

**Meta Platforms, Inc.**

Petitioner

V.

**Eight kHz, LLC**

Patent Owner

Case Nos. IPR2023-01019 and IPR2023-01020

Patent Nos. 10,368,179 and 10,448,184

**Patent Owner's Demonstratives**

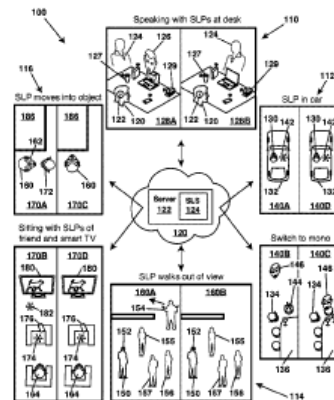
September 5, 2024

# Outline

- Overview of '179 and '184 patents
- Asserted Grounds
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    - Overview of prior art
    - No motivation to combine
    - Even if combined, not obvious
  - Ground 2
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  - Ground 1
  - Ground 2

# Overview of ‘179 and ‘184 patents

|                                                                                                                                                                                                                                                                                                                                                                                                |                      |                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (12) <b>United States Patent</b><br><b>Lyren et al.</b>                                                                                                                                                                                                                                                                                                                                        |                      | (10) <b>Patent No.:</b> <b>US 10,368,179 B1</b>                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                |                      | (45) <b>Date of Patent:</b> <b>Jul. 30, 2019</b>                                                                                                                                                                                                                                                                                                             |
| (54) <b>SWITCHING BINAURAL SOUND</b>                                                                                                                                                                                                                                                                                                                                                           | (52) <b>U.S. Cl.</b> |                                                                                                                                                                                                                                                                                                                                                              |
| (71) Applicants: <b>Philip Scott Lyren</b> , Bangkok (TH);<br><b>Glen A. Norris</b> , Tokyo (JP)                                                                                                                                                                                                                                                                                               |                      | CPC ..... <b>H04S 1/007</b> (2013.01); <b>G10L 19/167</b><br>(2013.01); <b>G10L 19/22</b> (2013.01); <b>H04R 5/04</b><br>(2013.01); <b>H04S 7/30</b> (2013.01); <b>H04S 7/302</b><br>(2013.01); <b>H04S 7/305</b> (2013.01); <b>H04S</b><br><b>2420/01</b> (2013.01)                                                                                         |
| (72) Inventors: <b>Philip Scott Lyren</b> , Bangkok (TH);<br><b>Glen A. Norris</b> , Tokyo (JP)                                                                                                                                                                                                                                                                                                |                      | (58) <b>Field of Classification Search</b><br>None<br>See application file for complete search history.                                                                                                                                                                                                                                                      |
| (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.                                                                                                                                                                                                                                                                       |                      | (56) <b>References Cited</b>                                                                                                                                                                                                                                                                                                                                 |
| (21) Appl. No.: <b>16/401,242</b>                                                                                                                                                                                                                                                                                                                                                              |                      | <b>U.S. PATENT DOCUMENTS</b>                                                                                                                                                                                                                                                                                                                                 |
| (22) Filed: <b>May 2, 2019</b>                                                                                                                                                                                                                                                                                                                                                                 |                      | 7,116,788 B1 * 10/2006 Chen ..... H04S 3/004<br>381/17<br>2009/0043591 A1 * 2/2009 Baerhuut ..... H04S 3/004<br>704/500<br>2010/0290636 A1 * 11/2010 Mao ..... H04S 7/304<br>381/74<br>2014/0328505 A1 * 11/2014 Heinemann ..... H04S 7/303<br>381/303                                                                                                       |
| <b>Related U.S. Application Data</b>                                                                                                                                                                                                                                                                                                                                                           |                      | * cited by examiner                                                                                                                                                                                                                                                                                                                                          |
| (63) Continuation of application No. 16/106,140, filed on Aug. 21, 2018, which is a continuation of application No. 15/826,721, filed on Nov. 30, 2017, now Pat. No. 10,080,093, which is a continuation of application No. 15/674,009, filed on Aug. 10, 2017, now Pat. No. 9,848,271, which is a continuation of application No. 14/979,483, filed on Dec. 27, 2015, now Pat. No. 9,749,766. |                      | <b>Primary Examiner</b> — Paul W Huber                                                                                                                                                                                                                                                                                                                       |
| (51) <b>Int. Cl.</b><br><b>H04S 1/00</b> (2006.01)<br><b>H04S 7/00</b> (2006.01)<br><b>H04R 5/04</b> (2006.01)<br><b>G10L 19/16</b> (2013.01)<br><b>G10L 19/22</b> (2013.01)                                                                                                                                                                                                                   |                      | (57) <b>ABSTRACT</b><br>A method provides binaural sound to a person through electronic earphones. The binaural sound localizes to a sound localization point (SLP) in empty space that is away from but proximate to the person. When an event occurs, the binaural sound switches or changes to stereo sound, to mono sound, or to altered binaural sound. |
|                                                                                                                                                                                                                                                                                                                                                                                                |                      | <b>20 Claims, 14 Drawing Sheets</b>                                                                                                                                                                                                                                                                                                                          |



Meta Platforms, Inc.  
Exhibit 1001  
Page 001

- The ‘179 and ‘184 patents are each entitled “Switching Binaural Sound” and share a common parent
- Specifications are the same
- Binaural sound “provides a listener with a superior ability to localize sounds in the 3D environment” because binaural sound accounts for “small differences to sound that arrives at one ear compared to sound that arrives at the other ear.” Ex. 1001 (‘179 patent) at 2:43-3:9.
- Providing binaural sound to a user using a head mounted display and altering the binaural sound after an event occurs
- For example, providing binaural sound to a user and altering the binaural sound to alert the user that the user is leaving an environment

# Independent claims (claims 1, 7, 14)

| '179 limitations                                                                                                                                                                                                                                                                                                                                             | '184 limitations                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b><i>alerting the user that the user is leaving the environment</i></b> by <b><i>reducing a volume</i></b> of the binaural sound that localizes from the virtual image and that is being provided to the user.</p> <p>(limitation 14[e])</p>                                                                                                             | <p><b><i>alerting the user that the user is leaving the virtual image in the environment</i></b> by <b><i>altering processing</i></b> of the binaural sound by the DSP <b><i>and reducing a volume</i></b> of the binaural sound that localizes to the user at the virtual image.</p> <p>(limitation 14[d])</p> |
| <p><b><i>alerting the user that the user is leaving the environment</i></b> by <b><i>altering processing</i></b> of the binaural sound to <b><i>degrade audio cues</i></b> in order <b><i>to prevent the user from experiencing external localization</i></b> of the binaural sound.</p> <p>(limitation 7[e])</p>                                            | <p><b><i>alerting the user that the user is leaving the environment</i></b> by <b><i>altering processing</i></b> of the sound by the DSP to <b><i>degrade a spatial cue and to lower a volume of the sound</i></b> playing to the user.</p> <p>(limitation 7[d])</p>                                            |
| <p><b><i>warning the user that the user is leaving the 3D virtual environment</i></b> by filtering, by the DSP, the binaural sound to <b><i>alter audio cues to prevent the user from experiencing external localization</i></b> of the sounds and by <b><i>lowering a volume</i></b> of the sounds being provided to the user.</p> <p>(limitation 1[e])</p> | <p><b><i>warning the user that the user is leaving the 3D virtual environment</i></b> by filtering, by the DSP, the binaural sound to <b><i>alter a spectral cue and lower a volume</i></b> of the sound playing to the user.</p> <p>(limitation 1[d])</p>                                                      |

# Independent claims (claims 1, 7, 14)

## '179 limitations

***determining, with the WED, when the user is leaving the environment***

(limitation 14[d])

***determining, with the WED, when the user is leaving the environment***

(limitation 7[d])

***sensing, with one or more sensors in the HMD, when the user leaves the 3D virtual environment that includes the virtual image***

(limitation 1[d])

Ex. 1001 ('179 patent)

# Asserted grounds

## II. Identification of Challenges (37 C.F.R. § 42.104(b))

- **Ground 1:** Claims 1, 3-4, 6-10, and 14-19 are unpatentable under 35 U.S.C. § 103 over **Clement** (Ex.1005) with **Osman** (Ex.1006) and **Sauk** (Ex.1007).
- **Ground 2:** All claims are unpatentable under § 103 over **Lyren** (Ex.1008) with **Reif** (Ex.1009).

'179 Petition (Paper 2) at 2; '184 Petition (Paper 2) at 2

- Challenged claims and grounds are the same with the '179 patent and '184 patent
- “It is of the utmost importance that petitioners in the IPR proceedings adhere to the requirement that the initial petition identify ‘with particularity’ the ‘evidence that supports the grounds for the challenge to each claim.’
  - *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369-70 (Fed. Cir. 2016)

Ex. 1146 ¶199

# Ground 1

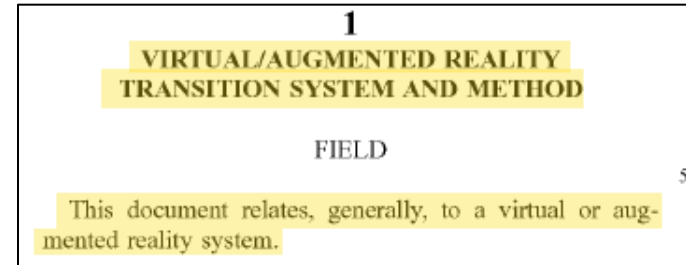
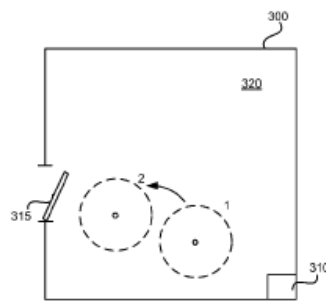
# No motivation to combine Clement, Osman, Sauk

## Legal standard

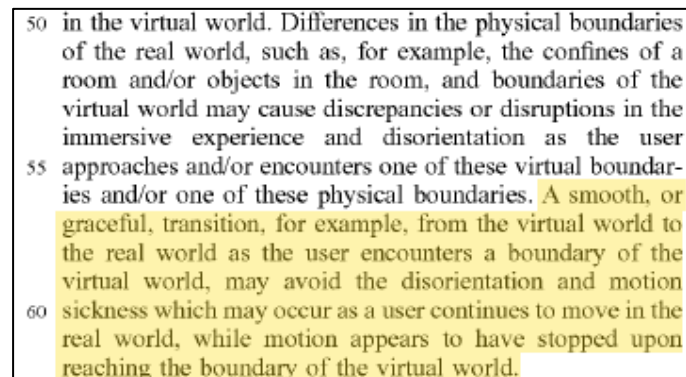
- Petitioner’s burden to prove obviousness, including demonstrating a motivation to combine
- “To satisfy its burden of proving obviousness, a ***petitioner cannot employ merely conclusory statements***. The petitioner must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.”
  - *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380-81 (Fed. Cir. 2016) (emphasis added)
- “It is improper to combine references where the references teach away from their combination.”
  - M.P.E.P. §2145 (subheading X.D.2., entitled “References Cannot Be Combined Where Reference Teaches Away from Their Combination” and *citing In re Grasselli*, 713 F.2d 731, 743 (Fed. Cir. 1983))
- Burden never shifts to PO
  - *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F. 3d 1375, 1378 (Fed Cir. 2015)

# Clement

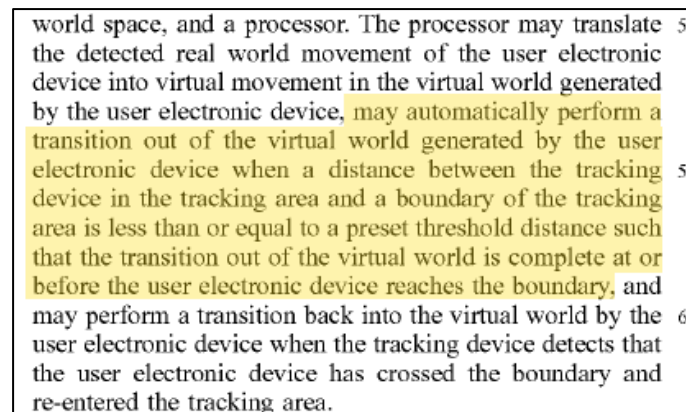
|                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (12) <b>United States Patent</b><br><b>Clement et al.</b>                                                                                                                                                                                                                                                                                        | (10) <b>Patent No.:</b> <b>US 9,690,374 B2</b><br>(45) <b>Date of Patent:</b> <b>Jun. 27, 2017</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| (54) <b>VIRTUAL/AUGMENTED REALITY<br/>TRANSITION SYSTEM AND METHOD</b>                                                                                                                                                                                                                                                                           | (56) <b>References Cited</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| (71) Applicant: <b>GOOGLE INC.</b> , Mountain View, CA (US)                                                                                                                                                                                                                                                                                      | U.S. PATENT DOCUMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| (72) Inventors: <b>Manuel Christian Clement</b> , Mountain View, CA (US); <b>Alexander James Faaborg</b> , Mountain View, CA (US)                                                                                                                                                                                                                | 5,900,849 A 5/1999 Gallery<br>6,278,418 B1* 8/2001 Doi ..... G09G 3/003 345/156<br>6,630,915 B1* 10/2003 Flood ..... G02B 27/017 345/8<br>7,386,163 B2 6/2008 Sabe et al. (Continued)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| (73) Assignee: <b>Google Inc.</b> , Mountain View, CA (US)                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 95 days.                                                                                                                                                                                                                        | OTHER PUBLICATIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| (21) Appl. No.: <b>14/696,716</b>                                                                                                                                                                                                                                                                                                                | International Search Report and Written Opinion for PCT Application No. PCT/US2016/023414, mailed May 30, 2016, 11 pages.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| (22) Filed: <b>Apr. 27, 2015</b>                                                                                                                                                                                                                                                                                                                 | Primary Examiner—Michael J Eurice                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| (65) <b>Prior Publication Data</b>                                                                                                                                                                                                                                                                                                               | (74) Attorney, Agent, or Firm—Brake Hughes Bellermann LLP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| US 2016/0313790 A1 Oct. 27, 2016                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| (51) Int. CL<br><b>G02B 27/01</b> (2006.01)<br><b>G06F 3/01</b> (2006.01)<br><b>G02B 27/00</b> (2006.01)<br><b>G06T 19/00</b> (2011.01)                                                                                                                                                                                                          | (57) <b>ABSTRACT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| (52) U.S. CL<br>CPC ..... <b>G06F 3/011</b> (2013.01); <b>G02B 27/0093</b> (2013.01); <b>G02B 27/017</b> (2013.01); <b>G06F 3/012</b> (2013.01); <b>G02B 2027/014</b> (2013.01); <b>G02B 2027/0138</b> (2013.01); <b>G02B 2027/0178</b> (2013.01); <b>G02B 2027/0187</b> (2013.01); <b>G06F 2203/012</b> (2013.01); <b>G06T 19/006</b> (2013.01) | A system and method of operating an audio visual system generating a virtual immersive experience may include an electronic user device in communication with a tracking device that may track a user's physical movement in a real world space and translate the tracked physical movement into corresponding movement in the virtual world generated by the user device. The system may detect when a user and the user device are approaching a boundary of a tracking area and automatically initiate a transition out of the virtual world and into the real world. A smooth, or graceful, transition between the virtual world and the real world as the user encounters this boundary may avoid disorientation which may occur as a user continues to move in the real world, while motion appears to have stopped upon reaching the tracking boundary. |
| (58) <b>Field of Classification Search</b><br>CPC ..... G02B 27/017; G02B 2027/0138; G02B 2027/014; G02B 2027/0178; G02B 2027/0187; G02B 27/0093; G06F 3/011; G06F 3/012; G06F 2203/012; G06T 19/006                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| See application file for complete search history.                                                                                                                                                                                                                                                                                                | 21 Claims, 14 Drawing Sheets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |



