

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VALVE CORPORATION,
Petitioner,

v.

IMMERSION CORPORATION,
Patent Owner.

IPR2024-00714
Patent 10,627,907 B2

Before WILLIAM V. SAINDON, MICHAEL R. ZECHER, and
CHRISTOPHER L. OGDEN, *Administrative Patent Judges*.

OGDEN, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Petitioner Valve Corporation (“Petitioner”) filed a Petition (Paper 2, “Pet.”) under 35 U.S.C. §§ 311–319 requesting *inter partes* review (“IPR”) of claims 1–20 of U.S. Patent No. 10,627,907 B2 (Ex. 1001, “the ’907 patent”). Patent Owner Immersion Corporation (“Patent Owner”) filed a Preliminary Response (Paper 6, “Prelim. Resp.”).

Under the authority delegated to us by the Director of the U.S. Patent and Trademark Office under 37 C.F.R. § 42.4(a), we may institute an IPR when “the information presented in the petition . . . and any response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a); *see also* 37 C.F.R. § 42.108(c). Applying that standard, we institute an IPR of all the challenged claims of the ’907 patent based on all grounds set forth in the Petition for the reasons explained below. This is a preliminary decision, and we will base our final written decision on the full trial record.

II. BACKGROUND

A. THE ’907 PATENT (EX. 1001)

The ’907 patent describes a method in relation to a haptic output device “for rendering a haptic effect at a user input element” such as “a digital button, analog button, bumper, directional pad, analog or digital stick, driving wheel, or trigger.” Ex. 1001, code (57), 4:31–33. This method defines “primary,” “secondary,” and “boundary” ranges of positions for the user input element, and a haptic effect is “rendered in response to an entry of

the user input element to positions within the boundary range.” *Id.* at code (57).

Example primary, secondary, and boundary ranges are shown in Figure 2, reproduced below:

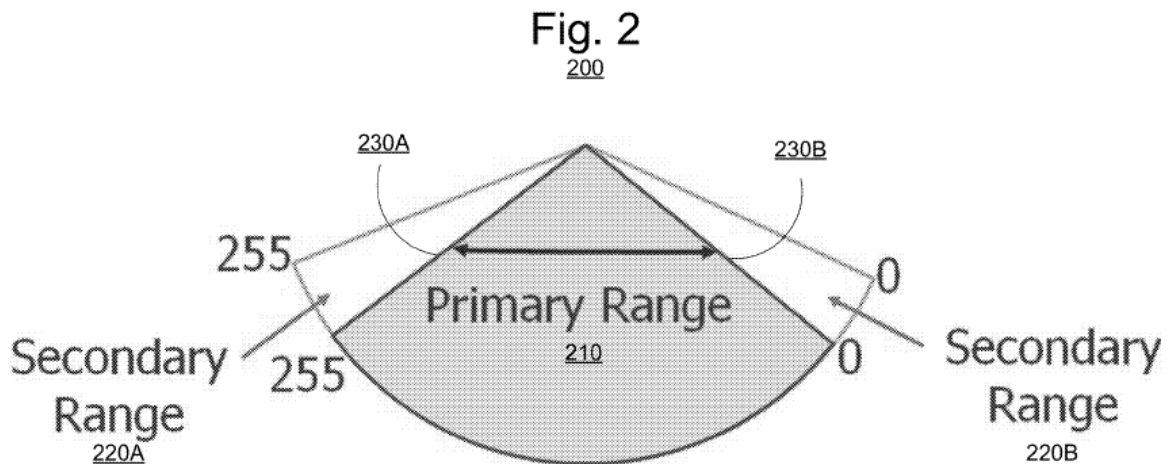
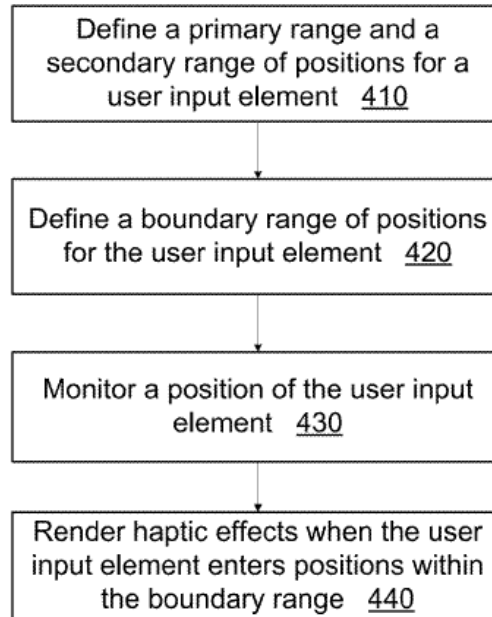


Figure 2 “is a simplified schematic illustrating a range of motion 200 for a user input element,” which is a trigger element that may be pushed or pulled at a particular angle encoded as an eight-bit value from 0 to 255. Ex. 1001, 5:13–16, 5:26–27, 5:43–46. Range of motion 200 “include[s] a primary range 210 and secondary ranges 220A, 220B. In addition, boundary ranges 230A, 230B may be defined so as to partially overlap primary range 210 and secondary ranges 220A, 220B.” *Id.* at 5:19–23. “[P]rimary range 210 and secondary ranges 220A, 220B may be fixed or variable.” *Id.* at 5:29–30.

Figure 4, reproduced below, is a flowchart illustrating an embodiment of the claimed invention:

Fig. 4
400



The flowchart illustrated in Figure 4 depicts “functionality 400 for controlling a user input element associated with a haptic output device.” Ex. 1001, 9:8–10. It begins with step 410, which “define[s] a primary range and a secondary range of positions for the user input element associated with the haptic output device.” *Id.* at 9:21–23. Next, step 420 “define[s] a boundary range of positions for the user input element associated with the haptic output device, the boundary range partially overlapping each of the primary and secondary ranges.” *Id.* at 9:24–27. Step 430 then “monitors the position of the user input element.” *Id.* at 9:27–29. Finally, in step 440, haptic effects are “rendered when the user input element enters positions within the boundary range.” *Id.* at 9:29–31.

