

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.

IPR2024-00839
Patent No. 11,448,863 B2

PATENT OWNER'S REQUEST FOR DIRECTOR REVIEW

Filed on behalf of Patent Owner by:

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Rules

37 C.F.R. § 42.75 1

Patent Owner Lumenco, LLC (“Patent Owner”) respectfully requests Director Review and reversal of the Final Written Decision (Paper 30; the “FWD”) in this *inter partes* review.¹ See 37 C.F.R. § 42.75.

I. INTRODUCTION

The Director should review and reverse the FWD because the Board made materially erroneous findings of fact and conclusions of law in its determination that claims 1, 2, 5, 6, and 12-20 of the U.S. Patent No. 11,448,863 (the “’863 patent”) are obvious based on Fuhse847 and in combination with certain other references.² FWD at 32.

For example, claim element [1a] requires that a first object and a second object are identified from the same single starting digital image, and that the two objects are displayed in two different planes. The FWD adopts Petitioner’s argument that the **body** of Fuhse847 is a starting digital image, but there is no disclosure in Fuhse847 that the **body** includes more than one object. Fuhse847 also fails to teach that two objects in the same starting digital image are extracted separately, or that two or more objects can be displayed in two different planes. Nonetheless, relying exclusively on a hypothetical proposed by Petitioners’ expert, Dr. Hesselink, the

¹ Unless otherwise noted, all emphasis has been added and all internal citations are omitted.

² The Board also held that Petitioners failed to establish by a preponderance of the evidence that claims 3, 4, and 7-11 of the ’863 patent are unpatentable. FWD at 32.

Board concludes that if Fuhse847 disclosed more than one object in the body (the FWD agrees it does not), then a person of ordinary skill in the art (“POSITA”) would modify Fuhse847 to extract and display the two objects separately. None of this has a basis in the teachings of Fuhse847 and neither Petitioners nor Dr. Hesselink present any independent motivation to modify the reference in this way. Instead, Petitioners and the FWD plainly use the ’863 patent’s claims as a roadmap to arrive at element [1a]. The use of hindsight bias renders the FWD’s decision in error.

Similarly, the Board concludes that “Fuhse847 also discloses that parts of a motif (i.e., the body) can be assigned to different planes.” FWD at 19. To the extent there is any evidence supporting this assertion, however, it also comes only from Dr. Hesselink and erroneously substitutes conjecture and expert testimony for actual disclosures in the prior art. The Board also improperly shifts the burden to Patent Owner to prove the patentability of claim elements of [1a] and [12b].

The Board’s material errors are compounded by the fact that it abused its discretion by crediting the testimony of Dr. Hesselink at all. The FWD acknowledges that the challenged claims of the ’863 patent require ambient light environments, and that ambient light environments include both parallel and diffuse light. FWD at 11. But Dr. Hesselink has no experience with systems including diffuse light—he only has experience in pure parallel light systems. PO Resp. (Paper 12) at 10-11 (citing Ex. 1003 ¶6); Exhibit 2001, ¶35-37. Petitioner admits this. *See*,

generally, Paper 16. By acknowledging that ambient light environments include diffuse light, the FWD *admits* that Dr. Hesselink has no experience in the ambient light environments claimed by the '863 patent and, thus, is not a POSITA. Dr. Hesselink's testimony should have been given little weight or excluded completely.

II. FACTUAL BACKGROUND

A. PETITIONERS USURP PATENT OWNER'S TECHNOLOGY

Patent Owner is a Colorado-based research and development company founded in 2012. Paper 12 at 2. Its business focuses on micro-optic, micro mirror, lighting, and screen technologies. *Id.* In early 2017, Patent Owner introduced its Dycyfer™ and micro mirror technology to Petitioners, who are limited liability companies based in Germany. *Id.* at 2, 3. Petitioners requested information and a demonstration. *Id.* at 3-4. Patent Owner's founders (who are also the named inventors of the '863 patent) were invited to meet with Petitioners in Germany. *Id.* at 4. During the meeting that was held in Gmund, Germany in May 2017, Messrs. Raymond and Porras presented Dycyfer™ technology and the patent application that issued as the '863 patent to Petitioners' executives, and, afterwards, they traded several emails with Petitioners' representatives regarding Patent Owner's technology and inventions. *Id.*

