

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VALVE CORPORATION,
Petitioner,

v.

IMMERSION CORPORATION,
Patent Owner.

Case IPR2024-00557
Patent 10,665,067

PATENT OWNER'S RESPONSE

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35 U.S.C. §103	5, 6, 8
35 U.S.C. §112(a)	5, 6

EXHIBIT LIST

Exhibit No.	Exhibit Description
2001	Declaration of Craig Rosenberg, Ph.D. in Support of Immersion Corporation's Patent Owner Preliminary Response, dated May 15, 2024
2002	<i>Curriculum Vitae</i> of Craig Rosenberg, Ph.D.
2003	<i>Immersion Corp. v. Valve Corp.</i> , 2:23-cv-000712-TL, Joint Claim Construction Statement (Exhibit A), Dkt. # 68-1
2004	<i>Immersion Corp. v. Valve Corp.</i> , 2:23-cv-000712-TL, Order on Motion to Stay Pending <i>Inter Partes</i> Review, Dkt. # 69
2005	<i>Immersion Corp. v. Valve Corp.</i> , 2:23-cv-000712-TL, Case Scheduling Order, Dkt. # 46
2006	<i>Immersion Corp. v. Valve Corp.</i> , 2:23-cv-000712-TL, Valve Corp.'s Invalidity Contentions
2007	Declaration of Dr. Robert Akl in Support of Immersion Corporation's Patent Owner Response, dated November 5, 2024
2008	<i>Curriculum Vitae</i> of Dr. Robert Akl

I. INTRODUCTION

Patent Owner Immersion Corporation (“Immersion”) respectfully requests the Board to affirm the Challenged Claims of Immersion’s U.S. Patent No. 10,665,067 (EX1001 or the “’067 Patent”).

The ’067 Patent is directed to systems and methods for integrating haptics overlay in augmented reality (AR) for enhancing user experience in AR environments by providing improved haptic feedback and visual effects, thereby providing a more immersive AR experience for the user. The inventors of the ’067 Patent sought to address the challenges of enhancing user interaction and feedback in virtual or augmented reality environments. The ’067 Patent teaches a solution to overcome these challenges with a system that includes a proxy object comprising a haptic output device, a sensor for tracking the position of the proxy object, a display for visual effects, and a processor for determining and outputting modified visual effects as well as haptic effects based on position data from the sensor.

The ’067 Patent’s proxy object includes real-world objects such as wearable peripheral devices that serve as a proxy for a virtual object. And by overlaying visual effects over the proxy object such as in AR/VR environments, the ’067 Patent bridges the disconnect between virtual experiences and physical interactions, which allows users to see, touch, and interact with virtual items or environments as if they are real. Thus, in the ’067 Patent, the position of the proxy object is not only used

for visual overlay to display a virtual object, but also to provide haptic feedback through the proxy object to provide a more immersive interaction with the virtual environment.

In contrast, the prior art Petitioner asserts are all directed to systems that utilize position tracking sensor data *only* for overlaying visual effects on physical objects to display images of corresponding visual objects—*not* for providing haptic feedback. For example, Petitioner asserts Banerjee and Meglan, which are both references directed to the simulation of hands-on medical treatment. Banerjee is directed to a surgical simulation workstation for simulated training for brain aneurysm clipping, and Meglan is directed to simulated training for hemorrhage control techniques such as the use of tourniquets. Petitioner also asserts a third reference, Rogers, which is directed to a virtual reality system employing a physical controller such as a gun that can be depicted as a virtual weapon and a head mounted display (HMD) unit through which the user can view the virtual environment, e.g., of a video game, as well as a simulated or virtual image of the gun overlaid on the physical weapon.

Though Banerjee and Meglan utilize a camera sensor for tracking the position of certain objects, neither disclose the use of such position tracking sensor data to enable *haptics*. Rather, as explained in detail below, the camera sensor is only used for overlaying visual effects, but not for enabling haptics. This is because the prior

art was only concerned with ensuring low latency in the *visual* overlay as opposed to also recognizing the importance of further position tracking for the purpose of providing haptic effects to enhance feedback. Petitioner's mapping of the Challenged Claims to the Rogers reference is also directed to the use of camera sensors only for overlaying visual effects. Indeed, Petitioner's mapping to Rogers does not disclose the use of cameras and position data to determine haptic feedback.

Accordingly, as detailed in this Response, all grounds of the Petition commonly suffer from a key deficiency, which is the failure to disclose haptics that depend on the position of the claimed proxy object as claimed by the '067 Patent. Therefore, the Board should affirm the Challenged Claims.

II. BACKGROUND

A. Overview of the '067 Patent

The '067 Patent is directed to a system that includes a proxy object with one or more haptic output devices, a display for outputting visual effects onto the proxy object, a sensor for tracking the proxy object's position, and a processor configured to modify visual effects displayed on the proxy object and to output haptics, both based on its position. EX1001, Abstract, 1:27-49.

The '067 Patent aims to solve the challenges of enhancing user interaction with virtual or augmented reality environments and addresses the need for a more immersive experience in such environments. *Id.*, 1:13-23. The '067 Patent solves

this problem by integrating haptic feedback and visual effects. *Id.*, Abstract, 1:27-49. Specifically, the patented system includes a proxy object that comprises haptic output devices, a display for visual effects, a sensor for tracking the position of the proxy object, and a processor that determines and outputs modified visual and haptic effects based on position data from the sensor. *Id.* This system allows users to have a tactile experience, such as feeling the texture of objects, that corresponds with what they see in the augmented reality environment, thereby making the interaction with virtual content more realistic and engaging. *Id.*, 1:3-49, 2:30-64.

B. Claims of the '067 Patent

Petitioner challenges Claims 1-8, 11-12, 15-21 of the '067 Patent. Exemplary independent Claim 1 is recited below:

1[pre]. 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:

[1D-1] determine a modified visual effect based in part on data received from the sensor; and

[1D-2] determine a haptic effect based in part on data received from the sensor;

- [1D-3] 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
- [1D-4] transmit a haptic signal associated with the haptic effect to the one or more haptic output devices; and
- [1D-5] output the haptic effect using the one or more haptic output devices.

C. Prosecution History of the '067 Patent

The application that later issued as the '067 Patent was filed on June 15, 2018. EX1002, 40. The Patent Office rejected the original claims under §103 in an Office Action dated July 5, 2019. *Id.*, 74-103. The Patent Office rejected claims 9 and 19 under 35 U.S.C. §112(a) as failing to comply with the written description requirement. *Id.*, 76. Additionally, claims 1-7, 9-17, and 19-21 were rejected under 35 U.S.C. §103 over Gonzalez et al. and Rimon (U.S. Patent Application Publication No. 2016/0274662). *Id.*, 77-99. Claims 8 and 18 were similarly rejected in further view of Vanslette et al. (U.S. Patent Application Publication No. 2018/0040038). *Id.*, 99-102.

Applicant filed a response on October 7, 2019, traversing the §112 rejection. *Id.*, 128-29. Applicant also made certain clarifying amendments to the claim as shown below. *Id.*, 124-27, 129-131.

1. A system comprising:

a proxy object:

sensor;

a haptic output device mechanically coupled to the proxy object;

a display configured to output a visual effect onto a surface of the proxy object;

a sensor for tracking a position of the proxy object; and

a processor configured to:

 determine a modified visual effect based in part on data received from the sensor;

 determine a haptic effect based in part on data received from the sensor;

 transmit a display signal associated with the modified visual effect to the display;

 transmit a haptic signal associated with the haptic effect to the haptic output device; and

 output the haptic effect using the haptic output device.

Id., 124. The other independent claims were similarly amended. *Id.*, 125-27.

The Patent Office issued a Final Office Action on November 22, 2019, maintaining the §112(a) rejection of claims 9 and 19 and further rejecting amended claims 1, 11, and 21 under the same. *Id.* at 137-38. The Final Office Action maintained the §103 rejections. *Id.*, 139-67.

An Examiner Interview was held on January 10, 2020, discussing a proposed amendment and the cited art of Gonzalez and Rimon. *Id.*, 253. The Examiner indicated that the proposed amendment would overcome the cited art. *Id.*

Applicant submitted a response to Final Office Action on January 22, 2020, amending the claim scope to address the rejections under §§112 and 103. *Id.*, 258-

60. Specifically, Applicant amended the “haptic output device” limitation of claim 1 as follows: “a haptic output device ~~mechanically coupled to~~ within the proxy object.” *Id.*, 258. The other independent claims were similarly amended. *Id.*, 259-60.