To implement this functionality, the ’907 patent describes a processing system including a computer program called a “boundary range module” that “controls the boundary range of the user input elements” of the haptic

output device. Ex. 1001, 3:18–19, 3:28–30. For example, the “boundary range module . . . may monitor the position of user input elements and render haptic effects in response [to] the user input elements entering positions with respective boundary ranges.” *Id.* at 3:31–34. The system detects the position or range of a trigger at any particular time based on “trigger data” collected by the haptic device’s firmware. *See id.* at 6:1–2, 7:1–6, 7:55–58, 8:10–17, 8:58–65, Fig. 3.

B. CHALLENGED CLAIMS AND GROUNDS

Independent claim 1 is as follows:

- [1PRE] 1. 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.

Ex. 1001, 13:56–67 (Petitioner’s reference numbers added); *accord* Pet. 87.

Petitioner argues six grounds for IPR, as summarized in the following table (*see* Pet. 2):

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–6, 8–13, 15–19	102(a)(1)	Goldenberg ¹
1–6, 8–13, 15–19	103	Goldenberg
7, 14, 20	103	Goldenberg, Cruz-Hernandez ²
1–4, 6, 8–11, 13, 15–17, 19	102(a)(1)	Rosenberg
1–4, 6, 8–11, 13, 15–17, 19	103	Rosenberg
5, 12, 18	103	Roberts, ³ Rosenberg
7, 14, 20	103	Roberts, Rosenberg, Cruz-Hernandez
1, 3, 4, 6, 8, 10, 11, 13, 15, 17, 19	102(a)(1)	Levin ⁴
1, 3, 4, 6, 8, 10, 11, 13, 15, 17, 19	103	Levin

C. DECLARATORY TESTIMONY

Petitioner submits a declaration by Jean Renard Ward. Ex. 1003; *see also* Ex. 1004 (Mr. Ward’s curriculum vitae). Patent Owner likewise submits a declaration by Craig Rosenberg, Ph.D. Ex. 2001; *see also* Ex. 2002 (Dr. Rosenberg’s curriculum vitae).

D. RELATED PROCEEDINGS

As a related matter, the parties identify *Immersion Corp. v. Valve, Corp.*, No. 2:23-cv-00712 (W.D. Wash. filed May 15, 2023; stayed Apr. 4, 2024). Pet. xiii; Paper 7, 1.

¹ Goldenberg et al., US 2004/0032395 A1, published Feb. 19, 2004 (Ex. 1016).

² Cruz-Hernandez et al., US 2008/0055244 A1, published Mar. 6, 2008 (Ex. 1005).

³ Roberts et al., US 6,203,432 B1, issued Mar. 20, 2001 (Ex. 1018).

⁴ Levin et al., US 2007/0152988 A1, published July 5, 2007 (Ex. 1006).

III. GROUNDS OF THE PETITION

For the reasons below, we determine that Petitioner has demonstrated a reasonable likelihood that it would prevail in showing that at least one of the challenged claims of the '907 patent is unpatentable under a ground set forth in the Petition.

A. LEVEL OF ORDINARY SKILL IN THE ART

The level of ordinary skill in the pertinent art at the time of the invention is a factor in how we construe patent claims. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc). It is also one of the factors we consider when determining whether a patent claim is obvious over the prior art. *See Graham v. John Deere Co. of Kan. City*, 383 U.S. 1, 17–18 (1966).

To assess the level of ordinary skill, we construct a hypothetical “person of ordinary skill in the art,” from whose vantage point we assess obviousness and claim interpretation. *See In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998). This legal construct “presumes that all prior art references in the field of the invention are available to this hypothetical skilled artisan.” *Id.* (citing *In re Carlson*, 983 F.2d 1032, 1038 (Fed. Cir. 1993)).

Petitioner argues that a person of ordinary skill in the art would have had “a bachelor’s degree in electrical engineering, computer science, or a related field, plus . . . two years of industry experience or graduate level experience with software engineering, haptics programming, human–computer interaction, or other relevant experience.” Pet. 6 (citing Ex. 1003 ¶¶ 38–42).

Patent Owner argues that a person of ordinary skill in the art “would have had 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.” Prelim. Resp. 13 (citing Ex. 2001 ¶ 33). Patent Owner also argues that formal education could substitute for practical experience, and vice versa. *Id.*

The parties’ proposed levels of ordinary skill appear to be substantially similar, supported by testimonial evidence, and consistent with the asserted prior art and the types of problems and solutions in the ’907 patent. *See, e.g.*, Ex. 1001, 1:14–62. Although we discern no difference in the outcome of this decision from choosing one over the other, we adopt Petitioner’s proposed level of skill for this decision because it is sufficiently persuasive to meet Petitioner’s “reasonable likelihood” burden at institution. 35 U.S.C. § 314(a).

B. CLAIM CONSTRUCTION

In an IPR, we construe a patent claim “using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b).” 37 C.F.R. § 42.100(b). This generally includes “construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” *Id.* The ordinary and customary meaning of a claim term “is its meaning to the ordinary

artisan after reading the entire patent,” and “as of the effective filing date of the patent application.” *Phillips*, 415 F.3d at 1313, 1321.

Petitioner argues that we need not construe any particular claim terms explicitly. *See* Pet. 7. Patent Owner generally agrees, but informs us that in parallel district court litigation, the parties agreed that the word *range* means “a sequence, series, or scale between limits,” and that the terms *primary range*, *secondary range*, and *boundary range* incorporate that construction and otherwise have their plain and ordinary meanings. Prelim. Resp. 14.