Ex. 1005 (Clement) at 1:1-7



Ex. 1005 (Clement) at 2:50-63



Ex. 1005 (Clement) at 1:50-63

- Clement directed to virtual reality/augmented reality games
- “A smooth, or graceful, transition ... from the virtual world to the real world”
- Transition is complete at or before user’s electronic device reaches the boundary

# Clement

In some embodiments, the transition may include a fade of sound content. For example, when transitioning from the virtual world to the real world, audio content associated with the virtual world may fade out, accompanied by a fade in of ambient sound. In some embodiments, the fade out of virtual audio content and the fade in of ambient sound may accompany the fade out of virtual images and the fade in of real world images. In some embodiments, the fade out of virtual audio content and the fade in of ambient sound may be accomplished serially, so that the ambient sound is not superimposed on, or output at the same time as, the virtual audio content.

Ex. 1005 (Clement) at 9:20-31

- Discloses a “fade out” of sound content
- No disclosure of “binaural”
- No disclosure regarding the location of sound

# Osman

(12) **United States Patent**  
**Osman**  
(10) **Patent No.:** **US 9,037,468 B2**  
(45) **Date of Patent:** **May 19, 2015**

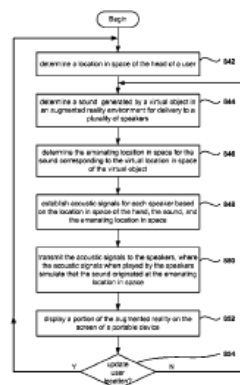
(54) **SOUND LOCALIZATION FOR USER IN MOTION**  
(75) Inventor: **Steven Osman**, San Francisco, CA (US)  
(73) Assignee: **Sony Computer Entertainment Inc.**, Tokyo (JP)  
(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 290 days.  
(21) Appl. No.: **13/478,582**  
(22) Filed: **May 23, 2012**  
(65) **Prior Publication Data**  
US 2013/0041648 A1 Feb. 14, 2013  
**Related U.S. Application Data**  
(60) Provisional application No. 61/523,100, filed on Aug. 12, 2011, provisional application No. 61/539,676, filed on Sep. 27, 2011.  
(51) **Int. Cl.**  
**G10L 21/00** (2013.01)  
**H04S 7/00** (2006.01)  
(52) **U.S. Cl.**  
CPC ..... **H04S 7/304** (2013.01)  
(58) **Field of Classification Search**  
CPC ..... G06F 9/4448  
USPC ..... 704/270  
See application file for complete search history.

(56) **References Cited**  
U.S. PATENT DOCUMENTS  
7,720,229 B2 5/2010 Duraiswami et al.  
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2013/0304479 A1\* 11/2013 Teller et al. 704/275  
2014/0029775 A1\* 1/2014 Anderson 381/309

\* cited by examiner  
*Primary Examiner* — Jakieda Jackson  
(74) *Attorney, Agent, or Firm* — Martine Penilla Group, LLP

(57) **ABSTRACT**  
Methods, apparatus, and computer programs for simulating the source of sound are provided. One method includes operations for determining a location in space of the head of a user utilizing face recognition of images of the user. Further, the method includes an operation for determining a sound for two speakers, and an operation for determining an emanating location in space for the sound, each speaker being associated with one ear of the user. The acoustic signals for each speaker are established based on the location in space of the head, the sound, the emanating location in space, and the auditory characteristics of the user. In addition, the acoustic signals are transmitted to the two speakers. When the acoustic signals are played by the two speakers, the acoustic signals simulate that the sound originated at the emanating location in space.

8 Claims, 14 Drawing Sheets



1. Field of the Invention  
The present invention relates to methods for delivering sound, and more particularly, methods, systems, and computer programs for simulating the source of the sound in a three-dimensional space.

Ex. 1006 (Osman) at 1:29-32

sound coming from the right. However, it should be noted that a good HRTF model will greatly improve the accuracy of sound localization for objects outside the field of display. This is because inaccuracies in virtual surround systems are ignored by the brain in the presence of visual feedback. If the player thinks that the sound is coming from a visible object, even if there is some error in the sound transmission, the brain uses the visual information to identify the sound origin. However, when the sound originates outside the field of view, the extra visual cue for sound localization is lost. In this case, a good HRTF enhances sound localization for objects outside the field of view.

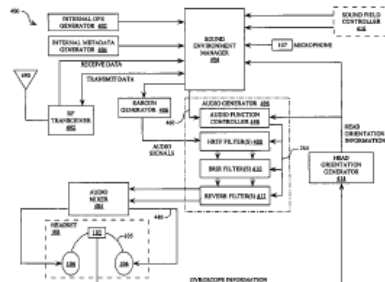
Ex. 1006 (Osman) at 7:31-42

- Simulates the source of sound in a three-dimensional space
- Used with virtual reality/augmented reality games
- “a good HRTF mode will greatly improve the accuracy of sound localization for objects outside the field of display”
- Providing spatial awareness is **more important** when objects/images are not in view of the user

# Sauk

|      |                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (12) | <b>United States Patent</b><br><b>Sauk</b>                                                                                                                                                                                                                                                                                                  | (10) <b>Patent No.:</b> <b>US 7,876,903 B2</b><br>(45) <b>Date of Patent:</b> <b>Jan. 25, 2011</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| (54) | <b>METHOD AND APPARATUS FOR CREATING A MULTI-DIMENSIONAL COMMUNICATION SPACE FOR USE IN A BINAURAL AUDIO SYSTEM</b>                                                                                                                                                                                                                         | 6,961,439 B2 11/2005 Ballus<br>7,706,543 B2* 4/2010 Daniel<br>2005/0198193 A1 9/2005 Halme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| (75) | Inventor: <b>Paul L. Sauk</b> , West Grove, PA (US)                                                                                                                                                                                                                                                                                         | FOREIGN PATENT DOCUMENTS<br>WO WO-0155833 8/2001<br>WO WO-02082860 10/2002                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| (73) | Assignee: <b>Harris Corporation</b> , Melbourne, FL (US)                                                                                                                                                                                                                                                                                    | OTHER PUBLICATIONS<br>Amatriain et al., "Transmitting Audio Content as Sound Objects", AES 22nd International Conference on Virtual, Synthetic and Entertainment Audio, 2002, 11 pages.*<br>Vaananen et al., "Encoding and Rendering of Perceptual Sound Scenes in the Carrouso Project", AES 2nd International Conference on Virtual, Synthetic and Entertainment Audio, 2002, 9 pages.*                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| (*)  | Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1236 days.                                                                                                                                                                                                                     | (Continued)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| (21) | Appl. No.: <b>11/482,326</b>                                                                                                                                                                                                                                                                                                                | <i>Primary Examiner</i> —Ping Lee<br>(74) <i>Attorney, Agent, or Firm</i> —Fox Rothschild, LLP; Robert J. Sacco                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| (22) | Filed: <b>Jul. 7, 2006</b>                                                                                                                                                                                                                                                                                                                  | (57) <b>ABSTRACT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| (65) | <b>Prior Publication Data</b><br>US 2008/0008342 A1 Jan. 10, 2008                                                                                                                                                                                                                                                                           | Method and apparatus for producing, combining, and customizing virtual sound environments. A binaural sound system (400) includes a transceiver (492) configured for receiving a signal (600) containing at least a first type of information and a second type of information. The first type of information includes enunciated data (602). The enunciated data specifies certain information intended to be audibly enunciated to a user. The second type of information comprises first type of metadata (604-1) and a second type of metadata (604-2). The first type of metadata includes information which identifies a characteristic of the enunciated data exclusive of spatial position information. The second type of metadata identifies a spatial position information associated with the enunciated data. |
| (51) | <b>Int. Cl.</b><br><b>H04R 5/00</b> (2006.01)<br><b>H04R 5/02</b> (2006.01)                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| (52) | <b>U.S. Cl.</b> ..... <b>381/17; 381/310</b>                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| (58) | <b>Field of Classification Search</b> ..... <b>700/94; 381/17, 18, 309, 310, 19-23, 74</b><br>See application file for complete search history.                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| (56) | <b>References Cited</b><br><b>U.S. PATENT DOCUMENTS</b><br>4,081,606 A 3/1978 Gerzon<br>4,086,433 A 4/1978 Gerzon<br>5,596,644 A 1/1997 Abel et al.<br>5,844,816 A 12/1998 Innama et al.<br>6,021,206 A * 2/2000 McGrath ..... 381/310<br>6,259,795 B1 7/2001 McGrath<br>6,370,256 B1 4/2002 McGrath<br>6,845,338 B1 1/2005 Williams et al. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

30 Claims, 6 Drawing Sheets



In an embodiment of the invention, a soldier can achieve an improved understanding of battlefield conditions (situational awareness) by better understanding the locations of other soldiers in his group. For example, a military reconnaissance mission may involve four groups of soldiers, with each group going in a different direction to survey the surrounding conditions. Instead of listening to all the various conversations occurring in the communication network, each group could select their own binaural environment. Thereafter, if soldiers of one group were to spread out in a crowded urban environment and lose sight of each other, they would still be aware of each of their group member's location. Their voice communication would inform everyone in the group of their approximate location by visualizing virtual positions for the speakers. And everyone within the group would understand their positional relationship to the others in the group by simply listening to their voices. Thus, the soldiers could keep their eyes focused on their surroundings instead of on their instruments.

Ex. 1007 (Sauk) at 10:44-52

listening to their voice communications. One or more sensors 401 could be used to detect threats, such as sniper fire. These sensors 401 could be activated by a sniper 402 located on a rooftop that has fired his weapon at the soldiers on the street. The sensors 401 would provide the spatial location of the sniper simultaneously to every soldier in the area. This is

Ex. 1007 (Sauk) at 13:12-17

- Sauk is not directed to virtual reality games
- Instead, real-life military missions
  - Military reconnaissance
  - Snipers

# Sauk's Alerts and Warnings

- Sauk discloses adding a binaural alert to alert/warn
- No teaching of lowering the volume
- No teaching of preventing the user from experiencing external localization
- Sauk warns the user of the hazard by providing directional context to indicate the location of the hazard to the user
- Lowering volume/preventing user from experiencing external localization would frustrate the purpose of Sauk

## C. Alerts and Warnings

15 In addition to voice communication, other types of information can be superimposed into the sound field using type 1 and type 2 metadata. For example, sensor information can be detected by using one or more sensors 401. This sensor information can be integrated into a format corresponding to signal 600. This signal is then transmitted to various users 109-1, 20 109-2, . . . 109-*n* and received using a BSS 400 associated with each user. The sensor 401 can be any type of sensor including a sensor for biological, nuclear, or chemical hazards. Moreover, the sensor 401 is designed to broadcast a signal 600 if a hazard 403 is detected. The signal 600 will include enunciated data 602 and metadata 604 as necessary to 25 alert users of the hazard. For example, the enunciated data will include audio data or a data pointer to a particular earcon which is to be used by BSS 400. The enunciated data can be used to communicate to a user the nature of a hazard. The 30 metadata 604 can include type 1 metadata and type 2 metadata.

The type 2 metadata can include GPS coordinates of a sensor that detected a hazard or an estimated GPS location of the hazard as detected by the sensor. When this RF signal is 35 received by a user's radio, the user's BSS 400 will use the type 2 metadata to determine where the sensor 401 is relative to the user, and provide the user with an earcon as specified by the enunciated data. The earcon would translate the received enunciated data to a phrase like, "chemical toxin detected, 40 stay away!" and would be heard in the soldier's 3-D sound environment. In particular, the sound environment manager 494 will use GPS coordinates provided by the sensor 401 and GPS coordinates provided of the user (as provided by the 45 internal GPS generator 402) to determine the direction of the hazard 403 relative to the user. The audible warning would thus alert the user that he is too close to the lethal toxin, and by listening to the 3-D binaural audio, the user would be able to ascertain a direction of the sensor 401 (and/or the associated 50 hazard). Consequently, the user would know which direction to move away from in order to escape the affected area.

