a POSA would understand that the detent profile is “associated with one of the [plurality of] systems.” Claim 1 recites a “plurality of systems” and “receiving a detent profile associated with one of the systems.” “One of the systems” claims antecedent basis to the “plurality of systems.” As discussed above,

these “plurality of systems” refer to subsystems and not the containing computer system. The specification confirms this understanding:

The processor 206 can be configured to determine a specific detent signal to generate. The **detent signal may be based at least in part on the system which is actively being controlled**. For example, if the **video system 210a is being controlled**, the processor 206 may generate **one type of detent signal**. Such as a click effect. Alternatively, if the **stereo system 210b is being controlled**, the processor 206 may generate **a second type of detent signal**. Such as a hard stop virtual detent.

Ex. 1001, 8:38-46.

146. As I’ve explained in this Declaration, the Patent Board previously confirmed this understanding. In the Decision on Appeal, the Board described Appellant’s invention to include detent profiles that *correspond to* one of the systems:

The invention at issue on appeal concerns vibrotactile feedback systems, computer-readable media, and methods for generating a vibrotactile signal. The method includes the steps of receiving an input signal responsive to manipulation of an input device (touch pad) configured to control various systems, receiving a *detent profile* comprising haptic data associated with a virtual detent *and corresponding to one of the systems*, and generating a vibrotactile signal.

EX1002, 588.

147. Then, the Board reversed the Examiner's rejection because the cited art did not disclose any relationship between detent profiles and manipulated systems. Ex. 1002, 589-91. There, the primary reference Grant taught vibrotactile effects (*e.g.*, Ex. 2008, ¶17, FIG. 2). The secondary reference Nyyssonen disclosed a virtual knob and vibrotactile feedback (Ex. 2009, ¶57) and vibro-tactual feedback (*id.*, ¶53). The Applicant of the '042 Patent argued that Nyyssonen's vibrotactile feedback was untethered to anything else in the disclosure and therefore could not teach "receiving a detent profile associated with one of the systems." EX1002, 520 (Reply Brief, 2). The Board agreed and found that the cited reference did not disclose any relationship between detent profiles **for particular systems**:

[W]e agree with Appellant that merely providing a general disclosure of vibrotactile feedback (Grant and Nyyssonen) and a virtual knob (Nyyssonen) does not sufficiently describe **detent profiles for a particular system/device**. 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). The Examiner fails to show any of the cited references discloses virtual knobs having increments or haptic effects associated therewith.

Id., 590. Therefore that prior art did not disclose a correspondence between the detent profile and the manipulated system.

148. In the present proceeding, the Board similarly understood the requirement that the received detent profile should correspond to one of the systems (although such correspondence need not be unique):

Claim 1, which is an open-ended claim, does not require a “unique” or “application-specific” association between the detent profile and one of the systems. The detent profile is not required to have a unique association with only *one* of the systems and not with any of the other systems; there is no requirement that each one of the plurality of systems be associated with its own unique detent profile. Rather, the detent profile **need only be associated with at least one of the systems** and could be associated with multiple systems.

Institution Decision, 24-25. Thus, even though a detent profile is not required to have a unique one-to-one correspondence with each of the subsystems, the requirement remains that it must correspond to at least one of them. Rosenberg does not teach any of these concepts as it does not teach detent profiles or virtual detents.

149. As explained above, the Rosenberg references only disclose a single host containing system and not a plurality of controlled subsystems to be manipulated. Also, the software applications disclosed in the Rosenberg references do not qualify as the claimed plurality of systems as I explained in § XI.A.1. But even if they did qualify as the claimed systems, the Rosenberg references do not teach providing different vibrotactile feedback that simulates a mechanical detent

based on the application being used, *e.g.*, a detent profile corresponding to a particular application.

150. Also, I have not seen any explanation, nor am I aware of any, of how these virtual detents are associated with the *applications* that Petitioner argues are the claimed “plurality of systems.” The ’042 Patent teaches having different simulated mechanical detents based on the particular system, *e.g.*, a video system versus a stereo system. Rosenberg does not disclose providing virtual detents in the context of a given software application. Rosenberg-I and II separately teach haptic effects and software applications without describing any relationship between them.

XII. GROUND 4: ROSENBERG+GOLDENBERG DOES NOT RENDER OBVIOUS THE CLAIMS OF THE ’042 PATENT

A. Goldenberg is Not Analogous Art

151. Counsel has informed me, and I understand that the combination of non-analogous art cannot render a claim obvious. Here, as I have explained above in § VIII, Goldenberg is not analogous art. Thus, I do not believe that the combination of Rosenberg and Goldenberg is obvious over the ’042 Patent.

B. Neither Rosenberg or Goldenberg, alone or in combination, Discloses “manipulation of an input device configured to control a plurality of systems”

152. As I explained in Ground 3, Rosenberg-I does not disclose “an input device configured to control a plurality of systems.” I understand that the Petition does not fill this gap with Goldenberg, as Petitioner only introduces Goldenberg for

purposes of meeting the claimed limitation, “detent profiles.” Pet., 70 (“The lone distinction between Ground 3 and Ground 4 is the latter’s use of Goldenberg’s ‘force detent profiles[.]’”) Thus, for at least the same reasons that I explained above for Ground 3, the Rosenberg-I and Goldenberg combination does not disclose “an input device configured to control a plurality of systems.”