Patent Owner also proposes a construction for the term *defining* as it appears in the phrase “defining position and range information.” *See* Prelim. Resp. 3. According to Patent Owner, “‘defining’ is not the same as ‘describing’ or ‘pre-defined,’” and in the context of the challenged claims it means “a discrete step or feature taken by, or allowing, a user to change the settings of their controller to adjust the ranges relative to when the controls on a device render a haptic effect.” *Id.* Patent Owner also contends that the ’907 patent “discloses that the user inputs the position and range information through software.” *Id.*

As evidence of this proposed construction, Patent Owner points to claims 8 and 15 which, according to Patent Owner, “expressly reference software.” Prelim. Resp. 28 (citing Ex. 1001, 14:24–25, 14:64–65). Patent Owner also argues that the ’907 patent discloses using computer architecture and components for defining position and range information for rendering haptic effects, and that these haptic effects may be modified “‘based on user input data’ which includes position and range information for one or more buttons, triggers, etc. on a controller.” *Id.* at 28–29 (quoting Ex. 1001, 7:3) (citing Ex. 1001, 3:11–20, 3:28–30, 7:1–3, 8:10–13; Ex. 2001 ¶ 72).

At this stage, we disagree with Patent Owner that the term *defining* in claim 1 requires that the recited position and range information must be user-modifiable. Although claims 8 and 15 (not claim 1) recite a “program comprising instructions for . . . defining position and range information,” nothing in these claims explicitly requires that this program has any interaction with a user. Ex. 1001, 14:24–25, 14:64–65.

Also, although the ’907 patent disclosure refers to computer architecture components for rendering a haptic effect within a boundary range, Patent Owner has not pointed to any disclosure in the ’907 patent suggesting that range settings must be user-modifiable. The ’907 patent does refer to “trigger data” that is “based on user input data,” but this trigger data appears to be collected by firmware, suggesting that the user’s involvement in creating trigger data consists of simply pulling or pushing the triggers of the controller. *See* Ex. 1001, 7:1–6, 8:10–16 (trigger data is “received from [the] controller . . . by peripheral firmware”), 8:58–65 (trigger data is obtained from potentiometers in the controller and sent to peripheral firmware), Fig. 3 (showing “[t]rigger data” 323 as part of peripheral firmware 320).

Further, the ’907 patent discloses that the primary and secondary ranges at least “may be fixed or variable.” Ex. 1001, 5:29–30. This suggests that an embodiment in which all the range information is fixed (i.e., unalterable by a user) would be within the scope of the claimed invention.

As to Patent Owner’s argument that *defining* would exclude something that is pre-defined, Patent Owner provides no evidence of this in the ’907 patent, its prosecution history, or extrinsic evidence. We find the proposition that something “pre-defined” is not “defined” illogical, and we

see nothing in the challenged claims explicitly limiting *when* the recited ranges of positions must be defined. The ranges evidently could, for example, be defined in firmware.

Although we preliminarily disagree with Patent Owner’s proposed construction of *defining*, our decision to institute does not adopt any explicit construction of this or any other claim term. We further discuss the meaning of *defining* and other claim terms below in the context of addressing the parties’ preliminary arguments regarding the prior art. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’” (quoting *Vivid Techs., Inc. v. Am. Sci & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

C. GROUND BASED ON GOLDENBERG, CLAIM 1

Because Patent Owner does not separately challenge Petitioner’s arguments on a claim-by-claim basis, we focus on claim 1 for our decision of whether to institute an IPR. Petitioner’s first and second grounds rely on Goldenberg to disclose or teach the limitations of claim 1, such that claim 1 is unpatentable under 35 U.S.C. § 102(a)(1) as anticipated by Goldenberg, or alternatively is unpatentable under § 103 as obvious over Goldenberg. *See* Pet. 9–17.

To show that a claim is anticipated under 35 U.S.C. § 102, the challenging party must demonstrate that each and every claim element, arranged as recited in the claim, is found in a single prior art reference. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008). The limitations may be present in the reference “either explicitly or inherently.”

In re Schreiber, 128 F.3d 1473, 1477 (Fed. Cir. 1997). We consider prior art references “together with the knowledge of one of ordinary skill in the pertinent art.” *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994) (citing *In re Samour*, 571 F.2d 559, 562 (CCPA 1978)).

A claim is unpatentable under § 103 “if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains.” 35 U.S.C. § 103; *see KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). When a ground in a petition is based on a combination of references, we consider “whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

We base our obviousness inquiry on factual considerations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) any objective indicia of obviousness or non-obviousness that may be in evidence. *See Graham*, 383 U.S. at 17–18.

Considering the above principles, we determine that Petitioner has shown a reasonable likelihood that Goldenberg anticipates claim 1 or alternatively that claim 1 would have been obvious over Goldenberg, for the reasons explained below.

1. Overview of Goldenberg

Goldenberg describes “provid[ing] haptic sensations for a haptic feedback device and especially for a rotational device such as a knob.”

Ex. 1016, code (57). This includes force effects and the use of a “force model” that establishes rules “for implementing the force effects included in the model based on conditions such as time, knob position, motion, velocity.” *Id.* ¶¶ 70, 102.

Figure 8, reproduced below, illustrates a force model for a simulated jog shuttle that “can be used to scroll through a list of items or a sequence of items or units”:

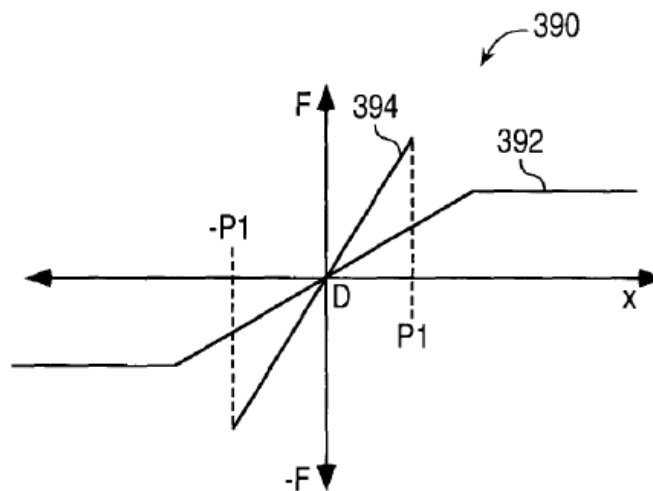


FIG. 8

Ex. 1016 ¶ 117.⁵ Figure 8 “is a force vs. position profile 390” designed to “simulate a mechanical jog shuttle having mechanical springs” so 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.” *Id.* ¶¶ 115–116.

