

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VALVE CORPORATION,
Petitioner,

v.

IMMERSION CORPORATION,
Patent Owner.

IPR2024-00557
Patent 10,665,067 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 (“Valve”) filed a Petition (Paper 2, “Pet.”) under 35 U.S.C. §§ 311–319 requesting *inter partes* review (“IPR”) of claims 1–8, 11, 12, and 15–21 of U.S. Patent No. 10,665,067 B2 (Ex. 1001, “the ’067 patent”). Patent Owner Immersion Corporation (“Immersion”) 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 *inter partes* review 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 *inter partes* review of all the challenged claims of the ’067 patent 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 ’067 PATENT (EX. 1001)

The ’067 patent describes “[s]ystems and methods for integrating haptics overlay in augmented reality” (“AR”). Ex. 1001, code (57). The ’067 patent acknowledges prior art solutions to the problem of providing haptic feedback in the virtual reality (“VR”) context, but suggests that “[i]n AR space, it is difficult to provide a haptic effect to the user.” *Id.* at 1:14–21.

Figure 2, reproduced below, illustrates an embodiment addressing this problem:

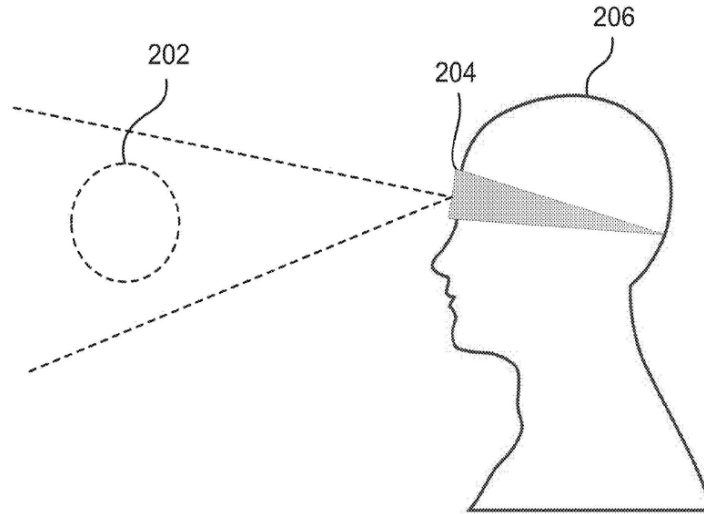


Figure 2

Figure 2 depicts user 206 using wearable AR device 204 and interacting with proxy object 202. Ex. 1001, 5:25–26. According to the '067 patent, “any type of AR display system may be used,” and “proxy object 202 may take the form of any object, including, but not limited to, a shoe, a bag, an article of clothing, an electronic device, a display, or an interface object.” *Id.* at 5:28, 5:34–37. The system also includes the ability to sense conditions of proxy object 202 and to generate and output haptic effects to one or more haptic output devices. *Id.* at 5:29–32.

Haptic output devices may include, for example, actuators and motors that may be integrated into proxy object 202 to provide various effects such as heating, cooling, stiffness, or force feedback. *Id.* at 4:23–46, 5:66–6:1. These effects may be selected based on the data from sensors that track characteristics of the haptic output device such as “location, path, velocity, acceleration, [or] pressure,” as well as “audio and video characteristics.” *Id.* at 4:47–66. According to the '067 patent, “[d]ifferent haptic effects may be

selected based on various combination[s] of these features.” *Id.* at 4:66–67. Also, “[a]ny suitable number, type, or arrangement of sensors can be used,” and may include “cameras, lasers, radars, accelerometers, gyrometers, pressure sensors, magnetic sensors, light sensors, microphones, capacitive sensors, touch sensors, tracking sensors, or any combination of such sensors.” *Id.* at 4:1–6.

B. CHALLENGED CLAIMS AND GROUNDS

Independent claim 1 is as follows:

- [1PRE] 1. A system comprising:
 - [1A] a proxy object comprising one or more haptic output devices;
 - [1B] a display configured to output a visual effect onto a surface of the proxy object;
 - [1C] a sensor for tracking a position of the proxy object; and
 - [1D] a processor configured to:
 - [1D1] determine a modified visual effect based in part on data received from the sensor;
 - [1D2] determine a haptic effect based in part on data received from the sensor;
 - [1D3] transmit a display signal associated with the modified visual effect to the display, the modified visual effect to be displayed on the proxy object via the display;
 - [1D4] transmit a haptic signal associated with the haptic effect to the one or more haptic output devices; and
 - [1D5] output the haptic effect using the one or more haptic output devices.

Ex. 1001, 10:41–58 (Valve’s reference numbers added).

Valve argues three grounds for *inter partes* review, as summarized in the following table (*see* Pet. 4):

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–8, 11, 12, 15–21	102(a)(1)–(2), 103	Banerjee ¹
1–8, 11, 12, 15–21	102(a)(1)–(2), 103	Meglan ²
1–8, 11, 12, 15–21	102(a)(1)–(2), 103	Rogers ³

C. DECLARATORY TESTIMONY

Valve submits a declaration by Gregory F. Welch, Ph.D. Ex. 1003; *see also* Ex. 1004 (Dr. Welch’s curriculum vitae). Immersion 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, Inc.*, No. 23-cv-00712 (W.D. Wash. filed May 15, 2023; stayed Apr. 4, 2024). Pet. ix; Paper 4, 1.

III. DISCRETIONARY DENIAL UNDER 35 U.S.C. § 314(a)

Immersion argues that the Petition should be denied under 35 U.S.C. § 314(a) because there is a district court case involving the ’067 patent. Prelim. Resp. 50–56 (discussing *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential) (“*Fintiv*”)). However, the co-

¹ Banerjee et al., US 2017/0108930 A1, published Apr. 20, 2017 (Ex. 1011).

² Meglan et al., US 2012/0045742 A1, published Feb. 23, 2012 (Ex. 1012).

