

Filed on behalf of: Giesecke+Devrient GmbH, *et al.*

Filed: January 5, 2026

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.

Case No. IPR2024-00839
U.S. Patent No. 11,448,863

**AUTHORIZED RESPONSE TO DIRECTOR REVIEW REQUEST OF
FINAL WRITTEN DECISION**

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Ex. 1004	U.S. Patent No. 62262767 Provisional
Ex. 1005	DE102010048262A1
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Ex. 1008	U.S. Patent No. 10,639,925 to Fuhse (“Fuhse925”)
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Ex. 1010-1021	RESERVED
Ex. 1022	WO2012048847A1_English (“Fuhse 847”)
Ex. 1023-1024	Reserved
Ex. 1025	R. Lee, “Micromirror array nanostructures for anticounterfeiting applications,” Proc. SPIE 5310, Optical Security and Counterfeit Deterrence Techniques V, (3 June 2004)
Ex. 1026	Lee R.A., Leech P.W., “Development of Optically Variable Devices for Document Security in CSIRO Journal of the Coatings Association of Australia,” Vol. 42(8), August 2005, p. 22-27.
Ex. 1027	<i>Optics</i> , Hecht, 4th Edition (2002)
Ex. 1028	Saleh and Teich. Fundamentals of Photonics (1st Edition 1991), Ch. 1

Exhibit	Description
Ex. 1029	Ebewele, R.O. (2000). Polymer Science and Technology (1st ed.). CRC Press.
Ex. 1030	Franssila, S. Introduction to Microfabrication (1st Edition 2004)
Ex. 1031	Finale coin in the Australian Centenary of Federation Program Featuring an Optically Variable Device
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Ex. 1050	Declaration of Eric E. Lancaster in Support of Petitioners' Motion

Exhibit	Description
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Ex. 1051	Reserved
Ex. 1052	Hyperplane Definition Dictionary.com
Ex. 1053	Hyperplane, Subspace and Halfspace Definition
Ex. 1054	Annotations of U.S. Patent No. 10,189,294 by Mikael Lindstrand
Ex. 1055	Transcript of Deposition of Mikael Lindstrand (April 11, 2025)
Ex. 1056	Petitioner's Demonstratives

I. INTRODUCTION

The Request for Director Review (“Request”) should be denied.¹ The Request centers on the narrow factual question of whether the Fushe847 prior art teaches element [1a]. PO’s challenge to this limitation comprises a series of arguments that are almost entirely new and fail to establish any error or abuse of discretion. As to the single-issue PO raises that was before the Board – whether first and second objects are in a “starting digital image” – PO fails to identify any error by the Board.

PO resorts to alleging the Board improperly shifted the burden onto PO regarding elements [1a] and [12b] because the Board noted that PO did not provide expert testimony for these elements. But the Board did not require PO to provide expert testimony, as PO assumes. Instead, the Board conducted its essential function of reviewing the record evidence, and in doing so observed that PO did not assert any testimonial evidence. Ironically and without merit, PO also alleges abuse of discretion for the “complete lack of citations” to its expert, *despite PO not relying on expert testimony for the disputed limitations*.

Last, PO repeats its unpersuasive and flawed argument that the definition of a POSITA requires experience with “diffusive light” – a concept entirely absent from

¹ The Request effectively exceeds the page limit by failing to comply with 37 C.F.R. §42.6(a) (requiring double spacing for footnotes). This Response is in compliance.

the '863 patent. Contingent on the this rejected argument, PO alleges the Board erred in crediting Dr. Hesselink, because he is allegedly unfamiliar with “diffusive light.” This is both factually incorrect and legally insufficient. PO merely speculates that Dr. Hesselink’s purported unfamiliarity with “diffusive light” should have precluded the Board from crediting his testimony. However, PO ignores Dr. Hesselink’s experience and identified no specific factual errors in his testimony.

The Request falls woefully short of demonstrating any abuse of discretion or erroneous conclusion of law or material fact. The Director should deny the Request.

II. LEGAL STANDARD

Director Review of a Board’s Final Written Decision is “limited to decisions presenting (a) an abuse of discretion, (b) important issues of law or policy, (c) erroneous findings of material fact, or (d) erroneous conclusions of law.” Director Review Process, § 2.B.² None of these categories apply. PO’s disagreement with the Board’s detailed analysis is not an abuse of discretion. PO identifies no important issues of law or policy. PO falls woefully short of demonstrating erroneous findings of material fact or conclusions of law.