# Sauk's Selective Relevance Mode

## B. Selective Relevance Mode

The selective filtering techniques described above can be utilized by BSS 400 in another configuration which combines a plurality of audio dimensions such as 3-D (binaural), 2-D (stereophonic), and 1-D (monophonic). For example, in certain circumstances, a user may not want to eliminate all background audio information. However, rather than keeping the less relevant audio in the same audio dimension with their desired binaural sound sources, a user could change the less relevant audio to a monophonic (1-D) or stereophonic (2-D) dimension. The effect of changing an audio format for sounds from binaural to monophonic or stereophonic audio signifies a different level of relevancy or importance for such audio. This process also removes any localization cues for that audio. The decibel level of the 1-D, 2-D or 3-D audio can be adjusted to whatever the listener desires for that dimension.

Ex. 1007 (Sauk) at 11:25-41

- Sauk's Selective Relevance Mode ***depends on user pre-selection***
- User selects certain groups to be in different audio dimensions
  - Less relevant audio in monophonic or stereo
  - More relevant audio in binaural
- Decibel level may be adjusted by user

# Sauk's Selective Relevance Mode

## B. Selective Relevance Mode

In order to implement the foregoing effects, separate binaural audio environments can be defined for each predetermined group of users. Thereafter each BSS 400 can use received metadata to determine a group of a user from which enunciated data originated. Enunciated data received from various users within a user's predetermined group will be presented in a binaural format. In particular, the sound environment manager 494 will use the type 1 metadata 604-1 to determine if a signal originated with a member of particular group. Enunciated data originating from members of the same group will be reproduced for a user of each BSS 400 in a 3-D binaural audio environment. Each BSS 400 can process enunciated data for group members using type 2 metadata to create binaural audio to represent where members of that user's group are located.

According to a preferred embodiment, BSS 400 will also receive RF signals 600 from users associated with at least a second one of the predetermined groups of users. Such RF signals can be identified based by using type 1 metadata. The enunciated data 602 from these signals is also reproduced at headset 108 and can be audibly perceived by the user. Significantly, however, BSS 400 can be configured to reproduce such audio in a different audio format. For example, rather than reproducing such audio in a 3-D binaural format, the audio can be presented in 1-D monophonic format. Because this audio is not presented with the same audio effect, it is

Ex. 1007 (Sauk) at 11:42-67

- “[S]eparate binaural audio environments can be defined for each **predetermined** group of users. **Thereafter**, each BSS 400 can use received meta data to determine a group of a user from which enunciated data originated.”
  - “Enunciated data received from various users within a user's predetermined group will be presented in a binaural format”
  - Audio from users in a “second one of the predetermined groups of users” can be reproduced in a different audio format, such as monophonic format
- **No change of format** from binaural to mono **based on changes in the listener's position** in the environment
  - Static relevancy **preselected by user** that does not change based on position

# No motivation to combine Clement and Sauk

As such, we have concerns at this stage about Petitioner's proposed motivation to combine. Although Petitioner relies on Clement in part for disclosing a "warning" and Sauk for "changing from binaural to stereo or monophonic sound," on this record, Petitioner's reasoning for doing so is lacking. *See* Pet. 14. Petitioner provides no persuasive reason why one of ordinary skill in the art would have ignored Sauk's disclosure of adding binaural sound for alerts and instead looked to Sauk's non-alert context for removing binaural sound.<sup>12</sup>

Paper 10 ('179 Decision) at 22; Paper 10 ('184 Decision at 17)

- Board recognized Petitioner's reasoning for combining Clement and Sauk was "lacking"
- "[N]o persuasive reason why one of ordinary skill in the art would have ignored Sauk's disclosure of adding binaural sound for alerts and instead looked to Sauk's non-alert context for removing binaural sound"
- Even in Sauk's non-alert context, the Selective Relevance Mode discussed above, the audio is switched **based on a user selection**, not based on a user's position in an environment

# Petitioner's *new* arguments in Reply

- Petitioner's improper new arguments in Reply
  - “Petitioner may not submit new evidence or argument in reply that it could have presented earlier, e.g. to make out a prima facie case of unpatentability.”
    - Patent Trial and Appeal Board Consolidated Trial Practice Guide November 2019 at 3
  - “It is of the utmost importance that petitioners in the IPR proceedings adhere to the requirement that the initial petition identify ‘with particularity’ the ‘evidence that supports the grounds for the challenge to each claim.’”
    - *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369-70 (Fed. Cir. 2016)
- Only basis disclosed in *Sauk* to switch the audio from binaural to mono/stereo is when user selects audio as being less relevant
- New argument in Reply depends on “automatic determination of relevance” in *Clement* and “Relevance Signal” in *Sauk*
  - Neither exists

# Petitioner's *new* arguments in Reply

- Petitioner argues “automatic determination of relevance” in Clement
  - Does not exist in Clement
  - In Clement, transition is not determined by relevancy; based upon “discrepancies in the immersive experience and disorientation”
- Petitioner argues “Relevance Signal” in Sauk
  - Does not exist in Sauk
  - No physical signal regarding relevance
  - Sauk’s Selective Relevance Mode allows a ***user to pre-define*** separate audio environments
  - Sauk teaches locations other than the user’s location could be extremely relevant, e.g., alerting a soldier on the street to a sniper’s location on the roof, using additive binaural virtual alerts

listening to their voice communications. One or more sensors 401 could be used to detect threats, such as sniper fire. These sensors 401 could be activated by a sniper 402 located on a rooftop that has fired his weapon at the soldiers on the street. 15 The sensors 401 would provide the spatial location of the sniper simultaneously to every soldier in the area. This is

Ex. 1007 (Sauk) at 13:12-17

# Petitioner's *new* arguments in Reply

- Stacks a series of assumptions on a faulty foundation
- To alert/warn the user that he/she is leaving the environment:
  1. A POSITA would ignore the “Alerts and Warnings” section of Sauk ***and instead***  
**Not established**
  2. Look to Sauk’s Selective Relevance Mode that discloses changing the audio format of the virtual audio into stereo/mono ***assuming***  
**Not established**
  3. The user predefines the event of leaving the environment as being less relevant ***AND***  
**Not established**
  4. While also fading out the virtual audio and fading in the ambient audio as described by Clement  
**Not established**

# Petitioner's *new* arguments in Reply

Also ignores that

- Sauk teaches ***retaining less relevant audio***
  - “a user may not want to eliminate all background audio information”
- while Clement teaches ***removing audio*** from virtual world
  - “transition out of the virtual world is complete at or before the user electronic device reaches the boundary”
- Osman teaches audio from objects ***outside the field of display is more relevant***, not less relevant
  - “a good HRTF mode will greatly improve the accuracy of sound localization for objects outside the field of display”

***Petitioner has failed to establish a motivation to combine Clement, Osman, and Sauk***

## Petitioner's *new* arguments in Reply

- Petitioner's second improper new argument
- In Reply, Petitioner suggests that Sauk's Selective Relevance Mode could be added to Sauk's Hazard Alert
  - Less relevant audio is switched to stereo or mono per user predefined selection AND
  - Additive binaural alert to help user focus on avoiding hazards
  - Ignores the claim language, which requires altering the binaural audio experienced by the user to alert/warn user

***Petitioner has failed to establish a motivation to combine Clement, Osman, and Sauk***

# Petitioner's *new* arguments in Reply

- Another improper new argument

Moreover, the Petition does not depend on Sauk for claim 14. Pet.23-24.

'179 Reply (Paper 25) at 11

## II. Identification of Challenges (37 C.F.R. § 42.104(b))

- **Ground 1:** Claims 1, 3-4, 6-10, and 14-19 are unpatentable under 35 U.S.C. § 103 over Clement (Ex.1005) with Osman (Ex.1006) and Sauk (Ex.1007).
- **Ground 2:** All claims are unpatentable under § 103 over Lyren (Ex.1008) with Reif (Ex.1009).

'179 Petition (Paper 2) at 2; '184 Petition (Paper 2) at 2

- “It is of the utmost importance that petitioners in the IPR proceedings adhere to the requirement that the initial petition identify ‘with particularity’ the ‘evidence that supports the grounds for the challenge to each claim.’
  - *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369-70 (Fed. Cir. 2016)

## Even if combined, fails to disclose claimed invention – '179 and '184

- ***alerting/warning ... by reducing/lowering volume*** of binaural sound provided to user
  - limitation 14[e] & limitation 1[e] (and dependent claims) of '179 patent
  - limitation 14[d], limitation 7[d], & limitation 1[d] (and dependent claims) of '184 patent
- ***alerting/warning ... by altering binaural sound provided to the user to “prevent the user from experiencing external localization”***
  - limitation 7[e], limitation 1[e] (and dependent claims) of '179 patent
- ***alerting/warning ... by altering processing/filtering binaural sound provided to the user***
  - limitation 14[d], limitation 7[d] , limitation 1[d] (and dependent claims) of '184 patent
  - ***to degrade/alter a spatial cue***
    - limitation 7[d], limitation 1[d] (and dependent claims) of '184 patent

# Does not disclose alerting/warning by reducing/lowering volume

- *alerting/warning ... by reducing/lowering volume* of binaural sound provided to user
  - limitation 14[e] & limitation 1[e] (and dependent claims) of '179 patent
  - limitation 14[d], limitation 7[d], & limitation 1[d] (and dependent claims) of '184 patent
  - Sauk does not disclose reducing a volume to alert or warn
  - Sauk suggests that the volume of the binaural audio alert (“chemical toxin detected, stay away!”) **would not be reduced** to warn users of the real-world danger of a toxic chemical spill
  - Clement does not disclose reducing a volume of binaural sound to alert or warn
    - Clement does not disclose anything about binaural sound
    - Clement discloses “transitions” based upon “discrepancies in the immersive experience and disorientation” not alerts or warnings based upon user leaving environment

# Does not disclose alerting/warning by reducing/lowering volume

Petitioner's expert agrees

19 Q So to ensure that that soldier would heed  
20 the warning, would you reduce the volume?  
21 A Reduce the volume of what?  
22 Q Of the warning.

---

1 A But that's not what Sauk talks about here.  
2 He's talking about changing the dimension.  
3 Q I understand. But back on Sauk, we can go  
4 back to Sauk if you don't mind, please, that's  
5 Exhibit 5. All right. So here we are again Sauk  
6 column 12, the earcon would translate the received  
7 enunciated data to a phrase like "chemical toxin  
8 detected, stay away!", that's the warning that is  
9 disclosed in this section of Sauk, correct?  
10 A That's correct.  
11 Q So here with the chemical toxin to the  
12 soldier, would you reduce the volume of the  
13 warning?  
14 MR. HENRY: Objection to form.  
15 BY THE WITNESS:  
16 A I wouldn't reduce the volume.

Ex. 2014, 270:19-272:16

2 Q Does Sauk disclose under this Alerts &  
3 Warnings section lowering the volume of a warning?  
4 A In Section C specifically under the Alerts  
5 & Warnings, Sauk I don't believe talks about  
6 lowering the volume.

Ex. 2014, 267:2-6

- Sauk is the only reference that discloses binaural audio serving as an alert, but Sauk does not disclose reducing the volume of the binaural audio alert to warn users and ***instead adds binaural sound for alerting***
- Accordingly, even if Clement and Sauk were combined, the hypothetical combination teaches away from alerting by reducing the volume of binaural audio

# Does not disclose alerting/warning by preventing external localization

- *alerting/warning ... by altering binaural sound provided to the user to “prevent the user from experiencing external localization”*
  - limitation 7[e], limitation 1[e] (and dependent claims) of '179 patent
  - Sauk expressly teaches to alert a user by generating binaural audio alerts, not by removing the binaural audio
  - Sauk focuses on *providing localization* to alert or warn a user of the location of the hazard
  - Sauk thus does not disclose alerting/warning the user by preventing the user from experiencing external localization spatial context of the binaural sound and indeed teaches away

## C. Alerts and Warnings

15 In addition to voice communication, other types of information can be superimposed into the sound field using type 1 and type 2 metadata. For example, sensor information can be detected by using one or more sensors 401. This sensor information can be integrated into a format corresponding to signal 20 600. This signal is then transmitted to various users 109-1, 109-2, . . . 109-n and received using a BSS 400 associated with each user. The sensor 401 can be any type of sensor including a sensor for biological, nuclear, or chemical hazards. Moreover, the sensor 401 is designed to broadcast a signal 25 600 if a hazard 403 is detected. The signal 600 will include enunciated data 602 and metadata 604 as necessary to alert users of the hazard. For example, the enunciated data will include audio data or a data pointer to a particular earcon which is to be used by BSS 400. The enunciated data can be used to communicate to a user the nature of a hazard. The metadata 604 can include type 1 metadata and type 2 metadata.

The type 2 metadata can include GPS coordinates of a sensor that detected a hazard or an estimated GPS location of the hazard as detected by the sensor. When this RF signal is 35 received by a user's radio, the user's BSS 400 will use the type 2 metadata to determine where the sensor 401 is relative to the user, and provide the user with an earcon as specified by the enunciated data. The earcon would translate the received enunciated data to a phrase like, “chemical toxin detected, 40 stay away!” and would be heard in the soldier's 3-D sound environment. In particular, the sound environment manager 494 will use GPS coordinates provided by the sensor 401 and GPS coordinates provided of the user (as provided by the internal GPS generator 402) to determine the direction of the hazard 403 relative to the user. The audible warning would thus alert the user that he is too close to the lethal toxin, and by listening to the 3-D binaural audio, the user would be able to ascertain a direction of the sensor 401 (and/or the associated hazard). Consequently, the user would know which direction 50 to move away from in order to escape the affected area.

# Does not disclose alerting/warning by altering processing/filtering

## B. Selective Relevance Mode

In order to implement the foregoing effects, separate binaural audio environments can be defined for each predetermined group of users. Thereafter each BSS 400 can use received metadata to determine a group of a user from which enunciated data originated. Enunciated data received from various users within a user's predetermined group will be presented in a binaural format. In particular, the sound environment manager 494 will use the type 1 metadata 604-1 to determine if a signal originated with a member of particular group. Enunciated data originating from members of the same group will be reproduced for a user of each BSS 400 in a 3-D binaural audio environment. Each BSS 400 can process enunciated data for group members using type 2 metadata to create binaural audio to represent where members of that user's group are located.

