

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VALVE CORPORATION
Petitioner,

v.

IMMERSION CORPORATION
Patent Owner.

Case No. IPR2024-00714
U.S. Patent No. 10,627,907

EXHIBIT 2004

**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” or “Patent Owner”) to assess the challenged claims of U.S. Patent No. 10,627,907 (“the ’907 patent”) in connection with this case which is the Petition for Inter Partes Review of the ’907 patent (“the Petition” or “Pet.”).

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 1990s 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 2005.

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 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 1001–1111 and other documents including, but not limited to, the materials listed below:

- IPR Petition, IPR2024-00714
- Institution Decision, IPR2024-00477
- U.S. Patent No. 10,627,907 (“’907 patent”) (EX1001)
- Prosecution History of the ’907 patent. (EX1002)
- Declaration of Jean Renard Ward (“Ward”) (EX1003)
- U.S. Patent Appl. Publ. No. 2007/0152988 (“Levin”) (EX1006)
- U.S. Patent Appl. Publ. No. 2004/0032395 (“Goldenberg”) (EX1016)
- U.S. Patent Appl. Publ. No. 2007/0139375 (“Rosenberg”) (EX1017)
- Joint Claim Construction Statement in W.D. Wash. (EX2003)
- 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 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 six grounds of invalidity:

- Ground 1 of the Petition argues that claims 1-6, 8-13, and 15-19 are anticipated and/or obvious over Goldenberg.
- Ground 2 argues that claims 7, 14, and 20 are obvious over Goldenberg in view of U.S. Patent Appl. Publ. No. 2008/0055244 (“Cruz-Hernandez”) (EX1005).
- Ground 3 argues that 1-4, 6, 8-11, 13, 15-17, and 19 are anticipated and/or obvious over Rosenberg.
- Ground 4 argues that claims 5, 7, 12, 14, 18, and 20 are obvious over U.S. Patent No. 6,203,432 (“Roberts”) (EX1018) and Rosenberg.
- Ground 5 argues that claims 7, 14, and 20 are obvious over Roberts in view of Rosenberg and Cruz-Hernandez.
- Ground 6 argues that 1, 3-4, 6, 8, 10-11, 13, 15, 17, and 19 are anticipated and/or obvious over Levin.

23. Based on my analysis of the Petition and the exhibits cited in the Petition, it is my opinion that none of the asserted prior art references anticipate and/or render obvious the claims of the '907 patent.

IV. APPLICABLE LEGAL STANDARDS

A. Ordinary Skill in the Art

24. 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 “POSITA” or “POSA” (person of ordinary skill in the art)—as of the time of the invention, which I understand to be the earliest priority date (December 23, 2014) of the '907 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 '907 patent at the time of the invention.

25. 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.

26. I understand that the Petitioner has proposed that the level of skill in the art at the time of the '907 patent is as follows:

POSAs would have had 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, human-computer interaction, or other relevant experience.

Pet. at 6 (citing Ward, ¶¶38-42).

27. In my opinion, the definition of a POSA should be one with:

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

28. Moreover, a person could have qualified as a POSA with more formal education and less practical or industry experience, or vice versa.

29. Consistent with either definition, I was at the time of invention, and 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.

30. The Petition fails to show that any challenged claim of the '907 patent is unpatentable under either Petitioner's or Immersion's definition of a POSA.

B. Claim Construction

31. I understand that, in the current parallel district court proceeding, Immersion and Petitioner have agreed to the following constructions with respect to the claims of the '907 patent.

Claim Term	Agreed Proposed Construction in District Court ¹
“range” claims 1, 2, 5, 8, 9, 12, 15, 16, 18	“a sequence, series, or scale between limits”
“primary range” claims 1, 2, 8, 9, 15, 16	“range” as construed above, but otherwise plain and ordinary meaning
“secondary range” claims 1, 2, 5, 8, 9, 12, 15, 16, 18	“range” as construed above, but otherwise plain and ordinary meaning
“boundary range” claims 1, 2, 5, 8, 9, 12, 15, 16, 18	“range” as construed above, but otherwise plain and ordinary meaning

32. I further understand that the parties have not proposed constructions for any other claim terms of the '907 patent in the parallel district court proceeding, and that Petitioner believes no terms require construction. Pet. at 7.

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

¹ See EX2003 (*Immersion Corporation v. Valve Corporation*, No. 2:23-cv-00712-TL, Dkt. No. 68-1 (W.D. Wash. Mar. 29, 2024)).

Claim Term	Patent Owner's Proposed Construction
“defining position and range information” (Claims 1, 8, and 15)	A step taken by, or a feature allowing, a user or device to change the settings of a controller to adjust the claimed ranges based on user input.
“partially overlaps” (Claims 1, 8, and 15)	Overlap between two ranges is less than total, such that neither range is completely overlapped by the other.
“in response to” (Claims 1, 8, and 15)	Plain and ordinary meaning, which requires a cause-and-effect relationship between a second event (e.g., a haptic effect) that occurs in reaction to a first event (e.g., entry of the user input element to one or more positions within the boundary range of positions).

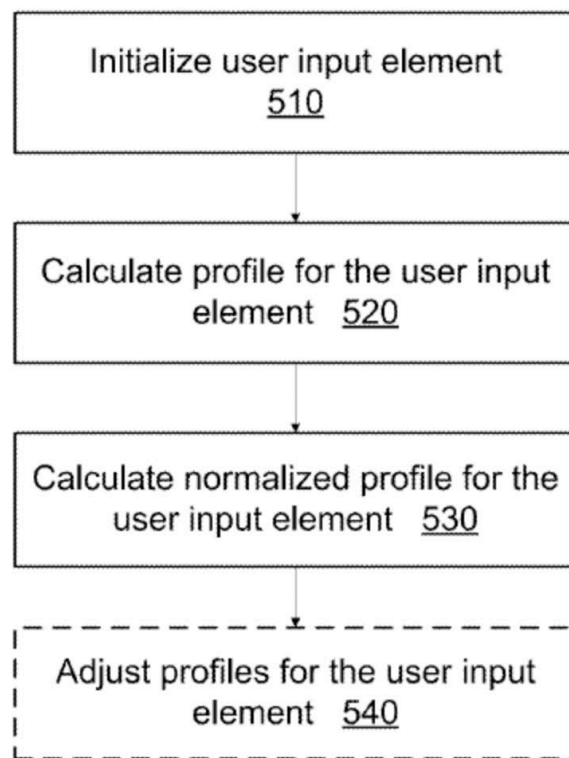
1. “Defining Position and Range Information”

a) The '907 patent does not teach “force profiles”

34. I understand that Petitioner relies on the “force profiles” disclosed in the asserted prior art references, which are also other patents of Patent Owner Immersion. I understand that Petitioner maps these “force profiles” to the claimed “defining input position and range information.” I further understand that by doing this, Petitioner improperly broadens the scope of the claim term to a construction that is unsupported by the '907 patent specification. I understand that the '907 patent's specification and claims do not mention the term “force profile” or “haptic profile.” The only “profile” that the '907 patent teaches and recites is the separate

ADC input profile which is defined for the user input element—not a *force* profile. See, e.g., EX1001 at Fig. 5, 9:44-10:13. Therefore, the '907 patent should not be improperly construed to include force profiles.

Fig. 5
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35. Because a POSA would understand that the '907 patent does not teach force profiles, construing the challenged claims to cover force profiles improperly broadens claim scope without any support in the written description. I understand that it is legally improper to construe a claim to cover subject matter that is not

disclosed in the written description of the patent such that doing so would render the patent invalid for lack of written description.

36. Also, I understand that the absence of the term “force profile” was not unintentional. As demonstrated in the other patent applications of Patent Owner, Patent Owner intended to cover the concept of “force profiles,” by clearly stating the term. For example, one of Patent Owner’s other applications and asserted prior art in this Petition, the Rosenberg reference, uses the term “force values that have been previously calculated or sampled and stored as a digitized ‘force profile’ in memory.” EX1017, ¶[0103]. Thus, Petitioner’s interpretation of the ’907 patent to cover force profiles or to map the asserted prior art’s force profiles to the claimed input position and range profiles is improper.

b) “defining” excludes the use of predetermined profiles

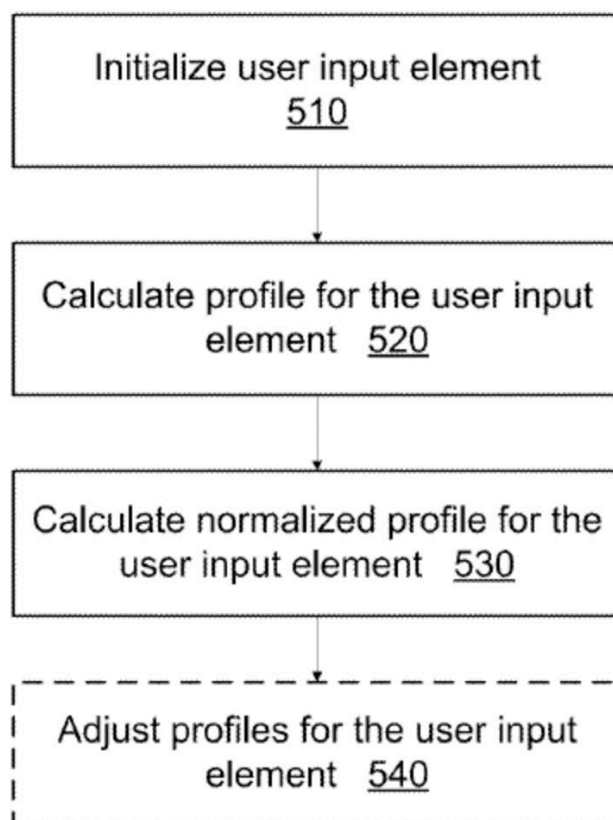
37. A POSA would understand that the term “defining,” as it is used in the claims of the ’907 patent, is the present continuous tense of “define” because it has the suffix “ing.” “Defining” refers to an event that can happen in the present as opposed to an event that has already happened in the past. Hence, a user or the device itself must be capable of “defining position and range information” in the present rather than using predetermined positions and range information, which is only possible if the position and range information can be set during use based on user inputs.

38. Moreover, a POSA reading the claims of the '907 patent as a whole would understand that the “defining” step or functionality must happen in the present, during use. Independent claims 1, 8, and 15 each have just two limitations directed to method steps or functionality: (1) the “defining” limitation and (2) the “rendering a haptic effect” limitation. Since both limitations begin with the present continuing tense of a verb, they both must be capable of being performed in the present during use. If “defining” were not performed in the present during use, it would have to be performed by, for example, the manufacturer, while “rendering” would occur when the controller is in use at a different place and time. The fact that both limitations use the same verb tense indicates that they are meant to be performed while a user operates the controller, not at different times by different entities.

39. A POSA reading the specification of the '907 patent would also understand that “defining” must be able to occur in the present, during use. The only way for “defining the position and range information” disclosed and enabled by the '907 patent requires the device to actively define (*i.e.*, “defining”) such information based on user input. For example, as shown in Figure of the specification, the functionality 500 “calculate[s] profiles for the user input element [at 520],” “calculate[s] normalized profile for the user input element [at 530],” and then “adjust[s] profiles for the user input element [at 540].” In this process, the ADC input

profile in terms of position and range information is calculated and defined for the user input element at runtime. EX1001 at 9:44-10:13. The specification also discloses that after initially setting the position and range information, these calculations are “based on the movement of the user input device from the maximum position to the grounding position” (*id* at 9:44-51) or variations in the resting position of the user input element (*id* at 10:4-13, cl. 7, 14, 20).

