

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GIESECKE+DEVRIENT GMBH, GIESECKE+DEVRIENT CURRENCY
TECHNOLOGY GMBH, AND PAPIERFABRIK LOUISENTHAL GMBH,
Petitioners,
v.
LUMENCO, LLC,
Patent Owner

**PATENT OWNER'S SUR-REPLY TO THE PETITION
FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 10,189,294**

Filed on behalf of Patent Owner by:

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EXHIBIT LIST

Exhibit	Description
2001.	January 21, 2021 Letter*
2002.	Voxel Definition from Scientific Volume Imaging B.V. (Copyright 1992-2024)*
2003.	“Chapter XXXIII - 3-D Visualization on Mobile Devices” Sanna and Lamberti, from Handbook of Research on User Interface Design and Evaluation for Mobile Technology, 3-D Visualization on Mobile Devices, 2008, DOI: 10.4018/978/1/59904-871-0.ch033*
2004.	Declaration Of Dr. Mikael Lindstrand*

* Previously submitted

I. INTRODUCTION

The parties dispute whether the asserted prior art renders obvious three claim elements: [1b.5], [35b.5], and [35b.5]/claim 24. Petitioner's Reply largely reiterates the arguments made in its Petition and fails to meaningfully rebut the evidence presented in the POR and Dr. Lindstrand's declaration. For that reason and the reasons detailed herein, Petitioner has not met its burden of establishing, by a preponderance of the evidence, that any challenged claim of U.S. Patent No. 10,189,294 (the "'294 patent") is unpatentable.

II. FUHSE262 DOES NOT TEACH ELEMENT [1B.5]: "WHEREIN A VOXEL IS CREATED AT EACH OF THE POINTS ON THE PLANE VIA INTERSECTION OF TWO OR MORE BEAMS OF THE REFLECTED AMBIENT LIGHT"

Fuhse262 does not teach or suggest element [1b.5]. Neither the Petition nor the Reply satisfies the high burden of showing that Fuhse262 inherently discloses creation of voxels. Petitioner's only evidence of the alleged disclosure of creation of voxels is predicated on a fundamental misunderstanding of the behavior of ambient light environments. That misunderstanding negates the arguments of Petitioner and its expert. On the other hand, the declaration and testimony of Dr. Lindstrand explains in detail why a POSITA would not understand Fuhse262 to teach or suggest creation of a voxel as required by element [1b.5]. On this record, Petitioner has not and cannot meet its burden to show that Fuhse262 teaches or suggests element [1b.5].

A. PETITIONER HAS NOT SHOWN THAT FUHSE262 INHERENTLY DISCLOSES CREATION OF VOXELS.

Fuhse262 does not use the term “voxel” and does not mention “pixels with volume,” “3D pixels,” or any similar term and does not contain any figures showing a voxel—neither Petitioner nor its expert argue otherwise. *See generally*, Ex. 1006; Petition, pp. 31-33; Ex. 1003, ¶¶ 166-175; Petitioner’s Reply, pp. 2-5. Thus, it is undisputed that Fuhse262 does not explicitly disclose voxels and does not explicitly disclose the creation of pixels with volume.

Where, as here, an element is missing from the applied prior art, the Petitioner bears the burden of supplying the missing element by demonstrating that:

- 1) The missing element is disclosed by another piece of prior art;
- 2) the missing element is “common sense;” and/or
- 3) the missing element is inherently disclosed by the prior art reference. In the context of an obviousness analysis, this means the missing element “necessarily must be present, or the natural result of the combination of elements explicitly disclosed by the prior art.”

Here, Petitioner fails to establish any of the three.

First, Fuhse262 is presented as single reference obviousness and neither the Petition nor Dr. Hesselink points to any reference—other than the ’294 patent itself—that discloses the concept of voxels.