According to a preferred embodiment, BSS 400 will also receive RF signals 600 from users associated with at least a second one of the predetermined groups of users. Such RF signals can be identified based by using type 1 metadata. The enunciated data 602 from these signals is also reproduced at headset 108 and can be audibly perceived by the user. Significantly, however, BSS 400 can be configured to reproduce such audio in a different audio format. For example, rather than reproducing such audio in a 3-D binaural format, the audio can be presented in 1-D monophonic format. Because this audio is not presented with the same audio effect, it is

Ex. 1007 (Sauk) at 11:42-67

- ***alerting/warning ... by altering processing/filtering binaural sound provided to the user***
  - limitation 14[d], limitation 7[d] , limitation 1[d] (and dependent claims) of '184 patent
  - Sauk does not disclose ***changing the existing binaural audio that is provided to the user*** to a different format
- ***to degrade/alter a spatial cue***
  - limitation 7[d], limitation 1[d] of '184 patent
  - Sauk focuses on ***providing localization*** to alert or warn a user of the location of the hazard
  - Sauk does not disclose dynamically changing the binaural sound provided to the user to “degrade/alter” a spatial cue
  - Sound is ***preselected*** by the user as being binaural, stereo, or mono

## Even if combined, fails to disclose claimed invention – '179 and '184

- ***alerting/warning ... by reducing/lowering volume*** of binaural sound provided to user
  - limitation 14[e] & limitation 1[e] (and dependent claims) of '179 patent
  - limitation 14[d], limitation 7[d], & limitation 1[d] (and dependent claims) of '184 patent

**Not established**

- ***alerting/warning ... by altering binaural sound provided to the user to “prevent the user from experiencing external localization”***
  - limitation 7[e], limitation 1[e] (and dependent claims) of '179 patent

**Not established**

## Even if combined, fails to disclose claimed invention – '179 and '184

- *alerting/warning ... by altering processing/filtering binaural sound provided to the user*
  - limitation 14[d], limitation 7[d] , limitation 1[d] (and dependent claims) of '184 patent  
**Not established**
  - *to degrade/alter a spatial cue*
    - limitation 7[d], limitation 1[d] (and dependent claims) of '184 patent  
**Not established**
- “To satisfy its burden of proving obviousness, a ***petitioner cannot employ merely conclusory statements***. The petitioner must instead ***articulate specific reasoning***, based on evidence of record, to support the legal conclusion of obviousness.”
  - *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380-81 (Fed. Cir. 2016) (emphasis added)

# Ground 2

# Lyren is not valid prior art

## II. Identification of Challenges (37 C.F.R. § 42.104(b))

- **Ground 1:** Claims 1, 3-4, 6-10, and 14-19 are unpatentable under 35 U.S.C. § 103 over Clement (Ex.1005) with Osman (Ex.1006) and Sauk (Ex.1007).
- **Ground 2:** All claims are unpatentable under § 103 over Lyren (Ex.1008) with Reif (Ex.1009).

'179 Petition (Paper 2) at 2; '184 Petition (Paper 2) at 2

- The '140 Application contains adequate written description for all claims
- Priority chain is not broken at the '140 Application
- Lyren is not valid prior art

# Claim construction

| limitations                                                                  | Petitioner's construction                                                                                                                    | PO's construction                                                                                                                      |
|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b><i>environment</i></b><br><br>Claims 14, 7 of '179 and '184 patents       | Plain and ordinary meaning but not limited solely a physical environment; must encompass physical and virtual environments<br><br>Reply at 2 | “physical surroundings in which a user operates”<br><br>POR at 8-10                                                                    |
| <b><i>3D virtual environment</i></b><br><br>Claim 1 of '179 and '184 patents | Plain and ordinary meaning but cannot be sound-only<br><br>Reply at 4                                                                        | “three-dimensional perceived surroundings in which a user operates that incorporates a virtual image and/or sound”<br><br>POR at 10-12 |

# Environment means physical environment

For spatialization management, the sound localization system 1810 manages geometric and acoustic properties of the local and/or remote environments (physical and/or virtual) and sound fields, and decides if and how output is

Ex. 1001 ('179 patent) at 37:20-23

In scenario 110, a user 120 wears electronic earphones 122 while simultaneously localizing a voice of an intelligent personal assistant (IPA) to a first sound localization point 124 and a voice of a friend to a second sound localization point 126. As shown in box 128A, the user 120 localizes the voice of the IPA to his left and localizes the voice of his friend in front of himself and above his laptop computer that is situated on his desk. An image of the friend appears on a display of the laptop while the SLP 126 appears above the laptop. As shown in the transition from box 128A to box 128B, the user 120 stops externally localizing a voice of his friend, and the sound localization point 126 disappears.

Ex. 1001 ('179 patent) at 6:13-24

- Specification explains term “environment” refers to either physical and/or virtual surroundings of the user
- Claim 1 uses different term: “3D virtual environment”
- Even in physical environments, virtualized images and/or sounds may be presented via display and/or headphones
- Physical environment may include virtual images and/or virtual sounds
- Moot issue as ‘140 Application supports claim language even if “environment” includes 3D virtual environment

# 3D virtual environment incorporates virtual image and/or sound

By way of introduction, sound localization (i.e., the act of relating attributes of the sound being heard by the listener to the location of an auditory event) provides the listener with a three-dimensional (3D) soundscape or 3D sound environment where sounds can be localized to points around the listener. Binaural sound and some forms of stereo sound provide a listener with the ability to localize sound, though binaural sound generally provides a listener with a superior ability to localize sounds in the 3D environment.

Ex. 1001 ('179 patent) at 2:40-46

3 Q Could a 3D, three-dimensional soundscape  
4 be a 3D virtual environment?  
5 A It could be in – sure, it could be in a  
6 virtual environment. It could be.

Ex. 2014 at 176:3-6

- Specification explains could be a three-dimensional soundscape or 3D sound environment
- PO never argued that 3D virtual environment is a “sound-only environment”
- Claim language clearly includes virtual image
- **3D virtual aspects** of the 3D virtual environment **may be a 3D binaural audio soundscape**

# No conflict with Dr. Begault's declarations

13. In my opinion, a PHOSITA would recognize that the stated “environment”, a “3D virtual environment”, or a “virtual image in the environment” in the subject claims all to refer to the same type of immersive virtual world context that the user interacts within. In this context, virtual sound sources are perceived to be externalized to the user at different sound localization points relative to the listener. *See* Figure 1 below, left (the violin and bell sound sources are heard outside of the head).

Ex. 2006 at ¶13

- No conflict with Dr. Begault's declarations
- “immersive virtual world context”

# No conflict with Dr. Begault's declarations

5           The word "environment," according to  
6 your construction, seems to refer to only the  
7 physical surroundings, and that seems to be what  
8 you're saying, even if the user's also in a  
9 virtual environment.

10           Is that correct?

11           MS. PARTRIDGE: Objection. Form.

12           A    No.   You completely transposed the  
13 concepts.

14           The user, themselves, is in a physical  
15 environment because a user cannot be -- you know,  
16 when I say "user," I'm talking about a human  
17 being. So a physical person that's perceiving  
18 either a virtual world or a real world, right?

19           So, when we say the word "environment," and we're  
20 talking about the physical surroundings in which a  
21 user operates, that refers to the reality of the  
22 fact that humans are operating in some sort of

1   real environment. They can't be -- only in the  
2 virtual world can we imagine them to be somewhere  
3 else, or can the user imagine themselves to be  
4 somewhere else. But, ultimately, there's a user  
5 in physical space. So you see a transposed  
6 concept.

Ex. 1147 at 125:1-6

8           So, if you take the first sentence of  
9 22 out of context, what can be easily  
10 misunderstood that I'm saying the word environment  
11 only refers to the physical world. And what I was  
12 saying here, really, is that the user is operating  
13 in a physical world and they are a physical  
14 person. But the displays, the virtual rendering  
15 system is going to include both aspects of the  
16 real world and the virtual world, and sometimes  
17 both, simultaneously.

Ex. 1147 at 126:8-17

- “transposed concept”

# Legal standard for written description

- Written description satisfied when “the disclosure of the application relied upon ***reasonably conveys*** to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date”
  - *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351–52 (Fed. Cir. 2010) (emphasis added)
- The claims and the entire specification, including the specific embodiments and figures, should be reviewed to understand how applicant provides support for the various features of the claimed invention
  - M.P.E.P. §2163, II, A, 2
- The subject matter of the claim need not be described literally (i.e., using the same terms or *in haec verba*) for the disclosure to satisfy the written description requirement
  - See M.P.E.P. §2163.02
- Claim limitations must be supported in the specification “through express, implicit, or inherent disclosure”
  - M.P.E.P. 2163.I.B

# Legal standard for written description

- Claim limitations must be supported in the specification “through express, implicit, or inherent disclosure.”
  - M.P.E.P. 2163.I.B
- *Novartis* does not conflict with this standard, and indeed repeats that a limitation “need not be recited in the specification *in haec verba*.”
  - *Novartis Pharms. Corp. v. Accord Healthcare, Inc.*, 38 F.4<sup>th</sup> 1013, 1017 (Fed. Cir. 2022)
- “[T]here is no suggestion of the specific claimed combination nor that a POSITA would alter Figure 6 in the precise way PO proposes to try to match the claims.”
  - Reply 22
- This is not the legal standard for written description

# '140 Application

- Specification sections of '179 patent, '184 patent, '140 application, and Lyren (Ex. 1008) are identical
- ***Providing binaural sound*** to a user and ***altering*** the binaural sound ***after an event occurs***

25 A determination to change from providing the sound in binaural sound to providing the sound in altered binaural or in stereo or mono sounds (or from providing the sound in stereo or mono sounds to providing the sound in binaural sound) can be based on or in response to one or more events, such as data from an event (such as a sensed event) or data from a condition (such as a network condition). For example, an event can trigger or cause the switch to occur. For instance, the switch occurs or executes when the event is sensed, is processed, is received, is transmitted, is obtained, is executed, occurs, stops or ends, begins or commences, is perceived, is heard, etc.

Ex. 1028 ('140 Application) at 106:21-29

- For example, providing binaural sound to a user and altering the binaural sound to alert the user that the user is leaving an environment

# Events that can trigger a change in binaural sound

10 Example embodiments are not limited to a specific type of an event or a specific time  
or duration of an event. As noted, such events can be dynamic or static and selected  
by one or more of a user, a person, apparatus or machine, method, etc. Examples of  
events and things that can trigger events include, but are not limited to, one or more  
15 of a time of day, a calendar day (such as a specific day of the week or day in a  
month), a location (such as a location of an electronic device or of a person listening  
to the sound), actions of a third person (such as a person walking into a room), a  
command or request from a person (such as a person interacting with a user  
interface to switch the sound), a command or request from a machine (such as a  
20 process, software program, intelligent user agent, or intelligent personal assistant  
commanding, requesting, initiating, or executing the switch), processing power (such  
as available processing power of an electronic device during a voice exchange or  
sound localization), bandwidth (such as available transmission and receiving wireless  
bandwidth of an electronic device during a voice exchange or sound localization),  
memory (such as available memory of an electronic device during a voice exchange  
25 or sound localization), position or movement or orientation of a person or head of the  
person (such as direction the person walks or head orientation of the person),  
distance from the person to an object (such as distance from the person to a wall or  
an obstruction), available space (such as how much physical 3D space is available to  
receive and/or localize a sound or voice), safety (such as not localizing sound when  
30 the person is driving a vehicle), proximity to or being at a restricted area (such as  
state, local, or United States Federal regulations prohibiting externally localizing  
sound while in a certain building or on an airplane), time (such as to switch the sound

Ex. 1028 ('140 Application) at 107:10-32

- Not limited to specific type of an event
- Events can be dynamic or static and selected by a user
- Examples
  - Location of person listening to the sound
  - Position or movement of a person such as direction the person walks
  - Distance from person to an object
  - Safety
  - Proximity to restricted area

# Events that can trigger a change in binaural sound

Among other things, events can be triggered by changes in a user's or a remote user's network conditions, system resources, hardware, software, operating system notifications, the passage of time, the granting or denial of various resource and/or file permissions, a change in the ability to detect motion and/or object location and/or orientation and/or position in a physical or a virtual environment, or a change in the ability to detect an environment, its shape, acoustic properties, or noise level. Events are also triggered according to one or more audio cues detected in a user's or a remote user's physical or virtual environment such as cues indicating a location, position, or orientation, or a change in them, cues indicating a reference frame of a user or a remote user, a lateral or vertical motion, a change in distance, a change in a physical or a virtual environment such as its shape, acoustic properties, noise level, or placement of objects or structures in the environment. Events can also be triggered by a change in the spatial or positional congruency between shapes or things within multiple physical or virtual environments, or by a request from a user or a remote user or their application software, operating system, or hardware.

