

Petition for *Inter Partes* Review of
U.S. Patent No. 10,828,559 B2

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

META PLATFORMS, INC.,
Petitioner

v.

MULLEN INDUSTRIES LLC,
Patent Owner.

Case IPR2025-00740
U.S. Patent No. 10,828,559 B2
Issue Date: November 10, 2020

Title: LOCATION-BASED GAMES AND
AUGMENTED REALITY SYSTEMS

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 10,828,559 B2**

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List of Exhibits

Exhibit No.	Description of Document
1001	U.S. Patent No. 10,828,559 B2 to Jeffrey David Mullen (filed December 14, 2018, issued November 10, 2020) (“ ’559 ” or “ ’559 patent ”)
1002	Declaration of Jeremy Cooperstock, Ph.D. (“ Cooperstock ”)
1003	U.S. Patent No. 6,166,744 to Ivan J. Jaszlics et al. (filed Sep. 15, 1998; issued Dec. 26, 2000) (“ Jaszlics ”)
1004	U.S. Patent No. 6,369,952 B1 to Richard Dennis Rallison et al. (filed Aug. 17, 1999; issued Apr. 9, 2002) (“ Rallison ”)
1005	U.S. Patent No. 6,411,266 B1 to Francis J. Maguire, Jr. (filed Nov. 17, 1995; issued Jun. 25, 2002) (“ Maguire ”)
1006-1007	(Reserved)
1008	Int’l Patent App. Pub. No. WO 2003/107039 A2 to Eli Sofer et al. (filed Jun. 12, 2003; published Dec. 24, 2003) (“ Sofer ”)
1009	U.S. Patent App. Pub. No. 2002/0163486 A1 to Peter A. Ronzani et al. (filed May 16, 1997; published Nov. 7, 2002) (“ Ronzani ”)
1010	(Reserved)
1011	U.S. Provisional Patent App. No. 60/066,904 (“ Jaszlics Provisional ”)
1012	Excerpts from Microsoft Computer Dictionary (5th ed. 2002)
1013	J. P. Rolland et al., “A Comparison of Optical and Video See-Through Head-Mounted Displays,” SPIE Vol. 2351 Telemanipulator and Telepresence Technologies (1994), pp.293-307 (“ Rolland ”)
1014	Excerpts from IEEE 100 : The Authoritative Dictionary of IEEE Standard Terms (7th ed. 2000)
1015	Excerpts from Joseph Angelo, Dictionary of Space Technology (1999)
1016	’559 Patent File History
1017	Declaration of Ingrid Hsieh-Yee, Ph.D. (“ Hsieh-Yee ”)

Petition for *Inter Partes* Review of
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List of Exhibits

Exhibit No.	Description of Document
1018	Proof of Service of Complaint

I. MANDATORY NOTICES UNDER §42.8(A)(1)

A. Real Party-In-Interest under §42.8.(b)(1)

Meta Platforms, Inc. is the real party-in-interest to this IPR petition.

B. Related Matters under §42.8(b)(2)

The '559 patent is the subject of pending litigation involving Petitioner: *Mullen Industries LLC v. Meta Platforms, Inc.*, Case No. 1:24-cv-00354-DAE (W.D. Tex.). Petitioner was served on April 5, 2024. (EX1018, p.003.)

Petitioner is filing IPR petitions against twelve related patents asserted by Patent Owner in the pending litigation involving Petitioner:

U.S. Patent No.	IPR Case
8,585,476 B2	IPR2025-00737
9,744,448 B2	IPR2025-00738
10,179,277 B2	IPR2025-00739
10,828,559 B2	IPR2025-00740
10,967,270 B2	IPR2025-00702
11,033,821 B2	IPR2025-00703
11,376,493 B2	IPR2025-00741
11,904,243 B2	IPR2025-00742
11,947,716 B2	IPR2025-00743
12,019,791 B2	IPR2025-00744
9,662,582 B2	IPR2025-00745
10,974,151 B2	IPR2025-00746

C. Lead and Back-Up Counsel under §42.8(b)(3)

Petitioner provides the following designation of counsel.

Petition for *Inter Partes* Review of
U.S. Patent No. 10,828,559 B2

LEAD COUNSEL	BACK-UP COUNSEL
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D. Service Information

This Petition is being served by Federal Express to the attorney of record for the '559 patent, 32733 - JEFFREY D. MULLEN, 2212 Hassinger Lane, Glenshaw, PA 15116. Petitioner consents to electronic service at the addresses provided above for lead and back-up counsel.

II. FEE PAYMENT

Petitioner requests review of four claims, with a \$51,875 payment.

**III. REQUIREMENTS UNDER §§ 42.104 AND 42.108 AND
CONSIDERATIONS UNDER §§ 314(A) AND 325(D)**

A. Grounds for Standing

Petitioner certifies that the '559 patent is available for IPR and that Petitioner is not barred or otherwise estopped.

B. Identification of Challenge and Statement of Precise Relief Requested

Petitioner requests IPR institution based on:

Ground	Claims	Basis for Challenge under §103
1	1, 12, 17, 20	Jaszlics in view of Rallison, Sofer, and Ronzani

Submitted with this Petition is the Declaration of Jeremy Cooperstock, Ph.D. (EX1002) (“Cooperstock”), a qualified technical expert. (EX1002, ¶¶1-18, Appendix A.)

C. Considerations Under §§ 314(a) and 325(d)

§314(a): The *General Plastic* factors are not relevant as this is the first and only IPR petition filed by Petitioner with respect to the '559 patent.

Nor do the *Fintiv* factors support discretionary denial under §314(a). The pending litigation against Petitioner is in relatively early stage, with little substantive discovery having taken place to date and claim construction proceedings ongoing. Trial is scheduled to start October 5, 2026—over eighteen months from now—and a motion to transfer the case by Petitioner to the Northern District of California is

currently pending, which if granted would likely result in an even later trial date. Petitioner also intends to move to stay the litigation pending resolution of the IPRs. Additionally, to allay concerns over duplication of efforts, Petitioner represents that, in the event of institution, it will not pursue in litigation any invalidity defense that was or could have been raised in IPR.

§325(d): This Petition does not raise a § 325(d) issue because none of the prior art relied upon was cited or otherwise identified during prosecution.

IV. OVERVIEW OF THE PATENT

A. Level of Ordinary Skill

A person of ordinary skill would have possessed a bachelor's degree in electrical engineering, computer science, or similar field, with two years combined experience in designing and/or developing interactive location-based computer systems/software, such as video games or other simulations incorporating location information (such as GPS information associated with a user's physical location), and in designing and/or developing computer systems/software involving graphical virtual and/or augmented reality. A person could also have qualified as a person of ordinary skill in the art with some combination of (1) more formal education (such as a master's of science degree) and less technical experience, or (2) less formal education and more technical or professional experience. (EX1002, ¶¶21-25.)

B. Specification Overview

The '559 patent states that it provides “a location-based game system in which the physical location (or physical movement) of a user on a physical playfield” obtained by, for example, a GPS device, “determines the virtual location (or virtual movement) of a virtual character on a virtual playfield.” ('559, 7:22-28.) The system may include a head-mounted display so that “video game indicia may be overlaid onto the user’s physical playfield,” such as the user’s “physical environment.” ('559, 3:52-54; *see also id.*, 1:57-61 (listing “the physical world, a physical environment, or a defined physical playfield” as examples of a “physical playfield”).) “The physical environment can then be manipulated by a processor such that, for example, virtual indicia (e.g., a video game character or component is added [sic]) is added to the physical environment.” ('559, 3:62-65.)

The '559 patent further states that “[a] landscape detector may be provided with a location-based game system such that information on the physical terrain of the user’s physical environment may be utilized by the gaming system.” ('559, 4:20-23.) Figure 4, reproduced below, “is an illustration of landscape detection constructed in accordance with the principles of the present invention”:

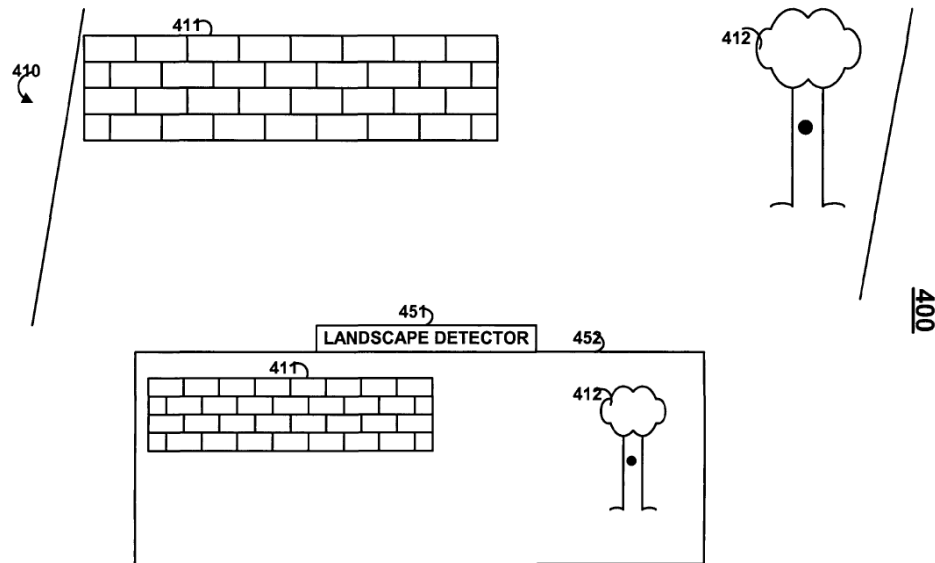


FIG. 4

(’559, Fig. 4, 6:14-15.) Referring to Figure 4, the ’559 patent states that “[l]andscape detector **451** may take multiple forms”:

For example, landscape detector **451** may measure the distance to objects and the shape of the object. This may be done for example by sound/light sensing (e.g., reflective sensing such as sound/light echoing or color sensing with respect to light source) or any type of object/distance sensing (e.g., infrared). A camera may be utilized to take a picture/video of the environment. Video processing features may be utilized to determine landscape as, for example, a user moves around the landscape.

(’559, 15:18-27.) “The information provided by the landscape detector may be utilized, for example, to position where portions of a video game playfield, objects, and characters may be positioned on a display (e.g., on a head-mounted display).”

(’559, 4:26-29.) “Such information may also be used, for example, to control the

movement characteristics of computer-controlled video game characters and indicia.” (’559, 4:29-32.) For example, Figure 6, reproduced below, “is an illustration of computer-controlled character positioning and movement based on detected landscape objects constructed in accordance with the principles of the present invention”:

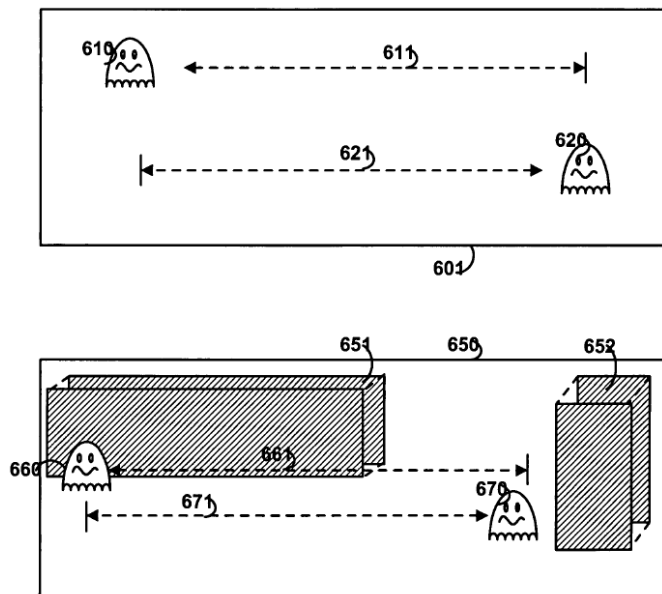


FIG. 6

(’559, Fig. 6, 6:20-23.) Referring to Figure 6, the ’559 patent states that “[i]n environment **650**, actual environmental object may be present and stored in memory as virtual objects **651** and **652**.” (’559, 18:14-16.) “If the stored location of virtual objects **651** impedes on the planned movement of virtual characters, then program logic (e.g., game code) may manipulate the movement path of virtual characters around these virtual objects.” (’559, 18:21-25.)

V. CLAIM CONSTRUCTION

Petitioner does not believe express claim construction is necessary at this time. The prior art cited herein, as demonstrated below, renders the challenged claims obvious under any reasonable construction. Petitioner therefore respectfully submits that, for purposes of this IPR, express constructions are not required.

VI. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. Overview of Grounds

The challenged claims attempt to lay claim to techniques for location-based video games in which a user sees their real-world surroundings combined with virtual objects. But these techniques were well-known before the '559 patent.

All grounds rely on Jaszlics (**EX1003**), which as its title demonstrates, describes a “system for combining virtual images with real-world scenes.” The augmented reality gaming and simulation system it describes is remarkably similar to the '559 patent. (Cooperstock, ¶52.) Jaszlics is a strong reference that discloses the majority of the claim limitations. Focusing on war gaming applications, but also making clear that the system is broadly applicable to outdoor location-based augmented reality gaming, Jaszlics provides a “combined reality” experience for a user by combining real-time, real-world imagery of a user’s physical surroundings with images of virtual entities, such as tanks. (*Id.* (citing Jaszlics, 1:64-67, 2:60-63).) For example, Jaszlics describes how, using data collected with a range

scanning device (such as a modified infrared surveyor's ranging laser), the distance and shape of real-world physical features around the user are detected and used to more realistically overlay virtual entities in the real-world scene. (*Id.* (citing Jaszlics, Fig. 1, 4:12-23).) The combined imagery—for example, as shown by Figure 1d below—can then be presented via head-mounted display to the user.