Fig. 5
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40. The specification also explains, “[t]rigger engine 316 may receive haptic data, such as a haptic effect definition, and may *modify* the haptic data *based on user input data*, such as trigger data 323.” EX1001 at 7:1-3. “Trigger data 323, as previously described, is data that includes one or more parameters that indicate a position and/or range of one or more triggers of controller 330 (e.g., triggers L and R of FIG. 3).” *Id.* at 8:10-13. In addition, the steps of the flow chart shown in Figure 4 of the ’907 patent are described in language similar to the claims (e.g., “Define a primary range and a secondary range of positions for a user input element 410”). As shown in Figure 4, the steps of defining the primary, secondary, and boundary ranges are immediately followed by monitoring the position of the user input element and then rendering haptic effects. This indicates that each of these steps (including “defining”) are performed during use rather than with predetermined profiles provided by, for example, the manufacturer. Whether the position and range data are set directly by the user through a user interface, through firmware based on user input, or some other way, the claims require the position and range information to be defined based on user input.

41. I understand that the Board has noted that the ’907 patent discloses that the primary and secondary ranges “may be fixed or variable” (EX1001 at 5:29-30) and states this language suggests that an embodiment in which the range information is fixed and cannot be altered by a user would be within the scope of the claims. DI

at 10. However, a POSA would understand, in the context of the '907 patent, a range may be “fixed” or variable” because the ranges can be defined as either being fixed ranges that do not change after being set during use (*see, e.g.*, EX1001 at 5:30-38) or variable ranges which are initially set but may change based on various factors (*see id.* at 9:44-51). Both embodiments require defining the ranges based on present user input rather than predetermined profiles. The term “fixed,” as it is used in the specification of the '907 patent, does not mean or imply that predetermined profiles that are not based on user input are within the scope of the patent

2. “Partially Overlaps”

42. A POSA would understand that the element “the boundary range of positions partially overlaps each of the primary range of positions and the secondary range of positions” (*see, e.g.*, EX1001 at 13:62-64), in the context of the '907 patent, excludes total overlap between the boundary range and each of the primary and secondary ranges. Otherwise, “partially” would seem to be a superfluous term. Had the inventors intended to include total overlap within the scope of the claims, they would have used a different term, such as “at least partially overlaps” or just “overlaps.”

43. I understand that Petitioner argues that the specification of the '907 patent discloses an embodiment in which the primary range may be extended to render haptic effects within the secondary range or the boundary ranges. I further

understand that Petitioner then concludes that for the primary range to extend into the secondary range, it would need to extend through the entirety of the boundary range. Pet. at 15. However, a POSA would understand that the primary range could extend into the primary range without either of those ranges totally overlapping the boundary range. For example, the '907 patent discloses one embodiment with a 39 degree range of motion, which includes a secondary range at 0-7 degrees, a primary range at 7-29 degrees, and another secondary range at 29-39 degrees. EX1001 at 5:29-38. The '907 patent does not expressly state the boundary ranges for that embodiment, but if, for example, one boundary range were defined as 4-10 degrees, a POSA would understand that the boundary range would partially overlap both the primary range and the initial secondary range, and the primary range would extend one degree (and up to 3 degrees) into the secondary range without the boundary range being entirely within the primary range or secondary range. Such an embodiment would be consistent with disclosure of a primary range extending into a secondary range without resulting in total overlap of the boundary range.

3. “In Response to”

44. A POSA would understand that “in response to,” as it is used in the claims of the '907 patent requires a cause-and-effect relationship between “rendering a haptic effect” that occurs in reaction to “entry of the user input element to one or more positions within the boundary range of positions.” If the haptic effect is

rendered as the result of some other event (*e.g.*, entry into a range other than the boundary range) that happens to merely coincide with entry into a position of an alleged boundary range, entering a position of the alleged boundary range is not the cause of the haptic effect being rendered, and a POSA would not consider the haptic effect to have been rendered “in response to” entry into a position of the boundary range.

4. Other Claim Terms

45. I also understand that, except for the terms listed in the tables 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. *See* EX2003.

46. Therefore, in my analysis of the challenged claims throughout this declaration, I apply the agreed constructions listed above. For all other claim terms, I apply the plain and ordinary meaning for all other claim terms as understood by a POSA in the context of the '907 patent specification.

47. I understand that in interpreting the claims of the '907 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.

48. 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

49. 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.

50. 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

51. 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 non-obviousness.

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

53. Counsel has informed me, and I understand, that in order to evaluate the obviousness of any claim of the '907 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.

54. 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.

55. 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.

56. 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.

57. Counsel has informed me, and I understand, in considering the obviousness of a claimed invention, one should not view the invention and the prior art with the benefit of hindsight. In an obviousness analysis, one must be aware of the distortion caused by hindsight bias and must be cautious of arguments reliant upon ex post reasoning. Counsel has instructed me, and I understand that when considering obviousness, I should not consider what is known today what was learned from the invention of the ’907 patent itself. Instead, obviousness is assessed by the person of ordinary skill in the art at the time the invention of the ’907 patent was made, but without the knowledge of the invention.

58. In this regard, I am informed and I understand that the '907 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.

59. 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.

60. 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 '907 patent.

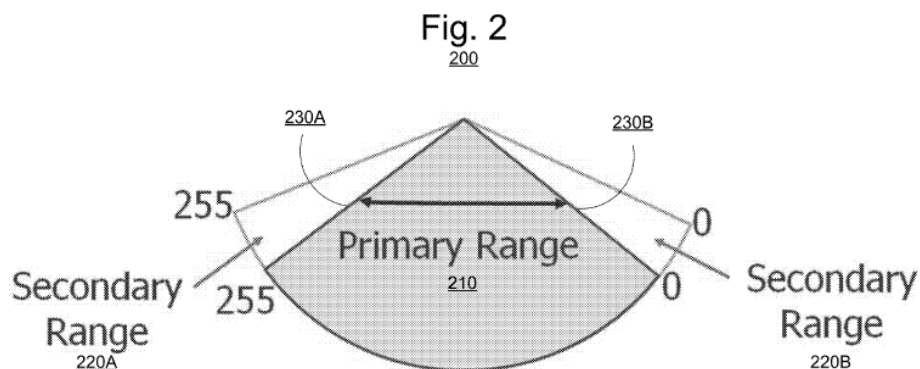
V. OVERVIEW OF THE '907 PATENT

61. The '907 patent is titled “Position Control of a User Input Element Associated with a Haptic Output Device” and discloses an invention for controlling a boundary range of positions of a user input (UI) element associated with a haptic device. EX1001 at 2:39-41. I understand that input devices, such as video game controllers, in the prior art tend to use visual and auditory cues as user feedback, but some UI devices use haptic feedback. *Id.* at 1:21-27. Haptic feedback is advantageous in that it provides user feedback that enhances and simplifies a user’s interaction with for example, a video game controller, by alerting the user to specific events, or providing realistic feedback to allow enhanced sensory feedback in a simulated or virtual environment for an immersive experience. *Id.* at 1:28-33. Haptic feedback is also advantageous for other devices such as medical devices, automotive controls, remote controls, etc. *Id.* at 1:34-38. The '907 patent improves upon prior art input devices by allowing a user to define and/or adjust various ranges of positions for a UI element (*e.g.*, a knob, joystick, etc.) such that when the UI element enters certain positions within a defined boundary range, the user input device renders a haptic effect. *Id.* at 1:41-58.

62. The '907 patent enables defining position and range information of a haptic output device based on user input (*e.g.*, through a user interface (“UI”), collected by firmware, etc.), including a primary, a secondary, and a boundary range

of positions. In an embodiment, the defined boundary range partially overlaps with each of the defined primary and secondary ranges, and a haptic effect is rendered in response to entry of the user input element into one or more positions within the boundary range of positions. *Id.* at cl. 1, 8, 15. This extends the range and capabilities of the UI elements and/or firmware and enables the user to experience a wider range of haptic effects. *Id.* at 9:36-39.

63. An embodiment of the invention is shown below to describe a range of motion 200 that includes a primary range 210 and two secondary ranges, 220A and 220B. *Id.* at 5:19-20. This shows two boundary ranges, 230A and 230B. *Id.* at 5:20-21. The boundary ranges are represented by lines in the figure. However, the specification of the '907 patent states that these boundary ranges are in fact defined ranges which partially overlap with the primary range and the secondary range, and the primary range can also overlap with the secondary range in some instances. *Id.* at 5:21-25.



Id. at Fig. 2.

64. According to the patent, the claimed “defining position and range information” step is carried out by a computer processor 120 that executes computer programs, including a boundary range module 142. *Id.* at 3:11-20. Figure 1 below shows the boundary range module 142 controls the boundary range of user input elements of the controller 150. *Id.* at 3:28-30. Thus, invention of the ’907 patent enables defining position and range information based on user input either by users themselves or by the device, which improves upon the prior art which limits users to previously determined profiles that can only mimic particular detents.

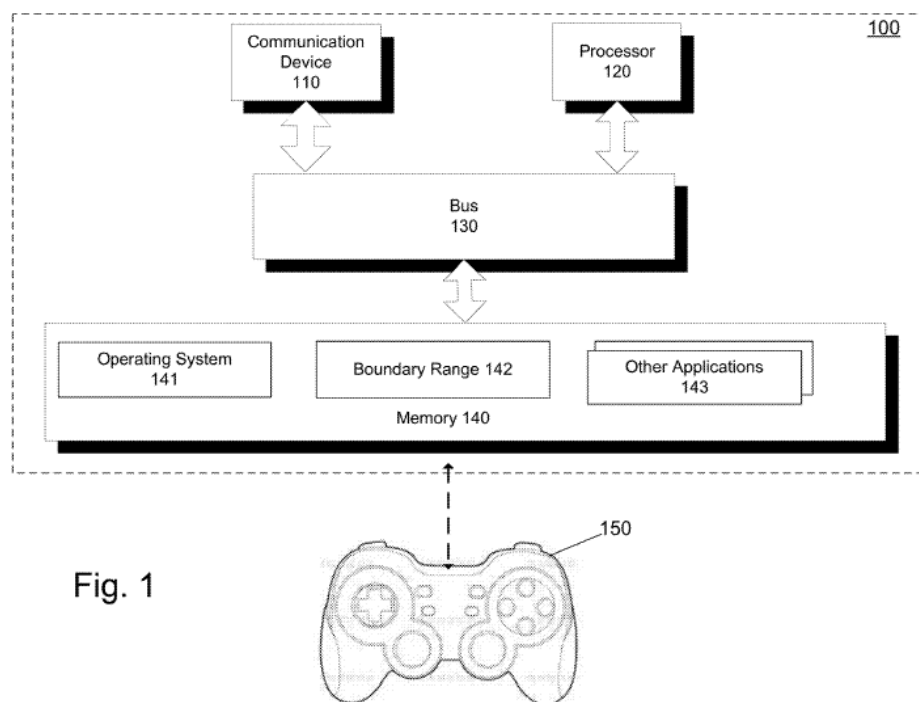


Fig. 1

Id. at Fig. 1.

65. The primary, secondary, and boundary ranges are software defined and therefore can either be fixed or variable. *Id.* at 5:29-30. In the context of the patent,

“fixed” means that, once the position and range information are set based on user input, they do not change (*see id.* at 5:29-49) while “variable” means that, after the position and range information is set based on user input, those ranges can vary based on various factors. *See id.* at 9:40-10:13. The ’907 patent states that “[t]rigger engine 316 may receive haptic data, such as a haptic effect definition, and may **modify** the haptic data **based on user input data**, such as trigger data 323.” *Id.* at 7:1-3. “Trigger data 323, as previously described, is data that includes one or more parameters that indicate a position and/or range of one or more triggers of controller 330 (e.g., triggers L and R of FIG. 3).” *Id.* at 8:10-13.