III. SUBSTANTIAL EVIDENCE AFFIRMS THE FINDINGS OF ELEMENTS [1A] AND [12B] IN FUHSE847

PO fails to identify material error in the Board’s conclusion regarding

²Available at <https://www.uspto.gov/patents/ptab/decisions/director-review-process>

elements [1a] and [12b]. PO Req., at 5-11.

A. PO's Argument for Element [1a] Should be Denied for Relying on New Theories

The Request should be denied because it improperly raises new arguments. “The Director will not consider new evidence or new arguments not part of the official record.” Director Review Process, § 3.E; Paper 9 (Scheduling Order) at 9 (“Patent Owner is cautioned that any arguments not raised in the [POR] may be deemed waived.”); *In re NuVasive, Inc.*, 842 F.3d 1376, 1380–81 (Fed. Cir. 2016) (holding PO waived arguments on an issue that were not raised in its POR).

Under the Director Review Process, new evidence or arguments not part of the official record will not be considered. The Request flagrantly violates this prohibition by introducing the following waived theories:

First, Section III.A.1.(a) introduces a novel “extracted separately” requirement that is not found in the claim language, the ’863 patent, or the briefing. PO Req. at 5 (“Limitation [1a] requires that a first object and a second object are ... extracted separately...”), 6 (“***Fuhse847 does not disclose two or more objects in the starting digital image that are extracted separately***”), 7 (“...extract those two objects separately.”), 8 (“...extract the two objects separately.”); POR at 14-18.

Specifically, PO never argued in its POR that element [1a] required “extracted separately”, let alone that the prior art failed to satisfy it. *See* POR at 14-18. In fact, the POR does not use the term “extract,” and the Request provides no explanation

of how the term is even relevant to the claims. Because this theory was not timely raised during the trial phase, the Director should disregard the entirety of Section III.A.1.(a) as waived. Director Review Process, § 3.E; Paper 9 (Scheduling Order) at 9; *In re NuVasive, Inc.*, 842 F.3d at 1380–81.

Second, PO's argument regarding "different display planes" in Section III.A.1.(b) is entirely new and should be disregarded. PO Req. at 9-10. PO never advanced an argument regarding "different display planes" for the first and second objects. POR at 14-18; PO Sur-Reply at 1-4. PO premises its argument on Fuhse847's disclosure of "foreground" and "background" images and a passage at p. 26, but PO *never* discussed (even a cursory reference) any of these teachings of Fuhse847 in its POR or Sur-Reply. *Id.*³

Third, PO relies on previously unasserted legal concepts, including motivation to combine references, hindsight bias, and teaching away, that were never brought

³ To the extent considered, PO's arguments are incorrect and should be soundly rejected. For example, PO refers to "a single 3D image in Fuhse847" (PO Req. at 10), but ignores Fuhse847's teachings of multiple images. *See, e.g.*, FWD at 19 (Fuhse847 at 25–26 "describe[es] a light-spot image A, a light-spot image B, and images in a foreground and background"); Pet. (Paper 1) at 21-22 (citing Fuhse847 at 25-28)); POR at fn. 2 (admitting "Fuhse847 teaches producing multiple images").

before the Board. In particular, PO argues for the first time that a POSITA would not be “motivated to extract the two objects separately” (PO Req. at 7-8), that a POSITA would not be “motivated to combine these references” (*id.* at 8-9), that Dr. Hesselink uses “classic hindsight bias” (*id.* at 9), and that the prior art “teaches away” from the claim language (*id.* at 10). These theories were never brought before the Board, and the Director should disregard them as waived. POR at 14-18.

Fourth, PO’s Request is premised on new assertions regarding the dimensionality of Fuhse847’s images. *See* PO Req. at 6 (“The only discussion a 2D-3D in Fuhse847 of two objects appearing together relates to a 2D-3D image...”), 7 (“...Dr. Hesselink does not explain how a POSITA would understand that two different 2D images are even disclosed by Fuhse847”), 8 (“...use of **one** font or logo as 2D image content that appears within a 3D image”), 10 (discussing “combining a 3D motif with a 2D motif” in Fuhse847). All these arguments are *entirely* new. *See* POR at 14-18. PO failed to address the dimensions of Fuhse847’s images, such as whether they are “2-D” or “3-D,” during the trial phase.⁴ *Id.* The Director should disregard these new arguments as waived.