³ Rogers et al., US 2017/0354864 A1, published Dec. 14, 2017 (Ex. 1010).

pending district court litigation has been stayed. Ex. 2004, 8. In *Valve Corp. v. Immersion Corp.*, IPR2024-00478, Paper 11 at 9–18 (PTAB July 25, 2024), the Board addressed nearly exactly the same arguments and issues raised by Immersion here. We adopt and incorporate the reasoning in that case as our own. In short, the stay obviates concerns over efficiency and duplicity of efforts raised in *Fintiv*. See, e.g., *Fintiv* at 6 (“A district court stay of the litigation pending resolution of the PTAB trial allays concerns about inefficiency and duplication of efforts.”). Therefore, we do not discretionarily deny the Petition.

IV. GROUNDS OF THE PETITION

For the reasons below, we determine that Valve has demonstrated a reasonable likelihood that it would prevail in showing that at least one of the challenged claims of the ’067 patent is unpatentable under a ground of 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)).

Valve 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 at least two years of industry experience or graduate-level experience with human–computer interaction. More education could substitute for experience, and *vice versa*.” Pet. 6 (citing Ex. 1003 ¶ 39).

Immersion 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. 12 (citing Ex. 2001 ¶ 33).

The parties agree that formal education could substitute for practical experience, and *vice versa*. Pet. 6, Prelim. Resp. 12.

The parties’ proposed levels of ordinary skill appear to be substantially similar, are both supported by testimonial evidence, and appears to be consistent with the asserted prior art and the types of problems and solutions in the ’067 patent. *See, e.g.*, Ex. 1001, 1:7–53. At this stage, we discern no difference in the outcome of this decision from choosing one over the other. We adopt Valve’s proposed level of skill for this decision because it is sufficiently persuasive to meet Valve’s “reasonable likelihood” burden at institution. 35 U.S.C. § 314(a).

B. CLAIM CONSTRUCTION

In an *inter partes* review, 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.

Neither party argues that we should construe any particular claim terms explicitly. Pet. 7–9 (citing Ex. 1001, 3:1–4, 5:60–62; Ex. 1003 ¶¶ 77–80; Ex. 1006, 4–5); Prelim. Resp. 13.

We agree that, for the purpose of institution, we do not need to adopt explicit constructions for any claim terms. To the extent that the meaning of any claim term is disputed, we discuss it below in the context of 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 BANERJEE

Valve argues that the challenged claims are unpatentable under 35 U.S.C. §§ 102(a)(1)–(2) as anticipated by Banerjee, or alternatively under § 103 as obvious over Banerjee. Pet. 4, 9–46.

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 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 to which said subject matter pertains.” *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.” *Id.* 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 these factors,⁴ we determine that Valve has shown a reasonable likelihood that at least one claim would have been obvious over Banerjee, for the reasons explained below.

1. Overview of Banerjee

Banerjee describes an augmented-reality simulation of cerebral aneurysm clipping, comprising an “open surgery station” to simulate open surgery steps, and a “microsurgery station” to simulate microsurgery steps. Ex. 1011 ¶ 2, code (57).

The open surgery station is depicted in Figure 1, which is reproduced below:

⁴ Neither party argues at this stage that there are objective indicia of obviousness or non-obviousness, so this factor is not part of our analysis.

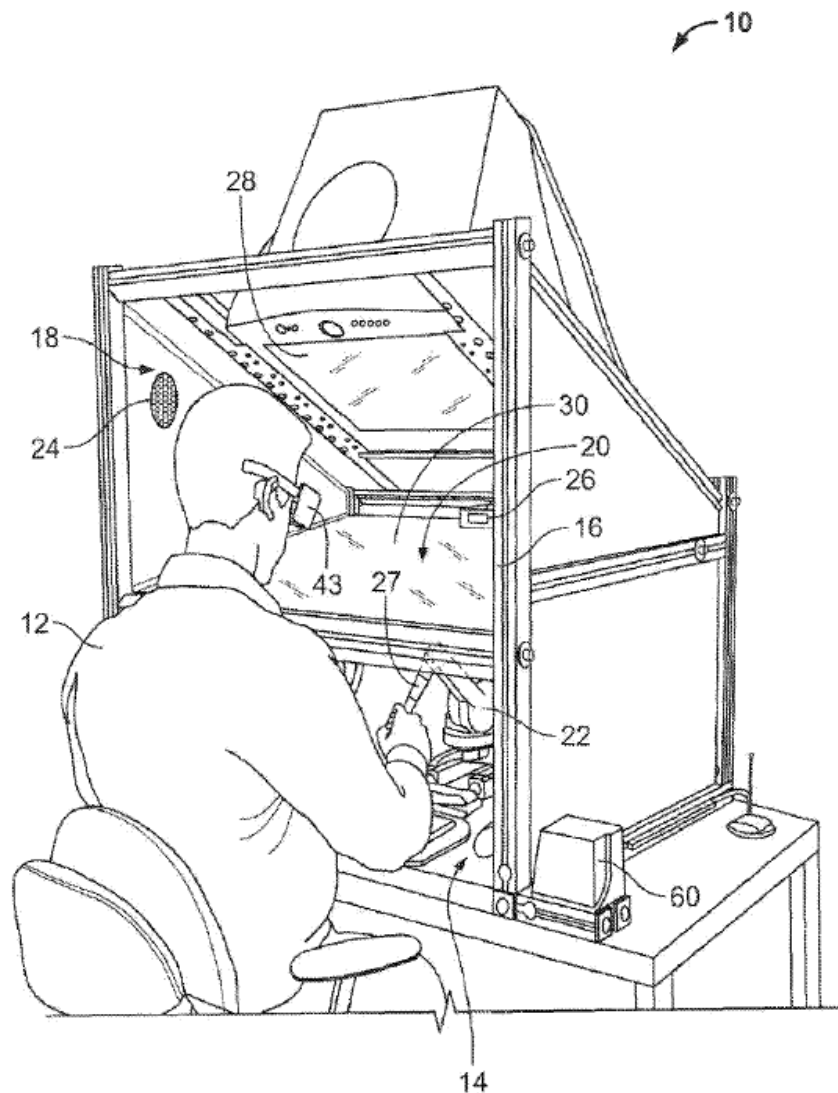


FIG. 1

Figure 1 depicts user 12 sitting at open-surgery station 10. Ex. 1011 ¶ 32. The system includes stereoscopic vision interface 20, haptic device 22, three-dimensional sound system 24, and “a hand tracking device in the form of at least one haptic robot stylus 27 [which] can provide information regarding the user’s interaction with the system as well as the user’s visual perspective relating to the open surgery station 10.” *Id.* The system also includes “display screen 28 that can be a single passive stereo monitor, a half-silvered mirror 30 to reflect the image of the display screen 28, and a