In an Advisory Action dated February 10, 2020, the Patent Office indicated that Applicant's amendments raise new issues that would require further search and/or consideration. *Id.*, 272. Accordingly, the amendments were not entered. *Id.*

In response, Applicant filed a response to the Final Office Action along with a Request for Continued Examination on February 24, 2020, further amending certain claims to address the pending rejections. *Id.*, 280-88. In particular, Applicant amended claim 1 as follows:

1. A system comprising:
 - a proxy object comprising one or more haptic output devices;
 - ~~a haptic output device mechanically coupled to the proxy object~~;
 - a display configured to output a visual effect onto a surface of the proxy object;
 - a sensor for tracking a position of the proxy object; and
 - a processor configured to:
 - determine a modified visual effect based in part on data received from the
 - determine a haptic effect based in part on data received from the sensor;
 - 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;
 - transmit a haptic signal associated with the haptic effect to

the one or more
haptic output device; and
output the haptic effect using the one or more haptic output
devices.

Id., 280. The remaining independent claims were similarly amended. *Id.*, 281-83.

Applicant further remarked in the response that “Gonzalez does not disclose ‘a proxy object **comprising one or more haptic output devices**’ with ‘**the modified visual effect to be displayed on the proxy object,**’ as is recited in amended claim 1.” *Id.*, 286 (emphasis in original). Applicant explained that while Gonzalez taught an AR system that “can be used to provide other types of vehicle function[s] to a vehicle such as modifying the appearance of the vehicle when viewed through the AR headset[,]” the appearance modification is not displayed on an object with any feedback devices. *Id.*, 287. Applicant further explained that Rimmon likewise did not teach overlaying virtual objects on an object comprising a haptic output device. *Id.*, 288. Applicant therefore concluded that the cited art could not render obvious claim 1 and requested withdrawal of the §103 rejection. *Id.*, 288. On March 4, 2020, the Patent Office agreed with Applicant and issued a Notice of Allowance. *Id.*, 295. The ‘067 Patent subsequently issued on May 26, 2020. *Id.*, 323.

III. PERSON OF ORDINARY SKILL IN THE ART (POSA)

Petitioner identifies a person of ordinary skill in the art (“POSA”) as one who would have possessed a bachelor’s degree in electrical engineering, computer

science, or a related field, plus at least two years of industry or graduate level experience with human-computer interaction. Pet., 6 (citing Welch, ¶¶39). Petitioner also states that “[m]ore education could substitute for experience, and *vice versa*. *Id.*

Immersion submits that a POSA at the time of the '067 Patent 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. EX2007, ¶30. Also, a person could have qualified as a POSA with more formal education and less practical or industry experience, or vice versa. *Id.* In any event, the Petition fails to show that any Challenged Claim of the '067 Patent is unpatentable under either Petitioner's or Immersion's definition of a POSA.

IV. CLAIM CONSTRUCTION

Although Petitioner provides a summary of its arguments directed to claim construction disputes between the parties in the co-pending district court litigation (see Pet., 7-9), Patent Owner submits that for purposes of this Response, the Board need not resolve any of those specific disputes. None of the reasons discussed herein for why Grounds 1 to 3 fail depend on the disputed constructions in the district court.

Patent Owner, however, proposes the following clarifying claim construction for the following terms:

Claim Term	Patent Owner's Proposed Construction
"a proxy object comprising one or more haptic output devices"	"a physical object that acts as a proxy for a virtual object and that itself contains inside a haptic output device, e.g., an actuator"
"determine a haptic effect based in part on data received from the sensor"	"determine a haptic effect based in part on position data of the proxy object received from the sensor that tracks a position of the proxy object"

A. "a proxy object comprising one or more haptic output devices"

Patent Owner offers the following construction for this term: "a physical object that acts as a proxy for a virtual object and that itself contains inside a haptic output device, e.g., an actuator."

This construction reflects how a POSA would understand the meaning of the term in light of the '067 Patent as fully supported by the intrinsic evidence including the plain language of the claims, the patent specification, and the prosecution history. Claim 1 recites three key interrelated aspects of the invention which will be detailed here: (1) "a proxy object comprising one or more haptic output devices," (2) "a sensor for tracking a position of *the proxy object*," and (3) "the modified visual effect to be displayed on *the proxy object*."¹ EX1001, cl. 1.

¹ Bold, bold italic, or plain italic emphases added unless otherwise specified.

1. The proxy object is a proxy for a virtual object

A POSA would understand a “proxy object” is a physical object in the real world that acts as a proxy for a virtual object in an Augmented Reality (AR) or Virtual Reality (VR) world. EX2007, ¶34. For example, the patent explains:

In one illustrative embodiment, a user is wearing an AR headset and is looking at **a proxy object, e.g., a shoe, in real space**. The user may choose a material from a library of materials (e.g., materials such as one or more of leather, plastic, rubber, metal, burlap, suede, denim, wood, cloth, ceramic, foamed material, or glass). **This material will then be displayed on the proxy object via the AR headset** by saying a voice command out loud (e.g., apply leather material) or inputting instructions via a visual menu in a VR or AR headset, a hand controller, a wearable device, or gesture recognition. The illustrative AR display of the AR headset is modified based on the command so that **the appearance of the proxy object is modified through the AR display to show the proxy object made of the selected material**.

EX1001, 2:39-52. In this example, the proxy object is an actual shoe in the real world that acts as a proxy for a virtual shoe in the AR or VR world viewed through the AR/VR headset. EX2007, ¶34. *See, e.g.,* EX1001, Figs. 2-3 (showing proxy objects 202 and 302), 2:40 (“a proxy object, e.g., a shoe in real space”), 3:3-4 (“The modified image of the proxy object through the AR display [...] can then be modified in real-

time to reflect any movement of the proxy object”), 5:34-37 (“In some embodiments, **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.”)

2. The proxy object contains inside a haptic output device, e.g., an actuator

A POSA would also understand the claimed “proxy object” itself contains inside a haptic output device. EX2007, ¶35. First, the plain language of the claim recites “a proxy object comprising one or more haptic output devices.” EX1001, 10:42-43. Thus, the claimed haptic output device must be contained inside the proxy object. EX2007, ¶35. Likewise, the specification also states:

In one illustrative embodiment, a haptic effect associated with the proxy object is output by a haptic output device, e.g., an actuator, that outputs a haptic effect (e.g., a vibration or ESF effect) simulating a texture of the material selected from the library.

EX1001, 2:53-57. The specification explains that the haptic output device 118 is “**integrated into a proxy object.**” EX1001, 2:37-38; *see also id.*, 5:67-6:1 (“As the AR visual effect is changed through the choice of texture, a haptic signal is transmitted to the **haptic output device(s) 118 contained in proxy object 202**”).

Further, the haptic output device that is contained inside the proxy object must comprise an actuator or similar component that generates the haptic effect. *See, e.g.,*

EX1001, 2:53-57 (“a haptic effect associated with the proxy object is output by a haptic output device, e.g., an actuator, that outputs a haptic effect (e.g., a vibration or ESF effect) simulating a texture of the material selected”), 6:26-29 (“proxy object 302 comprises one or more haptic output device(s) 118, e.g., actuators, capable of outputting a haptic effect to the user”); EX2007, ¶36.

The prosecution history as detailed above in § II.C also supports this claim construction. There, the Applicant amended the claim scope and disavowed proxy objects that were “mechanically coupled” to the haptic output device containing the actuator. EX1002, 280-88. Indeed, the intention of the Applicant to narrow the claim scope to only proxy objects with haptic output devices (e.g., actuators) inside of it is also reflected in a previous claim amendment (that was not entered). The Applicant had amended the “haptic output device” limitation of claim 1 as follows: “a haptic output device ~~mechanically coupled to~~ within the proxy object.” *Id.*, 258. Thus, a POSA would understand that the proxy object itself must contain the actuator inside of it. EX2007, ¶¶37-39. A POSA would understand that a proxy object that is “mechanically coupled to” e.g., appended to and/or connected to a haptic output device (containing the actuator) is outside the claim scope. *Id.*

The prosecution history also confirms that the claimed proxy object upon which the modified visual effect is overlaid (i.e., claim element [1D-3]) must directly contain the haptic output device. EX2001, 287. There, the Applicant distinguished

the claim scope from the Gonzalez reference which taught an alleged “proxy” object with modified visual overlaid effects that did *not* directly contain the haptic output device. *Id.* Rather, the haptic output device in Gonzalez was inside the AR glove (which had no overlays) that made contact with the alleged “proxy” object that had visual overlaid effects:

the physical portions of the vehicle where visible alterations are overlaid do not include any feedback devices. Therefore Gonzalez does not disclose “a proxy object comprising one or more haptic output devices” with “the modified visual effect to be displayed on the proxy object.”