Second, common sense can be used to supply a claim element that is “admittedly missing from the prior art” only if the element is “unusually simple and

the technology particularly straightforward.” *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, 1362 (2016). Petitioner does not argue that the creation of voxels is “common sense” and the complexity of the related technology is evident from the record. Dr. Lindstrand explains in great detail the technical challenges involved in creating a voxel, which include compensating for the diffused light rays present in ambient light conditions and the need to create more intense light rays to convey the amount of information necessary to present a voxel, among other challenges. **Exhibit 2004**, ¶¶ 37, 45-55. Petitioner’s Reply dedicated no less than seven full pages attempting to explain what a voxel is and how the same is allegedly shown by Fuhse262. Reply, pp. 4-11. This is not an unusually simple element—it is not common sense.

The same is true for the *third* option. Inherency may render a claimed element obvious, but only if the element is “necessarily present” or is “the natural result of the combination of elements explicitly disclosed by the prior art.” *PAR Pharm., Inc. v. TWI Pharm., Inc.*, 773 F.3d 1186, 1196 (Fed. Cir. 2014). Inherency is a “high standard” that is “carefully circumscribed in the context of obviousness.” *Id.* at 1195. Inherency “may not be established by probabilities or possibilities,” and “[t]he mere fact that a certain thing may result from a given set of circumstances is not sufficient.” *Id.* at 1196 (*quoting In re: Oelrich*, 666 F.2d 578, 581 (C.C.P.A. 1981)).

Petitioner has made no effort to meet this high standard. Instead, Petitioner openly ducks the standard by arguing that it is not relying on inherency and is,

instead, relying on obviousness. Reply, p. 6. In doing so, Petitioner tacitly admits that creation of voxels *are not* the necessary result of the Fuhse262 disclosure. Petitioner does not argue that it would have been obvious to *modify* Fuhse262 to display a voxel. Petitioner’s only argument is that, despite not using the term “voxel” or showing a voxel, Fuhse262 nevertheless “*discloses* such a ‘voxel’ as claimed.” *Id.*, p. 4. Petitioner then urges that “[it] is the substance of what Fuhse262 teaches that matters. . . .” *Id.* That is an inherency argument, plain and simple. And even given every benefit of the doubt, Petitioner has at most shown that Fuhse262 *might* be able to create voxels in some situations, i.e., a controlled lab environment. That falls far short of meeting the inherency standard, especially where, as here, the claims specifically recite an ambient light environment. Because Petitioner failed to even attempt to meet its burden of showing inherency, the Board should find that element [1b.5] is not obvious in view of Fuhse262.

B. PETITIONER’S ARGUMENTS RELY ON A FATAL MISUNDERSTANDING OF AMBIENT LIGHT ENVIRONMENTS AND ARE THEREFORE UNPERSUASIVE.

Whether analyzed under the inherency standard or some other, unidentified, more lenient rubric, Petitioner has not met its burden to show that Fuhse262 teaches or suggests creation of voxels. At the institution stage, the Board found that Petitioner had shown a reasonable likelihood that Fuhse262 teaches element [1b.5], noting that Dr. Hesselink testimony was, at that time, un rebutted. Paper 8, p. 16. At

this stage of the review, however, Petitioner must prove invalidity by a preponderance of the evidence, which is a very different analysis. *See In re: Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1376 (Fed. Cir. 2016). Petitioner has not met that burden—the preponderance of the evidence here shows that Fuhse262 **does not** disclose creation of voxels.

The evidence of validity is extensive and effectively unrebutted. The POR and Dr. Lindstrand’s declaration establish that a POSITA would not have understood Fuhse262 to teach a system capable of creating a voxel. POR, pp. 14-20; Exhibit 2004, ¶¶ 42-58.

In contrast, Petitioner relies exclusively on Dr. Hesselink in arguing that Fuhse262 discloses voxels. *See generally*, Petition, pp. 31-33; Reply, pp. 2-13. Dr. Hesselink’s opinions are premised on a fundamental misunderstanding of the behavior of ambient light environments. Most notably, Dr. Hesselink opines that “[i]n the patent, ambient light refers to parallel light, i.e., **all the rays** coming from the source are parallel to each other.” Exhibit. 1003, ¶ 46. Neither Dr. Hesselink nor Petitioner have ever explained the basis for this opinion, nor have they cited any portion of the ’294 patent in support of that proposition. *See id.*; Petition, *generally* (failing to even mention Dr. Hesselink’s understanding of parallel light); Reply, p. 13 (stating, without cited any evidence, that “PO is simply wrong that the ‘ambient light’ in the patent refers to . . . diffusive light and not parallel light”).