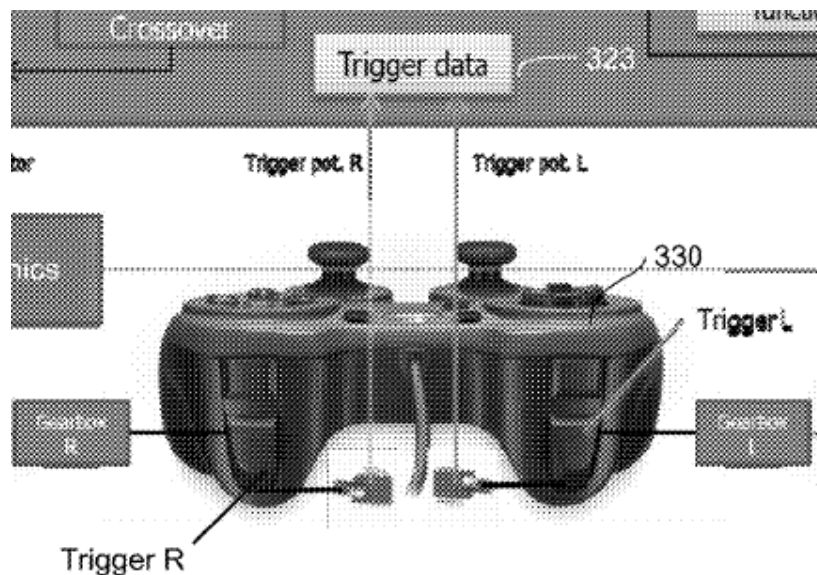


Fig. 3
300

Id. at Fig. 3.

VI. EXEMPLARY CLAIM OF THE '907 PATENT

66. Independent claim 1 is recited below:

1[pre]. A method for controlling a user input element associated with a haptic output device, the method comprising:

[1A] Defining position and range information for the user input element associated with the haptic output device, including

[1A1] a primary range of positions,

[1A2] a secondary range of positions, and

[1A3] a boundary range of positions, wherein the boundary range of positions partially overlaps each of the primary range of positions and the secondary range of positions; and

[1B] rendering a haptic effect in response to an entry of the user input element to one or more positions within the boundary range of positions.

EX1001 at cl. 1.

67. The other independent claims of the '907 patent, claims 8 and 15, contain substantially the same limitations as claim 1. Claim 8 has a different preamble from claim 1 (*i.e.*, “A non-transitory computer readable storage medium storing a program configured to be executed by a processor, the program comprising

instructions for:”). Claim 15 also has a different preamble (*i.e.*, “A device comprising:”), and it has two additional limitations immediately following the preamble (*i.e.*, “a processor; and a memory storing a program for execution by the processor, the program including instructions for:”).

VII. GROUND 1: GOLDENBERG

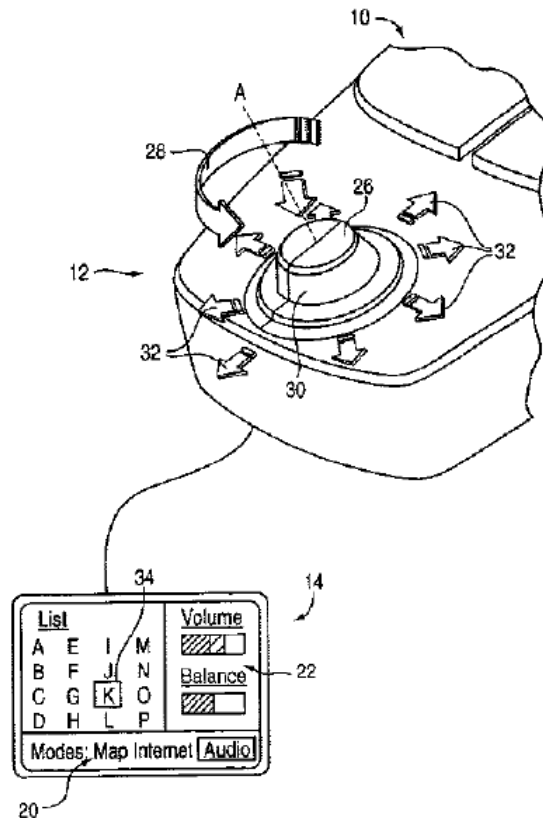
68. I understand that Ground 1 of the Petition challenges claims 1-6, 8-13, and 15-19 as anticipated and/or rendered obvious by Goldenberg. Pet. 7. For the reasons provided below, it is my opinion that Petitioner has not shown anticipation or obviousness with respect to Goldenberg.

69. While the Petition asserts that claims 1-6, 8-13, and 15-19 are anticipated and/or rendered obvious by Goldenberg, Petitioner provides only anticipation arguments as to claims 1, 8, and 15, which are the '907 patent's only independent claims. Petitioner's only statements relating to the alleged obviousness of claims 1, 8, and 15 are unsupported and conclusory. As I explained in Section IV.D., I understand that establishing that a claim is invalid for obviousness requires consideration of additional factors beyond mere disclosure of the claim elements, including, for example, whether a POSA would have had a sufficient motivation to modify the prior art. Since Petitioner has failed to provide the additional analysis required to show that claims 1, 8, and 15 are invalid for obviousness in view of Goldenberg, my analysis below is directed to Petitioner's anticipation arguments. In

any case, as I explain below, Goldenberg fails to disclose all limitations of claims 1, 8, and 15, so it cannot anticipate those claims or render them obvious.

A. Overview of Goldenberg (EX1016)

70. Goldenberg is directed to providing “haptic sensations for a haptic feedback device and especially for a rotational device such as a knob.” EX1016, Abstract. Goldenberg states that “force effects such as a hill force effect and barrier force effect allow easier selection of menu items, menus, values, or other options by the user.” *Id.* The knob disclosed in Goldenberg is a rotatable thumb stick, as shown below:



Id. at Fig. 1

71. Goldenberg discloses force feedback that can be associated with events such as user interaction with menu items. Goldenberg states, as an example, that “[a] detent force can be output when the cursor moves from one menu item to a different menu item.” *Id.* at [0012]. Goldenberg further states, “[f]or example, each successive item in a linear menu 306 can be provided with a detent, where the detent force profile overlaps with the beginning of the next items detent force profile as a way to provide a more compelling feel to the user and, in some cases, to reduce selection

overshoot.” *Id.* at [0085]). The input position and range information (in the x-axis) of this detent is predetermined by the nature of the detent.

72. The problem that Goldenberg is meant to address is as follows:

many of the well known force feedback sensations, such as detents, are applied in simple ways that are often inadequate for dealing with some of the selection functions required from a knob, where often complex control over functions and options must be provided with limited knob motion. For example, selecting options from a menu and navigating between menus can be difficult for a user when only simple detents are output. The user may accidentally skip menus or selections or may have to move a cursor through many undesired selections to reach a desired selection.

Id. at [0009].

73. Goldenberg attempts to solve this problem using a predetermined “‘force process’ that may be stored in local memory 206 and includes calculation instructions, formulas, force magnitudes (force profiles), and/or other data.” *Id.* at [0066]. Goldenberg uses the force profiles to simulate physical or mechanical effects such as a hill effect in which the knob encounters an increasing resistive force (*i.e.*, moving up the slope of the hill) followed by an assistive force (*i.e.*, moving down the slope of the hill). *Id.* at [0011]. Another simulated force effect disclosed in Goldenberg is a jog shuttle control model with a first spring effect centered around an origin position that applies over the knob’s entire range of motion and biases the knob back to an origin position, as well as a second spring effect that is stiffer than the first spring effect and is output over only a smaller range around the origin. *Id.*

at [0014], [0116]. Goldenberg graphically depicts the jog shuttle model as shown below:

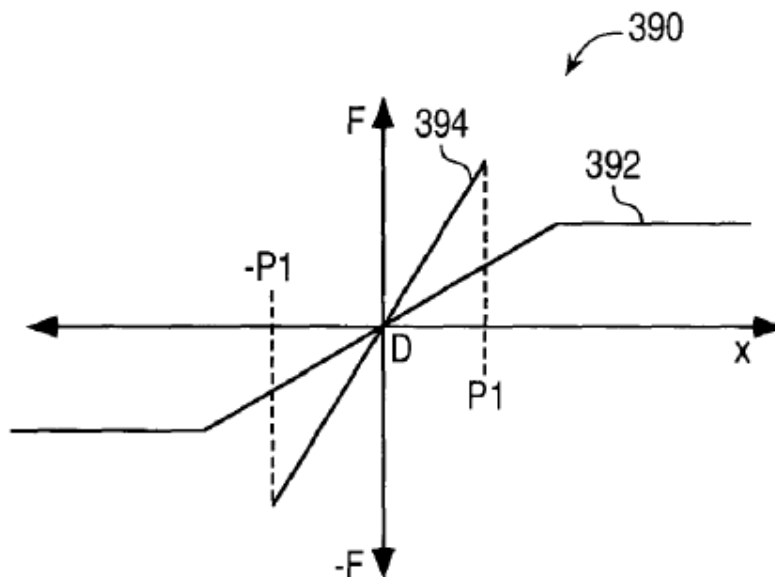


FIG. 8

Id. at Fig. 8

B. Goldenberg Fails to Disclose “Defining Position and Range Information for the User Input Element”

74. I understand that each of the challenged claims of the '907 patent requires “defining position and range information for [the/a] user input element.” For example, independent claim 1 is a method claim that requires a user to perform the step of “defining position and range information.” The other two independent claims 8 and 15 are directed to devices that use software for “defining position and range information.” I understand that each of the other claims of the '907 patent are

dependent on one of the independent claims, so they too require “defining position and range information.” As I explain below, Petitioner has not demonstrated that Goldenberg discloses defining position and range information for the user input element in accordance with the claims of the ’907 patent, and therefore, Goldenberg fails to disclose this element. Goldenberg instead discloses predetermined force profiles that **cannot** be adjusted based on user input; moreover, these force profiles include two predetermined ranges, one of which is entirely (not partially, as the claim requires) overlapped by the other. *See, e.g.*, EX1016 at [0021], [0066]; *see also* EX1001 at 3:21-30 (*e.g.*, “The modules may further include the boundary range module 142 that controls the boundary range of user input elements of controller 150.”), 5:29-30 (“In some embodiments, primary range 210 and secondary ranges 220A, 220B may be fixed or variable.”), 7:1-3 (“Trigger engine 316 may receive haptic data, such as a haptic effect definition, and may modify the haptic data based on user input data, such as trigger data 323.”), 8:10-14 (*e.g.*, “Trigger data 323, as previously described, is data that includes one or more parameters that indicate a position and/or range of one or more triggers of controller 330....”); *see also* EX1001 at Figs. 3-4. And as I’ve explained above, the proper construction of the “defining” claim element does not cover predetermined force profiles.

75. I understand that Petitioner points to the force profile diagrams, particularly the jog shuttle force model shown in Fig. 8 of Goldenberg, to map

“defining position and range information for the user input element associated with the haptic output device, including.” Pet. at 10, citing Ward, ¶90. Similarly, Petitioner points to the jog force shuttle model shown at Fig. 8 of Goldenberg to map “a primary range of positions” (*id.* at 12-13), “a secondary range of positions” (*id.* at 13-14), and “a boundary range of positions...” *Id.* at 14-16. In other words, Petitioner treats the “defining” element as nothing more than a description of the three claimed ranges. However, a POSA would understand that a description of particular predetermined ranges in a predetermined force profile is not the same as a process for “defining” those ranges, and identification of a range in a force profile does not disclose a method or device that enables defining that range. *See* Section IV.B.1.