Ex. 1028 ('140 Application) at 140:31-141:14

- Change in ability to detect user's position in a physical or virtual environment
- Change in ability to detect an environment
- Cues detected in a user's physical or virtual environment such as cues indicating a location, position, or orientation, or a changing in them
- Cues indicating a changing in the physical or virtual environment

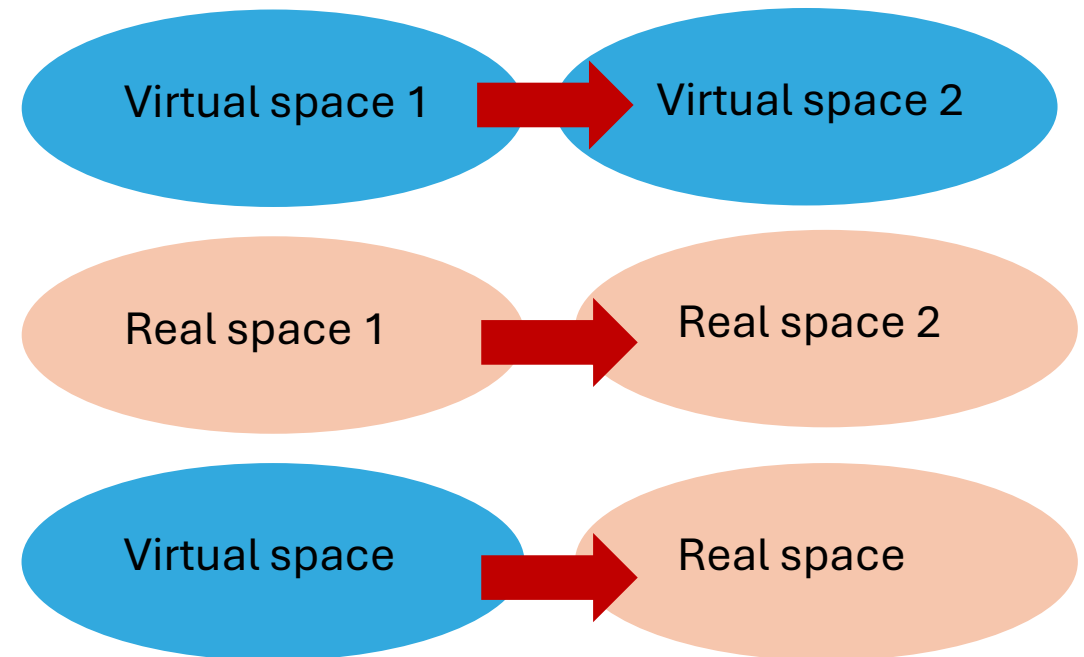
# Events that can trigger a change in binaural sound

15 receives binaural sound with a second set of background sound. A person can receive binaural sound corresponding to one virtual or real or augmented space, and a switch occurs such that the person receives binaural sound from a second virtual or real or augmented space. As yet another example, after an event is detected, a

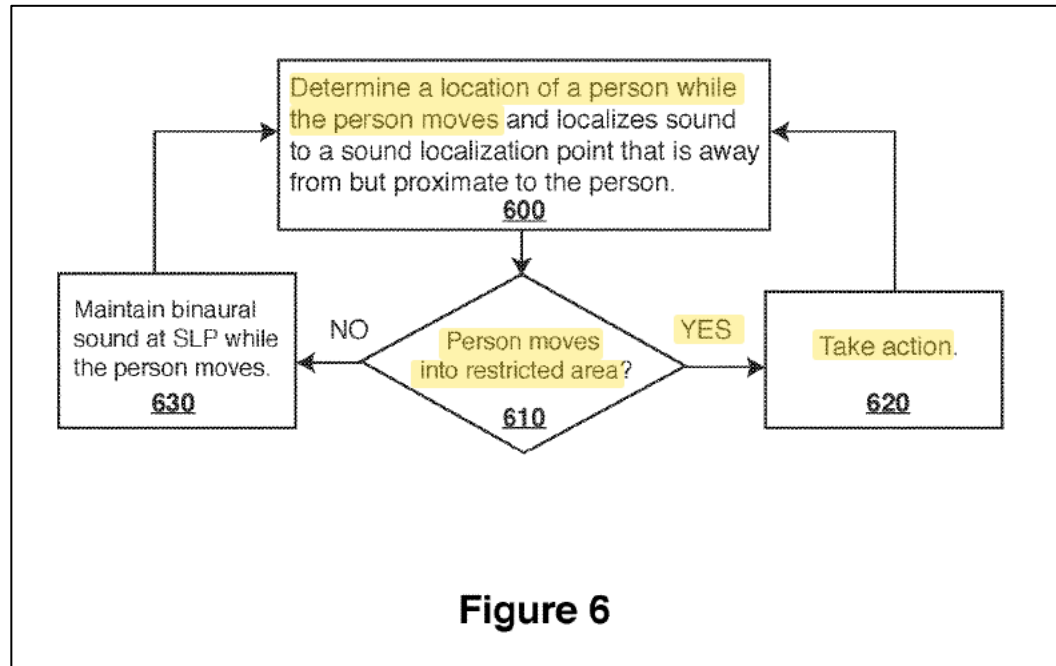
Ex. 1028 ('140 Application) at 113:13-16

Event may be a user moving

- from one virtual space to another virtual space
- from one real (physical) space to another real space
- from one virtual space to a real space



# Restricted area example



Ex. 1028 ('140 Application) at Figure 6

Figure 6 is a method to determine a location of a person and to take an action when the person moves into a restricted area.

20

Block 600 states determine a location of a person while the person moves and localizes sound to a sound localization point that is away from but proximate to the person.

25

Block 610 makes a determination as to whether the person moves into a restricted area.

If the answer to the determination is "yes" then flow proceeds to block 620 that states take action.

30

If the answer to the determination is "no" then flow proceeds to block 630 that states maintain binaural sound at SLP while the person moves.

Ex. 1028 ('140 Application) at 119:18-32

# Restricted area example

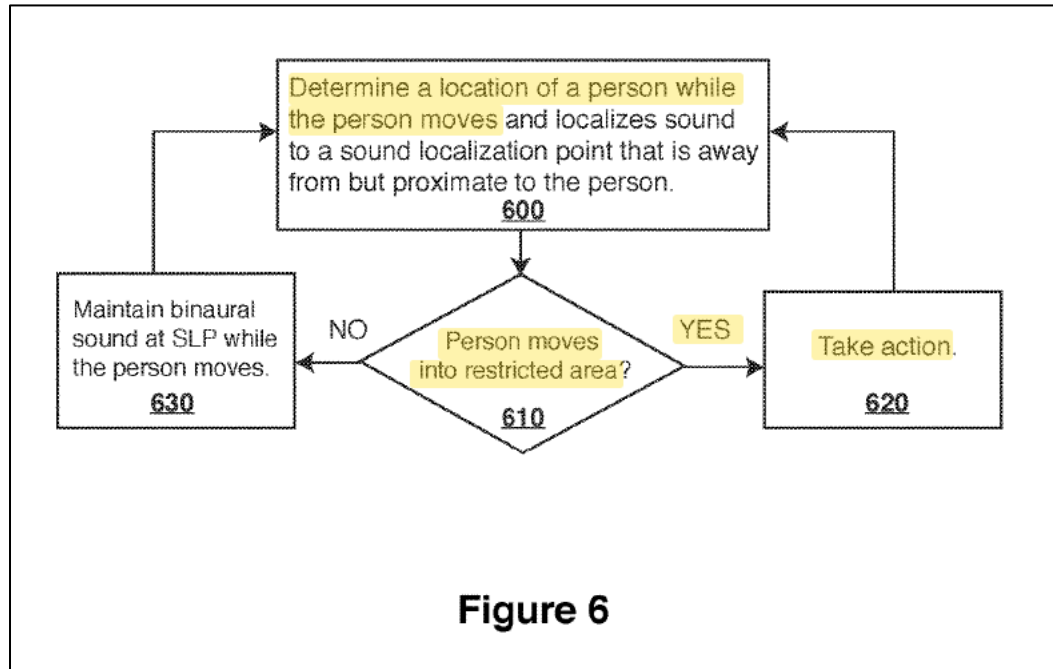


**Figure 6**

Ex. 1028 ('140 Application) at Figure 6

Consider an example in which Alice wears earphones and localizes a voice of Bob in front of her during a phone call. While talking to Bob, Alice gets into her car and begins to drive. The state where Alice is located, however, prohibits drivers from localizing sound while driving a motorized vehicle. The earphones immediately stop localizing the voice of Bob and switch the call from providing Alice with binaural sound to providing Alice with mono sound.

15

20

25

Consider the example above in which Alice wears earphones and localizes a voice of Bob in front of her during a phone call. The car has a sensor that determines Alice is on a binaural call and instructs an HPED of Alice to switch the call to mono. As another example, when Alice enters the car, a system in the car pairs with the HPED and automatically switches the call from binaural to mono. As another example, a GPS device or object recognition device (such as a camera with object recognition software) determine that Alice is entering or in the car and provides a signal to the HPED or other source of the call to switch the call from binaural to mono.

Ex. 1028 ('140 Application) at 120:13-27

Both examples involve change in physical environment and a change in 3D virtual environment (switch from binaural audio to mono audio)

Alice is in a physical environment and in a 3D virtual environment (receiving 3D audio)

Alice gets into her car – leaves her physical environment for a new physical environment

Alice also leaves her 3D virtual environment because her audio changes from being 3D to mono

## Restricted area example

Both examples involve change in physical environment and a change in 3D virtual environment (switch from binaural audio to mono audio)

| start                                                | transition                                                           | end                                                 |
|------------------------------------------------------|----------------------------------------------------------------------|-----------------------------------------------------|
| Alice in physical environment 1                      | Alice gets in her car (leaves physical environment 1)                | Alice in physical environment 2 (her car)           |
| Alice in 3D virtual environment (receiving 3D audio) | Audio switches from binaural to mono (leaves 3D virtual environment) | Alice in different virtual environment (mono sound) |

- Alice is in a physical environment and in a 3D virtual environment (receiving 3D audio)
- Alice gets into her car – leaves her physical environment for a new physical environment
- Alice also leaves her 3D virtual environment because her audio changes from being 3D to mono

# Restricted area example

Petitioner's expert acknowledges that Alice moves to an environment where she is no longer receiving 3D sound

2        So when Alice is outside of the car, she  
3        is getting binaural audio.  
4        Do you recall that from the example we  
5        were just discussing?  
6        **A I do.**  
7        Q So when Alice is getting binaural audio,  
8        is she in a 3D sound environment?  
9        **A Well, the environment that Alice is in**  
10       **when she's outside the car is in the physical**  
11       **environment so she is in an environment and she's**  
12       **hearing through her headphones I believe 3D sound.**  
13       Q And then when she gets in the car, she is  
14       no longer hearing 3D sound; is that correct?  
15       **A That's right. When she went from outside**  
16       **the car to inside the car, her sound switched I**  
17       **believe from binaural to mono.**  
18       Q So when she is inside the car she's in an  
19       environment where she is no longer receiving 3D  
20       sound; is that correct?  
21       **A That's what the example stated.**

Ex. 2014 at 280:2-21

# User leaving an environment/3D virtual environment supported

15 Examples herein can take place in physical spaces, in computer rendered spaces (VR), in partially computer rendered spaces (AR), and in combinations thereof.

Ex. 1028 ('140 Application) at 168:15-16

Thus, while “restricted area” is a physical space, it can also correspond to a virtual space where 3D audio is not permitted

Disclosure in '140 Application, including numerous examples of “events” disclosing user leaving environment/3D virtual environment triggering a change in the binaural sound support the claim language and meets the legal standard

- “the disclosure of the application relied upon ***reasonably conveys*** to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date”
- The claims and the entire specification, including the specific embodiments and figures, should be reviewed to understand how applicant provides support for the various features of the claimed invention

# Alerting/warning user supported

For example, the alert is an audible alert and/or a visual alert to a person. By way of example, such alerts include, but are not limited to, one or more of a displaying a  
5 visual warning, providing an audible sound, displaying or transmitting a message, altering or adding or removing an image or indicia, providing a command or instruction or notice to a process or computer program, actuating a light (such as a light emitting diode or LED), displaying a visual or perceivable indication or warning, playing an announcement, playing a video, and providing another indication that  
10 notifies a user.

Ex. 1028 ('140 Application) at 136:3-10

User would be alerted the user is leaving the first environment, including leaving a physical environment and leaving a 3D virtual environment, by the sound format change

# **Alerting/warning the user that the user is leaving the environment/3D virtual environment is supported**

- limitations 14[e], 7[e], 1[e] of '179 patent
- limitations 14[d], 7[d], 1[d] of '184 patent

# Petitioner relies on incorrect legal standard

Petitioner asserts “no suggestion of the specific claimed combination nor that a POSITA would alter Figure 6 in the precise way PO proposes to try to match the claims”

- Incorrect legal standard
- Correct legal standard: whether the disclosure “reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date”
  - *Ariad Pharms.*, 598 F.3d at 1351-52

# Petitioner asserts language disregarded as boilerplate

- *D Three Enters., LLC v. SunModo Corp.*, 890 F.3d 1042, 1050-51 (Fed. Cir. 2018) is distinguishable
  - “[PHOSITAs] will recognize certain modifications, permutations, additions and sub-combinations therefore. It is therefore intended that the following appended claims hereinafter introduced are interpreted to include all such modifications, permutations, additions and sub-combinations are within their true sprit [sic] and scope.”
  - No actual alternatives provided
  - Held insufficient to show adequate disclosure of the actual combinations
- Here, language is not boilerplate
- Provides particular alternative embodiments in which the examples described extensively throughout the specification can be applied

15 Examples herein can take place in physical spaces, in computer rendered spaces (VR), in partially computer rendered spaces (AR), and in combinations thereof.