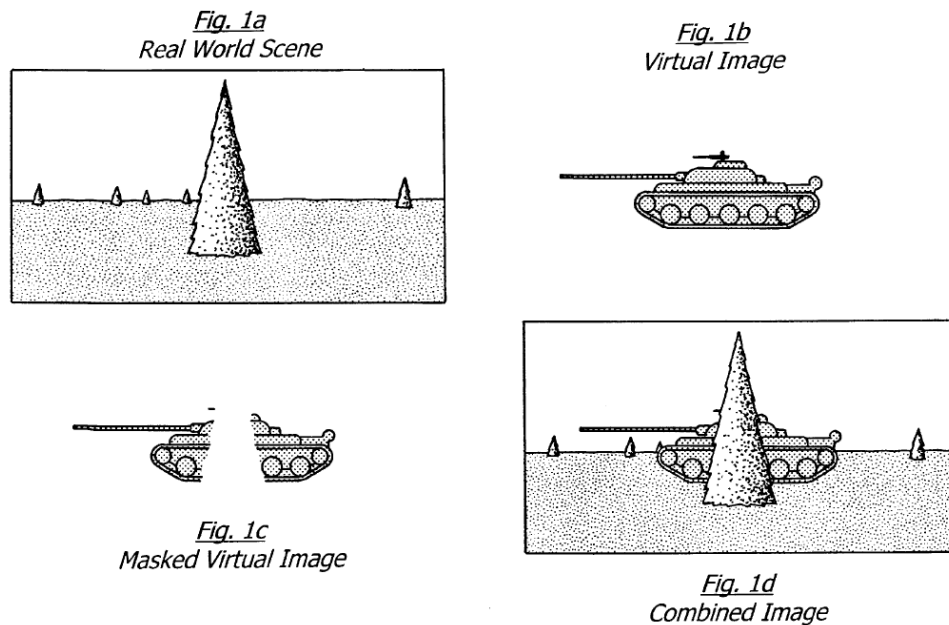


Fig. 1

(*Id.* (citing Jaszlics, 9:36, 9:48-57, 2:10-13).)

All grounds also cite Rallison (**EX1004**), Sofer (**EX1008**), and Ronzani (**EX1009**) in connection with minor points that are arguably disclosed by or at least obvious over Jaszlics alone. Rallison is cited for its disclosures regarding a head-mounted display device that includes a “**processor**” and an “**accelerometer.**” (Cooperstock, ¶¶56-58.) Sofer is primarily cited to confirm the obviousness of a *head-mounted* “**detector for determining landscape characteristics of said**

physical playfield.” (Cooperstock, ¶¶61-62.) Similarly, Ronzani is primarily cited in connection with confirming the obviousness of a *head-mounted* “**detector for determining landscape characteristics of said physical playfield**” and “**device for updating the physical location of said device on said physical playfield.**” (Cooperstock, ¶¶64-69.)

B. Prior Art Status of Relied-Upon References

Pre-AIA law applies to the challenged claims, and each reference cited in the grounds listed in **Part III.B** qualifies as prior art to the '559 patent. Jaszlics, Rallison, and Ronzani qualify as prior art under § 102(b) because they issued more than one year before the priority date.¹ Sofer qualifies as prior art under § 102(e)

¹ The '559 patent claims priority to a provisional application (no. 60/628,475) filed November 16, 2004. For purposes of this Petition, Petitioner has assumed a priority date of November 16, 2004. Petitioner at this time expresses no opinion on whether the '559 patent is actually entitled to the benefit of the provisional application filing date. This issue is not relevant here because all of the prior art references relied upon predate November 16, 2004. In the event entitlement to the provisional filing date or another earlier priority date may later become relevant, Petitioner reserves the right to respond at that time.

(and § 102(a)) because it is a PCT application that designated the United States and published in English before the priority date.

C. Ground 1: Claims 1, 12, 17, and 20 Are Obvious Over Jaszlics in view of Rallison, Sofer, and Ronzani

1. Independent Claim 1: “A head-mounted device comprising:” (1[pre])

As explained below, assuming the preamble provides a claim limitation, Jaszlics discloses “**a head-mounted device.**” For background, as described in **Part VI.A** above, Jaszlics discloses a “combined reality” computer system in which virtual images, such as images of a virtual tank or other animated virtual entities, are combined with real-world scenes and displayed together to a user. (Jaszlics, 2:40-56 (“This invention provides a system for combining virtual images with images of the real world.... The resulting combined image is presented in an electronic or optical display.”), 3:13-16 (describing Figs. 1a-1d), Table 7 (col. 21) (defining “combined reality” as “Apparent reality, with virtual elements projected into the image of the real world. Virtual and live elements may interact through simulation.”), 1:13-15; Cooperstock, ¶¶71, 52-53.)

Jaszlics discloses “**a head-mounted device**” for displaying combined virtual images and real-world scenes to a user, such as “electronic display goggles,” “virtual

reality goggles or visors worn by the observer [i.e., the user of the system²].” (Jaszlics, 9:48-57; *see also id.*, 2:10-13 (“The present invention can be used with electronic display goggles to greatly extend this entertainment medium by injecting, in real time, three-dimensional virtual elements into the view of the real world.”), 9:34-39 (“The display **111** may be any display system capable of displaying the combined image, such as...an electronic goggle or visor...”), 10:52-57 (“virtual reality goggles”); Cooperstock, ¶72.)³

As explained below, the “**head-mounted device**” as claimed is obvious over Jaszlics in view of Rallison, Sofer, and Ronzani.

Before turning to addressing the specific claim limitations, Petitioner notes at the outset that it has assumed for purposes of this Petition that the preamble is limiting. Petitioner has therefore assumed that each of the recited components that comprises the “head-mounted device,” such as “a processor,” must be head-mounted as part of that device. (*See also* Cooperstock, ¶74.)

² Jaszlics describes a player/user of its system as an “observer.” (*See* Jaszlics, 10:11-17 (“The observer **113** of the display is assumed to be the user of the invention for various purposes, such as military training, or entertainment....”).)

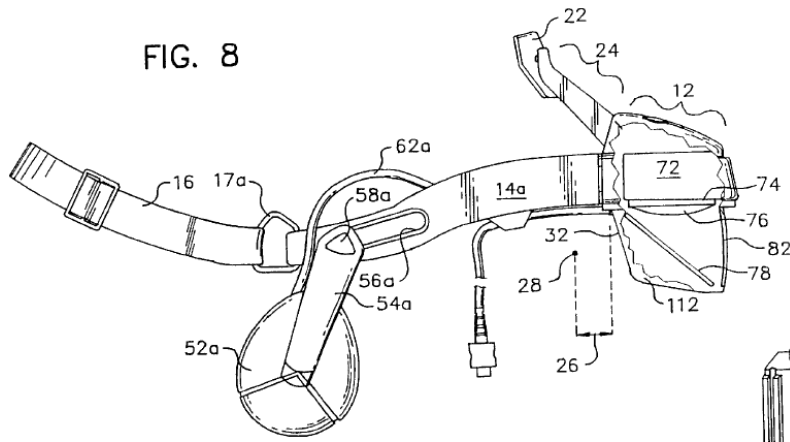
³ All underlining added to quoted material unless noted.

(a) “a processor;” (1[a])

A person of ordinary skill in the art would have understood and found it obvious that Jaszlics’ head-mounted electronic display goggles/visor would have included “a processor,” alone or in view of Rallison (EX1004). (Cooperstock, ¶¶75-82.)

With respect to Jaszlics alone, Petitioner notes that the claim does not require any particular type of processor or that the processor perform any particular function. A person of ordinary skill in the art would have understood and found it obvious that the electronic goggles/visor described in Jaszlics would include some form of “processor,” such as an integrated display controller or image signal processing circuitry to provide images to the display of the head-mounted device. (Cooperstock, ¶76 (citing EX1014, p.003 (entries for “display controller” and “display generator”)).)

A “head-mounted device [comprising] a processor” would have also been obvious in view of Rallison. (Cooperstock, ¶77.) Rallison, entitled “Head-Mounted Personal Visual Display Apparatus with Image Generator and Holder,” expressly describes a head-mounted display that includes “image processor circuitry.” Referring to Figure 8 (shown below), Rallison explains that “image processor circuitry” is contained within “main section 12” of the head-mounted device:



In one embodiment, the electronics used in generating the image 72 are substantially all contained in the upper portion of the main section 12 of the apparatus as depicted in FIG. 8. The electronics used for this purpose can be those generally well-known in the art for producing video images, such as the electronics used in producing video images in the eyepiece of a video recorder and can include, for example, power supply, timing circuitry (e.g. to assure that the data which arrives is routed to the proper position of the image generators), buffer memory or other memory devices, and/or image processor circuitry.

(Rallison, Fig. 8, 10:4-14.)

Rationale and Motivation to Combine (Jaszlics and Rallison). It would have been obvious to a person of ordinary skill in the art to combine Rallison's teachings regarding a head-mounted device that includes a processor with Jaszlics. (Cooperstock, ¶78.) The combination would have involved the straightforward incorporation of a processor into the electronic goggles/visor disclosed in Jaszlics and would have predictably resulted in a head-mounted device in Jaszlics' system

that included a processor. (*Id.*) The combination therefore discloses and renders obvious a “**head-mounted device** [comprising] **a processor**” as claimed. (*Id.*)

Jaszlics and Rallison are both analogous references to the ’559 patent, in the same field and reasonably pertinent to problems facing the ’559 patent inventor. (Cooperstock, ¶79 (citing ’559, 1:20, 1:65-66; Jaszlics, 1:13-15, 10:63-67; Rallison, 24:7-11).)

A person of ordinary skill in the art would have been motivated to combine. (Cooperstock, ¶80.) As discussed, a person of ordinary skill in the art would have understood and found it obvious for Jaszlics’ electronic goggles/visor to include a processor. Rallison provides confirmation, explaining that “[t]he electronics used in generating the image” in the head-mounted device “can be those generally well-known in the art for producing video images” and can include “image processor circuitry.” (Rallison, 10:4-14.) The combination would have therefore involved, at most, the use of a known technique to include a processor in a head-mounted device so as to improve a similar device (Jaszlics’ head-mounted device) in the same way—i.e., an integrated processor for controlling the display. (Cooperstock, ¶80.) Moreover, because the details of a head-mounted device are not a focus of Jaszlics, a person of ordinary skill in the art, seeking to implement and adapt Jaszlics, would have naturally turned to Rallison for its additional disclosures when considering a suitable head-mounted display for Jaszlics’ system. (*Id.*)

Petitioner further notes that Ronzani, discussed in connection with claim 1[c] & 1[d] and claim 12 also discloses various embodiments of a head-mounted display device that includes a processor, further confirming the obviousness of “**a head-mounted device** [comprising] **a processor**.” (Cooperstock, ¶81.) Ronzani explains that “[a]s described in the various distinct embodiments herein, the central programming unit, the memory and various parts can be included...with the headpiece.” (Ronzani, ¶0142.) For example, referring to Figure 33, reproduced below, Ronzani states that “The CPU and video drive circuitry are fabricated as an integral part of the head band **512**”:

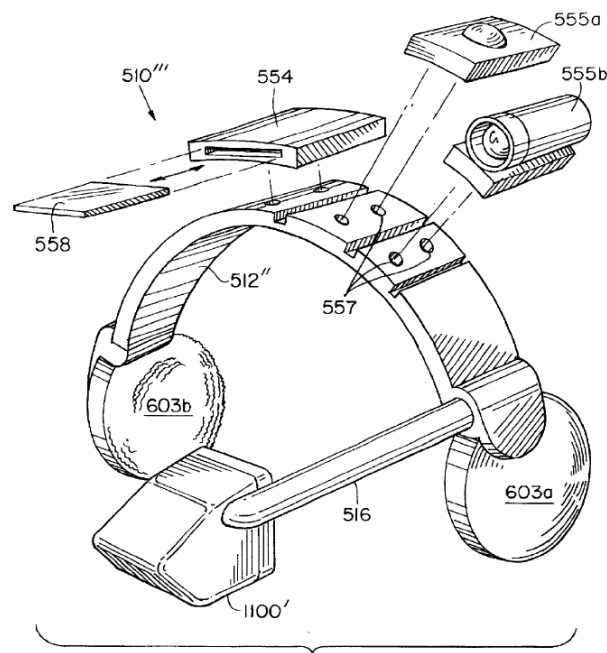


Fig. 33

(Ronzani, Fig. 33; *see also id.*, ¶0154 (“**FIG. 33** is a perspective view of another preferred head-mounted computer **510**”. As illustrated, there is a head band **512**”,

stereo headphones **603A**, **603B**, a display arm **516** connecting the headband **512"** to a display pod **1100'**, which includes a display panel. The CPU and video drive circuitry are fabricated as an integral part of the head band **512"**."); *see generally id.*, e.g., ¶¶0148, 0150, 0155, 0162, 0165-0166, 0168-0169, 0172, 0192-0193 (describing “CPU” of head-mounted devices).) As noted, the Petition discusses Ronzani more in connection with claim 1[c] & 1[d], and claim 12 below, and Petitioner incorporates that analysis here, including the motivation to combine and expectation of success. (Cooperstock, ¶¶82, 116-120, 131-134.)