76. Based on the Petition, it appears that Petitioner presumes that alleged disclosure of the claimed ranges also discloses “defining position and range information,” as if the latter is merely a description or recitation of the former. By mapping “defining position and range information...” to Goldenberg’s force profiles, Petitioner has improperly conflated the “defining position and range information” and the prior art’s force profile that incidentally uses input ranges. The claims separately recite “defining position and range information” that includes “a primary range of positions, a secondary range of positions, and a boundary range of positions....” *See, e.g.,* EX1001 at cl. 1, 8, 15. A POSA would understand that the

three ranges are distinct elements and that they are also separate and distinct from the process of defining them. Petitioner has failed to treat “defining position and range information” as separate from descriptions and depictions of the claimed ranges.

77. Counsel has informed me, and I understand, that different terms in a patent claim are presumed to have different meanings. I am not aware of anything in the patent or file history that suggests that the “defining” element is redundant with the claimed ranges or that the disclosure of the claimed ranges necessitates disclosure of the “defining” element, so a POSA would understand them to be distinct elements. The disclosure of the ’907 patent shows that the “defining” element is a separate step or feature from the claimed ranges. *See* EX1001 at 3:21-30, 5:29-30, 7:1-3, 8:10-14, Figs. 3-4.

78. Moreover, if those elements were not treated as distinct, the scope of the claims would become ambiguous to a POSA. Accordingly, Petitioner has not demonstrated that Goldenberg discloses “defining position and range information for the user input element associated with the haptic output device, including.”

1. Goldenberg’s Force Profiles Fail to Disclose “Defining Position and Range Information”

79. As explained in Section IV.B.1 and Section V, the ’907 patent discloses that the claim element “defining position and range information” is performed with software based on user input. Claims 8 and 15 expressly reference software. *See*,

e.g., EX1001 at 14:24-25 (“the program comprising instructions for: defining...”), 14:64-65 (“the program including instructions for: defining...”). Claim 1, a method claim, requires the step of “defining position and range information,” and the enabling disclosure describes using software to perform this step based on user input. A POSA would understand that the ’907 patent discloses computer architecture and components (*e.g.*, a “boundary range module 142”) for defining position and range information for rendering haptic effects rather than merely describing potential haptic effects relative to a predetermined input range for predetermined profiles. EX1001 at 3:11-20, 28-30. The ’907 patent also discloses that haptic effects may be changed “based on user input data” which includes position and range information for one or more buttons, triggers, etc. on a controller. *Id.* at 7:1-3, 8:10-13.

80. By contrast, I have not found any such disclosure in Goldenberg for “defining position and range information for the user input element.” Instead, Petitioner contends that “Goldenberg’s method uses ‘force profiles’ that define, *inter alia*, ‘position and range information’” (Pet. at 10, citing Ward, ¶89), but the force profiles show input position and range information that is merely predetermined, with graphical descriptions of certain force effects. They do not define position and range information for the user input element as required by the claims since Goldenberg does not appear to provide the user with any flexibility to change the

user input and range information. *See* EX1001 at 3:21-30, 5:29-30, 7:1-3, 8:10-14, Figs. 3-4.

81. Petitioner's citations to Goldenberg's force profiles demonstrate that they are simply "graphs," "illustration[s]," and "diagram[s]" of various force effects rather than disclosures of "defining position and range information." *See, e.g., id.*, citing EX1016 at [0021]-[0029]. Goldenberg expressly uses the phrase "force magnitudes (force profiles)," which demonstrates that force profile is a synonym for force magnitude, which is not a step or capability for "defining position and range information." EX1016 at [0066]. A POSA would understand that, at most, Petitioner has merely identified the description of the "haptic effect" limitation, but it has failed to show that Goldenberg explains how to define the position and range information in the x-axis for the user input element as described in Figures 4 and 5 of the '907 patent. *See* EX1001 at 3:21-30, 5:29-30, 7:1-3, 8:10-14, Figs. 3-4.

2. Goldenberg's Jog Shuttle Model Fails to Disclose "Defining Position and Range Information"

82. The Petition fails to explain how Goldenberg's description of the jog force model discloses the step of, or capacity for, "defining position and range information," including with regard to the specific ranges recited in the claims. While I understand that Petitioner makes a statement to the contrary (Pet. at 11), I am not aware of any disclosure in Goldenberg discussing "defining" an "origin O" for the jog shuttle model since Goldenberg fails to provide the user with the ability

to change the relevant values. EX1016 at [0115]-[0117]. A POSA would understand that Goldenberg refers to an “origin” or an “origin O” of the jog shuttle model only with respect to force effects centered around the origin,” but it does not disclose defining the origin or any other position or range information in the x-axis of the force profile. *Id.* at [0116].

83. I understand that Petitioner also claims that the jog force model of Figure 8 “further defines ‘positions -P1 and P1,’ (Pet. at 12; Ward, ¶94), but a POSA would understand that Figure 8 only describes those two points in the abstract. Neither Figure 8, nor the relevant paragraphs disclose defining those points or any others. *See* EX1016 at [0115]-[0117]. Rather, a POSA would understand that since the jog shuttle model is meant to “best simulate a mechanical jog shuttle having mechanical springs,” -P1 and P1 would be a predetermined consequence of a simulated spring effect and are not themselves defined. *Id.* at [0116].

84. Finally, a POSA would understand that Goldenberg’s express description of the jog shuttle model precludes disclosure of the “defining element.” The claims require “defining position and range information ...including a primary range...a secondary range...and a boundary range.” EX1001 at cl. 1, 8, 15. Therefore, a reference must disclose defining all three ranges, or it does not disclose all claim elements. The jog shuttle model discloses two spring effects. EX1016 at [0116]. As I will explain in greater detail in Section VII.C, Petitioner improperly

argues that the range of the first spring effect corresponds to the “primary range of position” and the “secondary range of positions.” Pet. 12-14. However, Goldenberg discloses that “the spring force is output over the entire movement range of the knob.” EX1016 at [0115]. That means that, regardless of whether the first spring effect is deemed to have one range or two, the position and range information for the claimed ranges corresponding to the first spring effect cannot be defined, since the range of the first spring effect is predetermined to cover the entire range of the knob. Put differently, by default the first spring effect covers the entire range of the knob, so there is nothing for the user to define, and therefore no “defining,” for that range. Accordingly, a POSA would understand that Goldenberg’s jog shuttle model precludes the “defining” element.

C. Petitioner Fails to Show that Goldenberg Discloses a “Secondary Range of Positions”

85. I understand that Petitioner argues that Goldenberg’s jog shuttle model discloses all three of the claimed ranges, but its position is inconsistent with the plain language of Goldenberg. That is because, while the challenged claims require three separate, distinct ranges (as counsel has informed me, and I understand, different terms in a patent claim are presumed to have different meanings), Goldenberg’s jog shuttle model discloses only two ranges, at most, both centered around an origin point, so at least one of the alleged claim ranges is necessarily absent. I also understand that Petitioner argues that the range of the second spring effect in the jog

shuttle model is the boundary range (Pet. at 15), but Petitioner inconsistently argues that the range of the second spring effect should be divided into the primary and secondary ranges. *Id.* at 12-14. Petitioner's attempt to divide the range of the first spring effect into two ranges conflicts with Goldenberg's disclosure and is inconsistent with its treatment of the boundary range as explained below.

1. Goldenberg Discloses that the Range of the First Spring Effect Is a Single Range

86. Rather than describing the first spring effect as having separate ranges depending on the direction the knob is turned, Goldenberg describes one range of effect centered on an origin point, that always biases the knob toward the origin point. Goldenberg states that, “the knob is provided with a centering spring force at all points of its rotation, the spring force biasing the knob toward an origin rest position,” and the first spring effect is “preferably output when the knob is moved in either direction away from the origin position.” EX1016 at [0115]. A POSA would understand Goldenberg's description to mean that the first spring effect is output over a range equal to the entire range of the knob rather than being divided between different ranges on either side of the origin. Like a spring affixed to a particular point, it exerts the same force regardless of which direction it is pulled. (Hooke's Law). Petitioner does not explain why the range of the first spring effect, which is centered around and always biased toward an origin, is actually two separate ranges.

2. Petitioner's Argument Is Internally Inconsistent

87. Petitioner's position as to what constitutes a range appears to change depending on its need at a given moment. The best example is how Petitioner characterizes the jog shuttle model's spring effects differently depending on which claim element it is trying to meet. As I explained above, Goldenberg's jog shuttle model has two spring effects centered around, and biased toward, an origin point. Section VII.A; EX1016 at [0115], [0116]. According to Goldenberg, there are only two disclosed differences between the two spring effects. First, while the first spring effect is output over the entire range of the knob, the second spring effect "is only in effect over a small range between positions -P1 and P1 around the origin position." EX1016 at [0116]. Second, while the first spring effect has "a medium amount of stiffness," the second spring effect "is preferably much stiffer than the first spring." *Id.* In Fig. 8 below, I have highlighted the range of the second spring effect in orange. It is encompassed by the range of the first spring effect, which I have highlighted in yellow.

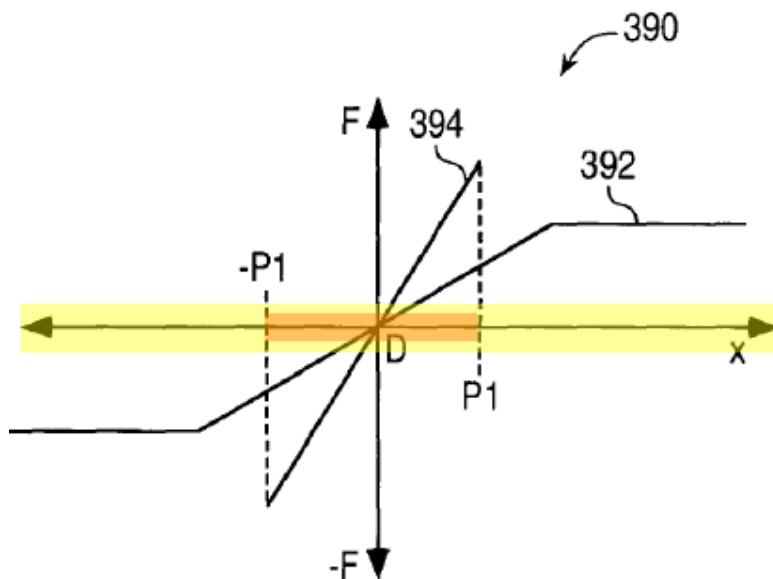


FIG. 8

88. As I explained above, Petitioner improperly attempts to divide the range of the first spring force into “a primary range of positions” to the right of the origin and “a secondary range of positions” to the left of the origin. *See* Section VII.C.1; Pet. 12-14, citing Ward, ¶¶95-96. By contrast, Petitioner treats the range of the second spring force as just one range that spans the origin point and alleges that it is the claimed “boundary range of positions.” Pet. 15-16, citing Ward ¶¶97-100. Petitioner never explains why it has chosen to treat the first and second spring forces, which are both centered around and biased toward an origin, differently. However, a POSA would understand that treating the ranges of the two forces consistently is fatal to Petitioner’s position.

89. If a POSA were to treat both spring force ranges as undivided ranges centered around an origin, Petitioner's argument would fail for two reasons. First, the jog shuttle model would disclose only one range for each spring force, and would, therefore, not disclose the three claimed ranges. Second, as I will explain in greater detail in Section VII.D, the jog shuttle model would not disclose that "the boundary range partially overlaps each of the primary range of positions and the secondary range of positions" because there would be no secondary range for the boundary range to overlap. In that scenario, the range of the second spring force would completely overlap the range of the first spring effect, but the claims expressly require that the boundary range only "partially overlaps" the primary and secondary ranges. Accordingly, Petitioner's argument fails if a POSA were to consistently treat the spring forces as each having only a single range.