Petitioners eventually informed Patent Owner that they were not interested in pursuing a license or partnership. Paper 12 at 4. Approximately one year later,

however, Petitioners announced that they would be offering a new line of micro mirror optical security products marketed under the brand name Galaxy[®]. *Id.* Those products infringed, and continue to infringe, Patent Owner’s U.S. patents, including the ’863 patent. *Id.*

Patent Owner sent Petitioners a letter on January 21, 2021, notifying Petitioners of their infringement of several of Lumenco’s patents. Paper 12 at 4. Petitioners not only failed to cease their infringement, but Patent Owner eventually learned that Petitioners were importing infringing products into and selling those products in the United States. *Id.* In 2023, Patent Owner initiated a patent infringement litigation against Petitioners, asserting four of its U.S. patents, including the ’863 patent. *Id.* at 4-5.

B. PARALLEL VERSUS DIFFUSIVE LIGHT SYSTEMS

A parallel (or collimated) light system is one in which “all the rays coming from the source are parallel to each other.” Ex. 1003 ¶46. The direction and angle of these rays of light are controlled and predictable. Ex. 2004 ¶27. Thus, “the designer knows exactly where the light is coming from and can manipulate and control variables like intensity, beam size, etc.” *Id.* “Such systems are ideal for well-defined problems in highly controlled environments with small and well-characterized sources of disturbance.” *Id.*

A diffusive light system, on the other hand, “creates multiple areas of

difficulty and challenges because the light energy is not transmitted in parallel rays, but instead is diffusive in nature and bounce around.” Ex. 2004 ¶26. “Diffusive light scattering causes unintended light rays in positions and directions not desired.” *Id.* at ¶28. “This presents a number of challenges, e.g. positions that should appear deeply black appear instead [to] be grayish.” *Id.* “Achieving high intensity and high contrast images in diffusive light systems is much more difficult than in collimated light source systems due to interference, diffraction, and scattering effects from untargted light rays.” *Id.*

III. ARGUMENT

Director Review requests are directed to “decisions presenting (a) an abuse of discretion,...[or] (c) erroneous findings of material fact.”³ This FWD presents both.

A. THE BOARD MADE MATERIALLY ERRONEOUS FINDINGS OF FACT AND CONCLUSIONS OF LAW IN CONCLUDING THE CLAIMS ARE OBVIOUS

1. Claim Element [1a] Is Not Obvious

Limitation [1a]⁴ requires that a first object and a second object are identified from the same single starting digital image, extracted separately, and displayed in two different planes. PO Resp. at 14. The Board admits, however, that Fuhse847 itself only discloses “assigning the body [*i.e.*, the first object] to a first image display

³ See <https://www.uspto.gov/patents/ptab/decisions/director-review-process>.

⁴ “assigning a first object in a starting digital image to a first image digital plane and a second object in the starting digital image to a second image display plane”

plane” or assigning parts of a single motif (*i.e.*, body / first object) to different planes. FWD at 19; *see also* Ex. 1022 at 5. The only discussion in Fuhse847 of two objects appearing together relates to a 2D-3D image in which the “2D and 3D parts can lie next to each other and/or appear alternately in the same place when the viewing direction changes.” Ex. 1022 at 7. There is no suggestion in Fuhse847, however, that the 2D object and the 3D object were identified from the body or from any other single starting digital image. Moreover, Fuhse847 states that, in the case of a 2D-3D image, “all image points are at the same height, preferably at the height of the level of the security element, or after the plane of the security element.” *Id.* at 26. Consequently, Fuhse847 does **not** disclose or teach the limitations of element [1a].