⁵ Goldenberg’s textual description of Figure 8 erroneously refers to Figure 7, and Figure 8 erroneously labels origin “O” as “D.” These appear to be clerical or typographical errors. *Compare* Ex. 1016 ¶ 116, *with id.* ¶ 27, and *id.* Figs. 7, 8; *see also* Ex. 1003 ¶ 84 n.42 (Mr. Ward opining that these are obvious typographical errors).

The horizontal axis represents position x of the knob, and the vertical axis represents force magnitude F “on the knob in the rotary degree of freedom,” which can be either positive or negative depending on the direction of the force. *See id.* ¶ 80.

There are two spring effects. The first spring effect, shown as curve 392, operates “over the entire range of the knob,” has “a medium amount of stiffness,” and “resists motion away from the origin O and increases in magnitude as the knob is moved away from the origin until the saturation level is reached, at which point the force is no longer increased in magnitude but still resists motion away from the origin.” Ex. 1016 ¶ 116.

The second spring effect, shown as curve 394, “overlap[s] the first spring effect but is only in effect over a small range between positions $-P1$ and $[+]P1$ around the origin position.” Ex. 1016 ¶ 116. The second spring effect is “preferably much stiffer than the first spring,” and “provides the perception of a rotational preload,” increasing the quality of the haptic sensation “since the knob is less likely to feel loose to the user around the origin position (the transition of moving from the second spring to first spring or vice-versa can be made not discernible by the user).” *Id.*

2. Preamble (IPRE)

The preamble of claim 1 recites “[a] method for controlling a user input element associated with a haptic output device, the method comprising [two steps].” Ex. 1001, 13:56–57.

Petitioner argues that Goldenberg discloses the preamble because it discloses a control knob that a user manipulates to control various functions of an electronic device that provides haptic feedback. Pet. 9 (citing Ex. 1016

¶¶ 10, 15, 16, 30, 31, 34, 46, 60, Fig. 2; Ex. 1001, 1:34–35, 4:31–33, 4:36, 5:17–18; Ex. 1003 ¶¶ 85–104).

Patent Owner does not specifically address this argument. *See* Prelim. Resp. Without determining whether or not the preamble is limiting, we find Petitioner’s argument sufficiently persuasive at this stage, for the reasons set forth in the Petition.

3. *Limitation 1A*

Limitation 1A recites “defining position and range information for the user input element associated with the haptic output device, including [three ranges of positions].” Ex. 1001, 13:58–60.

Petitioner argues that Goldenberg’s jog shuttle force model in Figure 8 defines position and range information for the haptic knob device, including defining origin O, two ranges of positions on each side of origin O, and the range between $-P1$ and $+P1$ which reflects the domain of curve 394.

Pet. 10–12 (citing Ex. 1016 ¶¶ 21–29, 70, 73, 80, 102, 115–117, Figs. 4A–4D, 5A–5B, 8–10; Ex. 1003 ¶¶ 89–94).

In response, Patent Owner argues that Goldenberg fails to disclose limitation 1A because it “discloses pre-defined force profiles that merely describe various force effects that cannot be adjusted by the user.” Prelim. Resp. 26 (citing Ex. 1016 ¶¶ 21, 66; Ex. 2001 ¶¶ 66–68). Patent Owner also contends that in applying limitation 1A to Goldenberg, “Petitioner treats the ‘defining’ element as nothing more than a *description* of the three claimed ranges.” *Id.* at 27 (citing Ex. 2001 ¶ 68). According to Patent Owner, this renders the word *defining* superfluous. *Id.* at 27–28. Patent Owner contends that Goldenberg, at best, merely provides “pre-defined, graphical *descriptions* of certain *force effects*” which “do[] not provide the user with

any flexibility to adjust the pre-set force profiles.” *Id.* at 29–33 (citing Ex. 2001 ¶¶ 73–77).

As we discuss above, we preliminarily disagree with Patent Owner’s contention that limitation 1A requires the recited position and range information to be user-settable, or that the recited ranges of positions cannot be pre-defined (i.e., defined at an earlier time, even if significantly earlier than the “rendering” step of limitation 1B). *See supra* Section III.B.

We also disagree with Patent Owner that Petitioner equates the step of “defining position and range information” with Goldenberg’s mere description of such information in its figures. Rather, we understand Petitioner’s argument to be that Goldenberg’s system explicitly defines jog shuttle force model 390 as shown in Figure 8, including all its position and range information. We find preliminary support for this in Goldenberg’s disclosure. *See, e.g.*, Ex. 1016 ¶¶ 66 (a force process, including force profiles and other data, “may be stored in local memory”), 102 (“The force model may also include behavior or rules for implementing the force effects included in the model . . .”), 104 (an “application program” can “define [various elements] in the force model”); *cf. id.* ¶ 108 (“The host processor determines the shape of detents and their range in the rotational degree of freedom of the knob device.”).

Thus, we determine that Petitioner has sufficiently shown, at this stage, that Goldenberg discloses limitation 1A.

4. Limitations 1A1–1A3

According to limitations 1A1–1A3, the recited position and range information of limitation 1A includes “a primary range of positions, a secondary range of positions and 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.” Ex. 1001, 13:60–64.