⁴ As one example, PO never rebutted or even addressed Petitioners’ position that “[b]ased on Fuhse847’s teachings that multiple images may be created in the

**B. Substantial Evidence Supports First and Second Objects
from a Starting Digital Image**

As the Board explained for element [1a], PO argued that “Fuhse847 does not teach the user selecting a first and second object from the same digital image.” FWD at 18. PO claimed that “Fuhse847 only discloses choosing a first object from a starting digital image and that object is the entirety of the starting digital image.” FWD at 18; POR at 14-18. The Board considered the evidence and rejected this theory, dismissing the claim that Fuhse847 fails to teach selecting separate objects. FWD at 18-20. PO’s Request fails to identify any error in the Board rejecting the notion that the first object in Fuhse847 constitutes the entirety of the starting digital image or that Petitioner improperly mapped the same body to different claim terms.

Although PO again asserts the *conclusion* that the first and second objects in Fuhse847 originate from different digital images, it fails to allege any error in the Board’s rejection of this theory. Indeed, the Request crucially does *not* argue, as it did in the POR, that the first object in Fuhse847 encompasses the “entire digital image.” PO Req. at 5-11; POR at 16-18. Nor does the Request address the Board’s factual findings regarding the specific teachings of Fuhse847 that clearly foreclose

foreground and background of each other, and that images may be two-dimensional, a POSITA would have understood to provide two two-dimensional image planes at different heights (*i.e.*, in different planes).” Pet. at 22; EX1003, ¶177.

PO's conclusion. FWD at 18-20 (citing numerous teachings of Fuhse⁸⁴⁷ (Ex. 1022); PO Req. at 5-11; *see supra* fn.2).

At best, PO's arguments regarding element [1a] amount to a simple disagreement with the Board's factual findings in crediting Dr Hesselink as to his testimony regarding the POSITA's understanding. POR at 6-10. However, PO fails to identify any error in Dr. Hesselink's testimony and instead resorts to waived arguments (discussed above) and false allegations of burden shifting (discussed below). The Request fails to identify factual or legal errors by the Board and instead merely airs its disagreement with the Board's conclusions. Disagreement with a conclusion is not an error of fact or law or an abuse of discretion.

C. The Board Applied the Correct Legal Standard

PO incorrectly alleges the Board of "improperly shifting the burden of persuasion" for elements [1a] (PO Req. at 10-11) and [12b] (PO Req. at 11). This argument is contradicted by the Board's own explicit findings and the standard of evidence weighing.

First, the Board explicitly maintained the burden on petitioner. FWD at 8. The Board's FWD left no ambiguity regarding the burden applied:

[T]he petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable...Although we may indicate in this Decision that certain Patent Owner arguments are not

persuasive, in doing so we do not shift the ultimate burden from Petitioner.

FWD at 8, *see also* 20 and 23 (finding Petitioners met its burden).

Second, PO confuses weighing evidence and burden-shifting. PO's allegation of burden shifting rests entirely on the Board's observation that PO failed to provide any testimony from Dr. Lindstrand to rebut Dr. Hesselink's testimony regarding elements [1a] (FWD at 20) and [12b] (FWD at 23). PO Req. at 10-11. However, noting that PO did not present testimony to rebut Petitioners' expert testimony was not a burden shift. Rather, it is a routine weighing of the evidence in determining "what a POSITA would have found obvious" for elements [1a] and [12b].

Third, PO's reliance on *FanDuel, Inc. v. Interactive Games LLC*, 966 F.3d 1334, 1344 (Fed. Cir. 2020), is misplaced. While *FanDuel* notes that PO is not strictly "required" to provide expert testimony (PO Req. at 10-11), it also affirms that the Board's "essential function" is to make factual findings based on its view of the record and assess the strength of a petitioner's argument and evidence.

FanDuel, 966 F.3d at 1344. The Board did exactly that. FWD at 17-23. Noting that PO did not provide expert testimony is simply a factual statement regarding the state of the record, not an imposition of a burden shift.

IV. THE BOARD DID NOT ABUSE ITS DISCRETION IN DEFINING THE POSITA

The Board mostly agreed with Petitioners and found a POSITA to mean: "a

minimum of an undergraduate degree in electrical engineering, mechanical engineering, or physics and 2 years of experience in micro-optic based security features.”⁵ FWD, at 9-11. The correctly Board rejected PO’s proposed POSITA level, including its necessary experience in “diffusive light.” FWD at 10-11.