a) *Fuhse847 does not disclose two or more objects in the starting digital image that are extracted separately.*

To satisfy the first half of the missing disclosure—that the second object is identified from the same single starting digital image as the first object and extracted separately from the first image—the Board relied exclusively on the testimony of Dr. Hesselink. FWD at 19. Dr. Hesselink’s testimony, in turn, is based on conjecture: **if** Fuhse847 disclosed that the body included multiple objects—instead of the single unitary object it actually discloses, **and** if those two imaginary objects were two different fonts or logos, **then** Dr. Hesselink claims it would have been obvious to a POSITA that they **would have** come from one starting digital image

because formats like 3D-CAD and 3D laser scanning, which were well-known, were generally capable of “provid[ing] multiple objects in their images.” *Id.* (quoting Ex. 1003 ¶176). Because “Patent Owner d[id] not cite to any testimony from Dr. Lindstrand to rebut Dr. Hesselink’s testimony as to what a POSITA would have found obvious,” the Board determined that Petitioners satisfied their preponderance of the evidence standard with respect to limitation [1a].

Dr. Hesselink’s testimony “merely offer[s] conclusory assertions without underlying factual support.” *Xerox Corp. et al. v. Bytemark, Inc.*, IPR2022-00624, Paper 12 (Vidal Feb. 10, 2023) at 5. It “does not provide any technical detail, explanation, or statements supporting *why* the expert determines that the feature in question...would have been obvious based on the prior art disclosure.” *Id.* (emphasis in original). There are several problems with this analysis. Most fundamentally, Dr. Hesselink fails to provide any link between the existence of 3D-CAD and 3D laser scanning, the existence of two objects in a single starting digital image, and any motivation a POSITA would have had in 2015 to extract those two objects separately.

To start, Dr. Hesselink does not explain how a POSITA would understand that two different 2D images are even disclosed by Fuhse847. Fuhse847’s invention is “based on the idea of specifying a three-dimensional motif that consists of light spots floating above or below the depiction element.” Ex. 1022 at 4. Thus, the only

thing taught or suggested by Fuhse847 is the use of one font or logo as 2D image content that appears within a 3D image. *Id.* at 7 (“With such a 2D-3D changing image, e.g., a two-dimensional image content (e.g., a font or logo) can be shown and hidden in a 3D image depending on the direction.”). Just because 3D-CAD or 3D laser scanning could provide multiple 2D objects in their digital image does not mean that it would have been obvious to a POSITA that both objects in Fuhse847 could be 2D objects from the same starting digital image. Dr. Hesselink does not even attempt to provide an explanation for this leap of logic.

Second, even assuming *arguendo* two objects existed in a single digital image as Dr. Hesselink claims, Dr. Hesselink never concludes that a POSITA would be motivated to extract the two objects separately. *See* Ex. 1003 at ¶¶173-177. Consequently, this requirement of element [1a] is still lacking, and the Board’s conclusion that element [1a] is obvious is in error.

Dr. Hesselink’s testimony that a POSITA would understand two objects to exist in a single starting digital image based on the combination of Fuhse847 with known programs like 3D-CAD and 3D laser scanning is “[u]ntethered to any supporting evidence, much less any contemporaneous evidence” and “fails to provide any meaningful explanation for why one of ordinary skill in the art would be motivated to combine these references *at the time of this invention.*” *TQ Delta, LLC v. Cisco Sys.*, 942 F.3d 1352, 1362 (Fed. Cir. 2019) (emphasis in original). “It

also fails to explain why a [POSITA] would have combined elements from specific references *in the way the claimed invention does.*” *Id.* (emphasis in original). This is classic hindsight bias, and these “conclusory statements and unspecific expert testimony are thus inadequate to support the Board’s factfinding.” *Id.*; *see also Polaris Indus. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1068 (Fed. Cir. 2018) (The Board erred because it “focused on what a skilled artisan would have been *able* to do, rather than what a skilled artisan would have been *motivated* to do at the time of the invention.”) (emphasis in original); *InTouch Techs., Inc. v. VGO Commc’ns, Inc.*, 751 F.3d 1327, 1352 (Fed. Cir. 2014).