Id. Therefore, a POSA would understand that the proxy object must contain inside the haptic output device, e.g., an actuator. EX2007, ¶¶35-39.

B. “determine a haptic effect based in part on data received from the sensor”

A POSA would understand this term to mean: “determine a haptic effect based in part on position data of the proxy object received from the sensor that tracks a position of the proxy object.” EX2007, ¶40 The recitation of “*the sensor*” in this claim element [1D-2] has its antecedent basis in the previous claim element [1C], “**a sensor for tracking a position** of the proxy object.” EX1001, 10:46-51. The type of sensor data in claim element [1D-2] must refer back to the specific sensor data type—i.e., position data—in claim element [1C]. *Wi-LAN, Inc. v. Apple Inc.*, 811 F.3d 455, 462 (Fed. Cir. 2016) (once a term is recited in a claim, “[s]ubsequent use

of the definite articles ‘the’ or ‘said’ in a claim refers back to the same term recited earlier in the claim.”). Thus, determination of the haptic effect must be based in part on the position of the proxy object. EX2007, ¶40.

The Board, however, preliminarily found that “the data received from *the sensor*” is not necessarily limited to position or location data, and that it may include other types of sensor data such as velocity, acceleration, etc. DI, 28-29. The Board bases this on broader disclosure in the specification stating that a sensor may comprise a combination of sensors including position sensors and other sensors such as an accelerometer. *Id.*, 28 (citing EX1001, 11:6-7 (dep. cl. 7)). The Board also relies on the following in the specification to reason that the claimed haptic effect can be based on other types of sensor data in addition to position data:

a device may be configured to determine and output haptic effects. In this example, a detection module 124 configures processor 102 to monitor sensor(s) 108 to determine characteristics of haptic output device 118. For example, detection module 124 may sample sensor 108 in order to track one or more of the location, path, velocity, acceleration, pressure, and/or other characteristics of haptic output device 118 over time.

EX1001, 52-55.

Even though the specification broadly discloses various types of sensors and data types (e.g., location, velocity, acceleration, etc.), the express language of the claim clearly specifies “**a sensor for tracking position** of the proxy object.” Thus,

to the extent that dependent Claim 7 recites **the sensor** of Claim 1 to comprise various types of sensors such as camera, laser, radar, accelerometer, etc., Claim 1 would be read as any of those sensors listed in Claim 7 **for tracking a position of the proxy object**. *Alcon Research, LTD. v. Apotex Inc.*, 687 F.3d 1362, 1367 (Fed. Cir. 2012).

In *Alcon Research, LTD*, the independent claim recited a method for treating allergic eye diseases by administering eye drops and recited the limitation “a therapeutically effective amount.” *Id.* Although the independent claim did not specify such amount, the dependent claim recited specific concentration range amounts for the eye drops such that the Court found the dependent claim’s concentration range amounts must necessarily meet claim 1’s limitations of being therapeutically effective for treating allergic eye disease because a dependent claim must incorporate all limitations of the independent claim to which it refers. *Id.* Accordingly, a POSA would understand that although claim element [1C] does not specify the type of sensor or sensor data type but does specify “*for tracking position of the proxy object*,” a POSA would understand that dependent claims for said sensor term (e.g., Claim 7) should be for the purpose of tracking position of the proxy object. EX2007, ¶¶41-43. In other words, the occurrence of the term “sensor” in claim element [1C] for tracking position of the proxy object can be read in light of dependent Claim 7 by substituting that sensor with the various sensors recited in

Claim 7. Thus, notwithstanding various sensors recited in Claim 7, claim element [1D-2]'s determination of haptic effects are based on position data from the sensor **for tracking position of the proxy object** in the previous claim element [1C] that can be achieved by various types of sensors. *Id.*

Moreover, to the extent additional sensor data types such as velocity and acceleration are taken into account for determining haptic effects in claim 1, a POSA would understand that those additional sensor data types are used to calculate the position of the proxy object consistent with the purpose of claim element [1C]. EX2007, ¶44. For example, a POSA would understand that an accelerometer can indirectly determine the position of an object by measuring its acceleration over time, but it cannot directly measure absolute position without additional information or calculations, as it only measures changes in velocity and not the object's starting point. *Id.* Thus, a POSA would understand this claim term to mean that the haptic effects are determined based on “position data” or data used for tracking position of the proxy object. *Id.*

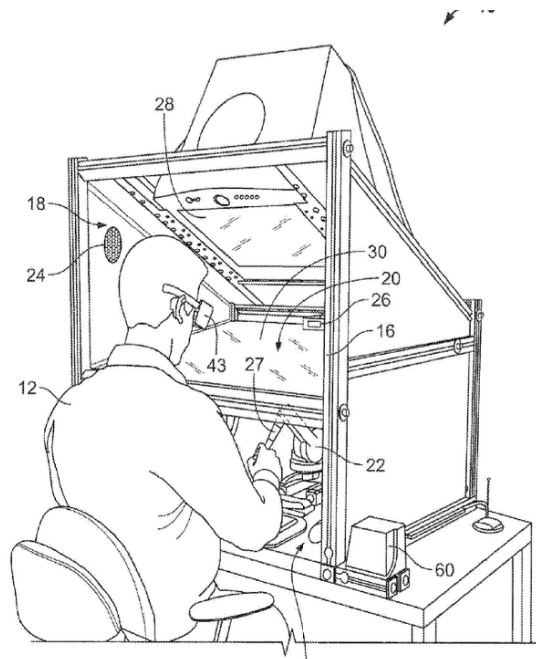
V. GROUND 1: CHALLENGED CLAIMS 1-8, 11-12, AND 15-21 ARE NOT ANTICIPATED BY AND/OR OBVIOUS OVER BANERJEE

Ground 1 does not show that Banerjee anticipates and/or renders obvious the Challenged Claims of the '067 Patent. Specifically, Banerjee does not disclose key limitations of the '067 Patent claims including (1) “a proxy object comprising one

or more haptic output devices,” (2) “a sensor for tracking a position of *the proxy object*,” and (3) “the modified visual effect to be displayed on *the proxy object*.”

A. Overview of Banerjee (EX1011)

Banerjee is directed to a surgical workstation for simulation of cerebral aneurysm clipping using an augmented and virtual reality system with haptic feedback. EX1011, Abstract. Banerjee discloses a surgical workstation as shown below that simulates performing surgery. *Id.* This provides interactive and immersive training for surgical trainees, facilitating the practice of complex surgical procedures in a virtual environment rather than on actual patients. *Id.*, ¶¶[0027]-[0029].



Id., Fig. 1.

Banerjee addresses the challenges of providing a realistic, interactive training environment for simulating neurosurgical procedures such as cerebral aneurysm clipping. *Id.*, ¶[0003]. By utilizing haptic feedback, augmented and virtual reality technologies, the system provides hands-on training without the risks associated with surgery on live patients. *Id.*, ¶¶[0027]-[0030]. This includes simulating the tactile feedback of surgical instruments and the visual and physical interaction with neurological tissue and organs. *Id.*, ¶¶[0033]-[0035].

B. Banerjee does not disclose “a proxy object”

Petitioner alleges that the claimed proxy object is met by Banerjee's “haptic device 22” (Pet., 14-16) or alternatively, “stylus 27” (Pet., 17). However, Banerjee does not disclose a proxy object and its three interrelated requirements expressly recited in the claims of the '067 Patent: (1) “a proxy object comprising one or more haptic output devices,” (2) “a sensor for tracking a position of *the proxy object*,” and (3) “the modified visual effect to be displayed on *the proxy object*.” EX1001, cl. 1; *see supra* §IV.A. In other words, these limitations require:

- the proxy object must contain the haptic output devices—i.e., the proxy object that acts as a proxy for a virtual object must directly contain the haptic output device. EX1001, cl. [1A].