Ex. 1028 (‘140 Application) at 168:15-16

# Petitioner asserts language disregarded as boilerplate

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| <p>“[PHOSITAs] will recognize certain modifications, permutations, additions and sub-combinations therefore. It is therefore intended that the following appended claims hereinafter introduced are interpreted to include all such modifications, permutations, additions and sub-combinations are within their true sprit [sic] and scope.”</p> <p><i>D Three Enters., LLC v. SunModo Corp.</i>, 890 F.3d 1042, 1050-51 (Fed. Cir. 2018) (relied upon by Petitioner)</p> | boilerplate                                                  |
| <p>“the present invention may be made to conform to any one of a variety of data transfer algorithms”</p> <p><i>Northrup Grumman Corp. v. Intel Corp.</i>, 325 F.2d 1346, 1356 (Fed. Cir. 2003)</p>                                                                                                                                                                                                                                                                        | not boilerplate<br><br>“substantive, albeit general support” |
| <p>“[w]hile specific configurations of the local display . . . have been described, it is understood that the present invention can be applied to a wide variety of display and vision aid devices”</p> <p><i>Honeywell Int’l., Inc. v. U.S.</i>, 609 F.3d 1292, 1301 (Fed. Cir. 2010)</p>                                                                                                                                                                                 | not boilerplate                                              |
| <p>“Examples herein can take place in physical spaces, in computer rendered spaces (VR), in partially computer rendered spaces (AR), and in combinations thereof”</p> <p>Present case</p>                                                                                                                                                                                                                                                                                  | not boilerplate                                              |

**'179 patent limitations 14[d], 7[d], 1[d]**

## **'179 patent limitations 14[d], 7[d], 1[d]**

- **“determining, with the WED, when the user is leaving the environment” limitations 14[d] and 7[d]**
- **“sensing, with one or more sensors in the HMD, when the user leaves the 3D virtual environment that includes the virtual image” limitation 1[d]**
- Claim Construction
- Ground 1
- Ground 2

# '179 patent limitations 14[d], 7[d], 1[d] – claim construction

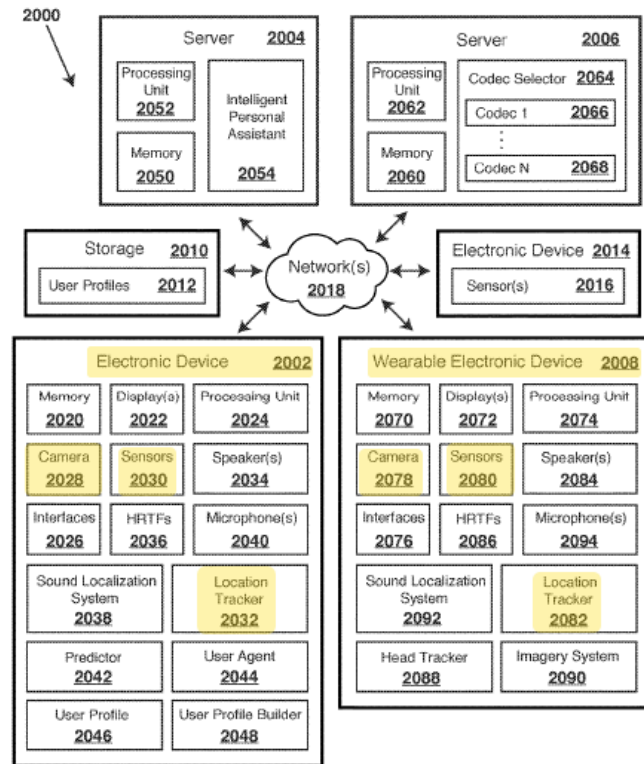


Figure 20

Meta Platforms, Inc.  
Exhibit 1001  
Page 015

By way of example, electronic devices include, but are not limited to, a computer, handheld portable electronic devices (HPEDs), wearable electronic glasses, watches, wearable electronic devices, portable electronic devices,

Ex. 1001 ('179 patent) at 39:9-11

Electronic device 2002 includes one or more components of computer readable medium (CRM) or memory 2020, one or more displays 2022, a processor or processing unit 2024, one or more interfaces 2026 (such as a network interface, a graphical user interface, a natural language user interface, a natural user interface, a reality user interface, a kinetic user interface, touchless user interface, an augmented reality user interface, and/or an interface that combines reality and VR), a camera 2028, one or more sensors 2030 (such as micro-electro-mechanical systems sensor, an activity tracker, a pedometer, a piezoelectric sensor, a biometric sensor, an optical sensor, radio-frequency identification sensor, a global positioning satellite (GPS) sensor, a solid state compass, gyroscope, magnetometer, and/or an accelerometer), a location or motion tracker 2032, one or more speakers 2034, head related transfer functions or HRTFs 2036, a sound localization system 2038 (such as a system that localizes sound, adjusts sound, moves sound, predicts or extrapolates characteristics of sound, manages SLPs, predicts SLPs, and/or executes one or more methods discussed herein), one or more microphones 2040, a predictor 2042, a user agent 2044 (such as an intelligent user agent), a user profile 2046 (including public and private information about a user), and a user profile builder 2048.

Ex. 1001 ('179 patent) at 39:25-48

# '179 patent limitations 14[d], 7[d], 1[d] – claim construction

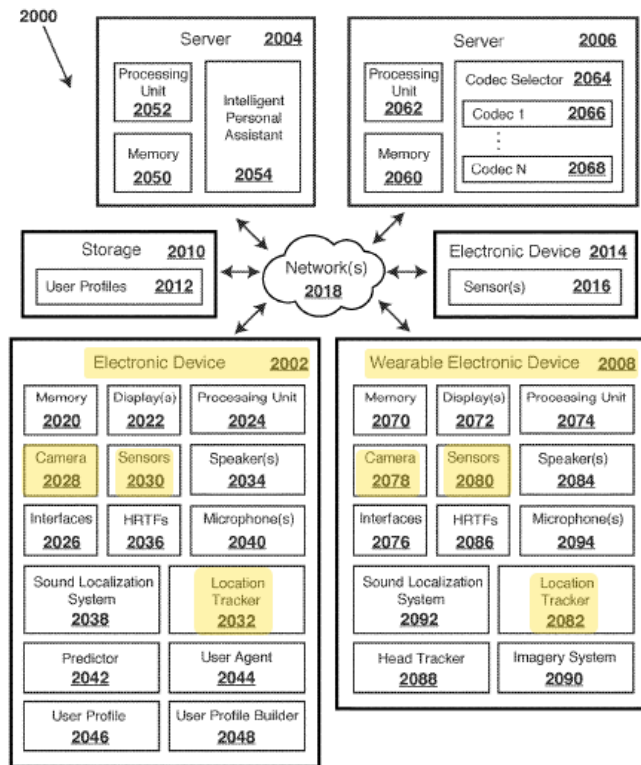


Figure 20

By way of example, the location or motion tracker includes, but is not limited to, a wireless electromagnet motion tracker, a system using active markers or passive markers, a markerless motion capture system, video tracking (e.g. using a camera), a laser, an inertial motion capture system and/or inertial sensors, facial motion capture, a radio frequency system, an infrared motion capture system, an optical motion tracking system, an electronic tagging system, a GPS tracking system, a compass, and an object recognition system (such as using edge detection).

Ex. 1001 ('179 patent) at 40:24-33

- '179 patent discloses the sensors can include, e.g., a GPS and the location tracker can include, e.g., a GPS
- no external stationary tracking device needed to determine user's location and when a user is leaving an environment/3D virtual environment
- no mention of additional external devices to determine when the user is leaving the environment
- WED/HMD self-detects location of user

## **'179 patent limitations 14[d], 7[d], 1[d] – claim construction**

- “determining, with the WED, when the user is leaving the environment” (limitations 14[d] and 7[d]) should be construed consistent with the specification to mean “determining, with the WED, when the user is leaving the environment.”
  - Does not include an independent, stationary tracking device to determine when the user is leaving the environment
- “sensing, with one or more sensors in the HMD, when the user leaves the 3D virtual environment that includes the virtual image” (limitation 1[d]) should be construed consistently

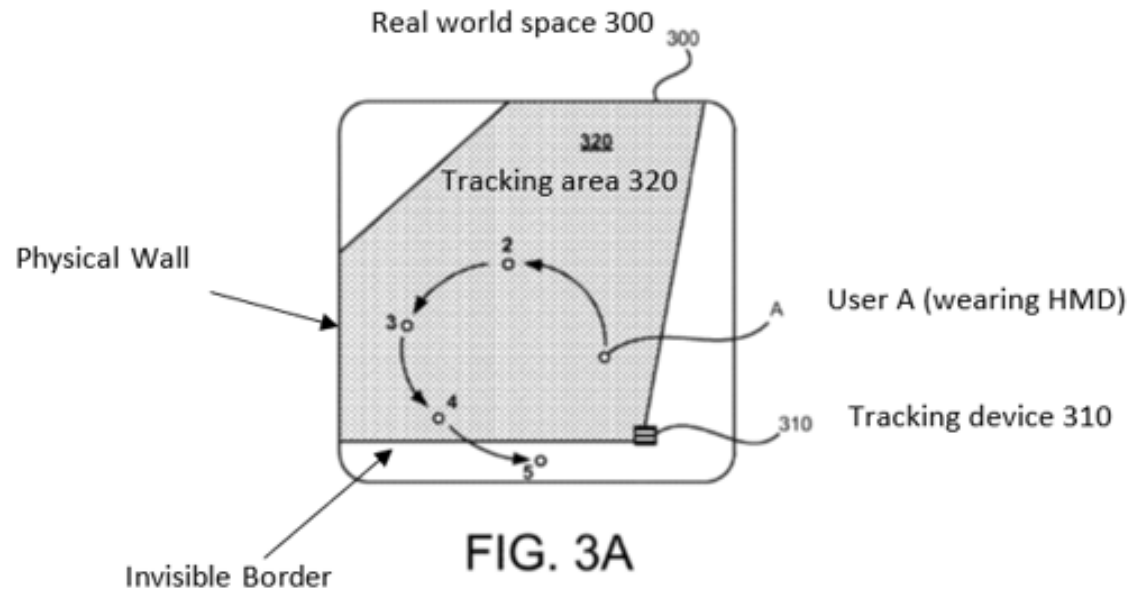
# '179 patent limitations 14[d], 7[d], 1[d] – claim construction

- Petitioner’s Reply: “Even PO’s expert does not agree with PO’s construction. EX.1147, 157:9-158:1; 159:19-160:12.” Reply at 7.
- Dr. Begault did not provide any opinions on the construction of this term.

5           Q     Right.   A WED is receiving information  
6           from a camera and using that to determine when the  
7           user is leaving the environment.  
8                     Does that fit this claim limitation?  
9           MS. PARTRIDGE: Objection. Form.  
10          Objection. Outside the scope.  
11          A     I mean, I'm not an expert on these sort  
12          of camera systems or, you know, tracking systems  
13          in general, and how they might interact with a  
14          WED, I don't know, necessarily, how that would  
15          work. I just know that this is a device that can  
16          determine when somebody's leaving an environment  
17          and the specifics I don't have. I don't think I  
18          indicate anything of that in my declaration.

Ex. 1147, 159:5-17

# Clement does not teach “determining, with the WED, when the user is leaving the environment”



Ex. 1005 (Clement), Fig. 3A (annotations added)

puting device included in the HMD worn by the user. In the example implementation shown in FIG. 3A, a tracking device 310, such as, for example, a camera 310, is positioned in a physical, real world space 300, and is oriented to capture as large a portion of the space 300 as possible with its field of view. This tracking area 320 defined by, for example, the field of view and range of the tracking device 310, is represented by the shaded portion of the space 300 shown in the example illustrated in FIG. 3A. In this example, the

Ex. 1005 (Clement) at 4:22-29

- Clement relies upon a stationary, external tracking device 310 (e.g., camera) outside the wearable electronic device that defines the environment
- “This tracking area 320 defined by, for example, the field of view and range of the tracking device 310...”

# Clement does not teach “determining, with the WED, when the user is leaving the environment”

Clement’s entire disclosure on using HMD to determine user’s position

30 zone meets the boundary of the tracking area 320. As the HMD 100 and/or the tracking device 310, or other component of the system, determines that the user is positioned within the preset threshold (in this particular example, 3 feet of the boundary of the tracking area 320, as at position 3B), the system 100 may initiate a gradual transition out of the virtual world. At position 4, the user has moved closer to the

Ex. 1005 (Clement) at 6:27-30

20 In the absence of a specific command to transition from the virtual world, the HMD 100 and/or the tracking device 310 may determine a current position of the user in the tracking area 320 at block 1030, as described above. If it is

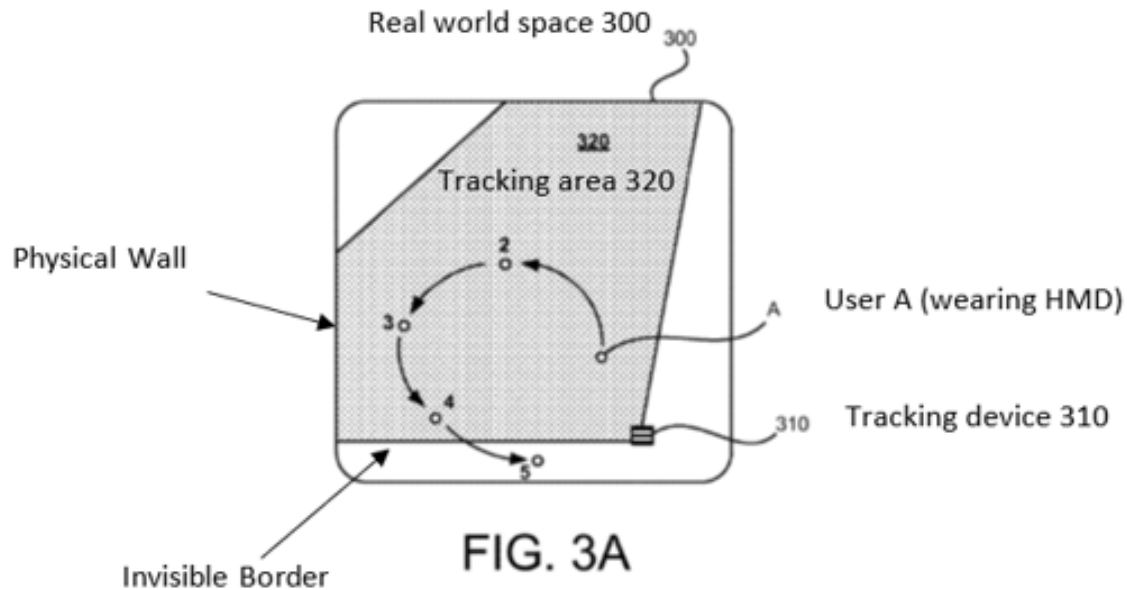
Ex. 1005 (Clement) at 12:20-23

As noted above, after the transition process has been 20 completed, the HMD 100 and/or the tracking device 310 may also detect when the user re-enters the tracking area 320 and may transition from the real world back into the virtual world. In some embodiments, this transition from the real

Ex. 1005 (Clement) at 13:20-22

- Passing mention using “and/or” in three places
- But Clement never discloses **how** its HMD could locate and track a user
- Petitioner’s burden to establish
  - *Raytheon Techs. Corp. v. Gen. Elec. Co.*, 993 F.3d 1374, 1381 (Fed. Cir. 2021) (“evidence of record must still establish that a skilled artisan could have made the claimed invention”)

# Clement does not teach “determining, with the WED, when the user is leaving the environment”



Ex. 1005 (Clement), Fig. 3A (annotations added)

- Clement’s sensors: camera, light sensors, distance/proximity sensors, and an audio sensor. Clement, 3:30-33 and 3:54-57.
- Clement’s sensors are only capable of detecting physical obstacles or objects
- Only able to detect a proximity to physical boundaries of the tracking area 320.
- Clement never explains how the sensors of its HMD can detect a boundary of the tracking area, much less an invisible border that is not a physical boundary. Id., 7:4–16.
- Clement must employ the tracking device 310 for tracking a user’s position within the tracking area 320 along with the HMD for tracking a user’s proximity to physical obstacles, such as a wall.