Petitioner argues that, in *Goldenberg*, these three ranges of positions are as indicated in an annotated version of Figure 8, reproduced below:

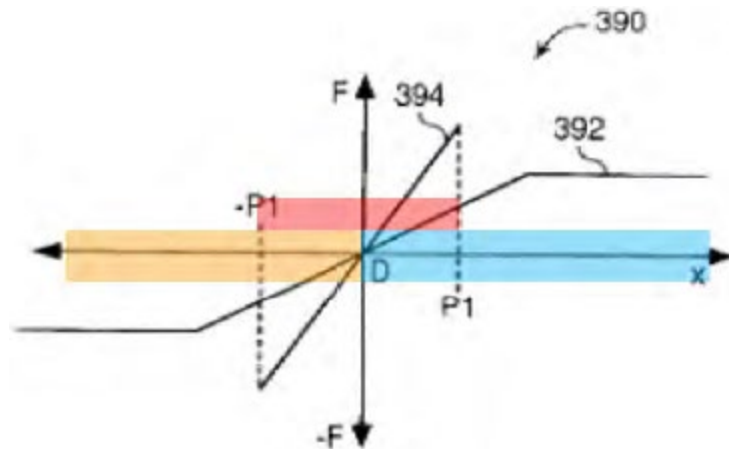


FIG. 8

Pet. 15. This version of Figure 8 is annotated to indicate that the recited “primary range” (1A1) corresponds to the blue positive portion of the horizontal axis reflecting “clockwise rotation correspond[ing] to moving video or auto forward, which is a primary function of a jog shuttle.” Pet. 12–13 (citing Ex. 1016 ¶¶ 115–117; Ex. 1003 ¶ 95). The recited “secondary range” (1A2) corresponds to the orange negative portion of the horizontal axis reflecting “counterclockwise rotation correspond[ing] to moving video or audio backwards, which is a secondary function (i.e., re-winding) of a jog shuttle. Pet. 13–14 (citing Ex. 1016 ¶ 115–117; Ex. 1003 ¶ 96).

Petitioner argues that the recited “boundary range” corresponds to the red portion of the horizontal axis between $-P1$ and $+P1$, reflecting a small range around the origin in which the first spring effect (curve 392) is output. Pet. 15 (citing Ex. 1003 ¶ 99). Petitioner contends that the recited “boundary

range” need not be a unique range of positions. Pet. 14–15 (citing Ex. 1001, 5:23–25, Fig. 2; Ex. 1003 ¶¶ 97–98). And according to Petitioner, this boundary range partially overlaps both the primary and secondary ranges, as recited in limitation 1A3. Pet. 16 (Ex. 1003 ¶ 100).

In response, Patent Owner first argues that the entire horizontal axis in Figure 8 must be regarded as a single “primary range” because the first spring effect (curve 392) is active over that entire range, and therefore that Goldenberg’s system does not define a “secondary range.” Prelim. Resp. 33–36.⁶ In particular, according to Patent Owner, “Goldenberg describes the first spring effect as having a single range centered on an origin point, that always biases the knob toward the origin point,” and Petitioner fails to justify dividing that range into two distinct portions. *Id.* at 35–36 (citing Ex. 1016 ¶¶ 115–116; Ex. 2001 ¶ 79). Patent Owner also argues that it is internally inconsistent to treat the range associated with the first spring effect as two separate ranges, while treating the range associated with the second spring effect as a single range. *Id.* at 40–44 (citing Ex. 1016 ¶¶ 115–116, Fig. 8; Ex. 2001 ¶¶ 80–84).

At this stage, we disagree with Patent Owner’s arguments. We see no explicit restriction in limitations 1A1–1A3 on which ranges of positions in a force model are identified as “primary,” “secondary,” or “boundary,” except

⁶ As part of its argument, Patent Owner takes issue (Prelim. Resp. 33–35) with Petitioner’s citation to a portion of the prosecution history in which the Examiner allegedly found that ranges may include “distances in proximity to boundaries” and that any range can “constitute first and second ranges.” Pet. 13, 14 (quoting Ex. 1002, 100). We need not address this issue to reach an outcome in our decision.

that the boundary range must partially overlap both the primary and secondary ranges. Ex. 1001, 13:60–64. Moreover, we find it reasonable, at this stage, to regard the positive and negative ranges of the horizontal axis in Figure 8 as separate ranges, given that the restorative force acting on the knob as it is turned away from the origin acts in a different direction (for both the first and second spring effects) depending on whether the knob is turned clockwise or counterclockwise. We also find nothing necessarily inconsistent about regarding the range between $-P1$ and $+P1$ as a single boundary range, given that this is the only range of knob positions in which the second spring effect (curve 394) is active.

Patent Owner also argues that the alleged “boundary range” of positions between $-P1$ and $+P1$ does not “partially” overlap the alleged primary and secondary ranges as recited in limitation 1A3, because this alleged boundary range is *totally* overlapped by the alleged first and second ranges, thus rendering the term *partially* superfluous. Prelim. Resp. 37–40.

At this stage, we disagree with Patent Owner’s argument. Limitation 1A3 only requires that “the boundary range of positions partially overlaps each of the primary range of positions and the secondary range of positions.” Ex. 1001, 13:62–64. It does not, conversely, require that the primary and secondary ranges only partially overlap the boundary range.

We preliminarily agree with Petitioner that, in an embodiment of the ’907 patent associated with Figure 2, “primary range 210 may be extended to render haptic effects within secondary ranges 220A, 220B” (Ex. 1001, 5:23–25), and in that case, this extension of primary range 210 would subsume the entirety of boundary ranges 230A and 230B, given that the boundary ranges are situated at the border between the primary and

secondary ranges. *See* Pet. 15 (citing Ex. 1003 ¶ 98). Thus, the primary range would totally overlap the boundary range, yet the boundary range would only partially overlap the primary and secondary ranges. This suggests that a person of ordinary skill in the art would have understood limitation 1A3 to include the case where some combination of a primary and secondary range totally overlaps a boundary range, so long as the primary and secondary ranges, themselves, are only partially overlapped.

Patent Owner also contends that it is possible in some situations (such as in Goldenberg) to extend a primary range into a secondary range without subsuming a boundary range, suggesting that we must construe limitation 1A3 to require the primary and secondary ranges to only partially overlap the boundary range. Prelim. Resp. 39–40 (citing Ex. 2001 ¶ 87). This argument is unpersuasive because we find no evidence on the preliminary record suggesting that a person of ordinary skill in the art would have looked to Goldenberg’s disclosure to interpret the claims of the ’907 patent.