A person of ordinary skill in the art would have had a reasonable expectation that the combination of Jaszlics and Rallison (alone or in further view of Ronzani) would have been successful. (Cooperstock, ¶82.) For example, Rallison treats the incorporation of a “processor” into a head-mounted device as an afterthought, explaining “[t]he electronics used for this purpose can be those generally well-known in the art for producing video images.” (Rallison, 10:4-14.) Similarly, Ronzani, with its passing references to integrating a processor into a head-mounted device, treats it as a routine design decision; not something that poses a technically challenging obstacle that would require undue experimentation. (Cooperstock, ¶82.)

(b) **“a display that displays 3-D video game indicia with respect to a physical playfield based on video game logic associated with a video game;” (1[b])**

Jaszlics’ head-mounted electronic display goggles/visor (**“head-mounted device”**) comprise **“a display.”** (Jaszlics, e.g., 9:48-57 (“Alternative display implementations are compatible with the method. These may include flat display panels, image projectors, or virtual reality goggles or visors worn by the observer.”), 2:10-13 (“electronic display goggles”), 9:34-39 (“The display 111 may be any display system capable of displaying the combined image, such as...an electronic goggle or visor....”); Cooperstock, ¶83.)

Jaszlics also teaches that the display of the head-mounted electronic display goggles/visor **“displays 3-D video game indicia with respect to a physical playfield.”** (Cooperstock, ¶84.) Petitioner notes that the ’559 patent describes **“physical playfield”** as broadly including **“the physical world, a physical environment, or a defined physical playfield[.]”** (’559, 1:57-61.)

Jaszlics teaches that the electronic display goggles/visor are used to display, for example, virtual tanks and other virtual objects (**“3-D video game indicia”**) overlaid within a physical landscape surrounding the user (**“physical playfield”**). (Cooperstock, ¶85.) Figure 1 of Jaszlics illustrates, with Fig. 1d in particular showing how a virtual tank (exemplary **“3-D video game indicia”**) is displayed within a real world scene (**“displayed...with respect to a physical playfield”**):

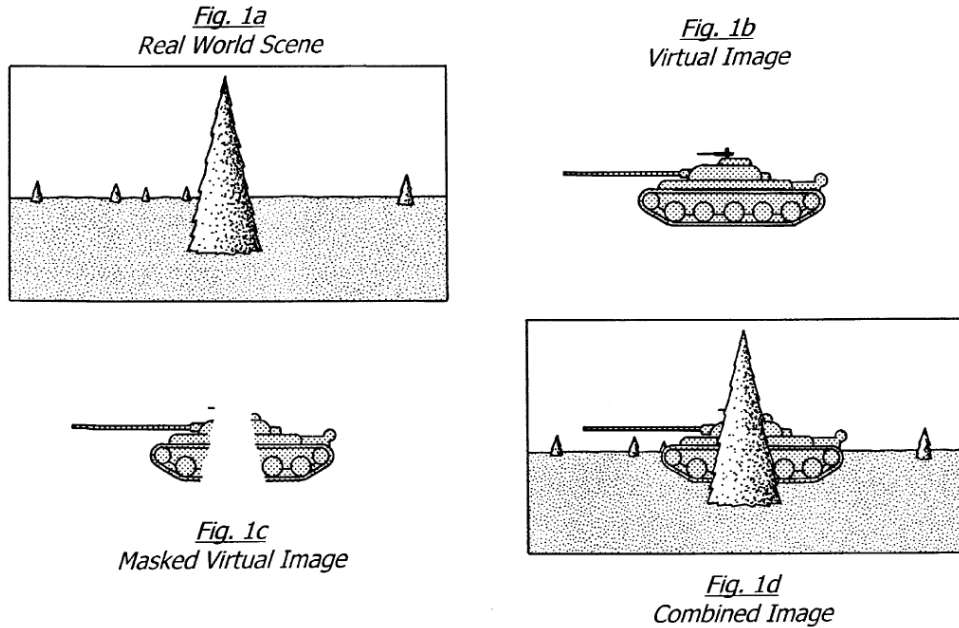


Fig. 1

(Jaszlics, Fig. 1; *see also id.*, 4:19-23 (describing Fig. 1d), 8:53-56 (“In this step **110** of FIG. 2, the virtual images constructed in the virtual image generation step **109** are combined with the real-world image **114** originating from the video camera **100**.”), 23:56-59 (claim 4, reciting “wherein said display means comprises an electronically-controlled visor and wherein the field of view comprises the field of view visible through said visor”), 25:3-6 (claim 15).)

As another example, Figure 14 of Jaszlics (below) illustrates virtual tanks **162** (“**3-D video game indicia**”) overlaid on hills **160** of the user’s physical environment (“**physical playfield**”):

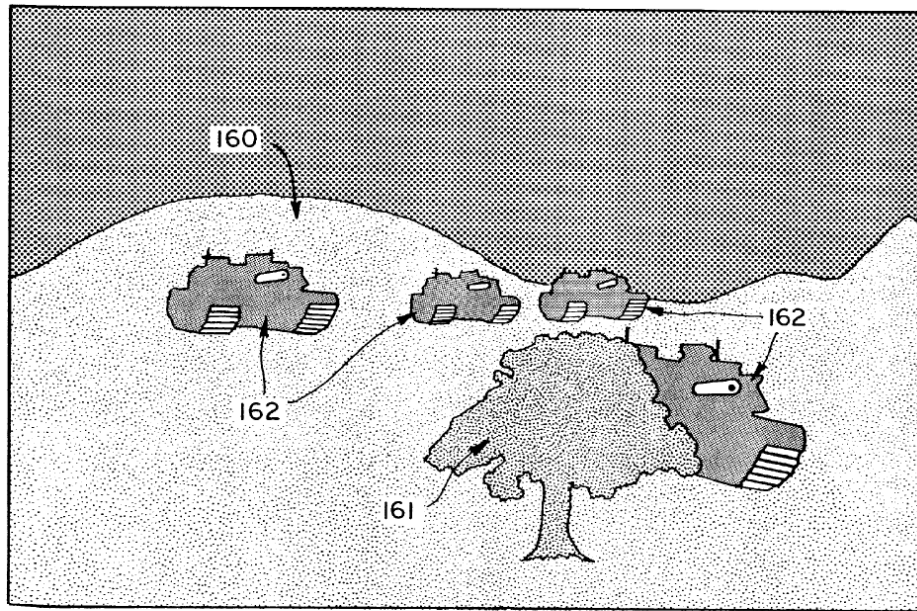


Fig. 14

(Jaszlics, Fig. 14; *see also id.*, 3:49-51 (“FIG. 14 is an example of a combined view of virtual tanks and the real world in the infrared as seen through the thermal viewer of a tank or infantry fighting vehicle.”), 9:60-62; EX1011 (Jaszlics Provisional), 00152, Fig. 14 (identifying **160** as “Hills” and **162** as “Virtual Entities”); Cooperstock, ¶86.)

As a third illustration, referring to Figure 15 (below), Jaszlics explains how the overlaid “**3-D video game indicia**” can be a variety of virtual elements, such as a path marker **172**, a unit boundary **173**, a navigational marker **174**, and a phase line **175**, which are overlaid on terrain **170**:

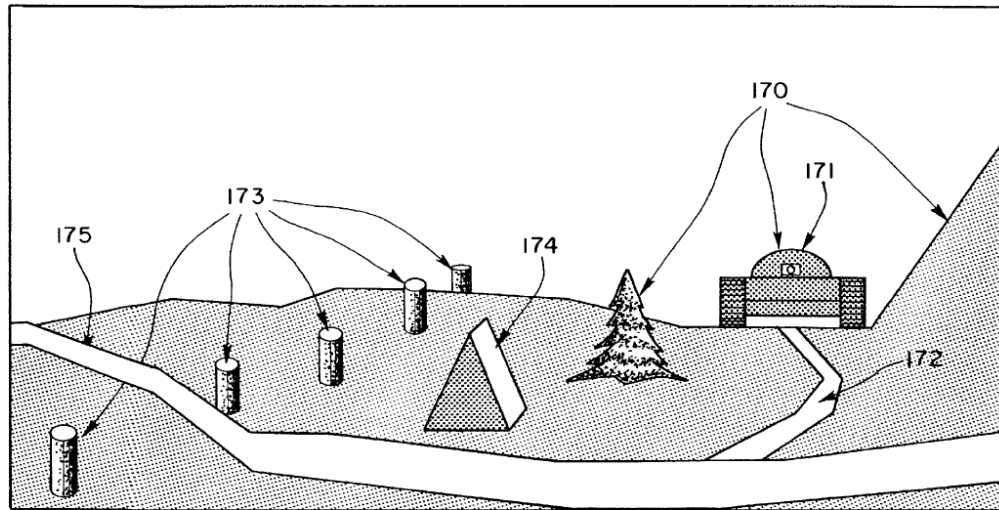


Fig. 15

(Jaszlics, Fig. 15; *see also id.*, 9:64-10:9 (“The virtual entities generated by a virtual entity simulation do not necessarily represent a real-world object. For example, they may represent fictional characters or entities, or views of conceptual objects. An example of conceptual virtual entities is shown in FIG. 15. In FIG. 15, the real-world objects 170 include the terrain, a tree, and a battle tank, in which the observer or observers 171 of a combined reality view presented to them are located. The conceptual virtual entities in the figure are conceptual objects: a path marker 172, a unit boundary 173, a navigational marker 174, and a phase line 175. The present system positions the conceptual virtual entities in the display in such a manner that they appear to be present in the landscape visible to the observer(s).”); Cooperstock, ¶87.)

Turning more specifically to the phrase “**3-D video game indicia**,” Jaszlics teaches that the virtual entities, such as virtual tanks and other characters, entities or

conceptual objects, are both “**3-D**” and “**video game**” indicia. (Cooperstock, ¶88.)

With respect to “**3-D**,” the figures from Jaszlics shown above include 3-D virtual elements, most clearly shown by unit boundary **173** and navigational marker **174** in Figure 15. More generally, Jaszlics explains that the virtual entities can be generated and rendered using the “Virtual Reality Modeling Language” (“VRML”) or “any rendering system capable of rendering three-dimensional objects, or two-dimensional projections of three-dimensional objects.” (Jaszlics, e.g., 8:7-16, 6:34-41.) VRML was a standard language for modeling three-dimensional interactive objects. (Cooperstock, ¶88 (citing EX1012, p.009 (entry for “VRML”)).) Jaszlics therefore discloses and renders obvious “**3-D**” indicia. (*Id.*)

With respect to “**3-D video game indicia**,” Jaszlics makes clear that its combined reality system is for “video games.” (Cooperstock, ¶89.) For starters, Jaszlics specifically describes using its system for virtual war games, and related game play, such as engaging in a virtual tank battle. (Jaszlics, e.g., 10:15-25, 11:4-6, 15:15-30.) This is just like the ’559 patent, which similarly states that “an AR game system may be utilized in the military training of soldiers” and specifically recognizes this sort of military simulation as “game play.” (’559, 5:24-25; *see also id.*, 5:25-28, 15:40-42; Cooperstock, ¶89.)

More specifically, Jaszlics explains that “[t]he present invention can be used in these war games to generate virtual tanks that appear to move about the terrain.

This can completely eliminate the need, for example, for live tanks representing the enemy force in a war gaming exercise. Virtual vehicles and real vehicles can appear in the same scene.” (Jaszlics, 1:53-58.) Jaszlics describes military simulation game play that includes a player/user (which Jaszlics refers to as an “observer”) engaging a virtual combat vehicle and taking damage or getting “killed.” (Jaszlics, 10:15-25 (“An example of such direct interaction is the engagement of a virtual opponent from a combat vehicle, such as a battle tank.”), 11:59-63 (“For example, if one of the virtual tanks represented in this simulation engage the avatar of the observer’s tank, the resulting damage information will activate damage displays, or a ‘killed’ indicator in the observer’s sensors and controls suite.”); *see also id.*, 11:4-6 (“virtual battle damage”), 15:53-56 (“The virtual entities implemented by the virtual simulation and control software are capable of engaging the avatar of the observer’s vehicle, depending on the scenario loaded in.”), 15:25-30 (“engaging the virtual T-80s operated by the virtual simulation”), 10:39-44 (engaging virtual tank).) Jaszlics’ disclosure of using its combined reality system for simulated war games therefore discloses “**3-D video game indicia.**” (Cooperstock, ¶90.)

Putting aside its military-specific gaming applications, Jaszlics expressly teaches that its system can be used as “an interactive, recreational device,” and is broadly applicable to gaming generally, explaining that, for example, “[a]nother possible field of use is in games, such as laser tag, so that virtual players, objects,

and special effects can be combined with real players and real objects in the playing field.” (Jaszlics, 1:64-67, 18:48-55; *see also id.*, 15:21-25 (“Other scenarios not related to tanks, or military training, can be selected by a user...”).) Jaszlics therefore clearly discloses and renders obvious “**3-D video game indicia.**” Jaszlics therefore teaches a head-mounted device comprising a display “**that displays 3-D video game indicia with respect to a physical playfield**” as claimed. (Cooperstock, ¶91.)