# Petitioner's expert could not answer how POSITA would know

- Petitioner's Expert

15 Q So as a person of ordinary skill in the  
16 art, what is that saying to you in terms of how  
17 the sensor is located on the HMD can determine the  
18 position of the user in the tracked area?  
19 A Well, to be honest with you, the mechanics  
20 of how the HMD and how the sensors figure out  
21 where a person is located is not as important as  
22 the fact that the HMD is determining the location  
204  
1 of the user. I'll tell you why. Because for a  
2 person of ordinary skill, it would have been  
3 obvious that an HMD – based on Clement's  
4 description a HMD can locate and track a user  
5 within the space.

Ex. 2014 203:19-204:5

6 A Clement discloses that the tracking may be  
7 done by a tracking device and/or the HMD 100 as we  
8 went through the example a few minutes ago.  
9 BY MS. PIANA:  
10 Q Is that the most level of detail that  
11 Clement discloses regarding how the HMD can be  
12 used by itself to determine a user's position in  
13 the tracking area 320?  
14 MR. HENRY: Objection to form, ambiguous.  
15 BY THE WITNESS:  
16 A So Clement lists in a few locations and I  
17 pointed to one, I can probably find others that I  
18 know I found before, that the tracking can be done  
19 by the HMD. He lists this in a number of  
20 locations. He says that the tracking can be done  
21 by the tracking device and/or the HMD so, I mean,  
22 so it's obvious that Clement disclosed here that  
222  
1 the tracking can be done by the HMD.

Ex. 2014 221:10-222:1

13 If there is camera on the HMD on the  
14 display and the user is moving from position 4 to  
15 position 5, how would the camera know that the  
16 eyes user has crossed that boundary at the bottom  
17 of Figure 3A the horizontal boundary that we  
18 previously established is not a physical wall?  
19 A I think that the important thing here is  
20 Clement describes an example of – let me  
21 rephrase. Let me start over.  
22 Clement describes in multiple parts in

225  
1 his -- in the document that the tracking can be  
2 done, yes, by the tracking device 310, but he also  
3 says that the tracking can be done by the HMD or  
4 it another component of the system. And the  
5 specific way of how this is done is maybe  
6 secondary to this but what is important and what a  
7 POSA would have focused on is that, okay, I have a  
8 HMD, Clement disclosed that, I can track the  
9 user's location by the HMD or in this case an  
10 external tracking device but I can also do it on  
11 the HMD.

Ex. 2014 224:15-225:6

- Could not answer how a POSITA would know how to make Clement's HMD determine when a user is leaving the environment without using the stationary tracking device

# Petitioner's Reply

- First, Petitioner points to Clement

as well as gyroscopes. Ex.2014, 202:6-13. The crucial disclosure, however, is Clement's teaching that the HMD is capable of locating and tracking the user.

Ex.2014 205:12-16. For example, Clement describes that a sensor on the HMD such as a proximity sensor or "the camera 180 of the HMD 100 may detect" proximity of the user to the boundary of the tracking area. Clement 7:7-16. Indeed, POSAs knew

Ex. 1146 ¶99

12 how he might do this. But, again, I think that  
13 the more important lesson that Clement teaches and  
14 that he teaches through this patent is that the  
15 HMD has the capability of locating a user and  
16 tracking a user.

Ex. 2014 205:12-16

zone meets the boundary of the tracking area 320. As the HMD 100 and/or the tracking device 310, or other component of the system, determines that the user is positioned within the preset threshold (in this particular example, 3 feet of the boundary of the tracking area 320, as at position 3B), the system 100 may initiate a gradual transition out of the virtual world. At position 4, the user has moved closer to the

Ex. 1005 (Clement) at 6:27-30

20 In the absence of a specific command to transition from the virtual world, the HMD 100 and/or the tracking device 310 may determine a current position of the user in the tracking area 320 at block 1030, as described above. If it is

Ex. 1005 (Clement) at 12:20-23

As noted above, after the transition process has been completed, the HMD 100 and/or the tracking device 310 may also detect when the user re-enters the tracking area 320 and may transition from the real world back into the virtual world. In some embodiments, this transition from the real

Ex. 1005 (Clement) at 13:20-22

# Petitioner's *new* argument in Reply

- Second, Petitioner points to Pedrotti and Donner:

the user to the boundary of the tracking area. Clement 7:7-16. Indeed, POSAs knew before the time of the alleged inventions that HMDs could independently determine position and orientation information and when a user is leaving an environment using cameras, light-emitting trackers, inertial sensors (e.g., accelerometers and/or gyroscopes), and any type of tracker (e.g., magnetic, optical, electrical, sonar, radar, ultrasonic, or any combination thereof). See Ex.1080 (Pedrotti) 5:8-24; 4:59-61 (“Such trackers, and the processors which determine the position and orientation of such trackers, are well known to those of skill in the art.”); see also Ex.1150 (Donner) [0013] (HMD based display system “determines the current pose (that is, one or both of position and rotational orientation)” of the HMD “relative to reference coordinate frame (that is, ‘world space’) and then generates imagery of a scene from a perspective associated with that pose (that is, ‘screen space’).”), [0027-0028] (hardware includes an inertial management unit (IMU) (including, for example a gyroscope, magnetometer, and accelerometer), image capture, image sensors, structured-light or time-of flight (ToF) depth sensor). From these teachings a POSA would have been able to use the sensors on Clement’s HMD to determine that the user is leaving the environment independent of a stationary tracking device.

# Petitioner's *new* argument in Reply

- Neither Pedrotti nor Donner relied upon in Grounds

**II. Identification of Challenges (37 C.F.R. § 42.104(b))**

- **Ground 1:** Claims 1, 3-4, 6-10, and 14-19 are unpatentable under 35 U.S.C. § 103 over **Clement** (Ex.1005) with **Osman** (Ex.1006) and **Sauk** (Ex.1007).
- **Ground 2:** All claims are unpatentable under § 103 over **Lyren** (Ex.1008) with **Reif** (Ex.1009).

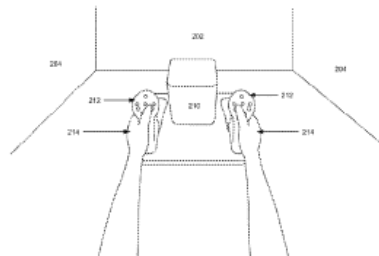
Petition (Paper 2) at 2

- “It is of the utmost importance that petitioners in the IPR proceedings adhere to the requirement that the initial petition identify ‘with particularity’ the ‘evidence that supports the grounds for the challenge to each claim.’”
  - *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369-70 (Fed. Cir. 2016)

Ex. 1146 ¶199

# Pedrotti

|                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (12) <b>United States Patent</b><br><b>Pedrotti et al.</b>                                                                                                                                                                                             | (10) <b>Patent No.:</b> <b>US 9,851,786 B2</b><br>(45) <b>Date of Patent:</b> <b>Dec. 26, 2017</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| (54) <b>SYSTEM AND METHOD FOR ASSISTING A USER IN REMAINING IN A SELECTED AREA WHILE THE USER IS IN A VIRTUAL REALITY ENVIRONMENT</b>                                                                                                                  | (58) <b>Field of Classification Search</b><br>None<br>See application file for complete search history.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| (71) Applicant: <b>Sixense Entertainment, Inc.</b> , Los Gatos, CA (US)                                                                                                                                                                                | (56) <b>References Cited</b><br><b>U.S. PATENT DOCUMENTS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| (72) Inventors: <b>Owen Walter Pedrotti</b> , Daly City, CA (US); <b>Alejandro Santiago Diaz</b> , Ross, CA (US); <b>Steven L. Brame</b> , San Francisco, CA (US); <b>Danny G. Woodall</b> , Kirkland, WA (US); <b>Amir Rubin</b> , Los Gatos, CA (US) | 6,714,213 B1 3/2004 Lithicum et al.<br>2005/0123171 A1* 6/2005 Kobayashi ..... G06F 3/011 382/103<br>(Continued)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| (73) Assignee: <b>Sixense Entertainment, Inc.</b> , Los Gatos, CA (US)                                                                                                                                                                                 | <b>OTHER PUBLICATIONS</b><br>Gabriel Cito, Peter Vangoor, Emmanuelle Chapoulie, Maud Marchal, Anatole Lecuyer, George Drettakis, Walking in a Cube: Novel Metaphors for Safely Navigating Large Virtual Environments in Restricted Real Workspaces, 2012 IEEE Transactions on Visualization and Computer Graphics, Institute of Electrical and Electronics Engineers, 18(4):546-554.*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 116 days.                                                                                                                             | (Continued)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| (21) Appl. No.: <b>14/793,731</b>                                                                                                                                                                                                                      | <b>Primary Examiner</b> —Michael J Cobb                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| (22) Filed: <b>Jul. 7, 2015</b>                                                                                                                                                                                                                        | (74) <b>Attorney, Agent, or Firm</b> —Gard & Kaslow LLP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| (65) <b>Prior Publication Data</b><br>US 2016/0171771 A1 Jun. 16, 2016                                                                                                                                                                                 | (57) <b>ABSTRACT</b><br>A method and apparatus is disclosed for assisting a user, wearing a head mounted display (HMD) that covers a user's field of vision and has a tracker providing information regarding the position and orientation of the HMD, in locating a physical controller located on a physical base station. A processor causes the HMD to display a virtual world, including a virtual representation of the physical base station and physical controller along with a virtual hand that helps guide the user to the physical base station to allow the user to pick up the physical controller. Another embodiment allows an area in the physical world to be defined within which the user should remain, for example to avoid physical obstacles. The processor causes the HMD to display a warning, such as a virtual fence, to alert the user if the user approaches to within a preselected distance of the boundary. |
| <b>Related U.S. Application Data</b><br>Provisional application No. 62/090,314, filed on Dec. 10, 2014.                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| (51) <b>Int. Cl.</b><br><b>G06F 3/01</b> (2006.01)<br><b>G02B 27/01</b> (2006.01)<br><b>G06F 3/00</b> (2006.01)                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| (52) <b>U.S. Cl.</b><br>CPC ..... <b>G06F 3/012</b> (2013.01); <b>G02B 27/017</b> (2013.01); <b>G06F 3/002</b> (2013.01); <b>G06F 3/011</b> (2013.01);<br>(Continued)                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |



Meta Platforms, Inc.  
Exhibit 1080  
Page 001

Attached to or incorporated in the HMD 106 is a tracker 108, which can be used to determine the position and orientation of the headset 104, and thus of the head of user 102, by, for example, sensing an electromagnetic field generated from a local base station, video game console or other apparatus (not shown). The tracker 108 provides

Ex. 1080 (Pedrotti) at 4:49-54

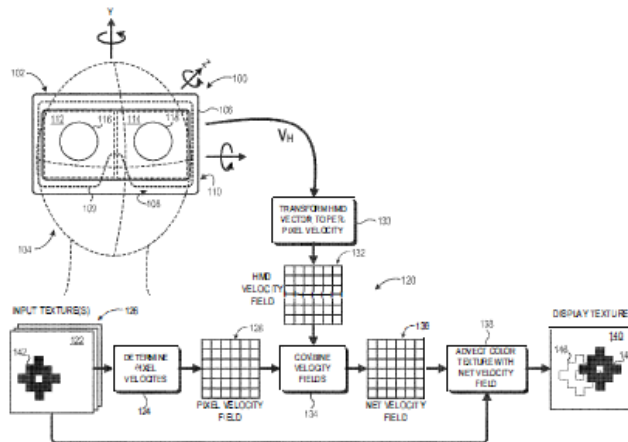
110 will also be known to those of skill in the art. In addition to tracker 108 in HMD 106, handheld controller 110 may also have a tracker, from which a processor can derive the position and orientation of handheld controller 110 relative to the base station, by any of the tracking techniques described above. Techniques for identifying multiple trackers and distinguishing the position and orientation of each are well known to those of skill in the art.