Thus, we determine that Petitioner has sufficiently shown, at this stage, that Goldenberg discloses limitations 1A1–1A3.

5. *Limitation 1B*

Limitation 1B recites “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.” Ex. 1001, 13:65–67.

Petitioner argues that Goldenberg’s system renders the “second spring” effect (curve 394) whenever user moves the knob within the positions of the boundary range between $-P1$ and $+P1$. Pet. 16–17 (citing Ex. 1016 ¶¶ 7, 9, 14, 34, 41, 115–117; Ex. 1003 ¶¶ 101–104).

Patent Owner does not specifically address this argument. *See* Prelim. Resp. We find Petitioner’s argument for limitation 1B sufficiently persuasive at this stage, for the reasons set forth in the Petition.

6. *Conclusion as to claim 1*

For the above reasons, we determine that Petitioner has shown, sufficiently at this stage, that Goldenberg discloses all the limitations of claim 1 in a manner identical to that recited in the claim, or at least that a person of ordinary skill in the art would have had reason, in view of Goldenberg, to implement the method of claim 1.

We therefore determine that Petitioner is reasonably likely to prevail in showing that claim 1 is unpatentable under §§ 102 or 103 based on Goldenberg, and we institute an IPR on all claims and all grounds raised in the Petition. *See* 37 C.F.R. § 42.108(a).

D. OTHER CLAIMS AND GROUNDS

Because Petitioner has shown a reasonable likelihood of prevailing with respect to claim 1 on the grounds based on Goldenberg, we need not address the other challenged claims or the other grounds of the Petition in detail. However, for the parties’ benefit we provide our preliminary assessment of the disputed issues relating to the other grounds.

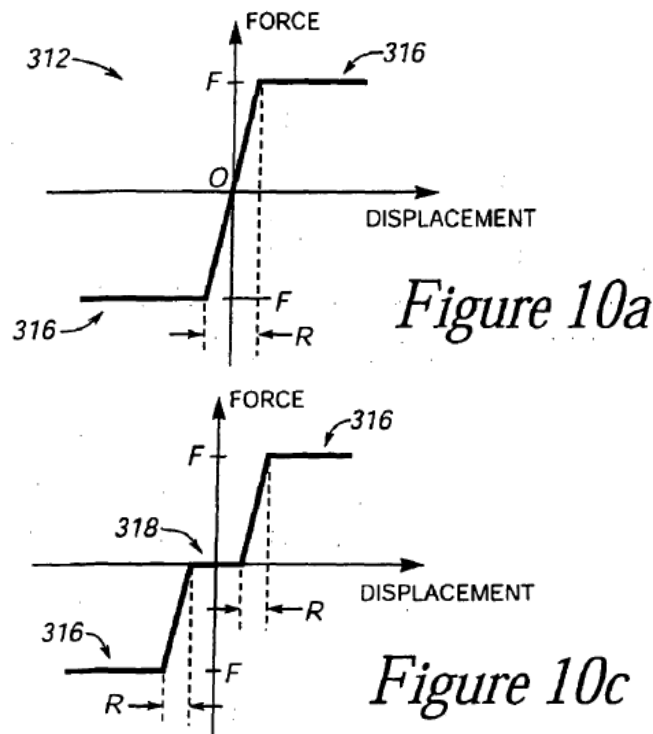
1. *Grounds Based on Rosenberg*

Three of Petitioner’s remaining grounds rely on Rosenberg to disclose or teach the limitations of claim 1. *See* Pet. 35–46. At this stage, Patent Owner only specifically challenges Petitioner’s arguments for limitation 1A. *See* Prelim. Resp. 45–49.

(a) Overview of Rosenberg

Rosenberg describes a method for providing force feedback to a user who is operating a joystick or mouse to control a graphical object in a user interface. Ex. 1017, code (57). In one embodiment, Rosenberg's system stores digitized force profiles in memory and accesses those profiles to render haptic effects. *Id.* ¶ 103.

Two examples of force profiles are illustrated in Figures 10a and 10c, which are reproduced below:



Figures 10a and 10c “illustrat[e] force versus displacement profiles for a restoring force” on a user object. Ex. 1017 ¶ 164. The force profiles in both figures include a constant range 316 at which there is a constant, maximum force F pushing on the user object to restore it back to origin position O. *Id.* ¶ 165. “As the [user] object is moved toward the origin position O, the applied force is constant until the user object is moved within a localized

region *R* about the origin position,” at which point “the applied force rapidly drops to zero or a small value.” *Id.*

Figure 10c differs from Figure 10a by including a “deadband” region (318) near the origin where “the applied force is about zero.” *Id.* ¶ 166. This “allows the user to have some freedom to move [the user object] for a short distance around the origin before forces are applied.” *Id.*

(b) Limitation 1A

Petitioner argues that Rosenberg discloses limitation 1A under two alternative theories, one based on Figure 10a, and another based on Figure 10c. Pet. 36–40. According to Petitioner, Rosenberg’s system defines the force profiles reflected in Figures 10a and 10c, and thus defines position and range information as recited in limitation 1A. *Id.*

In response, Patent Owner argues that “Figs. 10(a) and 10(c) and their related disclosure merely describe particular[] force effects but do not disclose any functionality for ‘defining range and position information.’” Prelim. Resp. 45–46 (citing Ex. 2001 ¶ 96). In particular, Patent Owner argues that Rosenberg does not disclose that the force effects can be defined “by a user via software as in the claims of the ’907 patent.” *Id.* at 46–47 (citing Ex. 2001 ¶ 97). Patent Owner also argues that Rosenberg’s force commands, which implement the restoring force profiles in figures 10(a) and 10(c), are not *defined*, as recited in limitation 1A because they “are pre-defined commands stored in a table.” *Id.* at 47 (citing Ex. 2001 ¶¶ 98–99).

As we discuss above, we disagree with Patent Owner at this stage that the term *defining*, as it appears in limitation 1A, requires that a user perform the definition via software, and that the term excludes pre-defining (i.e.,

defining earlier). *See supra* Section III.B. Thus, we find Patent Owner’s argument unpersuasive at this stage.