- the proxy object's position is tracked by a sensor and haptic feedback is based on this position sensor data and is produced inside the proxy object. *Id.*, cl. [1C].
- the proxy object must have a modified visual object displayed onto its surface. *Id.*, cl. [1D-3].

As detailed below, neither of Banerjee's haptic device 22 or stylus 27 meet the claimed proxy object and its three interrelated requirements as understood by a POSA. EX2007, ¶64.

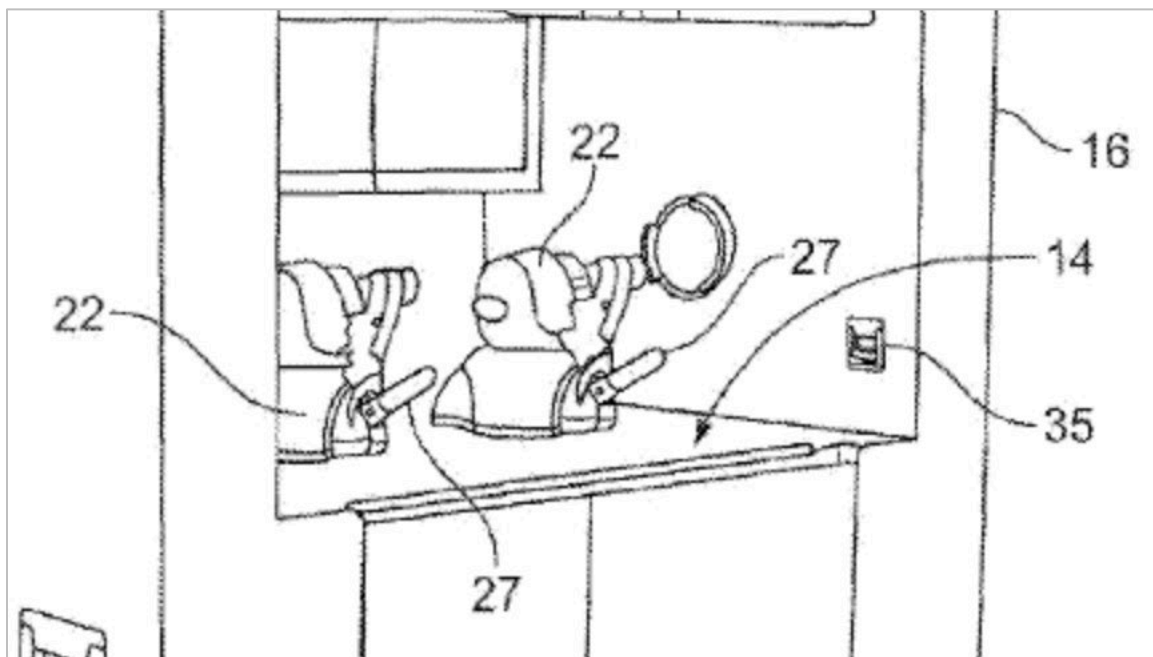
1. Haptic device 22 cannot satisfy the claimed proxy object

Petitioner alleges that haptic device 22 is a proxy object because it is a real world object that the user manipulates to control a corresponding virtual tool. Pet., 15. Petitioner further contends that haptic device 22 comprises a haptic output device based on three alleged reasons: (1) haptic device 22 comprises a haptic output device because it is a haptic device that outputs force feedback; (2) it includes actuators to produce the force feedback output; and (3) it comprises haptic stylus 27, which is a haptic output device because the user feels the haptic sensations through the stylus. Pet., 16.

As detailed in §IV.A, a POSA would understand that the claimed "proxy object comprising a haptic output device" is "a physical object that acts as a proxy for a virtual object and that itself contains haptic output device, e.g., an actuator."

EX2007, ¶¶65-67. Although Banerjee's haptic device 22 may be a "real world object," it is not the claimed proxy object because it is not a physical object that acts as a proxy for a virtual object in the AR or VR world. EX2007, ¶66.

Petitioner contends that haptic device 22 is a proxy object because the user holds and manipulates stylus 27 as a proxy for the virtual tool that the user controls in the simulation and because stylus 27 is connected to haptic device 22. Pet., 15. But haptic device 22 by itself does not act as a proxy for a virtual surgical tool that is manipulated by the user as it is merely a stationary base unit that a stylus 27 is *mechanically coupled* to as shown below in an excerpt of Banerjee's Figure 4. EX2007, ¶¶67-68.



Although Banerjee's haptic device 22 may contain an actuator producing force feedback output, the device itself is not a proxy object as the term is understood by

a POSA in light of the intrinsic evidence. *Supra* §IV.A. EX2007, ¶¶68. On the other hand, Banerjee's stylus 27 may possibly act as a proxy for a virtual handheld surgical tool, but the stylus does not contain inside it the actuator as required by the claim. *Id.*

The Board, however, preliminarily found that haptic device 22 "comprises" stylus 27 (illustrated below) and that they are a part of one another. DI, 16 (citing EX1010 ¶¶ 35, 42, 44, 57, claim 1). But, Banerjee's haptic device 22 and stylus 27 cannot be treated together as a whole to meet the claimed proxy object and its expressly claimed interrelated requirements as understood by a POSA. EX2007, ¶¶69-70. A POSA would understand that stylus 27 is an appendage or extension mechanically coupled to haptic device 22, as shown above in an excerpt of Banerjee's Figure 4.

Banerjee also states that there is an "interface" between stylus 27 and haptic device 22, thus confirming that they are separate components coupled together. EX1011, ¶37 ("The haptic augmented and virtual reality system can include [...] the hand tracking device shown as a haptic robot stylus 27, an interface with a haptic device 22").

As detailed above in §II.C and §IV.A.2, the Applicant of the '067 Patent narrowed the claim scope to exclude this exact type of arrangement alleged by Petitioner here where the proxy object is mechanically coupled to the haptic output

device containing the actuator. Therefore, haptic device 22 is not a physical object that is a proxy for a virtual object and that itself contains a haptic output device such as an actuator as required by the proper construction of the challenged claim. EX2007, ¶71.

2. Stylus 27 cannot satisfy the claimed proxy object

Petitioner's alternative mapping of the claimed proxy object to stylus 27 alone alleges that the stylus is a proxy object for controlling a virtual tool and that it comprises a haptic output device because "it is itself a '*haptic output device*' through which 'tactile sensations' are felt." Pet., 17. Petitioner argues that "POSAs understood that haptic stylus 27 comprises the actuators." *Id.* This contradicts Petitioner's own statement that "Banerjee's haptic device 22 that generates 'force feedback' includes actuators (e.g., motors) to produce the disclosed 'force feedback.'" The stylus is not a haptic output device, nor does Banerjee disclose that the stylus has any haptics producing hardware such as actuators. A POSA would understand that the stylus itself is not a "haptic output device." EX2007, ¶72. Rather, the stylus is a passive sink through which a user feels haptic effects produced by a separate haptic source device mechanically coupled to it. *Id.* Accordingly, Banerjee's stylus 27 by itself does not meet the claimed proxy object.

C. Banerjee does not disclose "a sensor for tracking a position of the proxy object" as required by the claims of the '067 Patent

Under the proper construction of the term proxy object, this claim limitation requires a sensor for tracking a position of the proxy object, which itself contains inside a haptic output device. Petitioner contends that “Banerjee’s system meets claim element [1C] because haptic device 22 tracks the position of haptic stylus 27.” Pet., 22. Petitioner alleges three reasons for why Banerjee tracks the position of the proxy object: (1) “the tracked position/orientation of haptic stylus 27 is a ‘*position*’ of haptic device 22 (a claimed ‘*proxy object*’ [...]) of which the stylus is a part,” (2) because the haptic stylus itself is allegedly a proxy object, the haptic device 22 tracks a position of the proxy object by tracking the position of the stylus, and (3) haptic device 22 purportedly includes sensors that track a position of haptic device 22 “at the corresponding joint, thereby also tracking ‘*a position*’ of the stylus.” *Id.*, 24.