90. If a POSA were to instead consistently divide both spring force ranges at the origin, Petitioner's argument would again fail since any boundary range would be unable to partially overlap both the primary and secondary ranges, as required by the claims. I understand that Petitioner contends that the "primary range" is "a range of the knob's rotary positions moving clockwise from the origin which correspond to positions to the right of the origin" (Pet. at 12-13, citing Ward, ¶95), and the "secondary range" is "a range of the knob's rotary positions moving counterclockwise of the origin which correspond to positions to the left of the origin

position.” *Id.* at 13-14, citing Ward, ¶96. Accordingly, Petitioner does not interpret either the alleged primary or secondary range as including the point of origin. I have highlighted these alleged ranges in the diagram below in yellow and blue, respectively. I further understand that Petitioner alleges that “the knob’s rotary positions between ‘positions -P1 and P1’...that form ‘a small range...around the origin position’” corresponds to the claimed “a boundary range of positions.” Pet. at 15, citing Ward, ¶99. If a POSA were to split this range into a first range “which corresponds to positions to the right of the origin” (*see id.* at 12) and a second range “which correspond to positions to the left of the origin position” (*id.* at 13), there would be two more ranges separated by the origin. I have highlighted the two ranges of the second spring effect in the diagram below in red and green, respectively. Thus, a POSA would understand that, consistent with Petitioner’s treatment of the first spring effect range, the ranges of the second spring effect do not meet at the origin and, therefore, do not overlap.

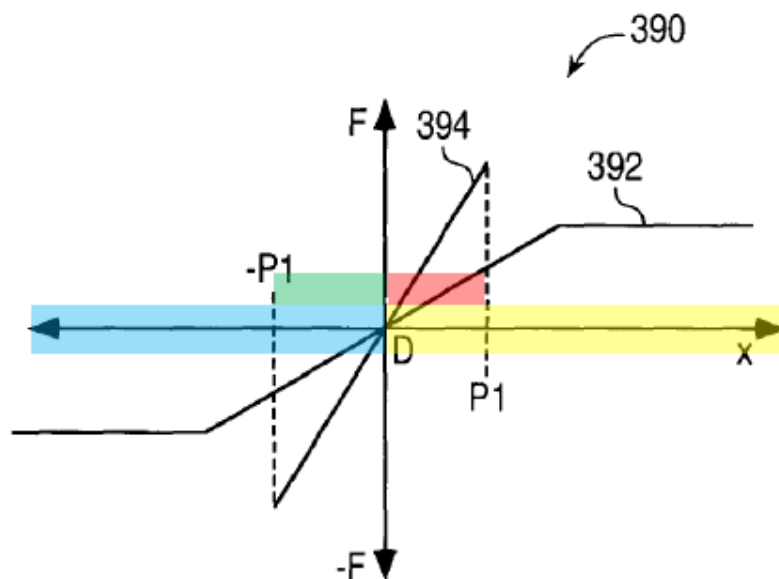


FIG. 8

EX1016 at Fig. 8.

91. A POSA would understand that, since the claims require that “the boundary range of positions partially overlaps each of the primary range of positions and the secondary range of positions,” the diagram above, consistent with Petitioner’s methodology for the first spring effect range, shows that each alleged boundary range entirely overlaps with either the alleged primary or secondary range of positions, but not both. In other words, the yellow highlighted range entirely overlaps the red highlighted range, and the blue highlighted range entirely overlaps the green highlighted range, but there is no overlap between the yellow and green

ranges or the blue and red ranges). Accordingly, Petitioner's argument fails when the ranges of the spring forces are treated consistently.

3. Petitioner Argument that the Boundary Range Can Be Entirely within the Primary Range Conflicts with the Claims

92. I understand that Petitioner argues that “[t]he claimed ‘boundary range’ need not be a unique range of positions,” but rather can “be made up partially or exclusively of positions that are in the” primary or secondary ranges. Pet. at 14-15 (citing Ward, ¶¶97-98). I further understand that, to support their position, Petitioner and its expert quote from the '907 patent, which states, with respect to Fig. 2 of that patent, the “primary range 210 may be extended to render haptic effects within secondary ranges 220A, 220B and/or boundary ranges 230A, 320 B.” Pet. at 15 (citing EX1001 at 5:23-25, Fig. 2; Ward, ¶98). They conclude that this language “mak[es] that boundary range of positions entirely within the primary range,” but a POSA would understand this to be incorrect for multiple reasons. Pet. at 15 (citing EX1001 at 5:23-25, Fig. 2; Ward, ¶98). First, as I will explain below in Section IV.B.2 and Section VII.D, interpreting the claim term “partially overlaps” as including “total” overlap would improperly deprive that term of meaning.

93. Second, a POSA would understand that “boundary range” is also its own claim term separate from the “primary range” and the “secondary range,” regardless of the degree of overlap. See EX1001 at 5:20-23 (“...boundary ranges

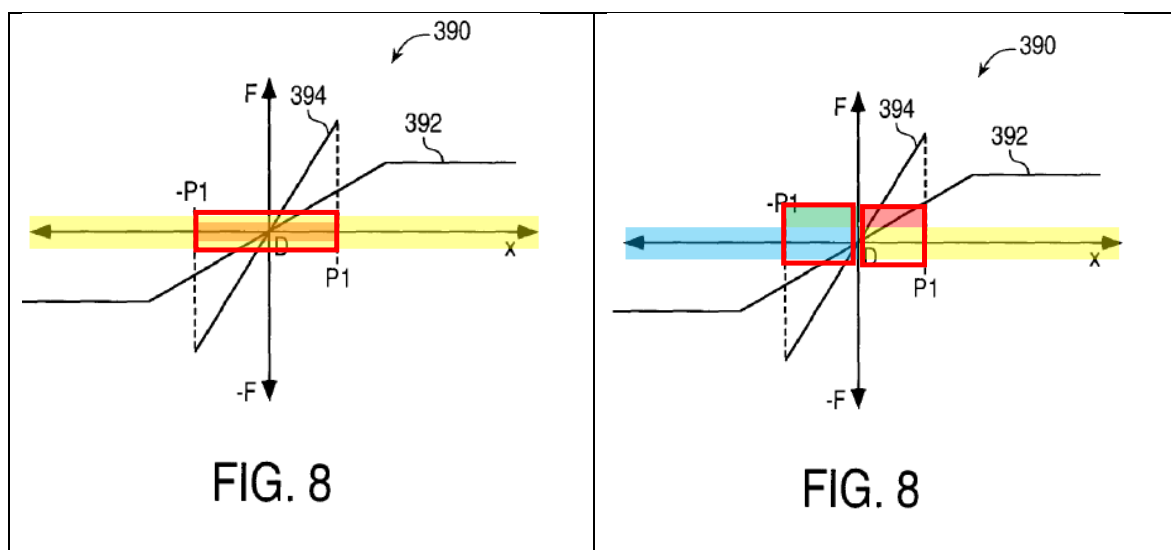
230A, 230B may be defined so as to partially overlap primary range 210 and secondary ranges 220A, 220B.”).

94. Third, a POSA would understand that Petitioner’s and its expert’s statement that the primary range “would need to extend through the entirety of [the] boundary range” in order for the primary range to extend into the second range is demonstrably false and, at best, misreads the language of the ’907 patent that they cite. As an example, the Petition includes an image of Fig. 8 of Goldenberg, which Petitioner highlighted in an attempt to show a blue primary range, and orange secondary range, and a red boundary range. Pet. at 15; *see also, id.* at 12-14. For the reasons that I provided in Section VII.C.2, I disagree with Petitioner’s designations of the alleged claimed ranges in Fig. 8. However, as explained in Section IV.B.2, a POSA would understand that a primary range can extend into the secondary range while an alleged boundary range still only partially, but not entirely, overlaps each of the primary and secondary ranges, as required by the claims.

D. Goldenberg Fails to Disclose “Wherein the Boundary Range of Positions Partially Overlaps Each of the Primary Range of Positions and the Secondary Range of Positions”

95. Under either scenario that I explained in Section VII.C.2 (*i.e.*, (1) each of the first and second spring effects have a single range centered on an origin point, or (2) each of the first and second spring effects a divided into two ranges separated by the origin point), the range of the second spring effect, which Petitioner identifies

as the boundary range (Pet. at 15), would be entirely enveloped by the alleged primary or secondary range. Thus, a POSA would understand that the jog shuttle model would not disclose a “boundary range” that “partially overlaps” each of the primary and secondary ranges because the overlap with one range would be total as shown in the figures below, in which the total overlap of the boundary range is outlined in red.



96. A POSA would understand that “partially overlaps” does not include “totally overlaps.” See Section IV.B.2. If one were to interpret the claim that way, the term “partially” would be deprived of meaning, and I am not aware of anything in the patent or file history that supports such an interpretation. A POSA would understand that the inventors’ decision to qualify “overlaps” with “partially” rather than “at least partially” or no qualification at all strongly indicates that total overlap of the boundary range is outside the claim scope. When the disclosed spring effects

are treated consistently (*i.e.*, both spring effects are treated as single ranges or both are divided into two ranges), Goldenberg does not disclose that the “boundary range of positions partially overlaps each of the primary range of positions and the secondary range of positions.”

VIII. GROUND 2: GOLDENBERG-CRUZ-HERNANDEZ

97. I understand that Ground 2 of the Petition challenges claims 7, 14, and 20, which are dependent on independent claims 1, 8, and 15, respectively. Pet. 28. Since claims 7, 14, and 20 include the limitations of claims 1, 8, and 15, respectively, for the reasons that I provided in Section VII with respect to claims 1, 8, and 15, it is my opinion that the Goldenberg-Cruz-Hernandez combination does not disclose all required claim elements. Therefore, Petitioner has not shown obviousness as to claims 7, 14, and 20 in view of the Goldenberg-Cruz-Hernandez combination.

IX. GROUND 3: ROSENBERG

98. I understand that Ground 3 of the Petition challenges claims 1-4, 6, 8-11, 13, 15-17 and 19 as anticipated and/or rendered obvious by Rosenberg. Pet. 32. For the reasons provided below, it is my opinion that Petitioner has not shown anticipation or obviousness with respect to Rosenberg.

99. While the Petition asserts that claims 1-4, 6, 8-11, 13, 15-17 and 19 are anticipated and/or rendered obvious by Rosenberg, Petitioner provides only anticipation arguments as to claims 1, 8, and 15, which are the '907 patent's only

independent claims. Petitioner’s only statements relating to the alleged obviousness of claims 1, 8, and 15 are unsupported and conclusory. As I explained in Section IV.D., I understand that establishing that a claim is invalid for obviousness requires consideration of additional factors beyond mere disclosure of the claim elements, including, for example, whether a POSA would have had a sufficient motivation to modify the prior art. Since Petitioner has failed to provide the additional analysis required to show that claims 1, 8, and 15 are invalid for obviousness in view of Rosenberg, my analysis below is directed to Petitioner’s anticipation arguments. In any case, as I explain below, Rosenberg fails to disclose all limitations of claims 1, 8, and 15, so it cannot anticipate those claims or render them obvious.

A. Overview of Rosenberg (EX1017)

100. Rosenberg is directed to “a method and apparatus for providing force feedback to a user operating a human/computer interface device in conjunction with a graphical user interface (GUI) displayed by a host computer system.” Ex. 1017 at Abstract. Rosenberg explains that, “[p]referably, the force sensation applied to the physical object is at least partially determined by a location of the cursor in the GUI with respect to targets associated with the graphical objects in the GUI.” *Id.* at [0012]. Rosenberg further discloses that, “[t]hese targets may include or be associated with such graphical objects as icons, windows, pull-down menus and menu items, scroll bars (‘sliders’), and buttons.” *Id.* According to Rosenberg, “[t]he

force sensation output to the physical object is associated with targets that affect the cursor,” and the “force preferably assists the user to select the desired operating system function that is associated with the force.” *Id.* The physical “object” operated by the user may be a joystick, such as the one shown below in Figure 7, but it can also be a “mouse, trackball, stylus, steering wheel, medical instrument (laparoscope, catheter, etc.), pool cue, hand grip, knob, button, or other article.” *Id.* at [0082]; *see also* [0026]. The input position and range information (in the x-axis) for such input devices is predetermined.