A. PO Fails to Dispute any Material Fact Relied on by the Board in Defining the Level of a POSITA

The Board conducted a sound analysis, thoroughly analyzed the record and found that “Petitioner’s definition is consistent with the types of problems encountered in the art, the prior art solutions to those problems, and the sophistication of the technology.” FWD, at 9-11. The Board reviewed the ’863 patent, including its “discussion of anti-counterfeiting devices made up of arrays of lenses used to display unique images...” FWD, at 10 (citing Ex. 1001, 1:31–43). The Board also considered the specification’s discussion of “using lenses to create holograms.” *Id.* (citing Ex. 1001, 2:7–20)).

Additionally, the Board evaluated “the prior art in this field, such as Fuhse847” and its disclosures “relat[ing] to the use of lenses and mirrors to create hologram images for security purposes.” FWD, at 10 (citing Ex. 1022 at 1–8). Based on this review, the Board found that the evidence supported “Petitioner[s]” proposed definition, that a POSITA would need an educational background to

⁵ The Board rejected the phrase “at least” preceding “2 years of experience.”

understand optics, lenses, and mirrors along with professional experience with optical security features to understand..." FWD, at 10.

PO does not dispute a single factual finding relied on by the Board. *See* PO Req., at 11-15. Instead, PO merely refers repeatedly to the expert declaration of Dr. Lindstrand. *Id.* However, Dr. Lindstrand fails to address these findings or even reference the '863 patent or the prior art. *Id.* Indeed, PO's only reference to the '863 patent in its Request is the statement that the invention is for use with "ambient light," a point never in dispute. PO Req., at 12.

B. The "Diffusive Light" Requirement Was Correctly Rejected

The Board correctly rejected PO's proposed "diffusive light" requirement for the level of a POSITA. FWD, at 11.

First, the Request should be denied for improperly raising new arguments regarding this unsupported requirement. Director Review Process, § 3.E; Paper 9 (Scheduling Order) at 9; *In re NuVasive, Inc.*, 842 F.3d at 1380–81. Despite this clear prohibition, the Request relies extensively on new evidence and arguments.

As an initial matter, the section of the Request regarding "diffusive light" cites new evidence: the '863 patent at 5:57-60 and the Abstract, and the Lindstrand Declaration at ¶26, ¶32, and ¶36. *See* PO Req. at 12-14 (Section III.B.1). However, the POR cited only the Lindstrand Dec. at ¶¶27-28 for this argument, and PO did not

cite this new evidence in its Sur-Reply⁶. POR at 9-10; *see* Paper 17 (“PO Sur-Reply”). Thus, the evidence now relied upon is new and should not be considered.

Furthermore, PO cites this new evidence in support of a novel theory: that the POSITA definition must include “experience with the specific subset of micro-optic based security features claimed by the ’863 patent (*i.e.*, micro mirrors that receive and reflect **ambient light**).” PO Req. at 13 (emphasis added). However, PO never proposed a level of skill requiring experience with “ambient light,” having argued only for “diffusive light.” PO cannot use Director Review to pivot to a new definition of the POSITA after its original proposal was rejected by the Board.

In addition, PO’s improperly introduces another novel “ambient light” theory relying on the unstated premises that the POSITA definition must require “diffusive light” as a “subset” of ambient light, and that a POSITA must possess experience across all such subsets. PO Req. at 12-14. PO never advanced this theory. *See* POR at 9-10; *see generally* PO Sur-Reply. Because this theory was not timely raised during the trial phase and represent a departure from the established record, the Director should disregard this new theory as waived. Director Review Process, § 3.E; Paper 9 (Scheduling Order) at 9; *In re NuVasive, Inc.*, 842 F.3d at 1380–81.

⁶ PO did not address the level of ordinary skill in its Sur-Reply. *See* Paper 17.

Second, the Board properly rejected PO's argument for a "diffusive light" requirement in the POSITA definition. FWD, at 11. In declining to adopt this extraneous requirement, the Board conducted a thorough review of the record and light environment of the '863 patent and concluded that the '863 patent does not "give any significance to the nature of diffuse light and its effects on the invention." FWD, at 11.

PO does not dispute these findings, effectively conceding the absence of error. Most significantly, PO does not dispute the Board's finding that "[t]he '863 patent does not mention 'diffusive light'." FWD, at 11. Accordingly, it is undisputed that PO's proposed definition attempts to require experience with a system unmentioned in the '863 patent. Faced with silence in the specification, PO improperly attempts to pivot to an "ambient light" requirement it never advocated for below.⁷

⁷ In a single-spaced footnote, PO alleges error in rejecting PO's "similar field" proposal, but this proposal was rightly rejected. *See* PO Req. at 14, fn.6. PO's "similar field" proposal in fn. 6 was rightly rejected as introducing "vagueness and unnecessary uncertainty." FWD, at 11; Hearing Tr. (Paper 30), at 36:3-39:12 (PO's counsel conceding "I don't know" what qualifies as a similar field).