Dr. Lindstrand has explained why Dr. Hesselink’s opinion is categorically false and why that misunderstanding resulted in Dr. Hesselink and Petitioner reaching a flawed conclusion. *See Exhibit 2004*, ¶35. Specifically, Dr. Lindstrand explains that a POSITA would understand that “ambient light” as used in the art and in the ’294 patent specifically refers to non-collimated light, i.e., an environment where light rays are scattered and diffused. *Id.* at ¶¶36-37. Dr. Lindstrand has also explained that creating a voxel in an ambient light environment, i.e., one that is diffusive, involves technical challenges that far exceed those required to make a pixel. *Id.* at ¶¶ 26 (explaining that the ambient light environment is a diffusive light environment and the associated challenges), 45-51 (expanding on the various technical issues associated with creating a voxel in an ambient light environment and how they are “beyond those required to create a pixel”). Neither Fuhse262 nor Dr. Hesselink acknowledge those technical challenges, much less explain how a POSITA would understand Fuhse262 to overcome those challenges to create a voxel. *Id.* at ¶¶52, 56; POR, pp. 18-19. Fuhse262 therefore fails to teach or suggest the creation of voxels. *Exhibit 2004*, ¶57.

Given this record, the preponderance of the evidence shows that Fuhse262 *does not* teach element [1b.5]. There is no evidence of record supporting Dr. Hesselink’s opinion that ambient light is parallel light, and that misunderstanding taints Dr. Hesselink’s entire analysis. Instead of presenting persuasive evidence, the

Reply turns to desperation. First, the Reply attempts to shift the burden to Patent Owner, arguing that “PO provided no explanation of why a pixel formed from Fuhse262’s reflected light beams all aimed at a common point *would not* have a volume.” Reply, p. 6 (emphasis added). But the “burden never shifts” from the IPR petitioner to the patent owner to prove validity after institution. *FanDuel, Inc. v. Interactive Games LLC*, 966 F.3d 1334, 1341 (Fed. Cir. 2020) (quoting *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015)).

The Reply also mischaracterizes Dr. Lindstrand’s deposition testimony in an apparent attempt to manufacture evidence at the twelfth hour. The Reply argues that “upon cross-examination, Dr. Lindstrand admitted that for someone on earth, sunlight is ‘best approximated as a parallel light source.’” Reply, p. 23 (citing Ex. 1052, 96:1-7, 98:10-20). That is a blatant mischaracterization of the record. What Dr. Lindstrand said was that “*in the void of space outside, far from earth . . . it’s best approximated as a parallel light source*”:

1	Q	Would the sunlight contain parallel rays?
2	MR. ROZIER:	Object to form.
3	THE WITNESS:	In certain
4		conditions, yes. As I said, in the void
5		space outside, far from the Earth, but
6		also from away from the sun, it's best
7		approximated as a parallel light source.

Ex. 1052, 96:1-7 (emphasis added). Dr. Lindstrand went on to explain that, *in*

contrast to the conditions in the void of space, “entering again closer to the earth, you have disturbances in our atmosphere’ that cause the light rays to “become[] messy . . . bouncing around, and then you have light rays from different directions. And *on the surface of the Earth you have bouncing around from the whole environment, the cars and the mirrors and everything, then you have an ambient light condition.*” *Id.*, 95:4-11 (emphasis added). That is entirely consistent with Dr. Lindstrand’s declaration and further illustrates how Dr. Hesselink fundamentally misunderstands the ambient light environment of the ’294 patent.