head tracking system 26 to display a dynamic viewer-centered perspective.”

Id. ¶ 35. The partially transparent mirror 30 can permit the user 12 to see both the virtual reality display and the user’s hands, thus providing an augmented reality environment.” *Id.* Also, “[t]he user can hold and manipulate the haptic device 22 with its stylus 27 below the mirror 30.” *Id.*

Figure 19 depicts an example of the augmented-reality display of open surgery station 10, from the perspective of user 12:

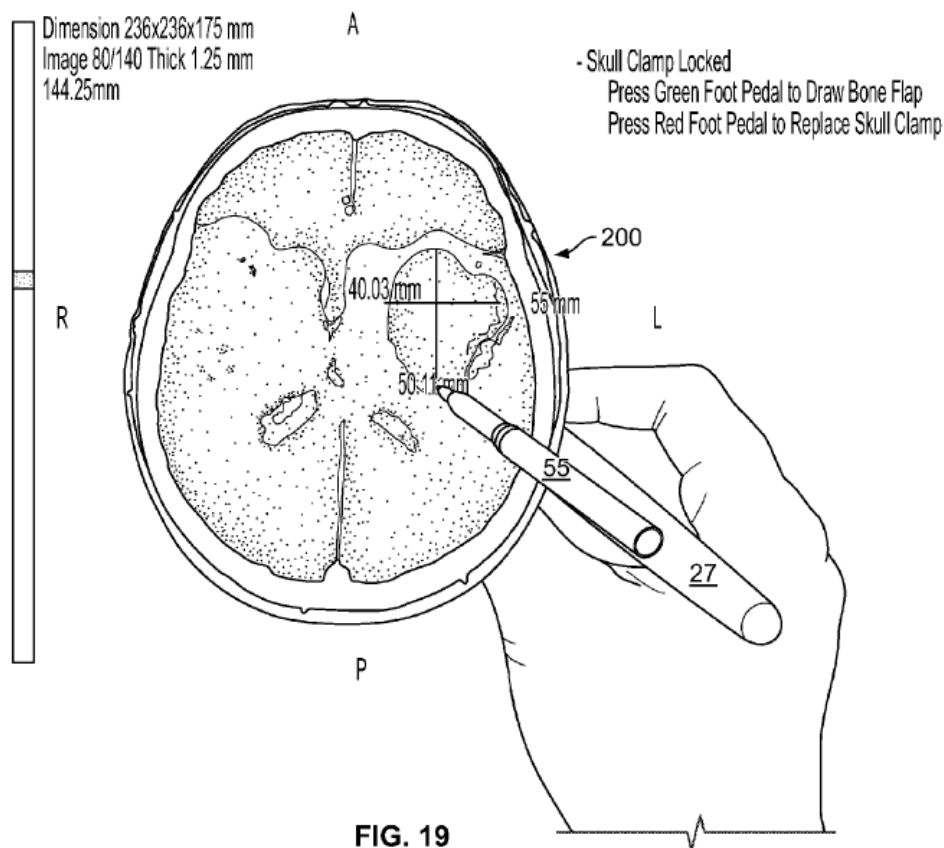


Figure 19 depicts simulated radiology scan 200 of a patient’s head “displayed on screen 28 and reflected on partially transparent mirror 30.” Ex. 1011 ¶ 53. “Using the haptic stylus 27, the user can manipulate the co-located virtual marker 55 to draw an outline of the intended craniotomy of the skin of the virtual patient’s head.” *Id.* ¶ 54.

Similarly, the microsurgery station, which simulates microsurgery, can “include some of the same types of physical components” as open surgery station 10, including haptic device 22 and haptic stylus 27. Ex. 1011 ¶ 31; *see also id.* ¶¶ 33, 35–36, Fig. 4 (describing a station similar to Figure 1, which includes two haptic devices 22, each with stylus 27, and two display screens 28, but also including binocular surgical microscopic eyepiece 31 which contains a mirror analogous to mirror 30 in open surgery station 10).

Banerjee incorporates by reference U.S. Patent No. 7,812,815 (*Id.* ¶ 32), which in turn describes the PHANTOM Desktop haptic device produced by SensAble Technologies as the preferred embodiment of haptic device 22. Ex. 1016, 3:35–36, 9:15–16. A separate application by Rawley et al., US Application No. 2010/0291505 A1 (Ex. 1019), which Petitioner does not assert as prior art in this proceeding, describes the PHANTOM force-feedback haptic interface device (*id.* ¶ 20) as depicted in Figure 3 below:

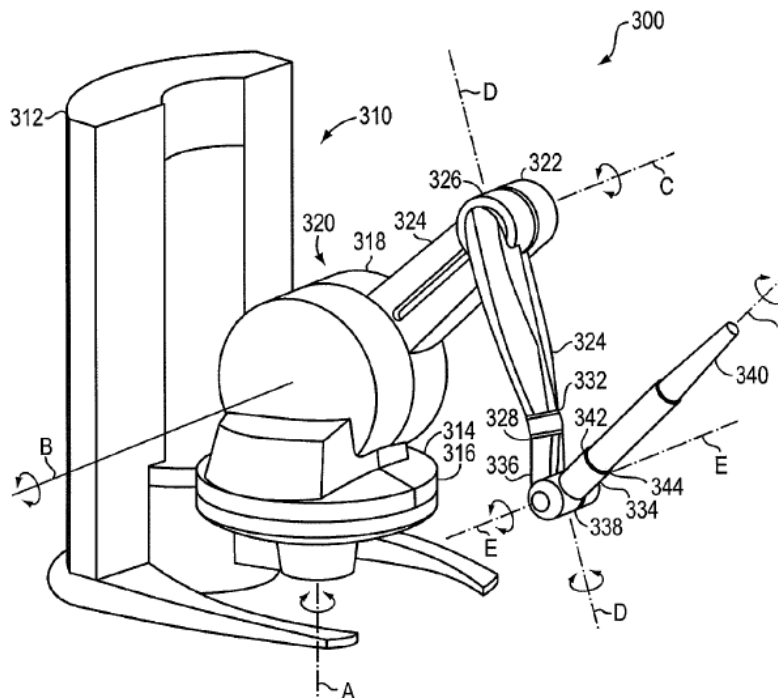


FIG. 3

Figure 3 of Rawley et al. depicts force-reflecting haptic interface 310. Ex. 1019 ¶ 39. It is a computer input device with six independent degrees of freedom, which also “provide[s] force feedback from the computer to the user.” *Id.* At the end of the robotic arm is “free rotary user connection element 340 in the form of a stylus configured to be grasped by a user.” *Id.* ¶ 40; *see also* Ex. 1017, Fig. 3 (depicting essentially the same haptic interface as Rawley’s Figure 3).

2. *Claim 1*

Because Immersion does not separately challenge Valve’s arguments regarding independent claims 1, 11, and 21, and does not raise any distinct issues as to the challenged dependent claims, we focus our preliminary analysis on claim 1.

(a) Preamble (1PRE)

The preamble of claim 1 recites “[a] system comprising” a set of claim limitations. Ex. 1001, 10:41.

Valve argues that Banerjee discloses haptic augmented and virtual reality systems, and thus meets the preamble. Pet. 14 (citing Ex. 1011 ¶¶ 27–31, 37, 53–68; Ex. 1003 ¶ 100).

Immersion does not specifically contest Valve’s arguments. *See* Prelim. Resp.

At this stage, we agree with Valve that Banerjee discloses the preamble for the reasons provided in the Petition; thus, we need not decide whether the preamble is limiting.

(b) Limitation 1A

Limitation 1A recites that the claimed system comprises “a proxy object comprising one or more haptic output devices.” Ex. 1001, 10:42–43.

Valve argues that Banerjee’s haptic device 22 (including stylus 27) is the recited proxy object. Pet. 14–16. According to Valve, stylus 27 is a component of haptic device 22 and is a “proxy” for a virtual tool by which the user controls the simulation. Pet. 14–16 (citing Ex. 1011 ¶¶ 29–34, 42, 44, 53–70; Ex. 1001, 5:34–47; Ex. 1003 ¶¶ 59–60, 102, 106–107). Valve also contends that haptic device 22 comprises one or more haptic output devices in the form of actuators (e.g., motors) that output (via stylus 27) “‘force feedback’ to simulate the ‘feel characteristics’ of virtual objects contacted by the virtual tool.” Pet. 16 (quoting Ex. 1011 ¶ 42) (citing Ex. 1011 ¶¶ 44, 57–59, 62–63, 68; Ex. 1001, 2:53–55, 4:23–33; Ex. 1003 ¶¶ 93–99, 106–109).

Alternatively, Valve argues that stylus 27 alone is a proxy object because a person of ordinary skill in the art would have understood that it “comprises the actuators . . . that cause the disclosed force feedback felt by the user.” Pet. 17 (citing Ex. 1011 ¶¶ 42–44; Ex. 1017, 1:18–65, 4:26–59, 12:64–13:10; Ex. 1018, 1:12–57, 3:38–6:36, 12:54–13:29; Ex. 1003 ¶¶ 59–62, 110–111).

In response, Immersion argues that Banerjee’s haptic device 22 and haptic stylus 27 “are two distinct and physically separate components that are, at best, mechanically coupled to each other,” so haptic device 22 cannot be the recited proxy object. Prelim. Resp. 18 (citing Ex. 2001 ¶¶ 62–69). According to Immersion, during prosecution of the ’067 patent, the applicant “disclaimed this same type of arrangement in which separate proxy object

and haptic output device components interact with each other or are ‘mechanically coupled’—expressly towards the ‘comprising’ relationship allowed by the Patent Examiner.” *Id.* (citing Ex. 1002, 287; Ex. 2001 ¶¶ 62–65).

Based on the preliminary record, which may be developed further at trial, we find sufficiently persuasive Valve’s argument that haptic device 22 and haptic stylus 27 can be treated together as the recited “proxy object.” Banerjee describes stylus 27 as part of haptic device 22. *See, e.g.*, Ex. 1011 ¶ 35 (“The user can hold and manipulate the haptic device 22 with its stylus 27”), ¶ 42 (“The haptics rendering software 44 can read the position and orientation of each haptic device 22, for example a stylus 27”). Functionally, stylus 27 is the part of haptic device 22 that directly interacts with the user. *See id.* ¶¶ 44, 57, claim 1.

If haptic device 22 comprises haptic stylus 27, as we preliminarily determine, it does not matter whether or not, during prosecution of the ’076 patent, the applicant allegedly disclaimed an arrangement in which the “proxy object” is merely “mechanically coupled to” the recited haptic output devices. Here, haptic device 22, as a whole including stylus 27, *comprises* the haptic output devices (i.e., the force-feedback actuators) and is not merely mechanically coupled to them.