First, as detailed above, Banerjee does not disclose the claimed proxy object, and for that reason, it also does not disclose this limitation for tracking the position of a proxy object. *See supra* § V.B. Further, to the extent Petitioner contends that the tracked position of the stylus 27 is merely “a position” of the separate haptic device 22 (e.g., the first and third alleged reasons listed above), Banerjee does not disclose the claimed “sensor for tracking a position of *the proxy object*” because as detailed above in §V.B, these two separate components are mechanically coupled where the alleged combination of the two is an arrangement that is outside the scope of the claim in light of the prosecution history. *See supra* §§II.C, IV.A.2; EX2007, ¶¶73-

74. Haptic device 22 is a stationary base unit with its own fixed position in the real world, which is not tracked, while stylus 27 does not contain inside the haptic output device actuator. *Id.* Thus, Banerjee does not disclose a sensor that tracks the position of the proxy object, nor does it disclose a proxy object that meets all the requirements of the claim as understood by a POSA. *See ABS Global, Inc. v. Cytonome/ST, LLC*, IPR2017-02161, Paper 11 at 23 (PTAB April 9, 2018) (citing *Net MoneyIN, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008) (Petitioner must establish that the prior art “not only disclose[s] all elements of the claim within the four corners of the document, but ... also disclose[s] those elements ‘arranged as in the claim.’”).

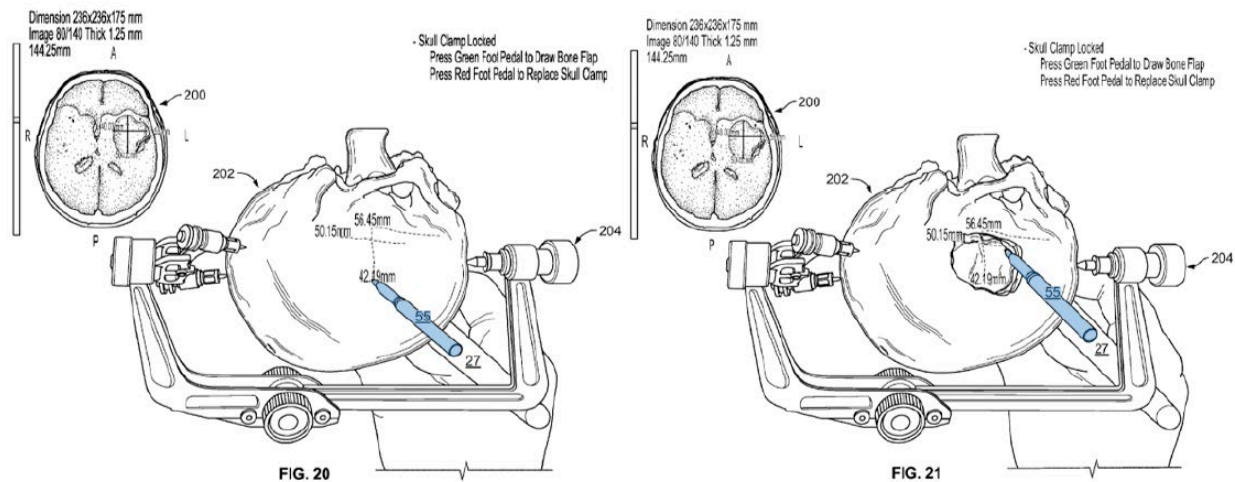
Also to the extent Petitioner contends that the stylus is itself a proxy object and that its position is tracked (e.g., the second alleged reason listed above), Banerjee does not disclose this limitation because as explained above, the stylus does not qualify as the claimed proxy object as it does not contain inside a haptic output device, e.g. actuator. *See supra* § V.B.2; EX2007, ¶75

D. Banerjee does not disclose “the modified visual effect to be displayed on the proxy object via the display” as required by the claims of the '067 Patent

Under the proper construction of the term proxy object, this claim limitation requires displaying a modified visual effect on the surface of a proxy object, which itself contains the haptic output device. Petitioner only relies on stylus 27 for this limitation, alleging that the modified visual effect is displayed on the surface of the

stylus, which it contends can be the proxy object. Pet., 32-34. For the reasons explained above, however, Banerjee's stylus 27 by itself is not a proxy object that contains inside a haptic output device actuator. *See supra* §V.B. Accordingly, to the extent Petitioner relies on stylus 27 for this limitation, this limitation is still not met by Banerjee because stylus 27 does not meet the requirements of the claimed proxy object. EX2007, ¶¶76.

Note that Petitioner does not rely on haptic device 22 for this limitation, nor can it because Banerjee does not disclose superimposing any images on to the surface of haptic device 22 because haptic device 22 does not act as a proxy for virtual objects. This is also shown in the Petition's discussion of the claimed modified visual effect where it reproduces Banerjee's figures 20-21, which only depicts stylus 27 highlighted in blue, but not haptic device 22:



Pet., 29 (reproducing EX1010, FIGs. 20-21 with blue highlights added).

E. Dependent Claims 2-8, 12, 15-20 are not anticipated by and/or obvious over Banerjee

Claims 2-8 depend from independent Claim 1. Claims 12 and 15-20 depend from independent Claim 11. As described above in §§V.B-D, Banerjee does not anticipate or render obvious independent Claims 1, 11, and 21. For example, Banerjee does not disclose the claimed limitations, “a proxy object comprising one or more haptic output devices” or “the modified visual effect to be displayed on [the proxy object / a surface of the proxy object] via the display,” as recited in Claims 1, 11, and 21. Banerjee also does not disclose “a sensor for tracking a position of the proxy object” as recited in Claim 1.

Therefore, Banerjee does not anticipate and/or render obvious dependent claims 2-8, 12, and 15-20 for the same reasons as those articulated above in §§V.B-D above.

VI. GROUND 2: CHALLENGED CLAIMS 1-8, 11-12, AND 15-21 ARE NOT ANTICIPATED BY AND/OR OBVIOUS OVER MEGLAN

Ground 2 does not show that Meglan anticipates and/or renders obvious the Challenged Claims of the '067 Patent. Specifically, Meglan does not disclose “determin[ing] a haptic effect based in part on data received from the sensor,” where such data is position tracking data of the proxy object as claimed in the '067 Patent.

A. Overview of Meglan (EX1012)

Meglan is directed to devices and methods for training individuals to treat individuals with hemorrhaging injuries. EX1012, ¶3. Meglan discloses a hemorrhage control simulator, as shown below, that measures the application of hemostatic agents and enables the extraction of objective measures of performance to assess the proficiency of trainees. *See, e.g., id.*, ¶¶11, 100. The simulator also supports real-time mentoring without the need for the presence of an instructor, making it a comprehensive tool for training in the treatment of bleeding injuries. *Id.*, ¶98.

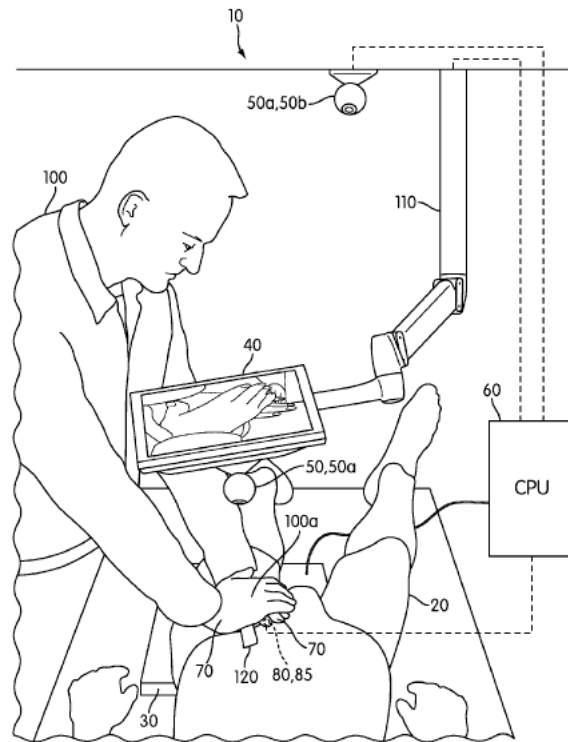


FIG. 1

EX1012, Fig. 1.

Thus, Meglan addresses the challenge of providing realistic, effective, and uniform hemorrhage control training without the need for an actual wound or the presence of an instructor. This approach overcomes limitations of traditional training methods, such as the lack of realism in simulated wounds, the difficulty of assessing performance uniformly, and the logistical challenges of coordinating training sessions with the physical presence of instructors and standardized materials. *Id.*, ¶¶17-22.