V. THE BOARD PROPERLY WEIGHED EXPERT TESTIMONY**A. No Abuse of Discretion in Weighing Dr. Hesselink's Testimony**

PO contends that the Board abused its discretion in crediting Dr. Hesselink's testimony because "he lacks experience with diffusive light systems." PO Req., at 14-15. Thus, PO's allegation is entirely contingent *under its own POSITA definition*. Because the Director should find no abuse of discretion in declining to adopt PO's "diffusive light" requirement, PO's challenge to Dr. Hesselink's credibility is moot.

Furthermore, any argument that the Board abused its discretion in crediting Dr. Hesselink regardless of the POSITA definition is waived. PO *exclusively* premised its challenge to Dr. Hesselink's testimony on the theory that he was unqualified under the proposed "diffusive light" definition. *See* POR, pp. 10-13 (Section IV.B: "DR. HESSELINK IS NOT A POSITA").

Because Dr. Hesselink is qualified under the Board's proper POSITA definition, his testimony was admissible and entitled to weight. Determining the relative weight of expert testimony is a core function of the Board. Here, the Board properly credited Dr. Hesselink over Dr. Lindstrand because it was consistent with the physical realities of the '863 patent, Fuhse847 and relevant disclosures.

PO now asserts for the first time that Dr. Hesselink's Declaration "should have been... excluded completely." PO Req., at 14-15. As the Board noted, "Patent Owner did not move to exclude Dr. Hesselink's testimony." FWD, at 12 (citing 37

C.F.R. § 42.62 and Pet. Reply, at 25). By failing to file evidentiary objections or a motion to exclude (*see* Pet. Reply, at 25 (citing cases)), PO waived any argument that Dr. Hesselink is unqualified to testify.

Moreover, PO incorrectly alleges that “Dr. Hesselink has no experience with systems including diffusive light...and Petitioner[s] admit[] this.” PO Req., at 2. This assertion is factually inaccurate. In direct response to the arguments raised in the POR, Petitioners identified in their Reply that Dr. Hesselink possesses two years of experience specifically with diffusive light micro-optic security features. Pet. Reply, at 26 (citing EX1003 ¶¶5-9 (describing decades of pioneering work in optical and holographic displays for security applications)).⁸ Further, PO’s Sur-Reply failed to address these points. *See* PO Sur-Reply. The Director should find no abuse of discretion and disregard the PO's request to exclude or re-weigh this testimony.

B. No Abuse of Discretion in Weighing Dr. Lindstrand’s Testimony

PO’s contention in a single-spaced footnote that “[t]he Board also abused its discretion by not treating Dr. Lindstrand as a POSITA or properly crediting his testimony, as evidenced by the complete lack of citations to the substance of his testimony in the FWD” is meritless to say the least. PO Req., at 15, fn.7. As an

⁸ Also, PO never sought to cross-examine Dr. Hesselink regarding his actual qualifications in this area. Pet. Reply, at 26.

initial matter, PO's argument misrepresents the Board's findings because the Board never found Dr. Lindstrand unqualified or not a POSITA, and PO does not cite any evidence it did.

In any case, PO's complaints about the Board not "properly crediting his testimony, as evidenced by the complete lack of citations" to his testimony is at best meritless considering (as PO acknowledges) ***PO did not rely on expert testimony for the limitations [1a] and [12b].*** PO Req., at 7, 10-11; FWD at 20, 23; POR at 14-21. PO does not identify any testimony that the Board should have cited, nor is there any.

VI. CONCLUSION

PO's Request for Director Review should be denied.

Dated: January 5, 2026

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CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that foregoing
Petitioners' Authorized Response to Director Review Request, exclusive of the
parts exempted as provided in 37 C.F.R. §42.24(c), is less than or equal to 15 pages.

Dated: January 5, 2026

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CERTIFICATE OF SERVICE

The undersigned certifies that on January 5, 2026, a true and correct copy of the foregoing **Petitioners' Authorized Response to Director Review Request** was served by electronic mail on Patent Owner's counsel of record listed below, pursuant to its Mandatory Notices.

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