Turning to the last portion of claim 1[b], Jaszlics also discloses, and a person of ordinary skill in the art would have understood and found it obvious, that Jaszlics’ virtual entities (“**3-D video game indicia**”) would be operable to be provided to the head-mounted display with respect to a physical playfield “**based on video game logic associated with a video game**”—i.e., the logic associated with Jaszlics’ “virtual simulation and control software” and virtual simulations executed by the software. (Cooperstock, ¶92.)

In particular, Jaszlics describes its system as using a conventional computing system, such as “a personal workstation running two 266 MHz Pentium II processors,” to execute software including “virtual simulation and control software” and virtual simulations executed by the software, such as various “scenarios” providing game simulations—military-based or otherwise. (Jaszlics, 14:13-18 (“Virtual masking object generation is presently implemented by virtual masking

object (VMO) generation software running in a virtual simulation computer 210 (e.g., a personal workstation running two 266 MHz Pentium II processors).”), 14:66-15:1 (“Virtual entity simulation is implemented in the virtual simulation computer through the virtual simulation and control software.”), 15:53-56 (“The virtual entities implemented by the virtual simulation and control software are capable of engaging the avatar of the observer’s vehicle, depending on the scenario loaded in.”), 17:11-14 (describing “scenario” “executed by the virtual simulation and control software”), 15:21-24 (“Other scenarios not related to tanks, or military training, can be selected by a user of the reference apparatus after minor modification of the VRML data, and the labels of the scenario control list.”).) The logic associated with Jaszlics’ “virtual simulation and control software” and virtual simulations executed by the software—i.e., logic associated with one or more video games—discloses the claimed **“video game logic associated with a video game.”** (Cooperstock, ¶92.)

- (c) **“a detector for determining landscape characteristics of said physical playfield, wherein said video game logic utilizes said landscape characteristics in providing said video game; and”** (1[c])

As explained below, this limitation is disclosed by and obvious over Jaszlics alone or in view of **Sofer** in the form of a head-mounted range scanner. (Cooperstock, ¶¶94-109.)

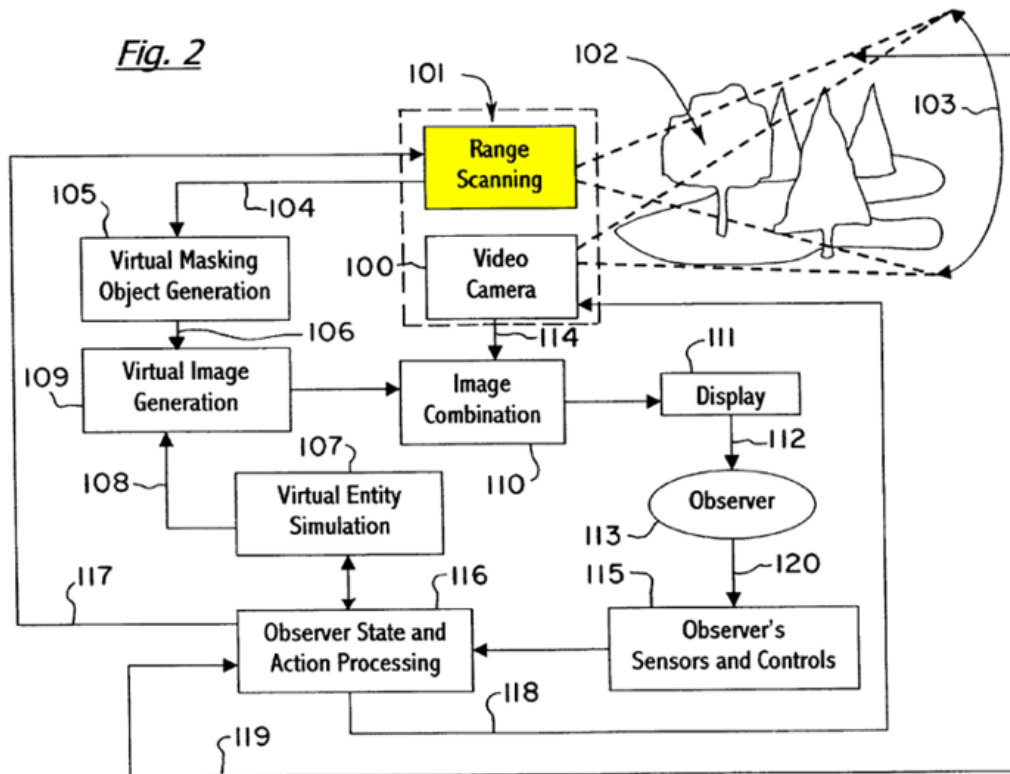
Petitioner notes that dependent claim 12 further recites that the **“detector”** **“includes a camera.”** Petitioner therefore also provides an additional, more specific

mapping based on Jaszlics alone or in combination with **Ronzani**, where the “**detector**” is specifically a *camera*-based range scanner comprising a head-mounted camera. (Cooperstock, ¶¶110-120.)

(1) First “detector” mapping, based on Jaszlics alone or in view of Sofer: “detector” is a range scanner

Jaszlics discloses and renders obvious “**a detector for determining landscape characteristics of said physical playfield**” in the form of a range scanner, such as a laser range scanner or other technology for scanning a real-world outdoor scene to determine characteristics of the scene, such as “the shape and distance of real-world objects within a field of regard of interest to the observer using the apparatus.” (Jaszlics, 2:41-46; *see also id.*, 12:19-13:44 (detailing laser scanner functionality, including transmitter and receiver sections for emitting and detecting, respectively, laser pulses); Cooperstock, ¶¶96-97.)

For example, Figure 2 of Jaszlics depicts a Range Scanning component **101** within Jaszlics’ system:



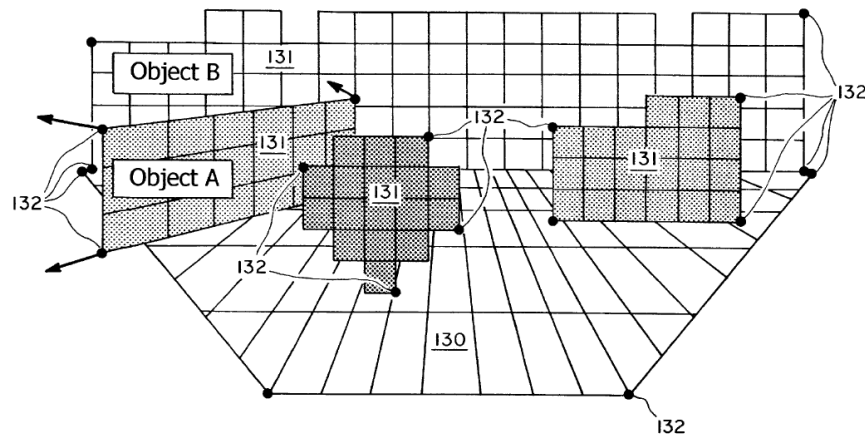
(Jaszlics, Fig. 2 (highlighting added); *see also id.*, 4:35-37 (“[A] range scanner **101** determines the distance of the entities present in a real-world scene **102** within small ranging sectors.”).) Jaszlics explains that “[r]ange scanning may be performed by a laser range scanner (as in the reference apparatus shown in FIGS. 16-22) or by other means that can determine the distance of objects within the angular space of ranging sector.” (Jaszlics, 4:43-46; *see also id.*, Figs. 16 (illustrating Laser Scanner **203**), 17 (illustrating transmitter section of laser scanner), 18 (illustrating receiver section of laser scanner), 4:60-5:6 (describing other methods for landscape detection).) The range scanner can be “a modification of a commercially available solid-state infrared surveyor’s ranging laser.” (Jaszlics, 12:19-20; *see also id.*, 12:34-36 (“The scanner

elements are built from commercially available components[.]”).)

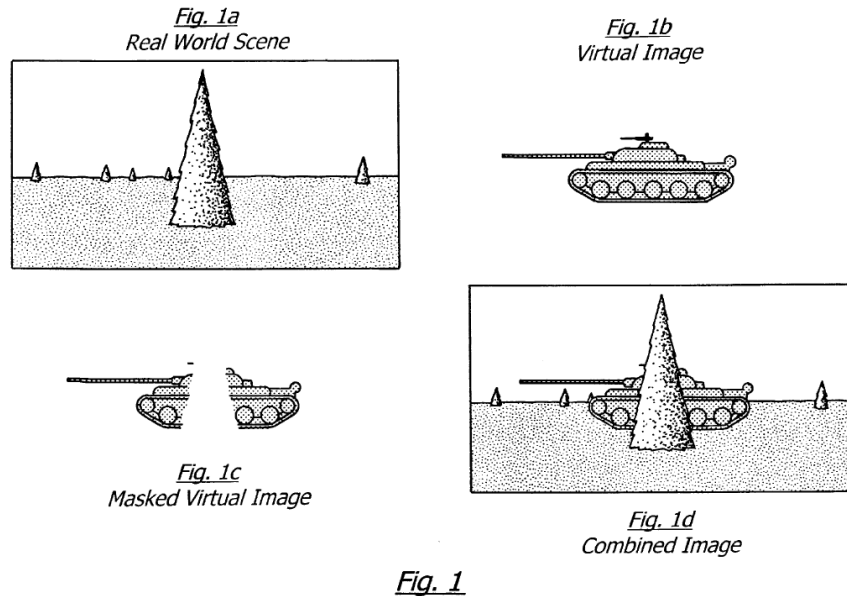
The written description of the ’559 patent provides further confirmation that Jaszlics’ range scanner is “**a detector of said head-mounted device operable to determine landscape characteristics of said physical playfield**” as claimed. Jaszlics’ description of a range scanner that determines the “shape and distance of real-world objects” (Jaszlics, 2:41-46) is remarkably similar to the ’559 patent’s own description of a “landscape detector” that “may measure the distance to objects and the shape of the object.” (’559, 15:18-27; Cooperstock, ¶98.)

Jaszlics also discloses “**said video game logic utilizes said landscape characteristics in providing said video game.**” (Cooperstock, ¶99.) Jaszlics’ system uses the distance and shape information provided by range scanning data (“**said landscape characteristics**”) to generate “virtual masking objects” that it uses to present a more realistic virtual simulation. (Jaszlics, 2:41-46 (“Virtual masking objects, which are simplified computer models of real-world objects, are derived from the range data.”), 4:50-55 (“Range scanning is an existing technology that provides range data necessary for virtual masking object generation.”).) Figure 9 of Jaszlics, below, illustrates how the range scanning data is used to generate virtual masking objects:

Fig. 9

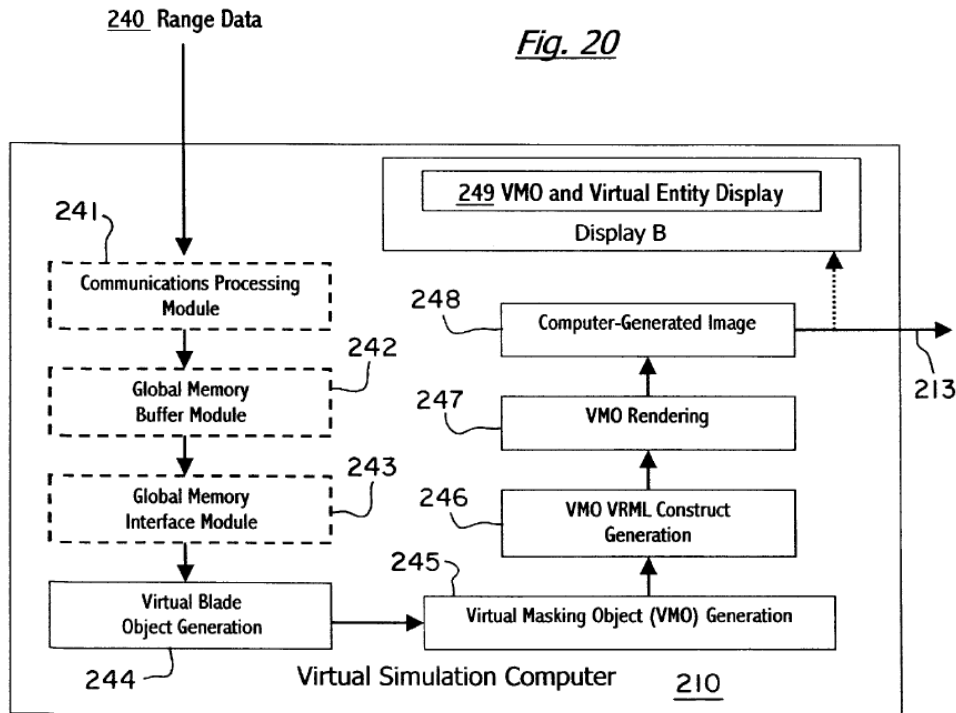


(Jaszlics, Fig. 9.) Referring to Figure 9, Jaszlics explains that it “shows several virtual masking objects, including the apparent terrain 130 observed by range scanning, and other virtual masking objects 131, which include Object A located near to the observation point, and Object B located at the extreme range of range scanning.” (Jaszlics, 7:29-34.) Jaszlics uses these virtual masking objects to present a more realistic virtual simulation, by for example, using them to generate a combined reality image where a portion of a virtual object, such as a tank, is masked out such that it appears to be partially concealed behind a real-world object, such as a tree. Figure 1 of Jaszlics illustrates:



(Jaszlics, Fig. 1; *see also id.*, 4:13-27 (describing Figs. 1a-1d).)