B. Meglan does not disclose “determine a haptic effect based in part on data received from the sensor” that tracks a position of the proxy object as required by the claims of the '067 Patent

As detailed below, Meglan does not disclose “determine a haptic effect based in part on data received from the sensor” as required by the claims of the '067 Patent. Claim 1 recites a system that comprises in relevant part a “*a sensor* for tracking a position of *the proxy object*” (claim element [1C]) and a processor that is configured to, *inter alia*, “determine a haptic effect based in part on data received from *the sensor*” (claim element [1D-2]). EX1001, 10:50-51. The '067 Patent explains that the data received from *the sensor* and which the haptic effect is based on is data reflecting the position of the proxy object tracked by the sensor:

Systems and methods for integrating haptics overlay in augmented reality are disclosed. One illustrative system described herein includes a haptic output device. The system also includes a display configured

to output a visual effect. **The system also includes a sensor for tracking a position of a proxy object. The system also includes a processor configured to:** determine a modified visual effect based in part on data received from the sensor, **determine a haptic effect based in part on data received from the sensor**, transmit a display signal associated with the modified visual effect to the display, transmit a haptic signal associated with the haptic effect to the haptic output device; and output the haptic effect using the haptic output device.

EX1001, Abstract; *see also id*, 1:29-40.

Meglan does not disclose “determin[ing] a haptic effect based in part on data received from the sensor,” where the data reflects **the proxy object’s position that is tracked by the sensor** as required by claim elements [1C] and [1D-2]. EX2007, ¶¶78-79. As detailed below, Meglan’s haptic effects are not based on data reflecting the alleged proxy object’s position. *Id.* Instead, according to the Petition, the haptic effects in Meglan are based on the location of the trainee’s hands and fingers—not the alleged proxy object (i.e., what Petitioner points to as surrogate 20 and/or substrate 2000) (Pet., 49). *Id.*

As detailed above, Petitioner alleges that “surrogate 20 and haptic substrate 2000, by themselves or together as a unit” satisfy the claimed proxy object. Pet., 48-51. Petitioner offers two alleged examples in Meglan to satisfy claim element [1D-2], neither of which provide haptic feedback based on data that reflects the position

of the alleged proxy object (substrate 2000 and/or surrogate 20) tracked by the sensor. In the first example, Petitioner alleges that Megan discloses claim element [1D-2] because haptic effects provided by a pulse generator are *based on the trainee's finger location* that is detected by the camera sensor. Pet., 57-58. Petitioner also provides a second example in which haptics effects provided by a heat generator are allegedly based on the location of the trainee's hands as detected by the camera. *Id.*, 58.

Both of these examples fail to show any haptic effect that is based on sensed *position data of the proxy object* itself (i.e., the alleged surrogate 20 and/or substrate 2000). EX2007, ¶82. They only show that haptic effects are based on position data of the trainee's hands or fingers. *First*, neither of the trainee's fingers or hands qualify as the claimed proxy object, nor does Petitioner allege these body parts satisfy the proxy object limitation (claim element [1A]). *Id.* Indeed, the trainee's hands or fingers in Megan do not include a haptic output device, and thus cannot satisfy the claimed limitation, “a proxy object comprising one or more haptic output devices.” Instead, as Petitioner contends, the claimed haptic output device in Megan is its “pulse generators” and “heat generators” contained in substrate 2000 (i.e., the alleged proxy object shown above). Pet., 50-51 (citing, e.g., EX1012, ¶[0107]).

The Board, however, has preliminarily found that Megan discloses that the camera system “**tracks not just trainee 100's hands, but also the position and**

orientation of surrogate 20.” DI, 25 (citing EX1012, ¶¶72-74, cls. 1, 13).² The Board further found that the haptic effect produced by the pulse generator is “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.” DI, 25. The Board reasoned that “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.” *Id.* (citing EX1012, ¶90).

But Meglan does not disclose that the haptic effect is based in part on the location of the surrogate 20. EX2007, ¶84. Paragraph 90 of Meglan cited by the Board states:

combining the information from the load sensor 30 beneath the surrogate 20 with the finger location(s) detected by the camera system 50, the status of the injury, and the hemodynamic state, the specific feel of the pulse can be modified to reflect the strength of the trainee's pressing into the surrogate 20

² Patent Owner notes that the Petition does not contend that Meglan discloses tracking the position of the stationary surrogate 20 as Petitioner only argues that the position of the user’s hands and fingers are tracked by the camera (Pet. 57-58). *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1356 (2018) (The Board may not institute a different IPR than what is described in the Petition).

Indeed, the pulse effect is based on the combination of (1) the data from load sensor 30 beneath surrogate 20 and (2) the finger location detected by the camera. EX2007, ¶84. Petitioner also confirms that the pulse effect is based on this combination of load sensor data which determines the contact and amount of pressure applied to the surrogate *and* the finger location. Pet., 58.

Likewise, Meglan also states: “**When the trainee 100 places his/her gloved hand on surrogate 20, the location of the finger(s) over simulated vascular structures**, combined with the current state of the hemodynamic simulation [...] and whatever the trainee 100 has done thus far on the surrogate 20, **will result in the program 90 calculating a simulated pulse.**” EX1012, ¶90. Thus, the simulated pulse is based on the placement of the hand on the surrogate and the amount of pressure applied on the surrogate **as determined by the load sensor** along with the finger location relative to the simulated vascular structures as determined by the camera. EX2007, ¶85. Meglan discloses that “the load sensor 30 senses a magnitude of force applied” and “may comprise a contact sensor that detects whether or not there is contact with the load sensor.” EX1012, ¶64. Therefore, Meglan does not disclose that the pulse effect is based on the location of the surrogate. EX2007, ¶86.

Second, Petitioner's other example contends that “program 90 determines that trainee 100's hands are in contact with surrogate 20 based on the video feed from the camera system” which “causes the heat generator to generate heat [...] so that

the trainee feels the heat of the simulated patient's body and/or blood upon contact with the simulated patient." Pet., 58. As explained above, however, contact with the surrogate is determined by the load sensor, and thus the heat generation is based on data from the load sensor, not the location of the surrogate. EX2007, ¶87.

Therefore, Meglan's alleged haptics produced by the pulse generator or heat generator are not based on the data received from the sensor tracking a position of the proxy object as required by the claims of the '067 Patent. EX2007, ¶¶83-88. Accordingly, Meglan does not disclose this claim limitation.

C. Dependent Claims 2-8, 12, 15-20 are not anticipated by and/or obvious over Meglan

Claims 2-8 depend from independent Claim 1. Claims 12 and 15-20 depend from independent Claim 11. As described above in §§VI.B, Meglan does not anticipate or render obvious the challenged independent claims. For example, Meglan does not disclose the claimed "proxy object" nor the claimed limitation, "determine a haptic effect based in part on data received from the sensor" as recited in the independent claims of the '067 Patent. Therefore, Meglan does not anticipate and/or render obvious dependent claims 2-8, 12, and 15-20 for the same reasons as those articulated above in §§VI.B above.

VII. GROUND 3: CHALLENGED CLAIMS 1-8, 11-12, AND 15-21 ARE NOT ANTICIPATED BY AND/OR OBVIOUS OVER ROGERS

Ground 3 does not show that Rogers anticipates and/or renders obvious the Challenged Claims of the '067 Patent. Specifically, Rogers does not disclose key limitations of the '067 Patent claims including (1) “a sensor for tracking a position of the proxy object,” (2) “determine a haptic effect based in part on data received from the sensor,” and (3) “determine a modified visual effect based in part on data received from a sensor.”

A. Overview of Rogers (EX1010)

Rogers is directed to the use of a directional interface object designed for various computing environments such as video games and interactive applications. EX012, ¶[0039]. Rogers discloses embodiments for providing input through this directional interface object in such interactive video games with hand-held user devices as shown below. *Id.*

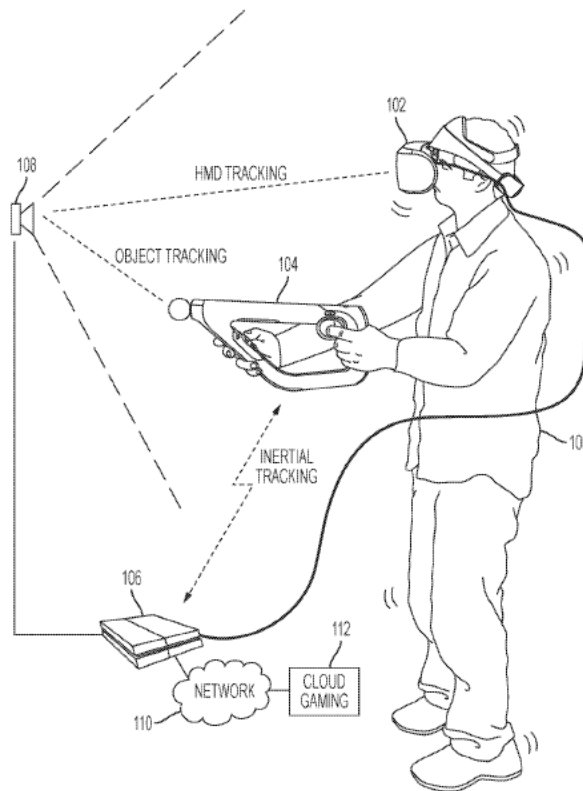


FIG. 1

EX1012, Fig. 1.