Finally, Patent Owner argues that for limitation 1A, “Petitioner does not separately map ‘defining position and range information’ and the claimed ranges, but rather maps both elements to the same figures in Rosenberg” (i.e., Figures 10a and 10c). Prelim. Resp. 48 (citing Ex. 2001 ¶ 100).

We disagree with Patent Owner that Petitioner equates the step of “defining position and range information” with Rosenberg’s mere description of such information in Figures 10(a) and 10(c). Rather, we understand Petitioner’s argument to be that Rosenberg’s system explicitly defines and stores force profiles as reflected in Figures 10(a) and 10(c). *See, e.g.*, Pet. 34 (arguing that “Rosenberg’s system provides force feedback through ‘force profile[s]’ stored in memory.” (alteration in original) (quoting Ex. 1017 ¶ 103)).

We find merit, at this stage, in Petitioner’s argument that Rosenberg discloses limitation 1A.

2. *Ground Based on Levin*

Petitioner’s final ground relies on Levin to disclose or teach the limitations of claim 1. *See* Pet. 68–78. At this stage, Patent Owner challenges Petitioner’s arguments for limitations 1A, 1A3, and 1B. *See* Prelim. Resp. 49–61.

(a) Overview of Levin

Levin discloses a control knob coupled to an actuator to provide force feedback in the rotary direction. Ex. 1006, code (57). The actuator simulates

a series of detents, each detent having an origin, and the actuator provides forces to push the knob toward each origin. *Id.* ¶ 9.

Figure 6B is reproduced below:

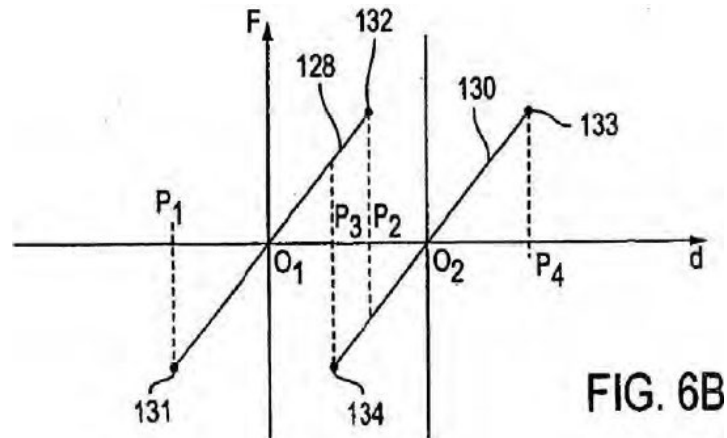


Figure 6B “shows a detent force profile . . . in which the detent forces of two successive detents are partially overlapped due to the detents, and provide a hysteresis-like force effect.” Ex. 1006 ¶ 70. Detent curves 128 (active between positions P_1 and P_2) and 130 (active between positions P_3 and P_4) have origins O_1 and O_2 , respectively, with the force positive to the right of each origin and negative to the left of each origin. *Id.* Curves 128 and 130 “are identical, thus allowing a single force command to create the multiple detents if desired.” *Id.*

The zone from P_3 to P_2 corresponds to an overlapping region between detent curves 128 and 130. Ex. 1006 ¶ 70. This overlap is used to reduce the applied force at the boundary between detents so that the user is less likely to unintentionally skip a detent when moving from one detent to another. *See id.* ¶¶ 69, 71. How this works is illustrated in Figure 6C, reproduced below:

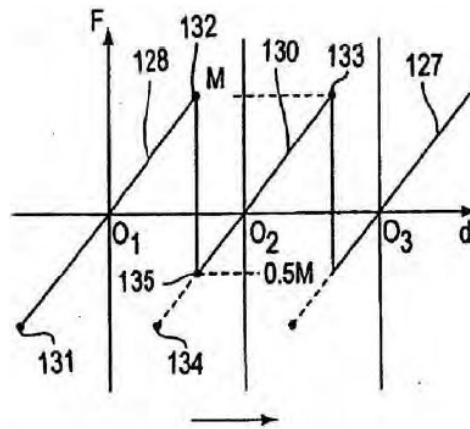
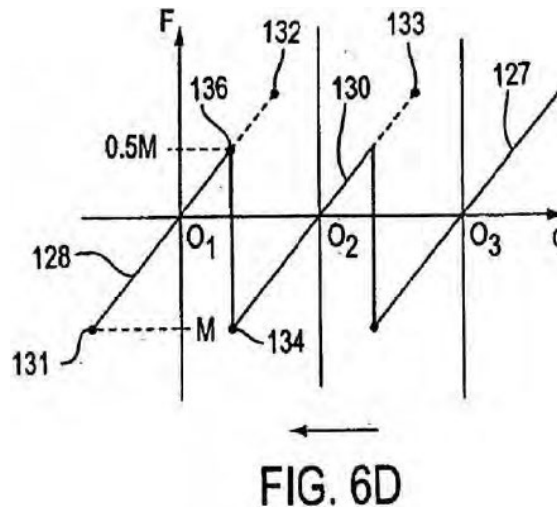


FIG. 6C

Figure 6C is similar to Figure 6B, except that it includes a third detent curve (127, with origin O_3). As a user moves the knob to the right through the first detent, the knob reaches point 132 (position P_2) at the end of the overlapping zone, where the force magnitude is M . *Id.* ¶ 71. When the user turns the knob into the second detent (130), the magnitude of the negative force is only $0.5M$, which is lesser than the magnitude would have been in the absence of the overlapping zone. *Id.* “The use of a lesser magnitude at the beginning of the second detent reduces the tendency of the user to unintentionally skip past a second detent after moving the knob over a first detent closely spaced to the second detent.” *Id.* ¶ 73.