C. Neither Rosenberg or Goldenberg, alone or in combination, Discloses “a detent profile associated with one of the systems, the detent profile comprising haptic data associated with a virtual detent”

1. The Rosenberg and Goldenberg combination Does Not Teach a “virtual detent”

153. Goldenberg does not teach “virtual detent,” *i.e.*, a sense of mechanical resistance produced through vibrotactile feedback. Petitioner does not rely on Goldenberg to teach “a virtual detent,” (Pet., 70 (“The lone distinction between Ground 3 and Ground 4 is the latter’s use of Goldenberg’s ‘force detent profiles[.]’”). And Goldenberg does not disclose vibrotactile feedback or virtual detents. This is because, as explained above, Goldenberg is concerned with force feedback applied to a 3-dimensional knob, not vibrotactile effects that simulate mechanical resistance. Thus, Goldenberg does not disclose “virtual detent.”

2. The Rosenberg and Goldenberg combination Does Not Teach a “a detent profile associated with one of the systems”

154. Similar to my discussion for Ground 3, here, Goldenberg teaches profiles associated with user interface interaction and not profiles corresponding to

one of the systems to be manipulated. I understand Petitioner argues that Goldenberg teaches the claimed “plurality of systems,” but I understand that identifying applications as a “plurality of systems” based solely on the infringement contentions is improper. Further, I do not believe that Goldenberg teaches that profiles should correspond to those specific mapped “systems.” Rather, Goldenberg’s profiles only correspond to specific *interactions* across the identified systems.

155. I also understand that Petitioner argues: “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 Goldenberg’s ‘force detent profile’ associated with that *function*.” Pet., 70. This confirms the deficiency in Goldenberg as Petitioner explicitly associates Goldenberg’s profile to the *function* of scrolling through menu lists rather than one of the alleged *systems*, e.g., videogame or Internet browser. *Id.* That is because Goldenberg does not teach that the alleged profiles can correspond to the alleged systems.

156. Rather in Goldenberg, these alleged profiles would produce the same behavior *across* the video game and Internet browser applications, further indicating the lack of correspondence to one of the specific *systems*. (Again, I understand that identifying applications as a “plurality of systems” based solely on the infringement contentions is improper.) Each of Petitioner’s citations to

Goldenberg confirms this correspondence of the alleged profile with a *function* rather than a particular *system*. See Ex. 1007, 2:40-42 (“detent force can be output when the cursor moves from one menu item to a different menu item.”), 16:15-19, 21:48-51 (“each item has a force detent effect associated with it, where the detent biases knob motion to the center of the item”), 22:52-57. Thus, Goldenberg only discloses profiles corresponding with interactions with graphical objects globally and not with one of a plurality of systems.

D. No Motivation to Combine Rosenberg and No Reasonable Goldenberg and No Expectation of Success

1. No Showing That a POSA Would Have Been Motivated to Modify Rosenberg with Goldenberg

157. As I explained above, the Rosenberg-I-Goldenberg combination does not disclose several claim limitations. But even if it did, I have not seen, nor am I aware of any reason a POSA would have combined the two references. Rosenberg-I discloses a touchpad input device (just like Ichinose) and Goldenberg teaches a physical knob (just like Levin and Wang). I have seen any reason or explanation for why a POSA would seek to modify Rosenberg’s touchpad, which is 2-dimensional and not capable of exerting resistive or assistive force feedback, with Goldenberg’s 3-dimensional knob.

158. To the contrary, a POSA would not be motivated to attempt to apply Goldenberg’s resistive and assistive forces on a two-dimensional touchpad because

they would recognize a 2-dimensional touchpad is not capable of supporting such forces nor would a POSA implement such force feedback mechanisms in the form factor of a touchpad.

159. To offer a motivation to combine, I understand that Petitioner explains how “force detents” are beneficial generally, but not why a POSA would see a specific benefit to a touchpad. Petitioner contends that Goldenberg teaches that force detents provide a better user experience, and thus, a POSA would have sought to improve the user experience of Rosenberg-I by using Goldenberg’s force detents. Pet., 67. This still does not explain how or why a POSA would modify Rosenberg’s touchpad with a mechanical force detents mechanism that requires a physical knob.

160. Petitioner also explains why Goldenberg’s force effects are beneficial, but not why a POSA would see a specific benefit to modifying Rosenberg’s touchpad with it. Pet., 67-68 (“FIG. 6. It likewise discloses ‘a jolt force’ that is ‘stronger in magnitude than normal detents, [and] which informs the user that the end of a value range or other range has been reached.’”). Thus, I do not believe that the Petition shows any motivation to combine.

2. No Showing of Reasonable Expectation of Success

161. I understand that Petitioner argues success should be expected because both systems use computers, processors, and actuators. Pet., 69. But Petitioner does not address how a POSA would approach applying resistive and assistive forces,

which require 3-dimensional knobs and sliders, on Rosenberg-I's 2-dimensional touchpad. The fact that both Rosenberg-I and Goldenberg generically employ processors and actuators does not show how a POSA would have expected success in attempting to apply Goldenberg's assistive and resistive forces to Rosenberg-I's touchpad. Rather, a POSA would not have expected success in modifying Rosenberg-I's touchpad to exert Goldenberg's force effects.

* * *

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 October 17, 2024, in Dallas, Texas.

By: Robert Akl
Dr. Robert Akl, D.Sc.