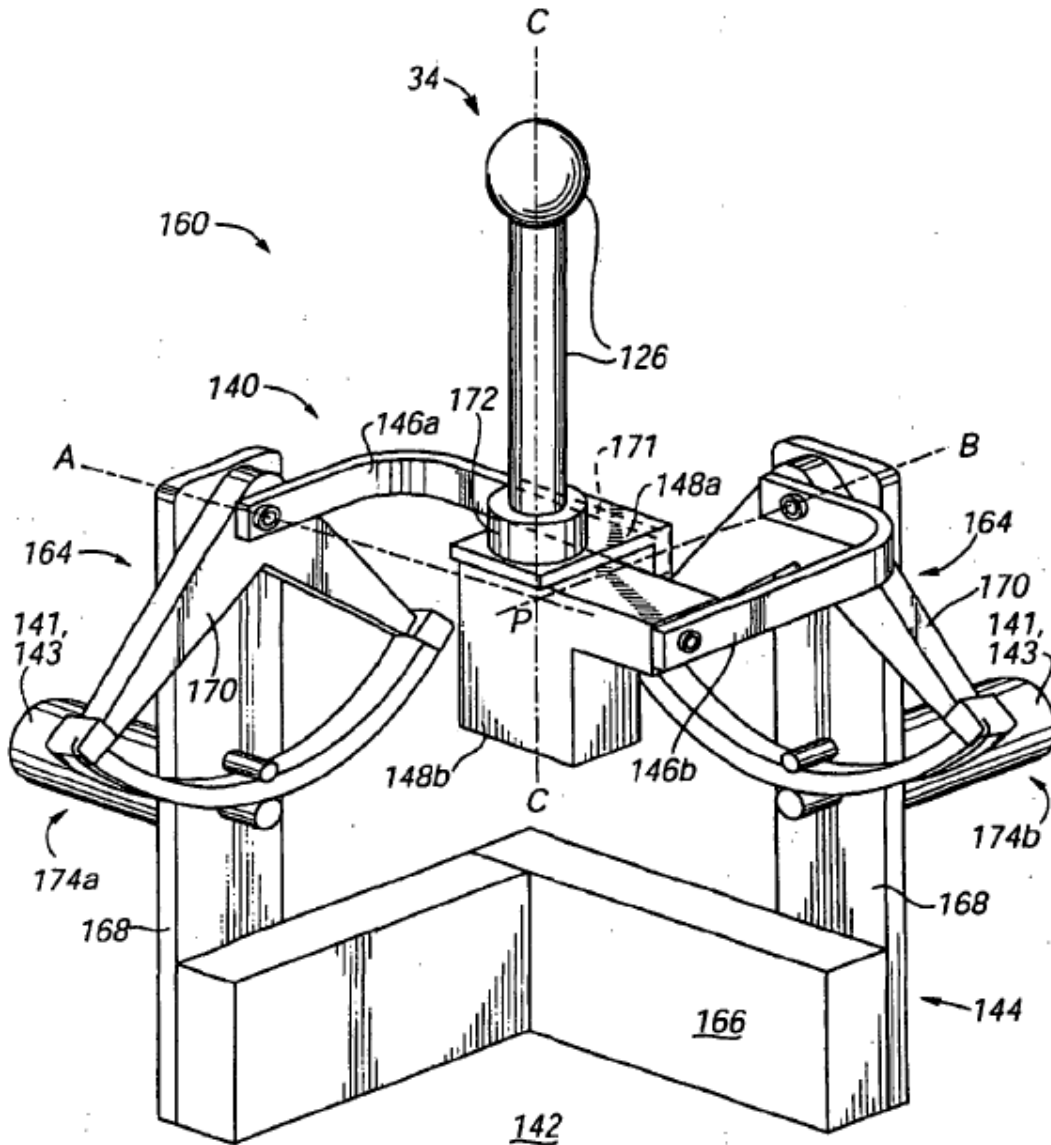


Figure 7

Id. at Fig. 7.

101. The problem that Rosenberg attempts to solve is making it easier to move a cursor of a GUI to a desired target, such as icon, window, etc., which would

make navigation of the GUI easier, particularly for users with disabilities. Rosenberg describes the problem as follows:

[t]he movement of a cursor onto various displayed graphical objects of a GUI may require significant dexterity. Users may move the cursor too far over an object and have to backtrack their cursor. Or, particular graphical objects might be mistakenly selected when the user does not wish to select the object due to pressing a button or moving the cursor by accident. In addition, a user may become confused as to which window a cursor is position in if the user is viewing other data on the screen at the same time as moving the cursor.

Id. at [0007]. Rosenberg acknowledges that people with neuromotor disabilities may find interacting with a GUI particularly difficult because they may “lack the fine motor coordination required to manually position the computer cursor accurately and efficiently.” *Id.* at [0008]. In this context, a POSA would understand that the invention could pertain to moving a cursor on a computer with a mouse or other input device.

102. Rosenberg’s proposed solution is “a computer system and interface device that will allow all users to more accurately and efficiently perform cursor movement activities and manipulating operating system and other functions within a GUI.” *Id.* at [0009]. To implement this solution, Rosenberg’s invention simulates force effects by using “force values [in the y-axis] that have been **previously calculated or sampled and stored** as a digitized ‘force profile’ in memory or other storage device. These force values may have been previously generated using an equation or algorithm...or provided by sampling and digitizing forces.” *Id.* at

[0103]. In other words, Rosenberg uses pre-existing, predetermined input and range information as well as predetermined force profiles to improve a user's interactions with a GUI.

B. Petitioner Has Failed to Show that Rosenberg Discloses “Defining Position and Range Information for the User Input Element Associated with the Haptic Output Device”

103. I understand that Petitioner identifies the “defining” element as “Rosenberg’s force restoring command with a deadband” (Pet. at 36, citing Ward, ¶161; *id.* at 38, citing Ward, ¶166) or, alternatively, “Rosenberg’s force restoring command without a deadband.” *Id.* at 40, citing Ward, ¶169. Regardless of which alternative Petitioner maps to this element, rather than explaining how or why either force restoring command permits “defining position and range information for the user element,” Petitioner and its expert merely describe the restoring force profiles, the forces exerted at various points, and the ranges shown therein, similar to Petitioner’s attempted mapping with respect to Goldenberg. *See, e.g., id.* at 37-40, citing Ward, ¶¶161-162, 164-169). However, as I’ve explained above, the ’907 patent does not teach or claim force profiles, and showing force profiles to meet the challenged claims is improper and insufficient. Merely describing “graphs,” “illustration[s],” and “diagram[s]” of various force effects relative to input ranges, *i.e.*, force profiles, is not the same as the claimed “defining position and range information for the user element.” Petitioner’s only discussion of “defining position

and range information” are unsupported assertions that the restoring force command defines an origin and the claimed ranges. *Id.* at 36, 38, 40, citing Ward, ¶¶161, 166, 169; *see also* EX1001 at 3:21-30, 5:29-30, 7:1-3, 8:10-14, Figs. 3-4.

104. As with Goldenberg, Petitioner misguidedly focuses on describing force profiles rather than “defining input position and range information.” For example, Petitioner points to Paragraph [0165] and Fig. 10(c) of Rosenberg as disclosing a “restoring force command with a deadband region” that “defines an origin (neutral) O position for the user objection.” Pet. at 36, citing Ward, ¶161. While Paragraph [0165] and FIG. 10(c) describe a force effect with respect to an origin point, Petitioner fails to point to any part of Rosenberg that explains how one would “defin[e] position and range information for the user input element” in the x-axis, particularly by a user via software as in the claims of the ’907 patent. EX1017 at [0165]; *see also* Sections IV.B.1 and V. Although Petitioner cites FIG. 10(c), a “diagrammatic representation[] of [a] restoring force profile[]” (*id.* at [0029]), shown below, Petitioner never explains how an abstract picture of an input range and restoring force profile discloses “defining position and range information for the user input element.”

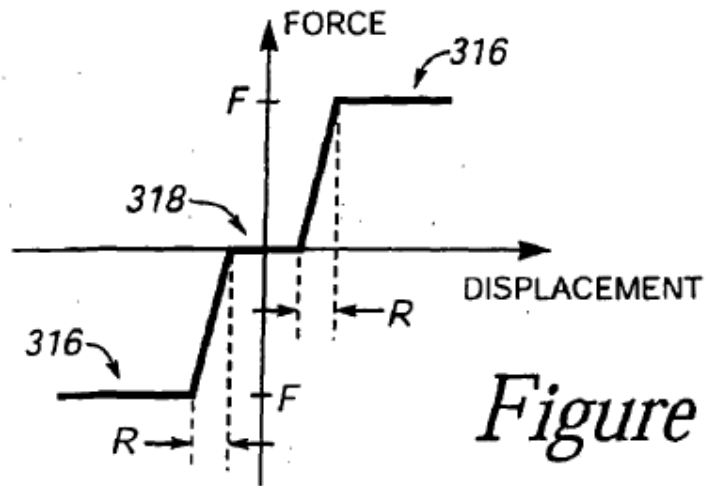


Figure 10c

105. A POSA would understand that Rosenberg does not disclose the “defining” element because its input position and range information is predetermined. Furthermore, the force commands, including the restoring force commands relied on by Petitioner and shown in Figs. 10a-c, are predetermined commands stored in a table, like table 300 shown below. *See, e.g.*, EX1017 at [0028], Fig. 9; Section IV.B.1.

300 RATE CONTROL COMMANDS		
302 FORCE	304 EXAMPLE OF COMMAND AND PARAMETERS	310 SUBCLASS
RESTORING	306 R_FORCE (MAGNITUDE, DURATION, STYLE, DEADBAND) 308	CONDITION
RESTORING SPRING	R_SPRING (COEFFICIENT, DURATION, STYLE, DEADBAND)	CONDITION
SLUGGISH STICK	SLUG (COEFFICIENT, DURATION, STYLE)	CONDITION
UNSTABLE	UNSTABLE (MAGNITUDE, DURATION, STYLE)	CONDITION
VECTOR	V_FORCE (MAGNITUDE, DURATION, DIRECTION)	OVERLAY
VIBRATION	V_VIBRATE (MAGNITUDE, DURATION, DIRECTION, FREQUENCY, STYLE)	OVERLAY
WOBBLE	WOBBLE (MAGNITUDE, DURATION, STYLE)	OVERLAY
BUTTON	B_FORCE (MAGNITUDE, DURATION, DIRECTION, BUTTON, AUTOFIRE)	OVERLAY/CONDITION
JOLT	JOLT (MAGNITUDE, DURATION, DIRECTION)	OVERLAY

Figure 9

106. For example, Rosenberg states in the context of Figs. 10a-c and with reference to table 300 that certain parameters are preferably “specified with...the style parameter 308 of the command 306 shown in table 300.” EX1017 at [0164]. A POSA would understand that, rather than permitting the user to define position and range information for the user input element, Rosenberg explains that its invention uses “force values that have been previously calculated or sampled and stored as a digitized ‘force profile’ in memory or other storage device.” *Id.* at [0103]. Thus, a POSA would understand that the force profiles identified by Petitioner do not disclose the “defining” claim element.

107. As with Goldenberg, Petitioner fails to treat “defining position and range information for the user input element” and the claimed ranges as separate terms and instead maps them to the same figures in Rosenberg. Pet. 37, 39.