Finally, the *In re: Epstein* case is inapplicable here. Reply, p. 10 (citing *In re: Epstein*, 32 F.3d 1559, 1568 (Fed. Cir. 1994)). That case addressed an issue of prior art enablement pursuant to 35 U.S.C. § 112, para. 1, not whether the prior art reference disclosed the relevant element in the first place. *In re: Epstein*, 32 F.3d at 1568. It is undisputed that Fush262 does not explicitly disclose the features of element [1b.5]. The deficiency with Fush262 is therefore disclosure in the first instance, not enablement of a disclosed feature. Moreover, the ’294 patent does describe how to form voxels and Petitioner itself admits that Dr. Lindstrand has “explained how the ’294 patent teaches forming voxels.” Reply, p 10.

For at least these reasons, all reliable evidence of record demonstrates that a POSITA would not understand Fush262 to teach or suggest creation of voxels, and the Petition should therefore be denied.

III. [35B.5]: FURTHER IN RESPONSE TO THE RECEIVING OF THE AMBIENT LIGHT, THE ARRAY OF MICRO MIRRORS DISPLAYS A SECOND IMAGE IN A SECOND PLANE *SPACED A DISTANCE APART* FROM THE PLANE DISPLAYING THE IMAGE.

The Board did not assess Petitioner’s arguments regarding claim 35 at the institution stage. Paper 3, p. 19 (noting that institution was based solely on the Board’s assessment of claim 1). At the trial stage, it is Petitioner’s burden to demonstrate invalidity by a preponderance of the evidence. *See In re: Magnum Oil Tools Int’l*, 829 F.3d at 1376. Petitioner has not met its burden.

A. PETITIONER HAS NOT PRESENTED A *PRIMA FACIE* OBVIOUSNESS POSITION.

The Petition and Reply present two arguments regarding element [35b.5]. Petition, pp. 42-43. *First*, Petitioner argues that Fuhse262’s disclosure of two motifs, one of which appears as if it is in the foreground of the other, “mean[s] that [the two motifs] are **spaced a distance apart** from each other.” Petition, p. 43 (emphasis in original). The Petition provides no explanation for this conclusion; it is merely presented as fact. *Id.* Moreover, the Petition itself admits that the two images are in the same plane, and therefore by definition are not “spaced apart.” *Id.* (“Fuhse262 discloses displaying two images in the same plane *The* two images are in the “foreground” and “background” of each other.”).

The cited portion of Dr. Hesselink’s declaration provides no meaningful additional analysis. He opines that “[a] POSITA would have understood that for

two images to be in the foreground and background of each other, they are spaced a distance apart from each other.” Ex. 1003, ¶ 221. That unsupported and unexplained opinion should be disregarded. 37 C.F.R. § 42.65(a) (“[e]xpert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight”).

Second, Petitioner argues that it would have been obvious to modify Fuhse262 to provide two two-dimensional images at different heights. Petition, p. 43. This argument relies entirely on the same conclusory opinion that the mere mention of an image appearing to be in the foreground of another image necessarily teaches that the two images are spaced a distance apart, and should be disregarded for that reason. 37 C.F.R. § 42.65(a). Dr. Hesselink’s declaration attempts to explain **how** a POSITA might modify Fuhse262 to achieve the features of element [35b.5]. Ex. 1003, ¶ 222 (“a POSITA would understand that a two-dimensional image **can** be constructed....”). But that opinion is not referenced or applied in the Petition and, more importantly, neither Dr. Hesselink nor Petitioner identify any reason **why** a POSITA might be motivated to modify Fuhse262 to achieve the features of element [35b.5]. *Id.* While a single reference can render a claim obvious, there must be a showing of a suggestion or motivation to modify the teachings of that reference to the claimed invention. *SIBIA Neurosciences, Inc. v. Cadus Pharm. Corp.*, 225 F.3d 1349, 1356 (Fed. Cir. 2000). Petitioner has made no such showing and therefore has

not met its burden. Using the invention of the challenged patent as a roadmap or motivation to modify a prior art reference is “hindsight bias of the worst kind, ‘wherein that which only the invention taught is used against its teacher.’” *Sci. Plastic Prods. v. Biotage AB*, 766 F.3d 1355, 1362 (Fed. Cir. 2014) (citations omitted).