Figure 20 of Jaszlics further illustrates how the detected ranging data—Range Data **240**—is input into and processed by Virtual Simulation Computer **210**, which implements “[v]irtual entity simulation” “through the virtual simulation and control software” (“**said video game logic**”):



(Jaszlics, Fig. 20; *see also id.*, 3:64-65 (“FIG. 20 is a simplified block diagram of the virtual masking object (VMO) generation software.”), 14:32-52 (describing input and processing of ranging data), 14:66-15:1 (“Virtual entity simulation is implemented in the virtual simulation computer through the virtual simulation and control software.”); Cooperstock, ¶100.)

Jaszlics therefore teaches that ranging data corresponding to the distances and shapes of real-world objects in the user’s physical environment (“**landscape characteristics of said physical playfield**”) is utilized by Jaszlics’ virtual simulation and control software (“**said video game logic**”) in providing a virtual simulation, such as military or non-military games (“**in providing said video game**”). (Cooperstock, ¶101.)

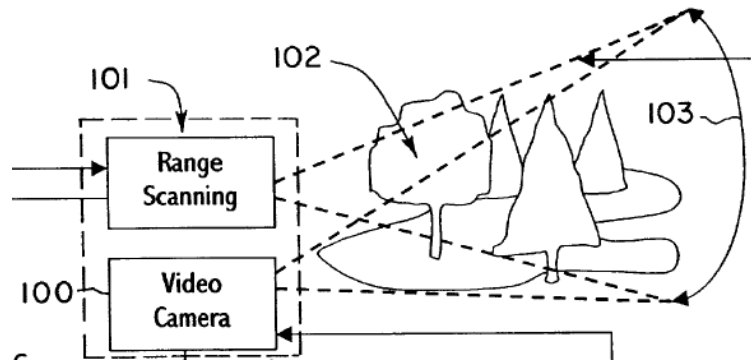
Petitioner will turn now to address how Jaszlics, alone or in view of Sofer, discloses and renders obvious a “**detector**” that is head-mounted as a part of the recited “head-mounted device.”

It would have been obvious to a person of ordinary skill in the art for Jaszlics’ range scanner itself to be head-mounted as a part of a head-mounted device. (Cooperstock, ¶103.) This is because Jaszlics itself describes a user wearing electronic display goggles or visor and further discloses that the user can be a mobile individual—not necessarily an individual located in a vehicle. (Jaszlics, e.g., 10:63-67 (“For moving observers, who may be individuals moving in the real world, or housed in a vehicle...”), 5:13-18 (“dynamic scenes with a moving observation point and mobile elements within the real-world scene”), 11:16-18 (“State vectors (three dimensional position, angles, velocity, and angular velocities) are generated for the observer, and for the observer’s vehicle (if any).”), 1:64-67 (describing laser tag).) A person of ordinary skill in the art would have understood that, in order to continue to present a usable and realistic simulation, updated ranging data would need to be collected from the user’s vantage point as the user moved around their environment. (Cooperstock, ¶103.)

And in fact, Jaszlics discloses that the range scanner is used to periodically scan the user’s field of view, including scanning more often for “dynamic scenes with a moving observation point and mobile elements within the real-world scene.”

(Jaszlics, e.g., 24:38-40 (“...said range scanner periodically scans an array of ranging sectors in the field of view.”) (claim 10), 5:7-18 (“The frequency of range data updates imposed on the range scanner depends on the type of real-world scene considered for specific implementations of the invention....For dynamic scenes with a moving observation point and mobile elements within the real-world scene, the system will normally require considerably higher range scanning pulse rates, such as 30 KHz, and a range frame update rate for the field of regard in the order of 1 Hz or higher.”).)

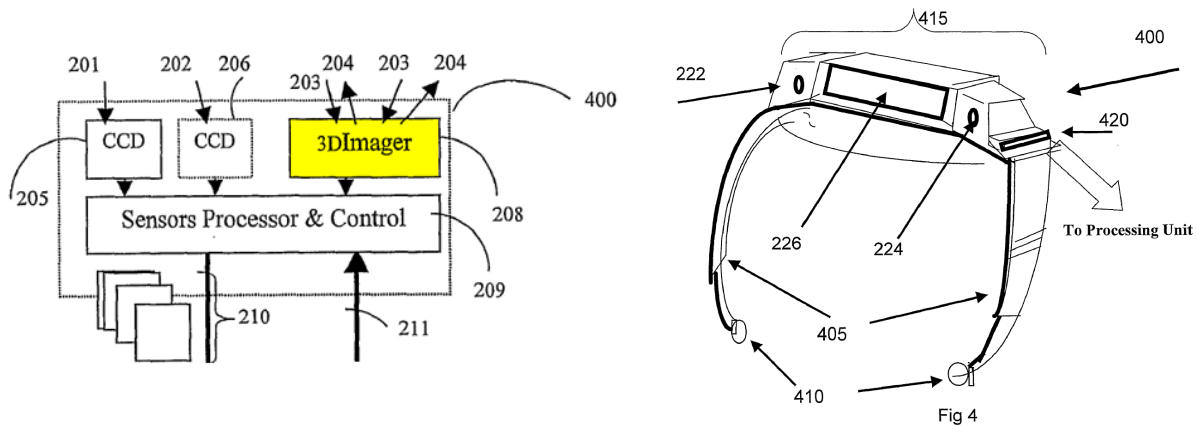
In addition, Jaszlics further suggests that the range scanner is mounted on the user’s head, explaining that “[c]hanges in the head position of the observer in some implementations of the invention will control the optical axes of the video camera and range scanner, to ensure that scanning and real-world scene acquisition coincides with the observer’s current field of view.” (Jaszlics, 11:43-47; Cooperstock, ¶104.) The close coupling of a user’s field of view and the range scanner is shown in Figure 2 of Jaszlics, which illustrates a range scanner (**101**) placed in proximity to the user’s vantage point captured by a video camera (**100**), so that “[t]he field of regard **103** of the camera **100** coincides approximately with the field of regard of the range scanning **101**”:



(Jaszlics, Fig. 2 (excerpt), 8:61-63.) Accordingly, Jaszlics alone suggests, and a person of ordinary skill would have found it obvious, that the range scanner would have been head-mounted as a part of an electronic goggles/visor head-mounted device. (Cooperstock, ¶104.)

To the extent there is any question whether it would have been obvious for a range scanner to be head-mounted, this is expressly disclosed by Sofer. (Cooperstock, ¶105.) Sofer, entitled “Method and Apparatus for a Multisensor Imaging and Scene Interpretation System to Aid the Visually Impaired,” describes a system to aid a person in “negotiating spaces where one’s view is partially or completely obstructed.” (Sofer, p.002 (“Field Of The Invention”).) Sofer’s system “provides detection and identification of fixed or moving obstacles, and can provide estimates of the relative range, speed and bearings of several simultaneous obstacles and objects.” (Sofer, pp.006-007.) Sofer accomplishes this, at least in part, by using a head-mounted laser range scanner. (Sofer, p.008 (“3D imager **208** emits sequences of laser beams **204** and measures the time of arrival of the return beams **203** in order

to compute the distance to the point on the surface of any object in the field of vision.”.) Figures 2 and 4 of Sofer, both reproduced below, together illustrate an exemplary headset “for use with the present invention, in accordance with an exemplary embodiment of the present invention”:



(Sofer, Fig. 2 (excerpt; highlighting added to indicate laser range scanner (“3D imager”) 208), Fig. 4; *see also id.*, p.0013.) As Sofer explains, the headset includes a “scanning range-finder” “mounted in the headset carrying compartment 415.” (Sofer, p.0013; *see also id.*, p.008 (“The input unit 400, illustrated in Fig. 4 comprises two sensors, CCD sensor 205 and 3D imager 208, and an optional third sensor shown as CCD sensor 206.”).)

Rationale and Motivation to Combine (Jaszlics-Rallison with Sofer). It would have been obvious to combine Sofer’s teachings regarding a head-mounted range scanner with Jaszlics’ combined reality computing system (and under the proposed combination with Rallison). (Cooperstock, ¶106.) The combination involved the incorporation of Sofer’s range scanning techniques, with no change in

function, into Jaszlics' system utilizing a head-mounted device. (*Id.*) This combination would have predictably resulted in a head-mounted range scanner used for the user's electronic goggles/visor—thereby disclosing a “**head-mounted device...comprising...a detector**” that is itself mounted on the user's head. (*Id.*)

Sofer is an analogous reference to the '559 patent. (Cooperstock, ¶107.) Like the '559 patent, Sofer relates to augmenting a user's view with the real world; in Sofer's case by scanning a user's physical surroundings in order to provide information to the user regarding obstacles and objects in the user's environment. Sofer also would have been reasonably pertinent to problems facing the '559 patent inventor, including techniques for helping a user avoid obstacles in their real-world environment during a virtual or augmented reality simulation. ('559, e.g., 1:30-33 (“If a user begins to physically move in his/her physical environment without being able to see his/her physical environment then the user may trip, or bump into, a physical object (e.g., a rock or chair).”), 19:54-57 (“For example, a user may trip over a rock if that user is in an ‘invincible mode’ and runs through a virtual character and that character covers the rock by being non-transparent.”).)

A person of ordinary skill in the art would have been motivated to combine. (Cooperstock, ¶108.) As discussed above, a person of ordinary skill in the art would have appreciated that it would be desirable for Jaszlics' range scanner to be placed in close proximity to the user's vantage point, and in fact Jaszlics teaches such an

arrangement. (Jaszlics, 11:43-47, Fig. 2, 8:61-63.) As also discussed, Jaszlics further describes how its system can be used by an individual mobile user. (Jaszlics, 10:63-67, 5:13-18, 11:16-18, 1:64-67.) Therefore, a person of ordinary skill in the art, seeking to implement or adapt Jaszlics' teachings, would have been motivated to investigate potential ways in which range scanning could be implemented for a mobile individual—and would have recognized that a head-mounted range scanner would have been obvious to try. (Cooperstock, ¶108.) A person of ordinary skill in the art would have therefore looked to a reference like Sofer for its disclosures confirming and describing an implementation of a lightweight, head-mounted range scanning device for a mobile individual. (*Id.*)

A person of ordinary skill in the art would have had a reasonable expectation of success. The combination would have simply involved where to place a known, available range scanner—in this case, mounting the scanner on the user's head. (Cooperstock, ¶109.)

(2) Second “detector” mapping, based on Jaszlics alone or in view of Ronzani: “detector” is a camera

Turning to the second mapping, where the claimed “**detector**” corresponds specifically to a camera, as noted above Jaszlics explains that range scanning can be performed by various means “that can determine the distance of objects within the angular space of ranging sector.” (Jaszlics, 4:43-46.) In particular, Jaszlics discloses that range scanning can be performed with a camera. (Jaszlics, e.g., 4:60-5:6

(describing “active flash ranging methods” and “passive ranging methods (e.g., stereographic or parallax comparison of real-world scene elements)”), 18:20-31; Cooperstock, ¶¶110-111.)

For example, Figure 24 of Jaszlics, reproduced below, “is a diagram illustrating passive optical ranging using two cameras to determine the range of an object”:

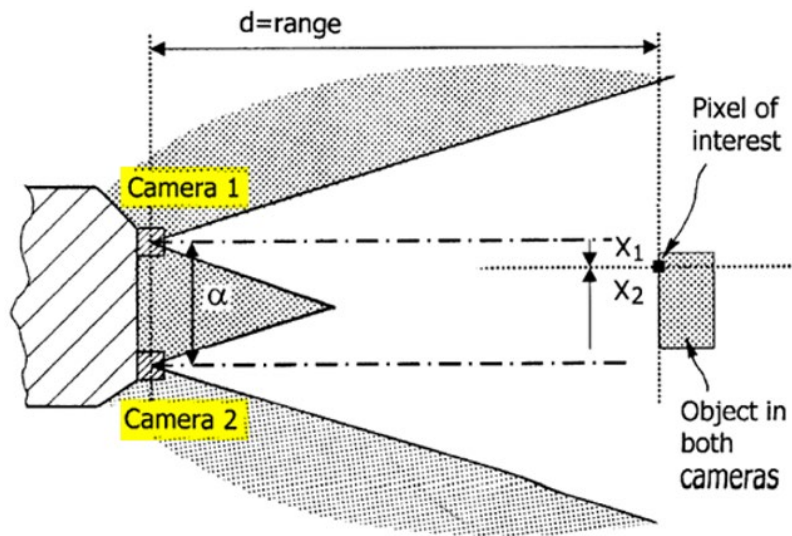


Fig. 24

(Jaszlics, Fig. 24 (highlighting added), 4:6-7.) Jaszlics explains that “[p]assive ranging methods are based on parallax measurements of ranging sectors (pixels) in coaxial CCD matrix cameras with parallel optical axes separated by a known baseline (FIG. 24).” (Jaszlics, 18:33-46.)