Rogers aims to address issues related to user interactions in virtual reality (VR) environments as experienced through head-mounted displays (HMDs). *Id.*, ¶[0007]. Rogers discloses methods and systems for improving the way users interact with VR content, through specialized interface objects or devices that include features such as for detecting which hands are grasping different portions of the interface object. *Id.*

B. Rogers does not disclose “a sensor for tracking a position of the proxy object” that is used to “determine a haptic effect based in part on data received from the sensor” as required by Claim 1

Ground 3 does not show that Rogers anticipates and/or renders obvious the Challenged Claims of the '067 Patent. As detailed below, Rogers does not disclose “a sensor for tracking a position of the proxy object” that is used to determine a haptic effect based on the position tracking data from that sensor as required by claim elements [1C] and [1D-2]. As detailed in §IV.B, the proper construction of the term “determine a haptic effect based in part on data received from the sensor” is understood by a POSA to mean: **“determine a haptic effect based in part on position data of the proxy object received from the sensor that tracks a position of the proxy object.”** *Supra* §IV.B; EX2007, ¶91. Thus, a POSA would understand that determining haptic effects must necessarily be based on position data. EX2007, ¶91.

For claim element [1C], Petition identifies two of Rogers' components: (1) “camera 108” *or* (2) the inertial sensor. Pet., 72-73. Petitioner alleges that either of these components alone meet the claimed “sensor for tracking a position of the proxy object.” *Id.*

1. Rogers' Camera 108

Petitioner contends that Rogers' "camera 108" for "determin[ing] the location and movements of the...interface object 104" satisfies element [1C]. Pet., 72 (citing EX1010, ¶[0044]). The embodiment in Rogers that Petitioner identifies to satisfy the Challenged Claims, however, is directed to a use case that does not involve location of the proxy object (which Petitioner alleges is the "virtual weapon" (Pet., 69-70)). Petitioner's mapping focuses on an embodiment in Rogers that provides haptic effects *based on direction* of the interface object—not position:

When a user reloads their corresponding virtual weapon by, for example, *pointing the directional interface object 104 upward*, the moveable weight 800 may be caused to move so as to mimic the sensation of the weapon reloading mechanism of the virtual weapon.

Pet., 77 (citing EX1010, ¶[0105]).

Contrary to Petitioner's argument that camera 108 is used to sense the direction of the weapon in the embodiment above (Pet., 77), there is no disclosure whatsoever in Rogers that position tracking data from camera 108 is utilized for this weapon reload use case. Rogers does not disclose the use of position tracking data to sense whether the weapon is titled upward. EX2007, ¶94. Yet, Petitioner cites to a different embodiment in which Rogers states that camera 108 can capture images

to be used for determining the location and movements of the interface object (Pet., 72-73 (citing EX1010, ¶[0044])).

As further explained below in § VII.B.2, however, this embodiment described in ¶[0044] of Rogers employs the combinational use of camera 108 and inertial sensors to determine location *and* orientation, respectively, where the camera alone determines location and the inertial sensor alone tracks orientation. This is also shown by Petitioner's citation to Figure 1, which depicts an "Inertial Tracking" line reflecting movement or orientation data and a "Object Tracking" line reflecting position tracking data. Pet., 73. Petitioner confirms as much by stating that "Object Tracking" *and* "Inertial Tracking" in Figure 1 are used to determine location *and* orientation, respectively. Pet., 74. Petitioner also cites to claim 9 of Rogers, which confirms that inertial sensor alone is only for sensing movement of the interface object—not position of the object. *Id*; *see also* EX1010, cl. 9.

Further, reliance on the embodiment of Figure 1 is inconsistent with the rest of Petitioner's mapping for Claim 1. For element [1D-2], Petitioner identifies the weapon reloading embodiment, which clearly describes determining haptic effects based on tilting the weapon upward, i.e., the weapon's direction—*not* location or position. Pet., 77 (citing EX1010, ¶[0105]).

Indeed, Rogers does not disclose the use of camera 108 to determine haptic feedback for a weapon reload based on its location, nor would a POSA see a need

for a position sensing camera in such embodiment that otherwise depends on the direction of the weapon, i.e., the alleged proxy object. EX1010, ¶[0105], EX2007, ¶¶94-95. A POSA would understand that this embodiment does not depend on the position of the alleged proxy object because reloading can occur anywhere, and thus haptic feedback only depends on *movement in the upward direction*. EX2007, ¶96. Thus, a POSA would understand that this use case only requires “Inertial Tracking” (which is further detailed below in the inertial sensors discussion), which merely tracks movement and direction—not position. *Id.*

In any event, the Petition cannot point to another embodiment that discloses the use of camera 108 for tracking weapon position since Petitioner has not shown that the features of the different embodiments in Rogers can be interchanged or combined. *See, e.g., Abiomed, Inc. v. Maquet Cardiovascular, LLC*, IPR2017-01204, Paper 8 at 11, (PTAB Oct. 23, 2017) (denying institution of IPR because petitioner failed to show that the features of disparate embodiments in the prior art reference were interchangeable or combinable).

Accordingly, Rogers fails to disclose “a sensor for tracking a position of the proxy object” that is used to determine a haptic effect based on the position tracking data from that sensor as required by claim elements [1C] and [1D-2].

2. Rogers' Inertial Sensor

Petitioner also contends that Rogers' "inertial sensor" for determining "interface object 104's 'location and orientation'" satisfies claim element [1C] as well. *Id.*, 73 (citing EX1010, ¶[0044]). Rogers, however, repeatedly explains that the "inertial sensors" track movement—not position. *See, e.g.*, EX1010, ¶[0016] ("In some implementations, the directional interface object further includes at least one inertial sensor for **sensing movement** of the directional interface object."), ¶[0018]. This is also confirmed by Petitioner's citation to claim 9 of Rogers, which recites an "inertial sensor for **sensing movement** of the directional interface object." Pet., 73. Further, another one of Petitioner's citations to Rogers discusses "various kinds of motion sensitive hardware, such as a magnetometer 1210, an accelerometer 1212, and a gyroscope 1214." Pet., 73; EX1010, ¶[0111]. Petitioner cannot dispute that inertial sensing is for tracking movement.

Petitioner also cites to another embodiment in Rogers directed to "Inertial Tracking" illustrated in Figure 1 as shown below. Pet., 73.

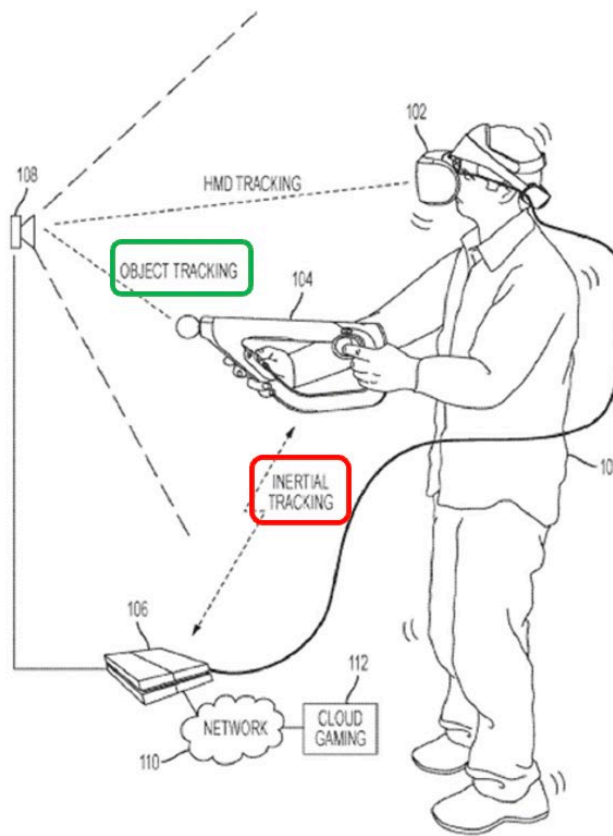


FIG. 1

EX1010, Fig. 1 (red and green boxes added). With respect to Figure 1, Petitioner cites to a passage in Rogers that explains how inertial sensors are used for Inertial Tracking:

a camera 108 can be configured to capture images of the interactive environment in which the user 100 is located. These captured images can be analyzed to determine the location and movements of the user 100, the HMD 102, and the directional interface object 104. In various implementations, the directional interface object 104 includes *a light which can be tracked, and/or inertial sensor(s), to determine its location and orientation.*

Pet., 73 (citing EX1010, ¶[0044]).