“[I]t is improper ‘to back-fill with opinion testimony a prior art disclosure that does not suggest a required feature of the claimed invention.’” *Mahle Behr Charleston Inc. v. Frank Amidio Catalano*, IPR2023-00861, Paper 15 (Vidal Apr. 5, 2024) at 8. Yet that is exactly what the Board did here.

b) *Fuhse847 does not disclose assigning a second object to a different display plane than the first object.*

Assuming *arguendo* that Dr. Hesselink’s testimony was sufficient to find that it would have been obvious for the second object to be in the same starting digital image as the first object and for it to have been extracted separately (it is not), neither Dr. Hesselink’s testimony nor Fuhse847 supports a finding that it would have been obvious to assign the second object to a different display plane than the first object.

Neither Dr. Hesselink nor the Board provide any explanation why the mere fact that a single 3D image in Fuhse847 can have light-spots at different heights above the substrate allegedly leads to the conclusion that two different objects can be in two different display planes. *See* FWD at 19 (citing Ex. 1022 at 13-15). While both Dr. Hesselink and the Board cite to Fuhse847’s disclosure of “foreground” and “background” images as evidence of multiple planes (*see* FWD at 19; Ex. 1003 ¶175), the foreground and background images were actually discussed in the context of combining a 3D motif with a 2D motif in a light-spot image “**in which all image points are at the same height.**” Ex. 1022 at 26. Thus, the use of these terms teaches away from two different planes for two different images.

c) The Board improperly shifted the burden to Patent Owner to prove non-obviousness.

Finally, the Board erred by improperly shifting the burden of persuasion to Patent Owner to prove that claim element [1a] was not obvious. *See In re: Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1376 (Fed. Cir. 2016) (“[N]o burden shifts from the patent challenger to the patentee. This is especially true where the only issues to be considered are what the prior art discloses...”); *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1379 (Fed. Cir. 2015). For example, after adopting Dr. Hesselink’s opinions, the Board required Patent Owner to provide testimony from its expert, Dr. Lindstrand, to rebut Dr. Hesselink’s testimony. FWD at 20.

However, Patent Owner is not required to provide expert testimony, especially when Petitioners have failed to meet their burden of proving obviousness. *FanDuel, Inc. v. Interactive Games LLC*, 966 F.3d 1334, 1344 (Fed. Cir. 2020) (“While the Board may appreciate receiving expert opinion from both sides to help it do so, no expert submissions are required.”).

2. Claim Element [12b] Is Not Obvious

The Board also improperly shifts the burden to Patent Owner to prove the nonobviousness of claim element [12b].⁵ FWD at 23. Specifically, after adopting Dr. Hesselink’s testimony, the Board required Patent Owner to cite “testimony from Dr. Lindstrand to rebut Dr. Hesselink’s testimony as to what a POSITA would have found obvious.” *Id.* As explained above, such burden shifting is improper and requires vacatur of the FWD. *See, e.g., FanDuel*, 966 F.3d at 1344.

B. THE BOARD ABUSED ITS DISCRETION IN ADOPTING DR. HESSELINK’S TESTIMONY WHOLESALE

The Board’s obviousness conclusions are based primarily, if not exclusively, on Dr. Hesselink’s testimony. In doing so, the Board abused its discretion, since Dr. Hesselink is not a POSITA with respect to the ’863 patent.

⁵ “generating a design output file including an angular orientation and location coordinates in the array for each of the micro mirrors”

1. The Board Made Materially Erroneous Findings Of Fact Regarding The Definition Of POSITA

The '863 patent repeatedly states that the invention is for use with “ambient light.” *See, e.g.*, '863 patent (Ex. 1001) at 5:57-60. As explained by Dr. Lindstrand:

Considerations such as light conservation are important [when designing an optical security system for use in ambient light] because an image created with ambient light must direct light in the right place. Ambient light also often ends up in the wrong place due to its diffusive nature, and thus may light up an area intended to be dark....[T]hese challenges and considerations must be familiar to a POSITA when designing or considering a security document substrate that works in diffusive or ambient light....