As explained above in the analysis under the first “detector” mapping, Jaszlics discloses that a range scanner is used for “**determining landscape characteristics**

of said physical playfield,” such as the distance and size of objects in the user’s physical surroundings. Therefore, a *camera*-based range scanner likewise discloses **“a detector for determining landscape characteristics of said physical playfield.”** (Cooperstock, ¶112.) And because, as explained above, Jaszlics uses the data collected using a range scanner in providing a simulation (such as to generate virtual masking objects), the use of a camera-based range scanner in providing a simulation also discloses **“said video game logic utilizes said landscape characteristics in providing said video game.”** (*Id.*)

Petitioner will turn now to address how Jaszlics, alone or in view of Ronzani, discloses and renders obvious a **“detector”**—in this case, a camera—that is head-mounted as a part of the recited “head-mounted device.”

For starters, for the reasons discussed above—i.e., moving user vantage point and need for ranging data that coincides with the user’s field of view—it would have been obvious to a person of ordinary skill in the art for the camera-based range scanner itself to be head-mounted. (*See* Jaszlics, e.g., 11:43-47, 8:61-63, 10:63-67, 5:7-18, 11:16-18, 23:38-40, Fig. 2; Cooperstock, ¶114.) Accordingly, Jaszlics alone suggests, and a person of ordinary skill would have found it obvious, that a camera-based range scanner would have been head-mounted as a part of an electronic goggles/visor head-mounted device. (Cooperstock, ¶114.)

To the extent there is any question whether it would have been obvious for a camera to be head-mounted, this is expressly disclosed by **Ronzani**. (Cooperstock, ¶¶115-120.) Ronzani, entitled “Head-Mounted Display System,” describes various embodiments of a head-mounted display device that can have a variety of uses—including, like Jaszlics, military and “entertainment purposes.” (Ronzani, ¶0005 (“The present invention relates generally to systems and methods for mounting display and electronic systems on the human body for numerous applications including commercial, industrial and entertainment purposes.”), ¶0189 (“**FIG. 42** is a functional block diagram of a head-mounted military computer 710F.”).) Ronzani expressly discloses a head-mounted display device that includes a camera. Referring to Figure 33 reproduced below, Ronzani explains that “head-mounted computer **510**” includes “a display pod **1100**’, which includes a display panel” and “a Charge Coupled Device (CCD) camera 555b”:

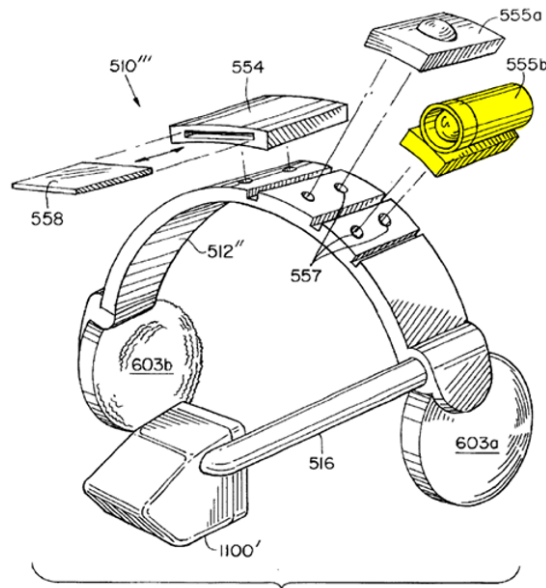


Fig. 33

(Ronzani, Fig. 33 (highlighting added); *see also id.*, ¶0154 (“**FIG. 33** is a perspective view of another preferred head-mounted computer **510''**. As illustrated, there is a head band **512''**, stereo headphones **603A**, **603B**, a display arm **516** connecting the headband **512''** to a display pod **1100'**, which includes a display panel.... Also illustrated are expansion modules **514**, an infrared communication sensor **555 a** and a Charge Coupled Device (CCD) camera **555b.**”).)

Rationale and Motivation to Combine (Jaszlics-Rallison-Sofer and Ronzani). It would have been obvious to a person of ordinary skill in the art to combine Ronzani’s teachings regarding a head-mounted camera that is part of a head-mounted display device with Jaszlics’ combined reality system involving a user wearing electronic goggles/visor (and under the proposed combination with Rallison and Sofer). (Cooperstock, ¶116.) The combination would have involved

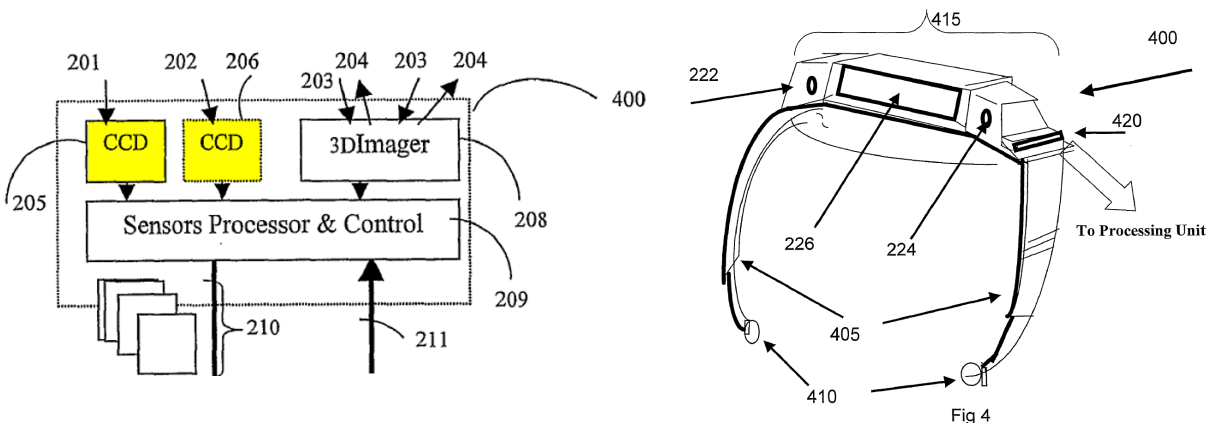
the straightforward addition of one or more cameras to Jaszlics' electronic goggles/visor and would have predictably resulted in a **“head-mounted device...comprising...a detector”** as claimed where the **“detector”** (a camera-based range scanner) is itself mounted on the user's head as a part of the **“head-mounted device.”** (*Id.*)

Ronzani is an analogous reference to the '559 patent. (Cooperstock, ¶117.) Like the '559 patent, Ronzani relates to a head-mounted display device that can be used for various purposes including for entertainment and military activities. (Ronzani, e.g., ¶¶0005, 0189.) Ronzani also would have been reasonably pertinent to problems facing the '559 patent inventor, including techniques for head-mounting various devices (such as a camera) as part of a head-mounted display device system.

A person of ordinary skill in the art would have been motivated to combine. (Cooperstock, ¶118.) As discussed above, a person of ordinary skill in the art would have appreciated that it would be desirable for Jaszlics' camera-based range scanner to be placed in close proximity to the user's vantage point. Therefore, a person of ordinary skill in the art, seeking to implement or adapt Jaszlics' teachings, would have been motivated to investigate potential ways in which a camera could be implemented for a mobile individual—and would have recognized that a head-mounted camera would have been obvious to try. (*Id.*) A person of ordinary skill in the art would have therefore looked to a reference like Ronzani—which describes

head-mounted display devices for similar entertainment and military-based uses as Jaszlics—for its disclosures confirming and describing implementations of a head-mounted camera for a mobile individual. (*Id.*)

Petitioner also notes that Sofer, discussed above in connection with the first “**detector**” mapping, further confirms the obviousness of a head-mounted camera. (Cooperstock, ¶119.) Sofer expressly discloses head-mounted cameras as part of its head-mounted range scanning device. Referring again to Figures 2 and 4 of Sofer, they together illustrate an exemplary headset that includes two cameras, i.e., (1) camera/CCD sensor **205** and (2) camera/CCD sensor **206**:



(Sofer, Fig. 2 (excerpt; highlighting added), Fig. 4; *see also id.*, p.008 (“The input unit 400, illustrated in Fig. 4 comprises two sensors, CCD sensor 205 and 3D imager 208, and an optional third sensor shown as CCD sensor 206.”), p.0013 (“Video sensor 205, i.e., a CCD chip or miniature television camera...[is] mounted in the headset carrying compartment 415.”).) As Sofer explains, “both CCD sensors **205** and **206** are used to compute the distance to the object’s points in addition to their

roles as color sensing cameras.” (Sofer, p.008.) The rationale and motivation to combine Sofer discussed above applies here as well. (Cooperstock, ¶¶119, 106-109.)

A person of ordinary skill in the art would have had a reasonable expectation of success. The combination would have simply involved where to place a known, available camera device—in this case, mounting the device on the user’s head. (Cooperstock, ¶120.)

- (d) **“a device for updating the physical location of said device on said physical playfield, wherein said video game logic utilizes the physical location of said device in providing said video game.” (1[d])**

Claim 1[d] recites **“a device for updating the physical location of said device on said physical playfield.”** Petitioner will refer to this **“device”** as a **“[locating] device”** to help distinguish it from the recited **“head-mounted device.”**

As explained below, this limitation is obvious over Jaszlics alone or in view of **Ronzani**. The Petition combines with Ronzani, for reasons similar to claim 1[c]—i.e., in connection with explaining the obviousness of a **“[locating] device”** that is head-mounted as a part of the claimed **“head-mounted device.”** (Cooperstock, ¶¶122-134.)

With respect to a **“[locating] device,”** the ’559 patent identifies a GPS device as an example of a **“locating device”** or **“location device.”** (’599, 4:23 (“If the locating device is a GPS device....”), 20:64-66 (“location devices (e.g., GPS, LPS,

accelerometers, gyroscopes, inertial movement sensors, hybrid location systems) **1445**”); Cooperstock, ¶123.)

Jaszlics likewise discloses GPS. Jaszlics discloses using “observer sensors” for sensing a user’s position, and that the observer sensors can include “a position determination system, such as a differential Global Positioning Satellite System (GPS).” (Jaszlics, 10:52-11:4 (“For moving observers, who may be individuals moving in the real world, or housed in a vehicle, the observer sensors include a position determination system, such as a differential Global Positioning Satellite System (GPS).”); *see also id.*, 16:30-32 (“A Global Positioning Satellite (GPS) receiver, with optional differential correction, and an aircraft altimeter determine the three-dimensional position of the observer.”).) Jaszlics therefore discloses a “[locating] **device**” in the form of a GPS receiver. (Cooperstock, ¶124.)

Jaszlics further explains that the GPS receiver (as an “observer sensor”) is used during game play “**for updating the physical location of said device on said physical playfield**”:

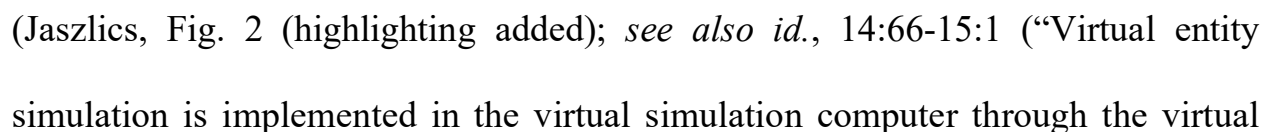
Changes in the position and orientation of the observer, of a vehicle housing the observer, or of movable elements of the vehicle (e.g. a tank’s turret) as sensed by the observer’s sensors and controls are processed by the observer state and action processing step. The virtual entity simulation receives this information for updating the simulation, in which the avatar of the observer, or the avatar of the observer’s

vehicle is represented. Both the virtual entity simulation and the virtual masking object generation function will respond to the position and attitude changes of the observer, or the observer's vehicle. Such changes will affect the angular orientation of the virtual entities and virtual masking objects, and the apparent distance from observer to virtual entities and masking objects.

(Jaszlics, 11:30-43; *see also id.*, 10:52-11:4 (“For moving observers...”), 10:29-34 (“The observer's interactions with the real world also include the movement of the observation point (in the case of a battle tank, the movement of the vehicle and rotation of the turret), and the resulting changes of three-dimensional position and attitude.”).) Jaszlics therefore discloses the claimed “[locating] **device**” in the form of a GPS receiver associated with the user and used to determine and update the receiver's (and thereby, the user's) physical location as the user (and receiver) moves about their physical environment.⁴ (Cooperstock, ¶125.)

Jaszlics also teaches “**said video game logic utilizes the physical location of said device in providing said video game.**” (Cooperstock, ¶126.) As discussed above, Jaszlics explains that the system utilizes user sensor information that it

⁴ And as a part of the head-mounted device, the GPS receiver's location updates would also correspond to the updated physical location of the head-mounted device. (Cooperstock, ¶125.)



simulation and control software.”).)

Jaszlics therefore teaches that system software including virtual simulation and control software (“**said video game logic**”) uses physical location information provided by a GPS receiver (“**utilizes the physical location of said device**”) to provide updated virtual simulation game play based on that information (“**in providing said video game**”). (Cooperstock, ¶127.)

Petitioner will turn now to address how Jaszlics, alone or in view Ronzani, renders obvious a “[locating] **device**” that is head-mounted as a part of the recited “head-mounted device.”