Immersion’s other arguments for limitation 1A rely on the premise that haptic stylus 27 is not part of haptic device 22, and thus cannot be part of the recited proxy object. In particular, Immersion argues that a position of haptic device 22 (disregarding stylus 27) is not tracked, and thus it lacks a characteristic of the proxy object according to limitation 1C (reciting “a sensor for tracking a position of the proxy object”). Prelim. Resp. 16–18

(citing Ex. 1011 ¶¶ 32–35; Ex. 2001 ¶¶ 60–61). Similarly, Immersion argues that haptic device 22 (disregarding stylus 27) is not associated with a “modified visual effect” according to limitations 1D1 and 1D3. *Id.* at 16, 20–21 (citing Ex. 2001 ¶¶ 67–69). We disagree, because as discussed below, these other limitations are met with respect to haptic stylus 27, which is part of the recited “proxy object” along with the rest of haptic device 22. *See infra* Sections IV.C.2(d)–(f).

For the above reasons, we determine that Valve has sufficiently shown, at this stage, that Banerjee discloses limitation 1A.

As to Valve’s alternative argument that stylus 27 is a proxy object in itself, Immersion argues that “Banerjee [does not] disclose that the stylus has any haptics producing hardware such as actuators or motors.” Prelim. Resp. 21. Immersion argues that, in light of the applicant’s alleged disclaimer of a proxy object that is merely mechanically coupled to the recited haptic output devices, a person of ordinary skill in the art would have “underst[oo]d that the stylus itself is not a ‘haptic output device.’” *Id.* at Resp. 21–22 (citing Ex. 1002, 287; Ex. 2001 ¶ 70).

Because of our preliminary finding that Banerjee’s haptic device 22 (including haptic stylus 27) is a proxy object as recited in claim 1, we need not decide at this stage whether or not a person of ordinary skill in the art would have considered haptic stylus 27 alone to be the recited proxy object. However, we find at least some merit to Immersion’s argument that Valve has not sufficiently established that haptic stylus 27 itself “compris[es] one or more haptic output devices” as recited in limitation 1A. Stylus 27 does not appear to “comprise” any of haptic device 22’s force-feedback actuators. *See, e.g.*, Ex. 1011, Fig. 6; Ex. 1019, Fig. 3.

(c) Limitation 1B

Limitation 1B recites that the claimed system comprises “a display configured to output a visual effect onto a surface of the proxy object.” Ex. 1001, 10:44–45.

Valve argues that limitation 1B is met by the display system in Banerjee’s open surgery station 10, including display screen 28 and mirror 30, which are configured to output a visual effect onto the surface of stylus 27, which is part of the proxy object. Pet. 17–20 (citing Ex. 1011 ¶¶ 29, 35–35, 42–44, 53–59, 63, 72, Figs. 1, 7–19, Ex. 1001, 2:49–52, 3:40–41, 5:26–28, 5:60–62, 8:19–24; Ex. 1006, 4–5 (Immersion’s preliminary infringement contentions in parallel district-court litigation); Exs. 1013, 1028 (describing head-mounted displays with elements allegedly analogous to screen 28 and mirror 30); Ex. 1003 ¶¶ 112–119). Valve makes similar arguments as to Banerjee’s microsurgery station, which includes a display system including screen 28 that is allegedly configured to output a visual effect onto the surface of haptic device 22. Pet. 22 (citing Ex. 1011 ¶¶ 30, 35, 42–44; Ex. 1006, 4–5; Ex. 1003 ¶¶ 124–125).

Alternatively, Valve argues that a person of ordinary skill in the art would have understood display screen 28 and mirror 30 to each be the recited “display” because each of them independently outputs the visual effect. Pet. 21–22 (citing Ex. 1011 ¶¶ 35, 53, 57–59, 62–63, 66, 68; Ex. 1003 ¶ 123).

As another alternative argument, Valve contends that Banerjee discloses a head-mounted display system, such as Microsoft’s Hololens, that performs the same the functions of screen 28 and mirror 30 and thus meets limitation 1B. Pet 20–21 (citing Ex. 1011 ¶ 72; Ex. 1001, 3:40–41, 8:19–24;

Ex. 1028, 2:25–26, 5:16–22, 5:24–6:44, Fig. 2 (describing the Microsoft Hololens); Ex. 1003 ¶¶ 88, 119–121).

Immersion does not specifically contest Valve’s arguments for limitation 1B. *See* Prelim. Resp.

We determine that Valve has sufficiently shown, at this stage, that Banerjee discloses limitation 1B for the reasons outlined in the Petition.

(d) Limitation 1C

Limitation 1C recites that the claimed system comprises “a sensor for tracking a position of the proxy object.” Ex. 1001, 10:46.

Valve argues that Banerjee meets this limitation because “haptic device 22 tracks the position of haptic stylus 27” in both the open surgery station and microsurgery station. Pet. 22–23 (citing Ex. 1011 ¶¶ 29–34, 44, Fig. 2; Ex. 1003 ¶¶ 126–127). Valve contends that the ’067 patent broadly describes sensors of various types, and a person of ordinary skill in the art would have understood Banerjee’s system to track the location in space of haptic stylus 27 using, for example, optical encoders. Pet. 23–25 (citing Ex. 1011 ¶¶ 29–34, 42–44, Fig. 2 (a block diagram depicting the haptics rendering software reading “stylus position & orientation” from haptic device 22); Ex. 1001, 3:49–51, 4:2–8, 4:52–55; Ex. 1003 ¶¶ 94–98, 127–131).

Immersion argues that Banerjee’s system does not track the position of haptic device 22 (disregarding haptic stylus 27), which is anchored to the surgery stations and does not need to be tracked. Prelim. Resp. 22–23 (citing Ex. 2001 ¶¶ 72–73).