X. GROUND 4: ROSENBERG-ROBERTS

108. I understand that Ground 4 of the Petition challenges claims 5, 7, 12, 14, 18, and 20, which are dependent on one of independent claims 1, 8, or 15. Pet. 53. Since claims 5, 7, 12, 14, 18, and 20 include the limitations of one of claims 1, 8, or 15, for the reasons that I provided in Section IX with respect to claims 1, 8, or 15, it is my opinion that the Rosenberg-Roberts combination does not disclose all required claim elements. Therefore, claims 5, 7, 12, 14, 18, and 20 are not obvious in view of the Rosenberg-Roberts combination.

XI. GROUND 5: ROBERTS-ROSENBERG-CRUZ-HERNANDEZ

109. I understand that Ground 5 of the Petition challenges claims 7, 14, and 20, which are dependent on independent claims 1, 8, and 15, respectively. Pet. 62. Since claims 7, 14, and 20 include the limitations of claims 1, 8, and 15, respectively, for the reasons that I provided in Section IX with respect to claims 1, 8, and 15, it is my opinion that the Roberts-Rosenberg-Cruz-Hernandez combination does not disclose all required claim elements. Therefore, claims 7, 14, and 20 are not obvious in view of the Rosenberg-Roberts-Cruz-Hernandez combination.

XII. GROUND 6: LEVIN

110. I understand that Ground 6 of the Petition challenges claims 1, 3-4, 6, 8, 10-11, 13, 15, 17 and 19 as anticipated and/or rendered obvious by Levin. Pet. 66. For the reasons provided below, it is my opinion that Petitioner has not shown anticipation or obviousness with respect to Levin.

111. While the Petition asserts that claims 1, 3-4, 6, 8, 10-11, 13, 15, 17 and 19 are anticipated and/or rendered obvious by Levin, Petitioner provides only anticipation arguments as to claims 1, 8, and 15, which are the '907 patent's only independent claims. Petitioner's only statements relating to the alleged obviousness of claims 1, 8, and 15 are unsupported and conclusory. As I explained in Section IV.D., I understand that establishing that a claim is invalid for obviousness requires consideration of additional factors beyond mere disclosure of the claim elements, including, for example, whether a POSA would have had a sufficient motivation to modify the prior art. Since Petitioner has failed to provide the additional analysis required to show that claims 1, 8, and 15 are invalid for obviousness in view of Levin, my analysis below is directed to Petitioner's anticipation arguments. In any case, as I explain below, Levin fails to disclose all limitations of claims 1, 8, and 15, so it cannot anticipate those claims or render them obvious

A. Levin Fails to Disclose “Defining Position and Range Information”

112. Petitioner fails to show that Levin discloses “defining position and range information” because Levin uses pre-existing, predetermined force detent profiles stored in memory. EX1006 at [0048]-[0049], [0070]; Pet. 69, citing Ward, ¶251; Section IV.B.1. As already explained above with respect to Goldenberg and Rosenberg, a POSA would understand that claim 1 of the ’907 patent recites a method that involves “defining position and range information for the user input element,” not simply using predetermined input position and range information with predetermined force effects stored in a memory. Moreover, claims 8 and 15 of the ’907 patent describe a non-transitory computer readable storage medium and a device, respectively, both of which require “instructions for...defining position and range information.” I understand that the specification of the ’907 patent also explains that the claimed boundary ranges can be variable and may be changed by a user. *See, e.g.*, EX1001 at 3:21-30; 5:29-30, 7:1-3, 8:10-14, Figs. 3-4. Similar to my previous explanations with respect to the other asserted prior art, here Petitioner incorrectly focuses on “force profiles,” but the ’907 patent does not teach or claim force profiles, and showing force profiles to meet the challenged claims is improper and insufficient. Merely describing “graphs,” “illustration[s],” and “diagram[s]” of various force effects relative to input ranges, *i.e.*, force profiles, is not the same as the claimed “defining position and range information for the user element.” While

Levin discloses instructions for implementing detent force profiles, the underlying position and range information in the x-axis is predetermined. Also, Levin's detent profiles are pre-existing and predetermined, which cannot be changed or adjusted by a user. Petitioner fails to point to any part of Levin disclosing instructions for actually "defining position and range information for the user input element."

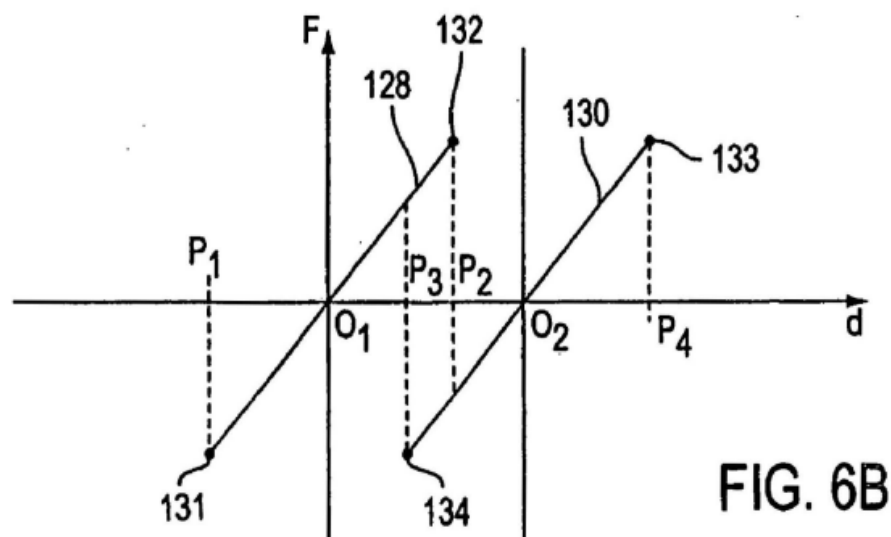
113. I understand that Petitioner argues, "Levin's detent force profiles define ranges, including" a range around a first detent and a range around a second detent. Pet. at 70. However, Petitioner argument is unsupported and conclusory and fails to identify any disclosure of actively "defining." *Id.* at 69-70, Ward, ¶¶252-253. As with its discussion of Goldenberg and Rosenberg, Petitioner discusses this element in a cursory manner that points to descriptions of the force profiles but fails to show how Levin's invention would enable a user to define position and range information for the user input element or enable a user to adjust such parameters. *Id.* at 69-70, Ward, ¶¶252-253.

B. Petitioner Fails to Identify a Separate "Boundary Range of Positions, wherein the Boundary Range of Positions Partially Overlaps Each of the Primary Range of Positions and the Secondary Range of Positions"

114. Once again failing to give proper effect to a claim term, Petitioner admits that what it points to as the claimed "boundary range" is nothing more than "[a] portion of the range of the first detent overlap[ping] a portion of the range of the second detent." Pet. at 73, citing EX1006 at [0009], Ward, ¶259. As I understand

Petitioner's position, Petitioner views any overlap between two ranges as a boundary range. However, a POSA would understand that Petitioner's argument is inconsistent with Levin's disclosure and would give no meaning to the "boundary range" term.

115. It is my understanding that Petitioner relies in part on Fig. 6B of Levin and related disclosure to show alleged disclosure of most claim elements, including "a boundary range of positions" that "partially overlaps each of the primary range...and the secondary range." *Id.* at 74, citing Ward, ¶¶259-260. Fig. 6B, shown below, shows a system with two detent points, O_1 and O_2 . EX1006 at [0070].



116. It is my understanding that lines 128 and 130 are the "detent curves," which show how the force of the detent changes with position. Levin discloses that the "two successive detents are partially overlapped due to the detents and provide a hysteresis-like force effect." *Id.* While I understand Petitioner to equate Levin's

reference to an “overlapped zone” with the “boundary range” (Pet. at 74, citing Ward, ¶¶259-260), it would be clear to a POSA that this language in Levin simply refers to the overlap between two detent ranges, and not a third, separate range. *See* EX1006 at [0070]. A POSA would further understand that where Levin states that “[t]he overlapped zone is between positions P3 and P2,” it is simply referring to the area where the first and second detents overlaps (*i.e.*, P2 is the end of the first detent, and P3 is the beginning of the second detent). *Id.*

117. It is my opinion that Petitioner improperly conflates any overlap between two ranges with the separate “boundary range” recited in the claims. In the context of the ’907 patent, a POSA would understand that the claims are not directed to mere overlapping ranges of forces effects. Rather, a POSA would understand that the claims explicitly require three specific and distinct ranges of positions: a primary range, a secondary range, and a boundary range. EX1001 at cl 1, 8, 15. I am not aware of anything in the ’907 patent or its file history that equates the boundary range with the mere overlap of two other ranges. Indeed, as discussed in Section IV.B.2 and Section VII.C.3, a POSA would understand that the ’907 patent discloses embodiments where the primary and secondary ranges overlap each other, but even those embodiments would still have a boundary range distinct from the overlap between the primary and secondary ranges: “primary range 210 may be extended to

render haptic effects within secondary ranges 220A, 220B and/or boundary ranges 230A, 230B.” EX1001 at 5:23-25.

118. Petitioner’s argument improperly deprives “boundary range” of its meaning. Petitioner seeks to reduce the boundary range to nothing more than an overlap between two pre-existing ranges and not a separate range at all. This interpretation would make “boundary range” an unnecessary claim term since it would add nothing to the claim that would be distinct from the primary and secondary ranges. However, a POSA would correctly understand that “boundary range” is its own claim term that, according to the ’907 patent specification and claims, has its own meaning and functionality separate from the primary and secondary ranges. *See, e.g.*, EX1001 at 3:28-34, 5:19-28, and 9:21-39. A POSA would also understand that the claims’ requirement that the “boundary range...partially overlaps each of the primary range...and the secondary range” demonstrates that “boundary range” is more than just an overlap between two pre-existing ranges. Accordingly, Petitioner’s argument fails because it would improperly reduce “boundary range” to a meaningless term.

119. For the reasons stated above, it is my opinion that the overlap between the first and second detents is not a boundary range as required by the challenged claims. However, even if that overlap were deemed to be a boundary range, a POSA would understand that Levin would still fail to disclose that the boundary range

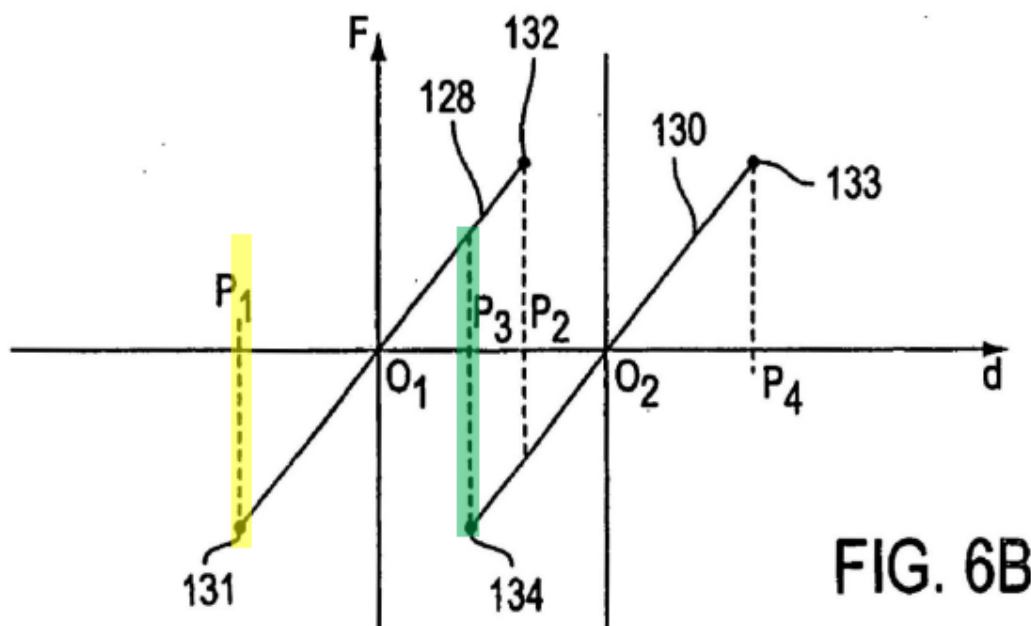
“partially overlaps” each of the primary and secondary ranges, as required by the claims. I understand that Petitioner contends that the overlap between the two detents is “a boundary range of positions,” and that it partially overlaps the primary and secondary ranges. Pet. at 74, citing Ward, ¶¶259-260. But, if the boundary range were comprised entirely of the overlap between the two detent ranges, the boundary range would entirely overlap the primary and secondary ranges, which would deprive the claim term “partially” of meaning. As I explained in Section IV.B.2 and Section VII.D, the inventors chose to use the term “partially overlaps” rather than “at least partially overlaps” or just “overlaps.” This demonstrates that complete overlap would fall outside the claim scope. Petitioner fails to identify anything in the ’907 patent or its file history suggesting that “partially” should include “entirely.” Accordingly, it is my opinion that Petitioner has shown that Levin discloses that the boundary range “partially overlaps” the first and second ranges.