Just like Jaszlics’ range scanner, it would have been obvious to a person of ordinary skill in the art for the user’s GPS receiver to be head-mounted. (Cooperstock, ¶129.) This is because, as discussed, Jaszlics teaches that the user can be a mobile individual. (Jaszlics, e.g., 10:63-67, 5:13-18, 1:64-67 (describing laser tag).) A person of ordinary skill in the art would have understood that, in order to continue to present a usable and realistic simulation, updated positioning information would need to be collected about the user as the user moved around their environment—in fact, as noted above, this is expressly acknowledged in Jaszlics. (Jaszlics, e.g., 11:30-43; Cooperstock, ¶129.) In order to collect accurate information about that user’s position, the GPS receiver would need to be kept in close proximity to the user—and the user’s head, as the body location most capable

of receiving unobstructed signals from overhead GPS satellites, would have been an obvious choice from a finite number of body locations. (Cooperstock, ¶129.)

To the extent there is any question whether it would have been obvious for a GPS receiver to be head-mounted as a part of the head-mounted device, this is expressly disclosed by **Ronzani**. (Cooperstock, ¶130.) As discussed, Ronzani describes various embodiments of a head-mounted display device—including head-mounted display devices that include a GPS receiver. For example, Figure 42 of Ronzani, shown below, is a “functional block diagram of a head-mounted military computer **710F**”:

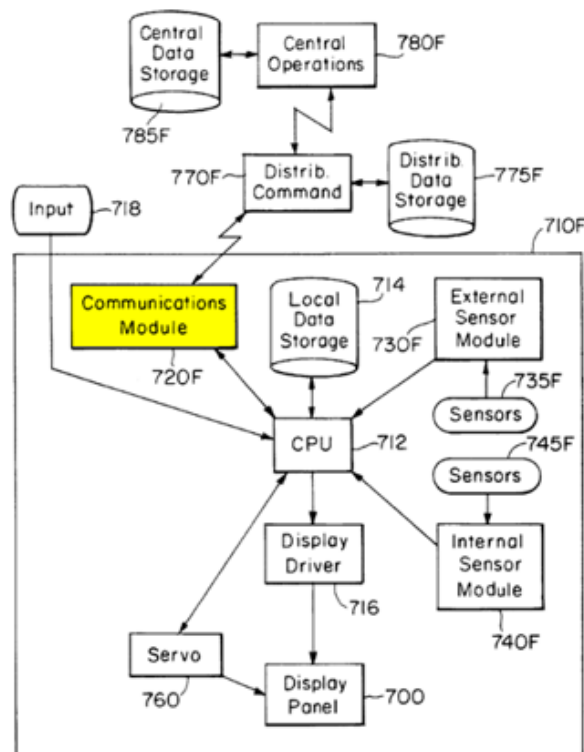


Fig. 42

(Ronzani, Fig. 42 (highlighting added), ¶0189.) As highlighted in the figure above,

the “head-mounted military computer” includes a Communications Module 720F, which can “contain a GPS, which provides the soldier and command officers with the soldier’s location.” (Ronzani, ¶¶0191.) Ronzani also describes numerous other, non-military, head-mounted devices that include GPS. (Ronzani, e.g., ¶¶0179-0181 (“head-mounted police computer” “can also include a GPS”), 0182-0183 (“head-mounted computer 710C for use by chemical factory workers” “can also include a GPS”), 0200-0201 (“head-mounted survival computer” “includes a GPS”).)

Rationale and Motivation to Combine (Jaszlics-Rallison-Sofer with Ronzani). Petitioner discussed the rationale and motivation to combine Jaszlics with Ronzani in connection with the analysis of claim 1[c], which applies here as well. (Cooperstock, ¶¶131, 116-118.) With respect to claim 1[d], it would have also been obvious to combine Ronzani’s teachings regarding a head-mounted GPS receiver with Jaszlics’ combined reality computing system. (Cooperstock, ¶131.) The combination would have involved no change in function and would have predictably resulted in a head-mounted GPS receiver as a part of the user’s electronic goggles/visor—thereby disclosing “**head-mounted device...comprising...a [locating] device**” as claimed. (*Id.*)

As discussed for claim 1[c], Ronzani is an analogous reference to the ’559 patent. (Cooperstock, ¶¶132, 117.) With respect to claim 1[d], Ronzani also would have been reasonably pertinent to problems facing the ’559 patent inventor,

including techniques for head-mounting various sensors, receivers, and other devices as part of a head-mounted display device system.

A person of ordinary skill in the art would have been motivated to combine. (Cooperstock, ¶133.) As discussed above, a person of ordinary skill in the art would have appreciated that it would be desirable for Jaszlics' GPS receiver to be placed in close proximity to the user. Therefore, a person of ordinary skill in the art, seeking to implement or adapt Jaszlics' teachings, would have been motivated to investigate potential ways in which a GPS receiver could be implemented for a mobile individual—and would have recognized that a head-mounted GPS receiver would have been obvious to try. (*Id.*) A person of ordinary skill in the art would have therefore looked to a reference like Ronzani—which as noted describes head-mounted display devices for similar entertainment and military-based uses as Jaszlics (Ronzani, ¶¶0005, 0189)—for its disclosures confirming and describing implementations of a head-mounted GPS receiver for a mobile individual. (Cooperstock, ¶133.)

A person of ordinary skill in the art would have had a reasonable expectation of success. As with a head-mounted camera, the combination would have simply involved where to place a known, available GPS receiver—in this case, mounting the device on the user's head. (Cooperstock, ¶134.)

2. Claim 12: “The head-mounted device of claim 1, wherein said display is a non-transparent display, said device includes an accelerometer, and said detector includes a camera.”

To facilitate analysis, the Petition addresses each portion of claim 12 separately below.

(a) “said display is a non-transparent display”

With respect to display of the head-mounted device being a “**non-transparent display**,” it would have been obvious for the display of Jaszlics’ electronic display goggles/visor to be “**non-transparent**.” (Cooperstock, ¶¶136-142.)

In particular, *optical* see-through and *video* see-through were the two known techniques for providing see-through head-mounted displays. (Cooperstock, ¶137.) For example, J.P. Rolland et al., “A comparison of optical and video see-through head-mounted displays” (“**Rolland**”) [EX1013], explains that “[t]o obtain an enhanced view of the real environment, the user wears a see-through HMD to see 3D computer-generated objects superimposed on his/her real-world view. This see-through capability can be accomplished using either an optical or a video see-through HMD.” (EX1013, p.007 (“Abstract”).)

In *video* see-through, the display is **non-transparent**, and the view of the user’s physical surroundings is via video image provided by head-mounted camera(s). (Cooperstock, ¶138 (citing EX1013, pp.007 (“With a video see-through

HMD, the real-world view is captured with two miniature video cameras mounted on the head gear”), 0010 (“Video see-through HMDs are more invasive in the sense that they block out the real-world view in exchange for the ability to merge the two views more convincingly.”), 0012 (“In the case of video see-through HMDs, real-scene images are digitized by miniature cameras and converted to an analog signal which is fed to the HMD displays.”)).) With optical see-through, the display is transparent. (Cooperstock, ¶138 (citing EX1013, p.007 (“With optical-see-through HMDs, the real world is seen through semi-transparent mirrors placed in front of the user’s eyes, as shown in Figure 1. These mirrors are also used to reflect the computer-generated images into the user’s eyes, thereby combining the real- and virtual-world views.”))).)

It would have been obvious in Jaszlics’ combined reality system for the display of the user’s head-mounted electronic display goggles/visor to be “**non-transparent.**” (Cooperstock, ¶139.) For starters, Jaszlics suggests both *optical* see-through and *video* see-through displays. With respect to *optical* see-through, for example, claim 4 of Jaszlics describes how the user’s field of view comprises “the field of view visible through [the electronically-controlled] visor.” (Jaszlics, 23:56-59.) This is consistent with the optical-see through



Figure 1. Optical see-through head-mounted display (Photo courtesy of Kaiser Electro-Optics).

visor depicted in Figure 1 of Rolland (at right). (Cooperstock, ¶139 (citing EX1013, p.008).)

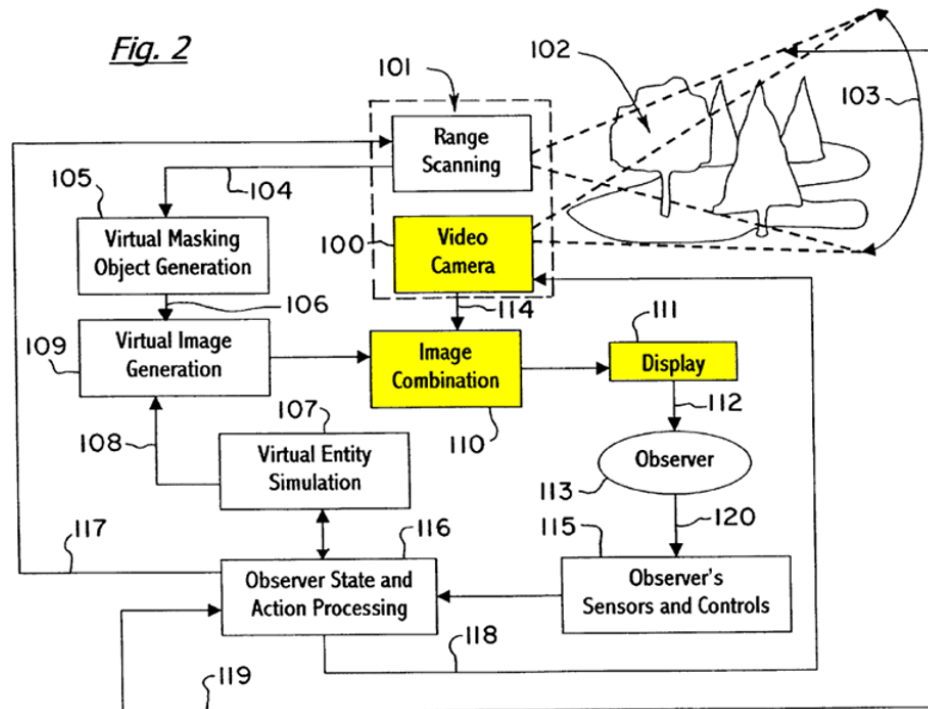
But Jaszlics also suggests *video* see-through—i.e., “a **non-transparent display.**” (Cooperstock, ¶140.) Jaszlics describes “virtual reality goggles” as a suitable display device. (Jaszlics, 9:48-57.) Virtual reality goggles—such as those shown in Figure 2 of Rolland at right—were known to use a non-transparent display and incorporate a view of the user’s real-world surroundings, if at all, “into a computer-generated environment” by using “portions of real-world images.” (Jaszlics, 1:25-28; *see also* EX1013, p.008 (Fig. 2 (at right))).⁵



Figure 2. A video see-through head-mounted display.

⁵ Petitioner also notes that Rolland provides further confirmation of the obviousness of head-mounted cameras discussed for claim 1[c]. As shown in Figure 2 of Rolland above, Rolland provides yet another example of a head-mounted display device that includes two head-mounted cameras. (*See also* EX1013, p.007 (“With a video see-through HMD, the real-world view is captured with two miniature cameras mounted on the head gear, as shown in Figure 2...”).)

Moreover, as noted, Jaszlics describes using a camera to obtain images of the user's field of view. (Cooperstock, ¶141.) For example, referring to Figure 2, reproduced below, Jaszlics how "virtual images...are combined with the real-world image **114** originating from the video camera **100**":



(Jaszlics, Fig. 2 (highlighting added), 8:53-56.) And as noted for claim 1[c], Jaszlics further indicates that the camera could be head-mounted, explaining how “[c]hanges in the head position of the observer in some implementations of the invention will control the optical axes of the video camera and range scanner, to ensure that scanning and real-world scene acquisition coincides with the observer’s current field of view.” (Jaszlics, 11:43-47.)

Even if there is any question whether Jaszlics expressly discloses or suggests using a “**non-transparent display**” as claimed, it would have been obvious to try. (Cooperstock, ¶142.) For example, Ronzani discloses both transparent and non-transparent head-mounted displays. (*See generally*, Ronzani, e.g., ¶¶0011-0012, 0276, 0280, Figs. 66 & 67 (transparent displays), Figs. 32A & 33 (non-transparent displays).) And as Rolland notes, video see-through displays—i.e., non-transparent displays—were one of two known types of head-mounted see-through displays. Rolland also provides motivation to use a “non-transparent display,” explaining that they have the ability to merge virtual and real-world elements “more convincingly.” (Cooperstock, ¶142 (quoting EX1013, p.0010).) Using a “**non-transparent display**” therefore would have been obvious over the prior art and background knowledge of a person of ordinary skill in the art. (*Id.*)

(b) “said device includes an accelerometer”

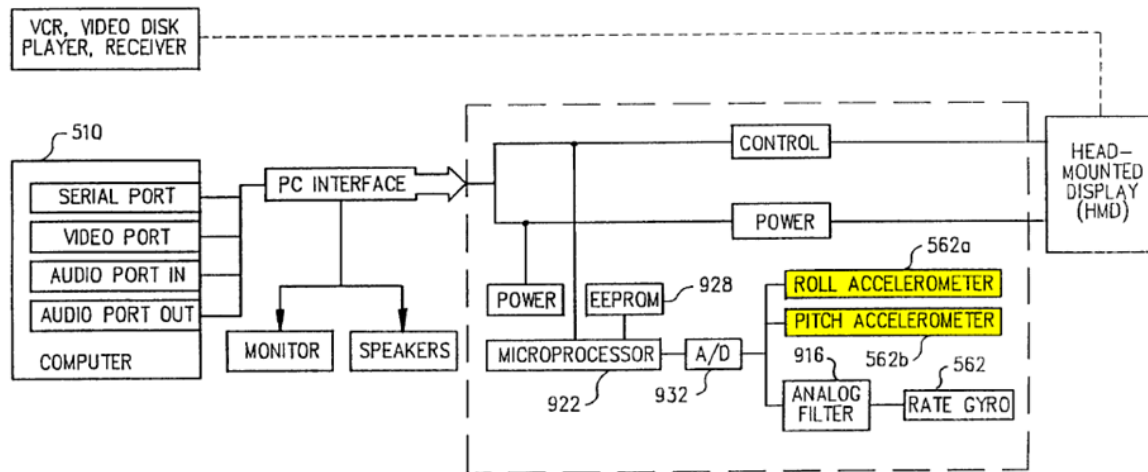
This portion of claim 12 would have been obvious over Jaszlics in view of **Rallison**. (Cooperstock, ¶¶143-146.)