This, however, does not disclose that inertial sensors alone track the position of the weapon. Rather, a POSA would understand this to be a description of how the combination of a camera and an inertial sensor are used to track location and orientation, respectively. EX2007, ¶¶98-99. In other words, the camera is responsible for tracking location and the inertial sensor is responsible for tracking orientation. *Id.* As illustrated in Figure 1 and discussed above, camera 108 captures images to determine the location of the interface object, which is depicted by the “Object Tracking” line highlighted in green. EX1001, Fig. 1, ¶[0044].

According to Rogers, the camera tracks a light on the interface object along with the use of an inertial sensor to determine its location and orientation. *Id.* The camera images are used together with the inertial sensor to determine the location—depicted by the “Object Tracking” line—and orientation of the interface object—depicted by the “Inertial Tracking” line highlighted in red. *Id.* In this embodiment, while the camera tracks location, the inertial sensors alone only track movement or orientation—not location. EX1010, ¶¶[0016], [0018], [0111]. Petitioner also confirms this by stating that “Object Tracking” *and* “Inertial Tracking” in Figure 1 are used to determine location *and* orientation, respectively. Pet., 74. As such, the “Inertial Tracking” line in Figure 1 only consists of movement data.

Therefore, inertial sensors alone do not satisfy the claim element [1C] “a sensor for tracking a position of the proxy object” since inertial sensors only track movement rather than position. EX2007, ¶¶98-99.

C. Rogers does not disclose “determine a haptic effect based in part on data received from the sensor” as required by the claims of the '067 Patent

Rogers does not disclose haptic effects based on sensor data reflecting the position of the proxy object. As explained in greater detail above in §VII.B.1, the weapon reload use case that Petitioner identifies does not use sensor data tracking the position of the alleged proxy object, nor would it need to because that use case depends on tilting the weapon in the upward direction rather than location of the weapon. At best, the use case identified by Petitioner only discloses haptic effects based on direction—not position. The Petition does not provide any support showing that both camera 108 (for tracking position) and the inertial sensor are employed for this weapon reload use case. EX2007, ¶100. In other words, Petitioner does not show that data is used from both the “Object Tracking” line and the “Inertial Tracking” line depicted in Figure 1 shown above.

Accordingly, Rogers does not disclose the determination of haptic effects based on data received from the sensor, and thus, Rogers does not anticipate and/or render obvious the claims of the '067 Patent.

D. Rogers does not disclose “determine a modified visual effect

**based in part on data received from the sensor” as required
by the claims of the '067 Patent**

Rogers does not disclose determining a modified visual effect based on sensor data that is also used to determine haptic effect as claimed by the '067 Patent. Indeed, Rogers does not disclose both determinations are based on the same position sensor data. Instead, Petitioner has only shown that modified visual effects are based on position sensor data while haptic effects are based on inertial sensor data.

As explained in greater detail above in §VII.C, Petitioner identifies the weapon reload use case in Rogers to show that haptics are determined based on the user tilting the weapon in the upward direction. Pet., 77. Thus, Petitioner contends that haptic effects are based on “Inertial Tracking” sensor data. *Id.* As to the limitation of determining a modified visual effect for overlaying it on the object, however, Petitioner contends this is done in response to the user *moving* interface object 104. Pet., 74. Petitioner states that a modified visual effect “changes in correspondence with the detected location and orientation of interface object 104—i.e., computer 106’s processor determines the ‘*modified visual effect*’ that the user sees as virtual hands gripping a virtual weapon that points in the same direction detected for interface object 104, thus meeting [1D1]” citing the Rogers’ disclosures at ¶¶[0018], [0043]-[0045], [0052]-[0055], [0068]-[0070], [0106]-[0109].

Nowhere in these passages that Petitioner cites is there any indication that the alleged modified visual effect is determined based on the same inertial sensor data that haptic effects are based on. Indeed, various sensors other than inertial sensors are utilized in these descriptions. For example, in regards to the “virtual hands gripping a virtual weapon” that Petitioner describes (Pet., 74), Petitioner’s citation to Rogers at ¶[0045] states: Using these various types of controllers, or *even simply hand gestures that are made and captured by one or more cameras*, it is possible to interface, control, maneuver, interact with, and participate in the *virtual reality environment presented on the HMD 102*. EX1010, ¶[0045]. Thus, this description shows that the camera is used, not the inertial sensor. EX2007, ¶103.

A further example is Petitioner’s citation to Rogers at ¶[0055] which states: *depending on the way the directional interface object 104 is being held*, the corresponding virtual reality view of the weapon will also be held in a similar fashion, which provides a more realistic and corresponding view to the user.” A POSA would understand that inertial sensor data is not used here as Rogers explains that how a user holds the interface object is determined by a sensor that detects the amount of contact made on the trigger area by the user’s hand. *See, e.g.*, EX1010, ¶[0055] (“If more surface area is being covered by the user’s hand when the user’s hand is in a gripping position, on a particular side, that may be indicative of the way the user is holding the directional interface object 104”); EX2007, ¶104.

Also, ¶[0052] of Rogers, which Petitioner cites to, explains that “camera 108 facing the user 100, may track the HMD102 and also track the directional interface object 104.” Although this paragraph also mentions inertial tracking, it is describing the processing of inertial data and that such processing can be performed in the HMD or transferred to a cloud gaming system. EX1010, ¶[0052] (“In one embodiment, it is possible to perform all processing on the HMD102, and the inertial tracking of the directional object interface 104, can be processed by the circuitry of the HMD102. In other embodiments, inertial data can be transferred to a cloud gaming system.”). In other words, inertial sensors are not used here for the purpose of superimposing a modified visual effect on the interface object.

Indeed, Rogers does not disclose overlaying a visual effect on the directional interface object using the inertial sensors. As explained above in §VII.B.2, inertial sensors are used to generate inertial data indicative of the *movement of the directional interface object*, which can be used alongside captured images to determine the position of a virtual object in the virtual environment. However, Rogers does not disclose overlaying the visual effect on the object using inertial sensor data. EX2007, ¶105.

Accordingly, Rogers does not disclose the determination of modified visual effects based on data received from the sensor, and thus, Rogers does not anticipate and/or render obvious the claims of the '067 Patent.

E. Dependent Claims 2-8, 12, 15-20 are not anticipated by and/or obvious over Rogers

Claims 2-8 depend from independent Claim 1. Claims 12 and 15-20 depend from independent Claim 11. As described above in §§VII.B-D, the Rogers does not anticipate or render obvious the challenged independent claims. For example, Rogers does not disclose the claimed limitation, “determine a modified visual effect based in part on data received from the sensor” as recited in Claims 1, 11, and 21. Therefore, Rogers does not anticipate and/or render obvious dependent claims 2-8, 12, and 15-20 for the same reasons as those articulated above in §§VII.B-D above.

VIII. CONCLUSION

Petitioner has not shown unpatentability of Challenged Claims 1-8, 11-12, 15-21 of the '067 Patent, and therefore the Board should affirm those claims.

Respectfully Submitted,

Dated: November 5, 2024

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Patent Owner's Response
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CERTIFICATION UNDER 37 C.F.R. § 42.24(d)

Under the provisions of 37 C.F.R. § 42.24(d), the undersigned hereby certifies that the word count for all portions of the foregoing Patent Owner's Preliminary Response totals 10,310 words per Microsoft Word, which complies with the requirement of 14,000 words allowed under 37 C.F.R. § 42.24(d).

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CERTIFICATE OF SERVICE

As authorized by Patent Owner's Mandatory Notice, I hereby certify that on November 5, 2024, a copy of this document has been served in its entirety by electronic mail on Petitioner's lead and backup counsel.

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