Ex. 1080 (Pedrotti) at 5:29-34

# Donner

(19) **United States**  
 (12) **Patent Application Publication** (10) Pub. No.: **US 2017/0148206 A1**  
 Donner et al. (43) Pub. Date: **May 25, 2017**

(54) **ELECTRONIC DISPLAY STABILIZATION USING PIXEL VELOCITIES**  
 (71) Applicant: **Google Inc.**, Mountain View, CA (US)  
 (72) Inventors: **Craig Donner**, Brisbane, CA (US);  
**Paul Albert Lakende**, Sunnyvale, CA (US); **Evan Hardesty Parker**, Los Altos, CA (US)  
 (21) Appl. No.: **14/946,983**  
 (22) Filed: **Nov. 20, 2015**  
**Publication Classification**  
 (51) Int. Cl. **G06T 15/04** (2006.01)  
**G06T 7/20** (2006.01)  
**G02B 27/00** (2006.01)  
**G06F 3/01** (2006.01)  
**H04N 13/04** (2006.01)  
**G02B 27/01** (2006.01)  
**G06T 19/00** (2006.01)  
**G06T 7/40** (2006.01)  
 (52) U.S. CL. **G06T 15/04** (2013.01); **G06T 19/006** (2013.01); **G06T 7/2086** (2013.01); **G06T 7/408** (2013.01); **G06F 3/012** (2013.01); **H04N 13/044** (2013.01); **G02B 27/012** (2013.01); **G02B 27/0093** (2013.01); **G06T 2200/04** (2013.01); **G02B 2027/014** (2013.01)  
 (57) **ABSTRACT**  
 A system includes a head mounted display (HMD) device comprising at least one display and at least one sensor to provide pose information for the HMD device. The system further includes a sensor integrator module coupled to the at least one sensor, the sensor integrator module to determine a motion vector for the HMD device based on the pose information, and an application processor to render a first texture based on pose of the HMD device determined from the pose information. The system further includes a motion analysis module to determine a first velocity field having a pixel velocity for at least a subset of pixels of the first texture, and a compositor to render a second texture based on the first texture, the first velocity field and the motion vector for the HMD, and to provide the second texture to the display of the HMD device.



[0003] HMD-based VR and AR systems display 3D imagery as a sequence of display textures (or “frames”), each display texture rendered based on a corresponding detected head pose and persisting for a particular period of time. However, as an HMD device generally permits a user to move freely about, the user’s head may have perceptibly moved in the time between the initiation of the rendering of a texture and the display of the resulting rendered texture. As such, the imagery displayed at the HMD device at a particular point in time may lag behind the user’s head movements. Further, virtual objects in the scene may be “in motion” and thus the rendered positions of the virtual objects may differ from where the objects should appear if the frame was rendered at the correct time. This dissonance between the user’s perceived orientation within a scene, as well as perceived orientation of objects within that scene, and the actual orientation of the scene and objects contained therein can lead to user disorientation or discomfort, or what is often referred to as “virtual reality sickness”. Thus, to reduce or eliminate user discomfort and thereby provide improved presence, HMD-based VR and AR systems seek to minimize the motion-to-photon latency; that is, the latency between a user head/eye movement and when photons representing a scene from the resulting new pose hit the user’s eye.

Ex. 1150 (Donner) at ¶3

Meta  
 Exhibit 1150  
 Meta v. BKHZ  
 IPR2023-01019  
 Ex. 1150-001

# Clement does not teach “determining, with the WED, when the user is leaving the environment”

- Pointing to Clement fails
- Pointing to Pedrotti and Donner fails
- Petitioner’s burden to establish; has not been disputed
  - *Raytheon Techs. Corp. v. Gen. Elec. Co.*, 993 F.3d 1374, 1381 (Fed. Cir. 2021) (“evidence of record must still establish that a skilled artisan could have made the claimed invention”)
- Clement discloses only using a tracking device that is stationary and separate from the HMD to detect when the user is within a proximity of a boundary of a tracking area throughout its disclosure.
  - Clement, 1:31-42, 43-50; 4:15-19, 21-29, 49-53; 5:41-44, 55-60.

# **Clement does not teach “determining, with the WED, when the user is leaving the environment”**

- No evidence of record that establishes a skilled artisan could have made the claimed invention in the ‘179 patent based on the disclosure of Clement
- Clement is inoperable as a prior art reference to teach “determining, with the WED, when the user is leaving the environment,” as recited in limitations 14[d], 7[d] and “sensing, with one or more sensors in the HMD, when the user leaves the 3D virtual environment” recited in limitation in 1[d].

## **'179 patent limitations 7[d], 14[d], 1[d] – Ground 2**

- “determining, with the WED, when the user is leaving the environment” (limitations 7[d] and 14[d])
- “sensing, with one or more sensors in the HMD, when the user leaves the 3D virtual environment that includes the virtual image” (limitation 1[d])
- Supported by the ‘140 Application

Ex. 1147, 159:5-17

# Legal standard for written description

## Legal standard

- Written description satisfied when “the disclosure of the application relied upon ***reasonably conveys*** to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date”
  - *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351–52 (Fed. Cir. 2010) (emphasis added)
- The claims and the entire specification, including the specific embodiments and figures, should be reviewed to understand how applicant provides support for the various features of the claimed invention
  - M.P.E.P. §2163, II, A, 2
- The subject matter of the claim need not be described literally (i.e., using the same terms or *in haec verba*) for the disclosure to satisfy the written description requirement
  - See M.P.E.P. §2163.02

Ex. 1147, 159:5-17

# ‘140 Application supports “determining, with the WED, when the user is leaving the environment”

- ‘140 Application discloses a user leaving an environment/3D virtual environment
- User leaving an environment/3D virtual environment is triggered by a user’s change in physical location (e.g., a user leaving a non-restricted area)

| start                                                | transition                                                           | end                                                 |
|------------------------------------------------------|----------------------------------------------------------------------|-----------------------------------------------------|
| Alice in physical environment 1                      | Alice gets in her car (leaves physical environment 1)                | Alice in physical environment 2 (her car)           |
| Alice in 3D virtual environment (receiving 3D audio) | Audio switches from binaural to mono (leaves 3D virtual environment) | Alice in different virtual environment (mono sound) |

# WED includes a location tracker

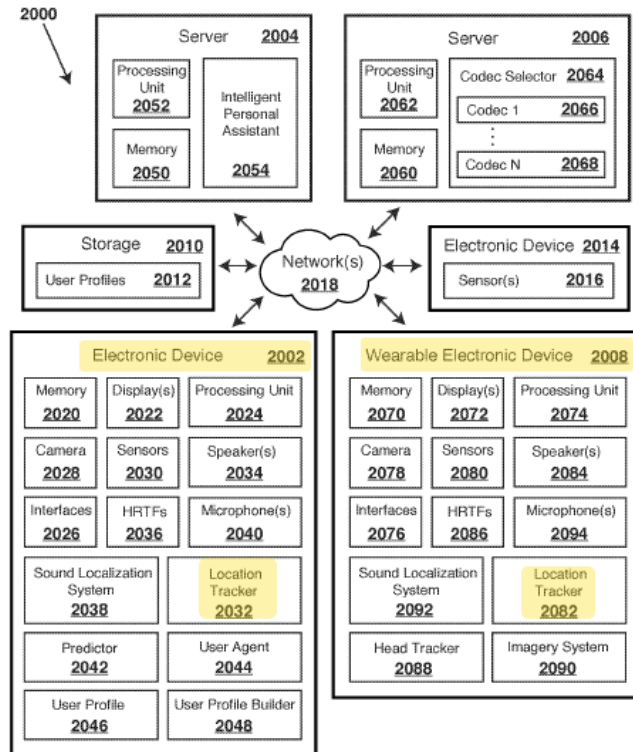


Figure 20

- 5 By way of example, electronic devices include, but are not limited to, a computer, handheld portable electronic devices (HPEDs), wearable electronic glasses, watches, wearable electronic devices, portable electronic devices, computing devices,
- Ex. 1028 ('140 Application) at 159:5-7

- Electronic device 2002 includes one or more components of computer readable medium (CRM) or memory 2020, one or more displays 2022, a processor or
- 20 processing unit 2024, one or more interfaces 2026 (such as a network interface, a graphical user interface, a natural language user interface, a natural user interface, a reality user interface, a kinetic user interface, touchless user interface, an augmented reality user interface, and/or an interface that combines reality and VR), a camera 2028, one or more sensors 2030 (such as micro-electro-mechanical systems sensor, an activity tracker, a pedometer, a piezoelectric sensor, a biometric sensor, an optical
- 25 sensor, radio-frequency identification sensor, a global positioning satellite (GPS) sensor, a solid state compass, gyroscope, magnetometer, and/or an accelerometer), a location or motion tracker 2032, one or more speakers 2034, head related transfer functions or HRTFs 2036, a sound localization system 2038 (such as a system that
- 30 localizes sound, adjusts sound, moves sound, predicts or extrapolates characteristics of sound, manages SLPs, predicts SLPs, and/or executes one or more methods discussed herein), one or more microphones 2040, a predictor 2042, a user agent
- Ex. 1028 ('140 Application) at 159:18-32

# ‘140 Application supports “determining, with the WED, when the user is leaving the environment”

- Location tracker in the WED determines when the user is leaving the environment/3D virtual environment
- “GPS or object recognition device” in Alice/Bob example
- “Blocks and/or methods ... can be executed ... by ... an electronic device”
- Electronic devices include WED
- Thus Alice’s WED may include a visual image (for example in an AR context), determine when Alice is leaving the non-restricted area for the restricted area, and alert Alice by the change in the 3D sound

POR (‘179) 57-58  
POSR (‘179) 23-26

- 20 Consider the example above in which Alice wears earphones and localizes a voice of Bob in front of her during a phone call. The car has a sensor that determines Alice is on a binaural call and instructs an HPED of Alice to switch the call to mono. As another example, when Alice enters the car, a system in the car pairs with the HPED and automatically switches the call from binaural to mono. As another example, a
- 25 GPS device or object recognition device (such as a camera with object recognition software) determine that Alice is entering or in the car and provides a signal to the HPED or other source of the call to switch the call from binaural to mono.

Ex. 1028 (‘140 Application) at 120:20-27

- 10 Blocks and/or methods discussed herein can be executed and/or made by a user, a user agent (including machine learning agents and intelligent user agents), a software application, an electronic device, a computer, firmware, hardware, a process, a computer system, and/or an intelligent personal assistant. Furthermore, blocks and/or methods discussed herein can be executed automatically with or without instruction from a user.

Ex. 1028 (‘140 Application) at 167:9-14

## **‘140 Application supports “determining, with the WED, when the user is leaving the environment”**

- POSITA would understand that embodiments described in ‘140 Application may be implemented with the WED (claims 14 and 7) or with the HMD (claim 1)
- WED is a type of electronic device described as executing actions triggered by the detected events of the ‘140 Application
- Disclosure “reasonably conveys” to one skilled in the art that the WED determines the user is leaving the environment/3D virtual environment

# Petitioner asserts language disregarded as boilerplate

- Language is not boilerplate
- Adds broadening statement that provides specific applications for the execution of blocks/methods disclosed in the '140 Application

10      Blocks and/or methods discussed herein can be executed and/or made by a user, a user agent (including machine learning agents and intelligent user agents), a software application, an electronic device, a computer, firmware, hardware, a process, a computer system, and/or an intelligent personal assistant. Furthermore, blocks and/or methods discussed herein can be executed automatically with or without instruction from a user.

Ex. 1028 ('140 Application) at 167:9-14

# Not wearing an HMD or WED

Petitioner asserts examples do not include a user “even wearing a HMD or other WED displaying a virtual environment”

- 3D virtual environment does not require visual display; 3D aspects of 3D virtual environment can be the binaural (3D) audio
- Alice has an HPED (handheld portable electronic device)
- GPS or object recognition device determine that Alice is entering or in the car
- WED includes a “location or movement tracker”

15 Consider an example in which Alice wears earphones and localizes a voice of Bob in front of her during a phone call. While talking to Bob, Alice gets into her car and begins to drive. The state where Alice is located, however, prohibits drivers from localizing sound while driving a motorized vehicle. The earphones immediately stop localizing the voice of Bob and switch the call from providing Alice with binaural sound to providing Alice with mono sound.

20 Consider the example above in which Alice wears earphones and localizes a voice of Bob in front of her during a phone call. The car has a sensor that determines Alice is on a binaural call and instructs an HPED of Alice to switch the call to mono. As another example, when Alice enters the car, a system in the car pairs with the HPED and automatically switches the call from binaural to mono. As another example, a  
25 GPS device or object recognition device (such as a camera with object recognition software) determine that Alice is entering or in the car and provides a signal to the HPED or other source of the call to switch the call from binaural to mono.

Ex. 1028 (‘140 Application) at 120:13-27

15 Examples herein can take place in physical spaces, in computer rendered spaces (VR), in partially computer rendered spaces (AR), and in combinations thereof.

Ex. 1028 (‘140 Application) at 168:15-16

# Not wearing an HMD or WED

Other examples disclose user wearing HMD and experiencing visual images where event occurs and sound switches from binaural to mono

- Scenario 114 user wears optical HMD
- Plurality of sound localization points (SLPs) during call with four individuals
- Each individual represented with a visual image
- SLP walks through a door and out of view of the user
- Sound changes from binaural to mono

25 In scenario 114, a user 150 wears an optical head mounted display (OHMD) 152 that simultaneously provides a plurality of sound localization points 154, 155, 156, and 157 during a conference call with four individuals (each individual being represented with a visual image and accompanying SLP). As such, the sound localization points 154 – 157 coincide with visual displays or images of people with whom the user 150 talks. As shown in the transition from box 160A to box 160B, sound localization point 154 (appearing as a visual image of person) walks through a door and out of view of the user 150. When this occurs, the SLS providing sound to the OHMD 152 switches the voice of the corresponding person to mono, and the system providing video to the

30 OHMD 152 removes the accompanying visual image of the person from being displayed to the user 150.

Ex. 1028 ('140 Application) at 103:21-31

# Challenged claims are patentable

Ground 1 fails

- No motivation to combine Clement, Osman, Sauk
- Even if combined, does not disclose all claim limitations
  - alerting/warning the user ... by decreasing volume and/or altering binaural sound
  - determining, with the WED, when the user is leaving the environment

Ground 2 fails

- ‘140 Application disclosure “***reasonably conveys***” to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date
  - alerting/warning the user that the user is leaving the environment/3D virtual environment
  - determining, with the WED, when the user is leaving the environment

IPR2023-01019 (Patent 10,368,179)  
IPR2023-01020 (Patent 10,448,184)

Patent Owner's Demonstratives

**CERTIFICATE OF SERVICE**

I hereby certify that on September 3, 2024, I caused a true and correct copy of the foregoing Patent Owner's Demonstratives to be served via electronic mail upon the following attorneys of record for the Petitioner:

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