Jaszlics, for its part, discloses using sensors to detect “three-dimensional position and attitude” and “used in conjunction with virtual reality goggles.” (Jaszlics, 10:48-57 (“Observer sensors and controls **115** (in FIG. 2) are devices using existing technology....The position and orientation of the observer (including the movement and attitude of the vehicle, if any, housing the observer) is sensed by

observer sensors and controls 115 such as a magnetic or infrared head tracker system used in conjunction with virtual reality goggles.”), 10:26-34 (“Observer actions also include interactions of the observer with the real world, such as head movement of the observer....The observer’s interactions with the real world also include the movement of the observation point (in the case of a battle tank, the movement of the vehicle and rotation of the turret), and the resulting changes of three-dimensional position and attitude.”); Cooperstock, ¶144.) Jaszlics does not appear to expressly disclose that the position and orientation sensors include an “**accelerometer**,” but it would have been obvious. (Cooperstock, ¶144.)

For example, **Rallison** describes a head-worn “tracker” device “for outputting an indication of the orientation, attitude and/or position of a head-mounted display (HMD).” (Rallison, Abstract; Cooperstock, ¶145.) The tracker can use different types of sensors, such as “magnetic sensors” or “one or more inertial sensors, such as a rate gyro and/or accelerometers.” (Rallison, Abstract; *see also id.*, 5:5-17 (“inertial sensors (such as one or more accelerometers) for detecting pitch and/or roll”).) Figure 25C of Rallison, reproduced below, depicts two accelerometers **562a** and **562b**, of a tracker device, which “can be integrally built into the head-mounted display device”:

FIG. 25C



(Rallison, Fig. 25C (highlighting added); *see also id.*, 20:60-63 (“In the embodiment of FIG. 25C, pitch and roll are sensed respectively by accelerometers 562a, 562b....”), 17:50-55 (“[O]ne or more trackers can be integrally built into the head-mounted display device.”).)

The combination of Rallison’s teachings with Jaszlics would have predictably resulted in electronic goggles/visor (“**head-mounted device of claim 1**”) that “**includes an accelerometer.**” (Cooperstock, ¶146.) The rationale and motivation to combine Jaszlics and Rallison discussed for claim 1[a] applies here as well. (Cooperstock, ¶¶146, 78-80.) In addition, it would have been obvious, and imperative, to a person of ordinary skill in the art to use observer sensors to determine attitude/orientation of the user’s head-mounted display in order to correctly overlay virtual entities in the user’s field of view. (Cooperstock, ¶146.) Without pitch and roll information regarding the head-mounted display, the virtual

entities would not be properly registered to their intended locations from the user's perspective. For example, a virtual tank might be incorrectly placed over the sky instead of appearing at ground level. (*Id.*) This imperative is recognized in Jaszlics, which explains that “[c]hanges in the head position of the observer in some implementations of the invention will control the optical axes of the video camera and range scanner, to ensure that scanning and real-world scene acquisition coincides with the observer's current field of view.” (*Id.* (quoting Jaszlics, 11:43-47).) As Rallison teaches, using a head-mounted accelerometer is one of a finite number of ways of achieving this imperative, and accordingly it would have been obvious to try. (*Id.*)

(c) “said detector includes a camera”

For claim 12, “**said detector**” refers back to the “**detector for determining landscape characteristics of said physical playfield**” recited in claim 1. As discussed above for claim 1[c], Jaszlics discloses and renders obvious “**said detector**” in the form of a range scanner, and also more specifically in the form of a *camera*-based range scanner. For example:

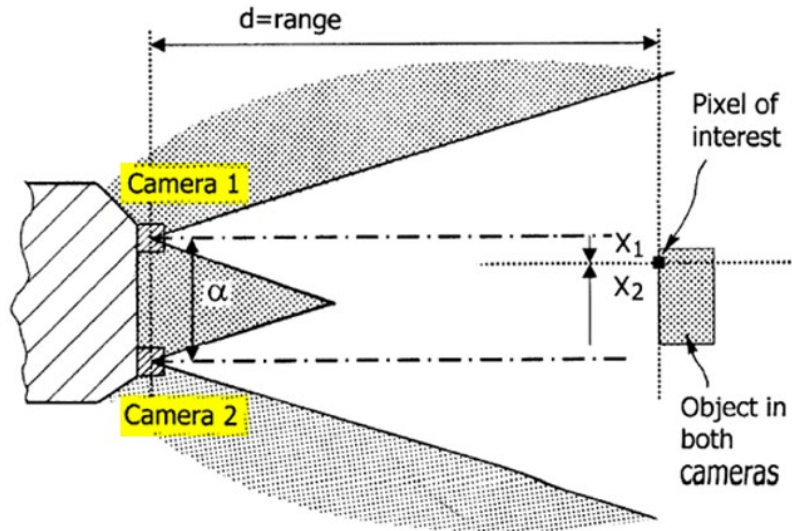


Fig. 24

(Jaszlics, Fig. 24 (highlighting added), 4:6-7.) Therefore, for the reasons discussed for claim 1[c], the limitation “**said detector includes a camera**” is disclosed and obvious. (Cooperstock, ¶¶147, 110-120.)

3. Claim 17: “The head-mounted device of claim 1, wherein the pitch, roll, and direction of said head-mounted display are utilized in said video game.”

With respect to “pitch” and “roll,” as discussed for claim 12, Jaszlics discloses using sensors to detect “three-dimensional position and attitude” and “used in conjunction with virtual reality goggles.” (Jaszlics, 10:48-57, 10:26-34.) Three-dimensional “attitude” includes pitch, roll, and yaw. (Cooperstock, ¶148 (citing EX1015, p.004 (entry for “attitude”); EX1005, 4:62-64 (“A viewer head attitude monitor **38** is provided for monitoring the attitude of the viewer’s head. By ‘attitude’ is meant the same concept used in regard to aircraft pitch, roll and yaw.”))).)

Jaszlics also discloses sensing “**direction**,” explaining that, for moving users, sensors to detect “changes in spatial direction” “must be included”:

For moving observers, who may be individuals moving in the real world, or housed in a vehicle, the observer sensors include a position determination system, such as a differential Global Positioning Satellite System (GPS). If the platform housing the observer changes its spatial direction, an attitude sensing system, such as a three-antenna GPS system measuring angular differences by signal phase shift measurements must be included in the suite of observer sensors.

(Jaszlics, 10:63-11:4; Cooperstock, ¶149.)

For the same reasons discussed in connection with claim 12, a person of ordinary skill in the art would have understood and found it obvious that the detected “**pitch, roll and direction**” would be “**of said head-mounted display**”—it would be imperative for this information to be associated with the head-mounted display in order to correctly overlay virtual entities in the user’s field of view. (Cooperstock, ¶¶150, 146.)

Lastly, Jaszlics makes clear that “**pitch, roll and direction**” are “**utilized in said video game**.” (Cooperstock, ¶151.) In particular, Jaszlics explains that the observer sensor information, which includes pitch, roll and direction, is used to update the simulation (“**said video game**”):

Changes in the position and orientation of the observer, of a vehicle housing the observer, or of movable elements of the vehicle (e.g. a

tank's turret) as sensed by the observer's sensors and controls are processed by the observer state and action processing step. The virtual entity simulation receives this information for updating the simulation, in which the avatar of the observer, or the avatar of the observer's vehicle is represented. Both the virtual entity simulation and the virtual masking object generation function will respond to the position and attitude changes of the observer, or the observer's vehicle.

(Jaszlics, 11:30-43; *see also id.*, 11:14-21 (“Observer actions sensed by the observer's sensor and controls are transformed into data or control signals appropriate for responding to the observer's actions.”).)

4. Claim 20: “The head-mounted device of claim 1, wherein said detector is utilized before the start of said video game.”

Claim 20 would have been obvious over Jaszlics in two separate ways.

First, as a simple matter, it would have been obvious to use Jaszlics' range scanner (“**said detector**”) immediately before actually starting game play in order to ensure that the simulation was properly displayed to the user from the outset. (Cooperstock, ¶153.) Without range scanning before game play, virtual elements might be incorrectly or confusingly rendered to the user, even if only momentarily. Range scanning before game play would thus help ensure a realistic experience without any initial delays in providing the intended combined reality experience. (*Id.*)

Second, Jaszlics describes using a camera before starting a simulation in order to determine and correct landscape characteristics. (Cooperstock, ¶154.) In particular, Jaszlics explains how terrain data obtained from the US Geological Survey may need to be edited before it can be used in a simulation because the data “usually does not correspond exactly to the terrain visible through the video camera **200** (FIG. 16), or sensed by the laser scanner **203**.” (Jaszlics, 17:1-4.) “To correct the VRML elevation grids on the basis of real-world data,” Jaszlics explains, “during scenario preparation, before a scenario is executed by the virtual simulation and control software, the direct video feed from the video camera can be used to edit the VRML terrain grid.” (Jaszlics, 17:4-14; *see also id.*, 17:14-18 (“In this editing mode, the virtual image of the terrain grid, displayed by the Java component of the route generation module, is mixed, through the video mixer **213** with the video image of the corresponding terrain in the S-Video display **215**.”).)

It would have been obvious for “the video camera” Jaszlics describes using to correct landscape characteristics to be the head-mounted camera comprising the *camera*-based range scanner (“**said detector**”) Petitioner discussed in connection with claim 1[c]. It would have simply involved the straightforward use of one or more of the cameras of the camera-based range scanner—and would have predictably resulted in “[t]he head-mounted device of claim 1, wherein said

detector [camera-based range scanner] **is utilized before the start of said video game** [a simulation provided by a scenario]” as claimed. (Cooperstock, ¶155.)

A person of ordinary skill in the art would have been both motivated to use the head-mounted camera and would have found it obvious to try. (Cooperstock, ¶156.) Because the head-mounted camera would accurately capture the landscape from the user’s vantage point, a person of ordinary skill in the art would have appreciated that using the head-mounted camera could advantageously allow the user to, in turn, accurately correct the terrain data. (*Id.*) Moreover, with respect to using *stereo* cameras of a camera-based range scanner, doing so would provide the user with a more consistent viewing experience that would help both to preserve a realistic 3-D viewing experience and to reduce potential disorientation that may come from switching between 2-D and 3-D views of their surroundings. (*Id.*) Furthermore, because the actual terrain may include trees and other objects partially occluding the user’s view, using stereo cameras would help the user to see more of the scene so that the terrain data might be more accurately corrected. (*Id.*) In addition, as one of a finite number of cameras in Jaszlics’ combined reality system, using the head-mounted camera(s) would have been obvious to try. (*Id.*)

VII. CONCLUSION

Petitioner respectfully requests IPR institution.

Petition for *Inter Partes* Review of
U.S. Patent No. 10,828,559 B2

Dated: March 26, 2025

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CERTIFICATE OF COMPLIANCE WITH WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), I certify that this petition complies with the type-volume limits of 37 C.F.R. § 42.24(a)(1)(i) because it contains 11,222 words, according to the word-processing system used to prepare this petition, excluding the parts of this petition that are exempted by 37 C.F.R. § 42.24(a) (including the table of contents, a table of authorities, mandatory notices, a certificate of service or this certificate word count, appendix of exhibits, and claim listings).

DATED: March 26, 2025

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CERTIFICATE OF SERVICE

I hereby certify, pursuant to 37 C.F.R. Sections 42.6 and 42.105, that a complete copy of the attached **PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO. 10,828,559 B2**, including all exhibits (**Nos. 1001-1005, 1008-1009, 1011-1018**) and related documents, are being served via Federal Express on the 26th day of March, 2025, the same day as the filing of the above-identified document in the United States Patent and Trademark Office/Patent Trial and Appeal Board, upon Patent Owner by serving the correspondence address of record with the USPTO as follows:

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And, via Federal Express upon counsel of record for Patent Owner in the litigation pending before the U.S. District Court for the Western District of Texas entitled *Mullen Industries LLC v. Meta Platforms, Inc.*, Case No. 1:24-cv-00354-DAE (W.D. Tex.) as follows:

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