For those reasons, Petitioner failed to present even a *prima facie* case that Fuhse262 teaches or suggest element [35b.5]. The validity of claim 35 should be affirmed on that basis alone.

B. THE TWO IMAGES OF FUHSE262 ARE NOT “SPACED A DISTANCE APART.”

Even if Petitioner had established a *prima facie* obviousness position, the vast weight of the evidence of record, including the disclosures of Fuhse262 itself and the detailed testimony of Dr. Lindstrand, establishes that Fuhse262 does not teach or suggest element [35b.5].

Specifically, the two motifs in Fuhse262 are “combined” within a single image and are therefore in the same plane. Ex. 1006, ¶ [0117]. Again, the Petition admits this. Petition, p. 43 (“Fuhse262 discloses displaying *two images in the same plane* *The* two images are in the “foreground” and “background” of each other.”). Dr. Lindstrand confirms that Fuhse262 teaches a POSITA that the 3-D motif and the 2-D motif are both displayed *within the same plane*. See Exhibit 2004, ¶65. If the two motifs were in two separate planes spaced a distance apart from one

another, as required by element [35b.5], then they would not form part of the same light spot image—they would instead appear as two separate, distinct light-spot images. See Exhibit 2004, ¶65. Consistent with this understanding, Fuhse262 explains that the 3D motif can be “*simply reduced* to the more robust two-dimensional foreground motif” in certain lighting situations. Ex. 1006, ¶ [0117]; Exhibit 2004, ¶67. If the two motifs were indeed in entirely different, nonoverlapping planes, then the light spot image would not *reduce* into the 2-D motif in poor lighting conditions—the 3-D motif would simply disappear, leaving the separate 2-D image visible in a different location. Exhibit 2004, ¶67.

Petitioner’s Reply provides no explanation of how two motifs that are combined within a single image could possibly be “spaced a distance apart from each other.” Instead, the Reply argues that 1) *if* Fuhse262 did disclose two two-dimensional images that were in the foreground and background of each other (which it does not) *and* 2) *if* a POSITA modified Fuhse262 such that the height values of those two were space apart from each other (which is not disclosed by Fuhse262), then there would be obviousness. Reply, p. 17. But the obviousness analysis does not deal in hypotheticals—the focus must be on what the reference actually teaches.

The evidence also establishes that even if a POSITA would have understood Fuhse262 to disclose a 3-D motif in a 3-D plane and a 2-D motif in a 2-D plane, it

still would not teach or suggest that the 3-D plane and the 2-D plane are *spaced a distance apart* from one another as required by element [35b.5]. Exhibit 2004, ¶70. Those claims could just as easily be abutting each other or partially overlapping, and Petitioner has pointed to no evidence—other than the teachings of the '294 patent itself—that would suggest to a POSITA spacing two images a distance apart from each other.

For at least these reasons, Petitioner has failed to meet its burden to show that claim 35 is obvious in view of Fuhse262.

IV. CLAIM 24: THE ASSEMBLY OF CLAIM 15, WHEREIN . . . THE ARRAY OF MICRO MIRRORS DISPLAYS A SECOND IMAGE IN A SECOND PLANE SPACED A DISTANCE APART FROM THE PLANE DISPLAYING THE IMAGE

Claim 24 depends from and adds element to independent claim 15. Claim 15 recites displaying a first image in a plane spaced apart from the surface of the substrate. Claim 24, like element [35b.5], recites a second image spaced a distance apart from the first image. Thus, claim 24 is valid for at least the same reasons as claim 35.

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), I hereby certify that the foregoing Patent Owner's Sur-Reply contains 3097 words as measured by the word processing software used to prepare the document, excluding the cover page, signature block, and portions exempted under 37 C.F.R. § 42.24(a) or (b).

DATED: June 26, 2025

Respectfully submitted,

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Counsel for Patent Owner

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6, the undersigned certifies that June 26, 2025, the foregoing document was served on counsel of record for Petitioners by filing this document through the End-to-End System, as well as *via* electronic mail to counsel of record for Petitioners at the following address:

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