At this stage, we find Valve’s argument sufficiently persuasive and disagree with Immersion’s argument, which relies on the premise, discussed

above in the context of limitation 1A, that haptic stylus 27 cannot be regarded as part of haptic device 22 and thus cannot be part of the recited proxy object. *See supra* Section IV.C.2(b). Limitation 1C recites “a sensor for tracking *a position* of the proxy object,” and the tracked position of haptic stylus 27 is one of the positions of haptic device 22 as a whole. We preliminarily find that a person of ordinary skill in the art would have understood that the system tracks haptic stylus 27 using one or more sensors. *See, e.g.*, Ex. 1011 ¶ 34 (“[H]aptic devices 22 . . . track the user’s hand position . . .”), ¶ 42 (“[H]aptics rendering software . . . can read the position and orientation of each haptic device 22, for example a stylus 27), claim 1 (“the first haptic device tracks a user’s hand movements”), Fig. 2 (depicting the measurement of “stylus position & orientation”).

Thus, we determine that Valve has sufficiently shown, at this stage, that Banerjee discloses limitation 1C, or at least would have motivated a person of ordinary skill in the art to use a sensor as a well-known mechanism for tracking the position of a proxy object according to limitation 1C.

(e) Limitations 1D, 1D1–2, and 1D4–5

Limitations 1D, 1D1, and 1D2 recite that the claimed system comprises “a processor configured to: determine a modified visual effect based in part on data received from the sensor; [and] “determine a haptic effect based in part on data received from the sensor.” Ex. 1001, 10:47–51. Limitations 1D4 and 1D5 recites that the processor is configured to “transmit a haptic signal associated with the haptic effect to the one or more haptic output devices; and output the haptic effect using the one or more haptic output devices.” Ex. 1001, 10:55–58.

Valve argues that Banerjee’s computer 32 includes a processor that meets each of these limitations. Pet. 25–32, 34–36 (citing Ex. 1011 ¶¶ 29, 34–35, 37–44, 46, 53–68, Figs. 2–3, 5, 8; Ex. 1001, 9:54–58, 10:24–26, Fig. 1; Ex. 1003 ¶¶ 132–155, 162–165).

Immersion does not specifically contest Valve’s arguments. *See* Prelim. Resp.

We determine that Valve has sufficiently shown, at this stage, that Banerjee discloses limitations 1D, 1D1–2, and 1D4–5, for the reasons outlined in the Petition.

(f) Limitation 1D3

Limitation 1D3 recites that the system’s processor is configured to “transmit a display signal associated with the modified visual effect to the display, the modified visual effect to be displayed on the proxy object via the display.” Ex. 1001, 10:52–54.

Valve argues that Banerjee’s system transmits a modified visual effect to be displayed on haptic stylus 27. Pet. 32–34 (citing Ex. 1011 ¶¶ 29, 35, 38–39, 42–44, 53–70, Fig. 2; Ex. 1006, 10; Ex. 1003 ¶¶ 156–161).

Immersion argues that Banerjee’s system does not transmit a display signal to be displayed on haptic device 22 (disregarding haptic stylus 27), because the only such superposition in Banerjee’s disclosure is on haptic stylus 27. Prelim. Resp. 23–24 (citing Ex. 1011, Figs. 20, 21; Ex. 2001 ¶¶ 74–75).

At this stage, we disagree with Immersion because this argument relies on Immersion’s assumption, discussed above in the context of limitation 1A, that haptic stylus 27 cannot be regarded as part of haptic device 22 and is thus not part of the recited proxy object. *See supra* Section

IV.C.2(b). Banerjee clearly discloses superimposing a modified visual effect on haptic stylus 27, which in our preliminary view is part of the recited proxy object. *See, e.g.*, Ex. 1011, claim 1 (“the virtual instrument is visually superimposed over the hand-held stylus of the haptic device”), Figs. 19–21.

(g) Conclusion as to claim 1.

For the above reasons, we determine that Valve has shown, sufficiently at this stage, that Banerjee discloses all the limitations of claim 1, or at least that a person of ordinary skill in the art would have had reason, in view of Banerjee, to combine features, including a sensor, as recited in claim 1. We therefore determine that Valve is reasonably likely to prevail in showing that claim 1 is unpatentable under §§ 102 or 103 based on Banerjee.

3. *Other Claims*

Because Valve has shown a reasonable likelihood of prevailing with respect to claim 1 as discussed above, we will institute on all claims and all grounds raised in the Petition. *See* 37 C.F.R. § 42.108(a).

Independent claim 11 is similar to claim 1, except that it is a method claim, and independent claim 21 is likewise similar except that it is directed to a “non-transitory computer readable medium.” *Compare* Ex. 1001, 11:20–33, *and id.* at 12:26–41, *with id.* at 10:41–58. Claims 11 and 21 are not addressed in the Preliminary Response separately from claim 1, but our reasoning above applies equally to those claims.

Also, in light of our determination as to claim 1, we need not address the patentability of the dependent claims, which are not separately addressed in Immersion’s Preliminary Response.

D. GROUND BASED ON MEGLAN

Although we need not address Valve's ground based on Meglan in detail, we briefly provide our preliminary thoughts as to the disputed issues. *See* 37 C.F.R. § 42.108(a).

Meglan describes a training simulator for hemorrhage control. Ex. 1012, code (57). Figure 8 is reproduced below:

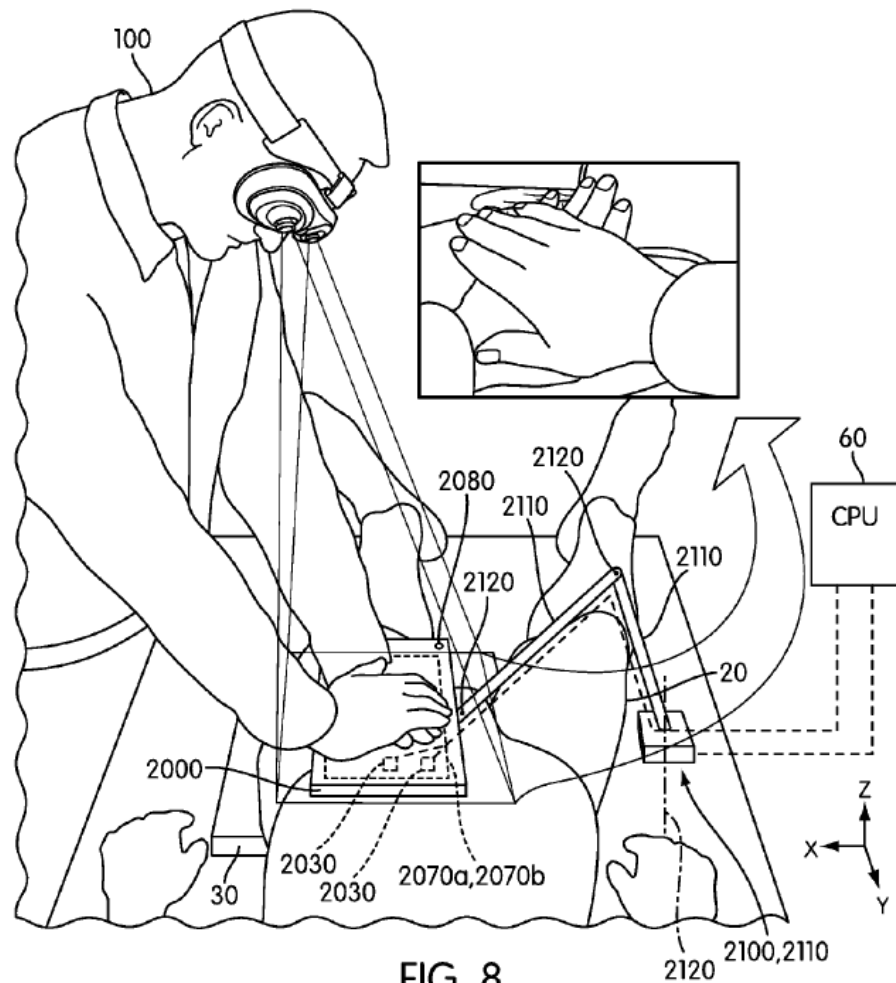


Figure 8 depicts trainee 100 wearing a head-mounted display and controlling simulated bleeding of surrogate 20 (a mannequin). Ex. 1012 ¶¶ 61, 107. Between trainee 100's hands and surrogate 20 is sensorized substrate 2000, which is mounted on automated positioning device 2100. *Id.* ¶ 108.

Substrate 2000 contains load sensors 2030 as well as pulse generators 2070a and heat generators 2070b. *Id.* ¶ 107. Substrate 2000 is flexible and conforms to the surface of surrogate 20, and moves such that “when the trainee 100 attempts to contact the surrogate 20, the trainee 100 actually contacts the sensorized substrate 2000 that becomes sandwiched between the trainee’s hands and the surrogate 20.” *Id.* ¶¶ 109–111.

Meglan’s system tracks position and orientation using the video feed from one or more cameras which “may provide stereoscopic information to triangulate the location of imaged objects,” or a single camera may “include distance sensors whose measurements are provided” to a processor for “determining the position and orientation of the imaged objects.” Ex. 1012 ¶ 72.

Valve argues that the “proxy object” recited in limitation 1A is surrogate 20, the “sensor” recited in limitation 1C is the video feed from the cameras, and that the system determines haptic effects based on data from that sensor, meeting limitation 1D2. Pet. 48–51, 53–54, 57–58 (citing Ex. 1003 ¶¶ 59–62, 214–223, 229–231, 240–244).

Immersion argues that Meglan’s haptic effects are not based on the recited “sensor” because Meglan’s camera feed only tracks the position of trainee 100’s hands and fingers, not the position of surrogate 20 (the alleged “proxy object”). Prelim. Resp. 28–31 (citing Ex. 1012 ¶ 107, Fig. 8; Ex. 2001 ¶¶ 81, 84–88). Immersion argues that haptic effects are based on load sensors which measure pressure, not position, and the camera has no bearing on haptic effects. *Id.* at 31–32 (citing Ex. 1012 ¶ 90; Ex. 2001 ¶¶ 86–89).

Based on the preliminary record, we disagree. Meglan discloses that the camera system tracks not just trainee 100's hands, but also the position and orientation of surrogate 20. Ex. 1012 ¶¶ 72–74, claims 1, 13 (“determine, based at least in part on the input video feed, a location of the surrogate and the at least one object,” e.g., “a hand of the user”). This appears to be necessary because the system provides a haptic effect, such as “the specific feel of [a simulated] pulse” only when trainee 100's hands contact the surface of surrogate 20. Ex. 1012 ¶ 90. The haptic effect is therefore based, at least in part, on the position of surrogate 20 as sensed from the camera feed, and whether the user's hands are in contact with that position.

Thus, at this stage, we find merit in Valve's arguments that Meglan discloses limitation 1D2.

E. GROUND BASED ON ROGERS

Although we need not address Valve’s ground based on Rogers in detail, we briefly provide our preliminary thoughts as to the disputed issues. *See* 37 C.F.R. § 42.108(a).

Rogers describes a gaming controller as shown below in Figure 1:

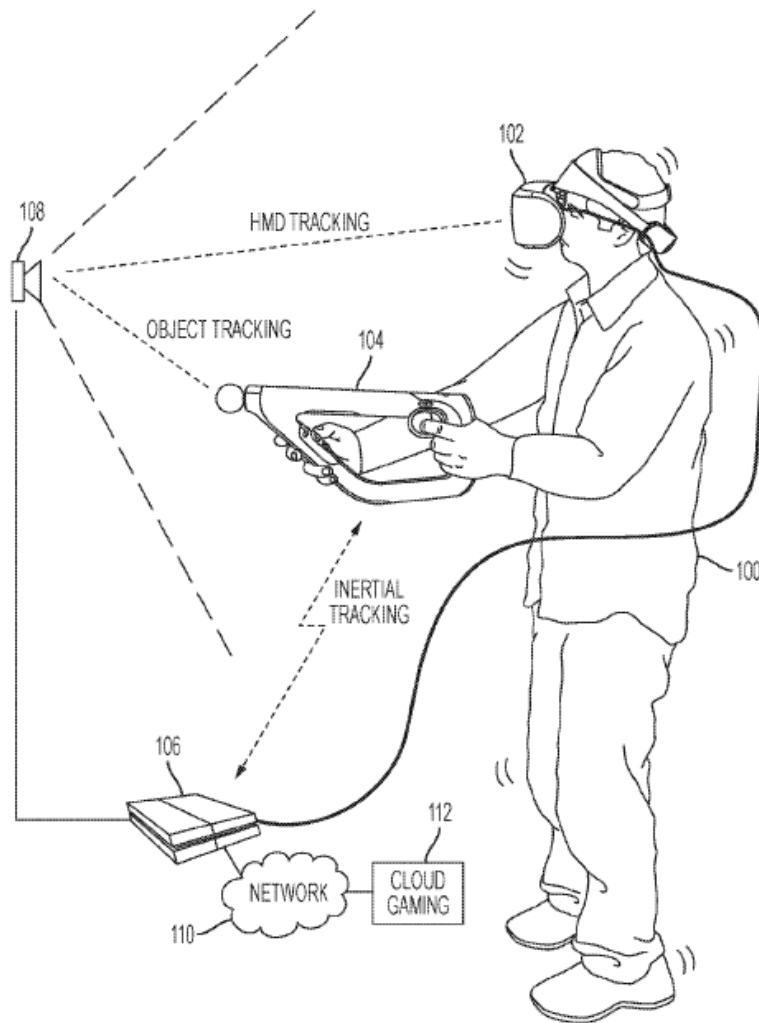


FIG. 1

Figure 1 depicts user 100 wearing head-mounted display 102 connected to computer 106. Ex. 1010 ¶¶ 42–43. User 100 operates “directional interface object 104 to provide input for the video game.” Ex. 1010 ¶ 44. Camera 108

also “capture[s] images of the interactive environment in which user 100 is located,” which “can be analyzed to determine the location and movements of the user 100, the [head-mounted display] 102, and the directional interface object 104.” *Id.* ¶ 44.

The location and orientation of directional interface object 104 can also be tracked using internal sensors. Ex. 1010 ¶ 44. For example, it can use an integrated inertial sensor. *Id.* ¶ 52. To provide a haptic effect, directional interface object 104 can also include a movable weight that moves along a track to “provide sensations of momentum based on events occurring in the VR environment.” *Id.* ¶ 105. “[F]or example, pointing the directional interface object 104 upward, the moveable weight 800 may be caused to move so as to mimic the sensation of weapon reloading mechanics of the virtual weapon.” *Id.*

Valve argues that camera 108, in conjunction with an inertial sensor in directional interface object 104, meet the “sensor” of limitation 1C. Pet. 72–73 (citing Ex. 1010 ¶¶ 44, 52, 81, 103, 111, Fig. 1, claim 9; Ex. 1001, 4:1–18 (“Any suitable number, type, or arrangement of sensors can be used.”); Ex. 1003 ¶¶ 299–303). Valve also argues that the “modified visual effect” of limitation 1D1 and the haptic effect of limitation 1D2 are both based on the data from the combined “sensor” including the camera and the inertial sensor. Pet. 74–77 (citing Ex. 1003 ¶¶ 309–319).

Immersion argues that, to the extent camera 108, object 104’s internal sensor, or the combination of the two are considered the recited “sensor,” there is no position data from either sensor used to determine a haptic effect under limitation 1D2 because the “reloading” haptic effect is determined solely from the *directional* data of object 104’s internal sensor. Prelim. Resp.

35–45 (citing Ex. 1010 ¶¶ 16, 18, 44, 96, 105, 111, Fig. 1; Ex. 2001 ¶¶ 94–96, 98–100). Thus, according to Immersion, to the extent either camera 108 or the combination of camera 108 and object 104’s internal sensor is considered the recited “sensor,” there is no position data used to determine a haptic effect under limitation 1D2.

At this stage, we question whether this argument is material. Although limitation 1C recites “a sensor for tracking a position of the proxy object,” limitation 1D2 only explicitly requires determining a haptic effect based on “data received from the sensor”—not necessarily *positional* data received from the sensor. It appears that in claim 1, a “sensor” may comprise a combination of sensors. *See* Ex. 1001, 11:6–7 (dependent claim 7 in which the “sensor” of claim 1 potentially comprises a combination of sensors such as a camera and an accelerometer). There is at least some merit to Valve’s position that the combination of camera 108 and the inertial sensor of directional interface object 104, collectively, is “a sensor for tracking a position of” proxy object 104 as per limitation 1C, and that “data” from the combined sensor—in this case directional data—is used to determine a haptic effect as per limitation 1D2.

Immersion also argues that Immersion has failed to show that Rogers discloses any modified visual effect, under limitation 1D1, based on the *same* sensor data used to determine a haptic effect in limitation 1D2. Prelim. Resp. 45–49 (citing Ex. 2001 ¶¶ 101–104).

At this stage, we question whether this argument is material. Although both limitations 1D1 and 1D2 require determining a modified visual effect or haptic effect, respectively, “based in part on data received from the sensor,” nothing in claim 1 appears to require that these two determinations

are based on the same data, or even the same type of data (e.g., positional data). It appears that the recited “sensor” can provide many types of data, including acceleration, magnetic or gyroscopic orientation, pressure, or sound. *See* Ex. 1001, 4:2–22, 4:47–67 (“Different haptic effects may be selected based on various combination[s]” of features such as “location, path, velocity, acceleration, pressure, and/or other characteristics of haptic output device 118 over time.”), 11:6–9 (dependent claim 7).

V. CONCLUSION

For the reasons set forth above, Valve 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).

VI. ORDER

It is

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–8, 11, 12, and 15–21 of the ’067 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, *inter partes* review of the ’067 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 10,665,067 B2

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