C. Levin Fails to Disclose “Rendering a Haptic Effect in Response to an Entry of the User Input Element to One or More Positions within the Boundary Range of Positions”

120. A POSA would understand that the claims of the ’907 patent require that the haptic effect is rendered “in response to” entering a position of the boundary range rather than rendering a haptic effect that happens to coincide with entry to one or more positions in the boundary range. *See* EX1001 at cl. 1, 8, 15; Section IV.B.3. Accordingly, a POSA would understand that a haptic effect that coincides with

entering the alleged boundary range but is rendered in response to some other event does not satisfy the claims. Rather than properly mapping the “in response to” claim term, Petitioner largely ignores that term and only mentions it once in a conclusory sentence stating that Levin discloses that claim language. Pet. at 78, citing Ward, ¶266.

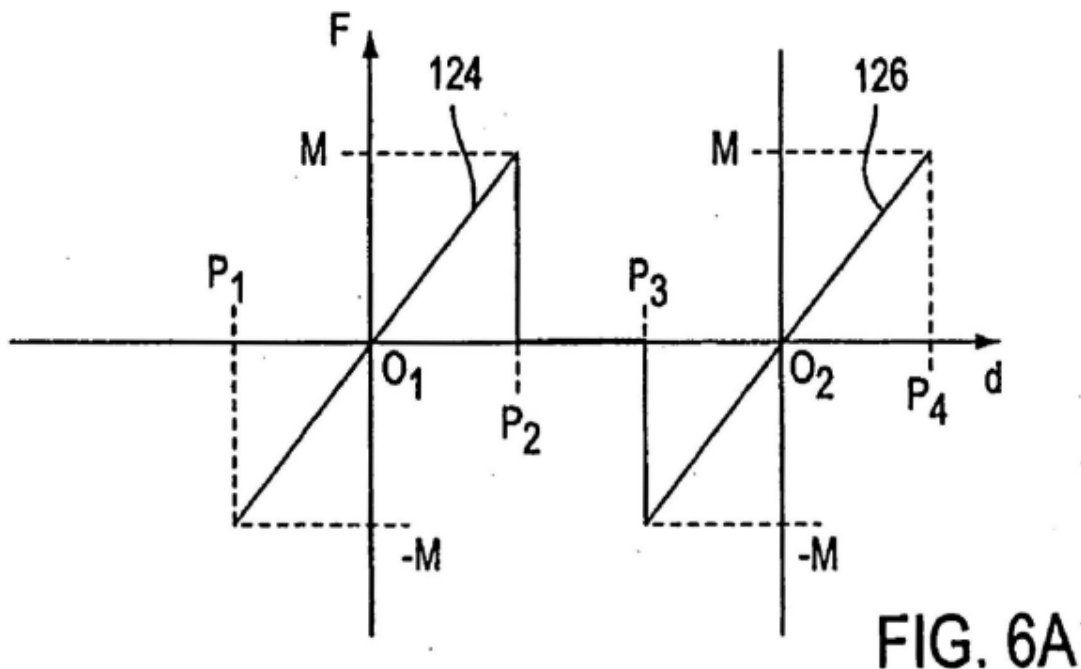
121. A POSA would understand that Levin discloses an invention with one or more detents. A POSA would further understand that Levin discloses that moving a knob within the range of a detent results in a force effect – *i.e.*, renders a haptic effect. EX1006 at [0067]. A POSA would also understand that, in Levin, the haptic effect happens in response to entering the range of each detent, regardless of overlap (which Petitioner maps as the boundary range)—*i.e.*, even if the overlap is interpreted to be the boundary range, as Petitioner argues, the haptic effect’s occurrence is unrelated to the overlap/alleged boundary range and would be triggered even if there is no overlap at all between the detents. *Id.* In Levin’s Figure 6B below, I have highlighted the position at which the force associated with the first detent begins in yellow, and I have highlighted the position at which the force associated with the second detent begins in green. *See id.* at [0070].

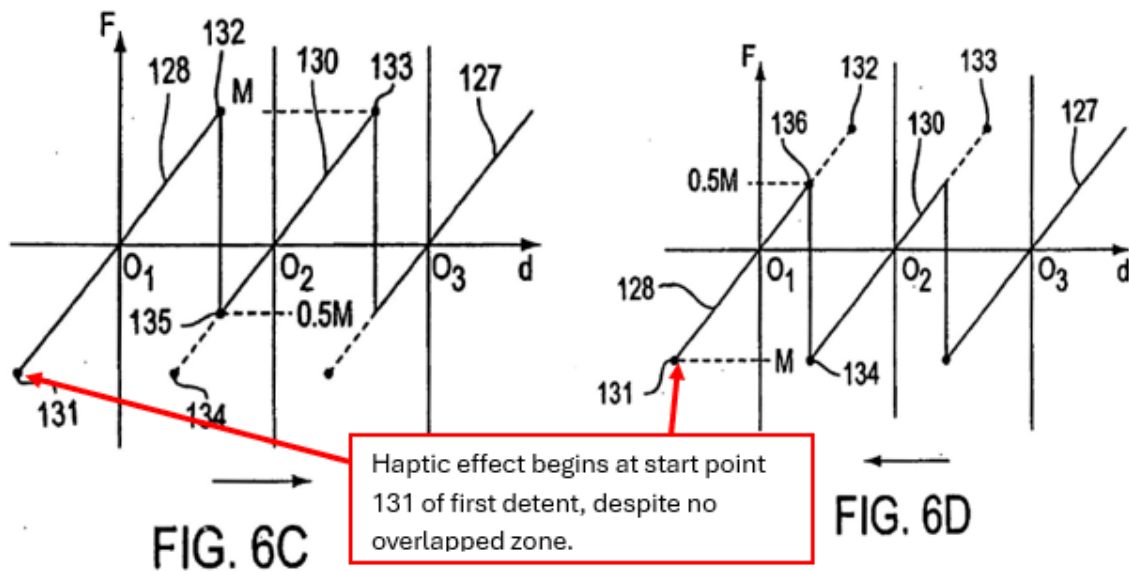


122. A POSA would understand that this diagram demonstrates that the invention renders a haptic effect for the first detent 132 starting at P_1 , even though there are no prior detents overlapping with detent 132 at P_1 . In other words, the haptic effect of detent 132 happens upon the entry into the range of the first detent, even though there is no overlap and the boundary range alleged by Petitioner is entirely absent. The same would be true for the second detent, because Levin states that it is identical to the first—“[t]he two detent curves 128 and 130 are identical, thus allowing a single force command to create the multiple detents if desired.” *Id.* at [0070]. Accordingly, a POSA would understand that the haptic effect of the second detent, as with the first detent, is rendered in response to entry into the range of the detent, and rendering the haptic effect is not conditioned on, or related to, the number of detents or an overlap (*i.e.*, an alleged boundary range). In other words, the haptic

effect is not rendered in response to entry into the overlap, particularly since the overlap might not even exist. Petitioner does not attempt to show that Fig. 6B discloses that the haptic effect is rendered “in response to,” as opposed to coinciding with, the overlapped zone. *See* Pet. at 74-75, citing Ward ¶¶261-263.

123. A POSA would recognize that other embodiments disclosed by Levin further demonstrate that Levin fails to disclose “rendering a haptic effect in response to an entry...to one or more positions of the boundary ranges.” For example, Fig. 6A below, which Petitioner references but does not specifically discuss (*id.* at 67, 79), shows a force profile with no overlapping detents which establishes that Levin’s invention renders haptic effects in response to entering the range of each detent, even in the absence of an overlap/alleged boundary range.





124. Regarding Fig. 6C, I understand that Petitioner contends that the force of 0.5M at point 135 “is of a ‘lesser magnitude’ than the force that would be output at the start of the second force curve [*i.e.*, end point 134] if there was no overlapped zone” (Pet. at 76, citing EX1006 at [0073], Ward, ¶264), but Petitioner misreads and mischaracterizes Levin. In the embodiment of Fig. 6C, Levin explains that it is trying “[t]o solve the problem of unintentionally moving past a successive detent.” EX1006 at [0071]. Levin therefore provides the following solution: “the range of the second or successive detent is adjusted such that a lesser magnitude is preferably output at the beginning of the successive detent that would normally be output if the entire curve of the successive detent were used.” *Id.* In other words, after the first detent 128, subsequent detents shown in Fig. 6C have a shortened range. A POSA would understand that this would mean, for example, that the second detent 130 is not

applied until the knob reaches end point 135, and the initial force of 0.5M would be rendered independent of any overlap with the first detent 128.

125. I understand that Petitioner argues that the embodiment of Fig. 6D discloses this element because it shows force changes in the alleged overlap. Pet. at 78, citing Ward, ¶266. However, Petitioner does not and cannot point to anything in Fig. 6D or Levin's specification teaching a separate boundary range for two reasons. First, a POSA would understand that Levin discloses that "[t]he force output on the knob thus changes depending on the direction of the knob," not a non-existent boundary range. EX1006 at [0072]. Second, a POSA would understand that Levin describes force effects beginning or ending at the endpoints of detent curves without indicating that the haptic effects are rendered "in response to" the overlap between detents rather than the beginning and end points of the detents. *Id.* at [0072] ("In FIG. 6d, starting from origin O2, the force at the beginning of the range of detent curve 128 is at point 136 having a magnitude of 0.5M, which is one-half the magnitude M of the force at the other endpoint 131 of curve 128...."); EX1006 at [0073].

126. In addition, a POSA would understand that as a result of the shortened detents of Figs. 6C and 6D, the overlaps in those figures would consist of just a single point at the end points of neighboring detents. However, a POSA would also understand that a single point would not qualify as a "boundary range." As I

explained in Section IV.B, the parties agreed in a parallel court proceeding that “range,” as it is used in the claims of the ’907 patent, means “a sequence, series, or scale between limits.” A POSA would understand that a sequence, series, and scales between limits, by definition, include more than one point. This means that, under the construction Petitioner has agreed to, a claimed range must have more than one point. A POSA would understand that the embodiments depicted by Figs. 6C and 6D of Levin disclose a single point of overlap and therefore cannot disclose a “boundary range.” Since they do not disclose a “boundary range,” a POSA would also understand that those figures cannot disclose limitations containing that term, including “rendering a haptic effect in response to entry of the user input element to one or more positions within the boundary range of positions.” Accordingly, it is my opinion that Petitioner has failed to show that Levin discloses all elements of the challenged claims.

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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 January 21, 2025, in Dallas, Texas.

By: Robert Akl
Robert Akl, D.Sc.