Figure 6D, reproduced below, is essentially the same as Figure 6C, except that it shows what happens when the knob is turned to the left instead of to the right:



Ex. 1006 ¶ 72. Here, as a user moves the knob to the left through the second detent, the knob reaches point 134 (position P₃) at the end of the overlapping zone, where the magnitude of the negative force is M. *Id.* When the user turns the knob into the first detent curve (point 136), the magnitude of the positive force is only 0.5M, which is less than the magnitude would have been in the absence of the overlapping zone. *Id.*

(b) Limitation 1A

Petitioner argues that Levin’s detent force profiles, such as that reflected in Figure 6B, define position and range information according to limitation 1A. Pet. 69–70 (citing Ex. 1006 ¶¶ 9, 31, 32, 49, 67, 70, Fig. 6B; Ex. 1003 ¶¶ 251–253).

In response, Patent Owner argues that Levin fails to disclose limitation 1A “because it uses pre-existing, pre-defined force detent profiles stored in memory,” and it is not possible to carry out a step of “defining” force profiles if they are pre-defined. Prelim. Resp. 49–51 (citing Ex. 1006 ¶¶ 48–49, 70; Ex. 2001 ¶¶ 105–107).

As we discuss above, we disagree with Patent Owner at this stage that the term *defining*, as it appears in limitation 1 A, excludes pre-defining (i.e.,

defining earlier). *See supra* Section III.B. We find merit, at this stage, in Petitioner’s argument that Levin discloses limitation 1A.

(c) Limitation 1A3

Petitioner argues that the overlapped zone between positions P_3 and P_2 corresponds to the “boundary range of positions” as recited in limitation 1A3 and that this zone partially overlaps the range from P_1 to P_2 (which Petitioner identifies as the primary range) and the range from P_3 to P_4 (which Petitioner identifies as the secondary range). Pet. 73–74 (citing Ex. 1006 ¶¶ 9, 11, 70, Fig. 6B; Ex. 1003 ¶¶ 259–260).

In response, Patent Owner argues that the alleged “boundary range” from positions P_3 to P_2 is exactly the same as the overlapping range between curves 128 and 130, and choosing the same range for both the overlap and the “boundary range” would render the term *boundary range* superfluous. Prelim. Resp. 51–54 (citing Ex. 2001 ¶¶ 108–112).

At this stage, we disagree with Patent Owner’s argument. Claim 1 does not define a distinct “overlapping range” that must differ from the recited boundary range. Nor is there any explicit prohibition against overlap between the primary and secondary ranges. *See* Ex. 1001, 5:23–25 (“In some instances, primary range 210 may be extended to render haptic effects within secondary ranges 220A, 220B and/or boundary ranges 230A, 230B.”). Thus, we see nothing in claim 1 that prevents the “boundary range of positions” from coinciding with the overlap between the primary and secondary ranges.

Patent Owner also argues that, if the primary, secondary, and boundary ranges are allocated as Petitioner contends, the primary and secondary ranges would entirely overlap the boundary range, thus reading

the term *partially* out of the claims. Prelim. Resp. 54–55 (citing Ex. 2001 ¶ 113).

As we discuss above in the context of Goldenberg, we disagree at this stage with Patent Owner’s interpretation of limitation 1A3. *See supra* Section III.C.4. This limitation only requires that “the boundary range of positions partially overlaps each of the primary range of positions and the secondary range of positions.” Ex. 1001, 13:62–64. It does not, conversely, require that the primary and secondary ranges only partially overlap the boundary range.

We find merit, at this stage, in Petitioner’s argument that Levin discloses limitation 1A3.

(d) Limitation 1B

For limitation 1B, Petitioner argues that Levin’s system “renders a gradual[ly] increas[ing] force feedback as the knob moves (clockwise or counterclockwise) through initial positions of the boundary range, and then renders force feedback of a lesser magnitude and in the opposit[e] direction when the knob moves to an end point of the boundary range.” Pet. 78 (citing Ex. 1003 ¶ 266); *see* Pet. 74–78 (citing Ex. 1006 codes (54), (57), ¶¶ 2–11, 47–49, 67–71, 73, 86, 94, Figs. 6B–6D; Ex. 1003 ¶¶ 261–265).

In response, Patent Owner argues that the haptic effect that occurs within the overlapping zone (P_3 to P_2) of Levin’s detent profiles is only coincident with, not “in response to,” entry into that zone; rather, the haptic effect within that zone is in response to entering the range of each detent, regardless of any overlap. Prelim. Resp. 55–61 (citing Ex. 1006 ¶¶ 67, 70–72, Figs. 6B–6D; Ex. 2001 ¶¶ 114–120).

At this stage, we disagree with Patent Owner's argument. In Levin's detent force profiles, there appears to be a haptic effect (a gradual increase and then a drop in magnitude from M to 0.5M and a change in the force direction) as the user turns the nob through the overlapping zone. *See* Ex. 1006 ¶¶ 71–73, Figs. 6c, 6d. Even though that effect is a consequence of the shape of curves 128 and 130 and how they are combined, Levin describes a deterministic consequence in which, whenever the knob enters the overlapping zone, this haptic effect will occur. *See id.* We therefore preliminarily regard this as being “in response to” the knob's entry into the boundary range. Patent Owner has not proposed a construction for the term *in response to* and has not pointed to anything within the '907 patent or otherwise in the record that would lead us to construe *in response to* inconsistently with Petitioner's argument.

We therefore find merit, at this stage, in Petitioner's argument that Levin discloses limitation 1B.

IV. CONCLUSION

For the reasons set forth above, Petitioner has shown that there is a reasonable likelihood it would prevail with respect to at least one of the claims challenged in the Petition, and we institute trial on all asserted grounds and all challenged claims. *See* 37 C.F.R. § 42.108(a).

V. ORDER

It is

ORDERED that, pursuant to 35 U.S.C. § 314(a), an IPR of claims 1–20 of the '907 patent is instituted with respect to all the grounds set forth in the Petition; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, IPR of the '907 patent commences on the entry date of this Order, and the Board hereby gives notice of the institution of a trial.

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Patent 10,627,907 B2

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