Ex. 2001 ¶26. “Diffusive light and the behavior of reflected ambient light presents challenges, especially when considering how the human observer perceives light reflected from a security feature.” *Id.* For this reason, “[e]xperience in micro-optic security features more broadly, without specific diffusive light experience, would not qualify a person as skilled in the art of the Lumenco Patents.” *Id.*

Nonetheless, the Board refused to include experience with diffusive light in the definition of a POSITA, instead only requiring a POSITA to have “experience in micro-optic based security features.” FWD at 9-10. Although the Board recognized that ambient light includes diffusive light and the term “ambient light” is used in the '863 patent, the definition of a POSITA adopted by the Board nonetheless permits someone with only parallel light experience to qualify as a POSITA because the '863 patent “does not discuss any distinctions between parallel

light and diffuse light.” *Id.*; *see also* Ex. 2004 ¶32. Such individuals, however, are not POSITAs given the differences between parallel and diffusive light systems and the significant technical challenges presented by the latter. *See* Ex. 2004 ¶26. Moreover, a POSITA would not have expected the ’863 patent to contain any discussion comparing parallel and diffuse light since they would already understand the term “ambient light” to inherently mean “a non-collimated light environment, i.e., an environment where light rays are scattered and diffused.” *Id.* at ¶36. Any discussion of parallel light in the ’863 patent therefore would have been superfluous and unrelated to the disclosed invention.

The ’863 patent discloses and claims a “visual display assembly useful as an authentication or anti-counterfeiting element” that “includes a substrate and, on a surface of the substrate, an array of micro mirrors receiving ambient light. Each mirror includes a reflective surface to reflect the ambient light....” Ex. 1001 at Abstract. The Board’s minimum experience for a POSITA—at least 2 years in micro-optic based security features—is “too generic in the context of the” ’863 patent’s claimed invention. *Samsung Elecs. Co., Ltd. et al. v. Chien-Min Sung*, IPR2024-00534, Paper 36 (PTAB Sep. 17, 2025) (“*Samsung IPR*”) at 22. Instead, the definition of a POSITA should reflect 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), just as the definition of a POSITA in the

Samsung IPR reflected the specific subset of integrated circuit processing and fabrication techniques to which that patent was related.⁶ *See Samsung* IPR at 19-21; *see also Sigray, Inc. v. Carl Zeiss X-ray Microscopy, Inc.*, IPR2022-00218, Paper 40 (PTAB Dec. 12, 2025) (“*Sigray* IPR”) at 9.

2. Dr. Hesselink’s Testimony Should Have Been Given Little Weight Or Excluded Completely

While Dr. Hesselink has experience with micro-optics design, he lacks experience with diffusive light systems. *See* Ex. 2004 ¶30. His high-level summary

⁶ The Board also erred by rejecting the possibility that an undergraduate degree in “a similar field” may qualify a person as a POSITA when coupled with appropriate experience. FWD at 11. The Board’s rationale was that the “proposed definition introduces vagueness and unnecessary uncertainty into the definition.” *Id.* Yet inclusion of such language is common in patent disputes. *See, e.g., Fluidmaster, Inc. v. Danco, Inc.*, IPR2024-00633, Paper 45 (PTAB Dec. 15, 2025) at 11-12 (adopting POSITA definition including “a Bachelor of Science degree in mechanical engineering or a related field”); *see also, e.g., Sigray* IPR at 8 (adopting POSITA definition that includes “master’s degree in physics, optics, electrical engineering or a similar field”). The Board’s exclusion of “a similar field” unnecessarily limits the scope of a POSITA to only those persons with an undergraduate degree in electrical engineering, mechanical engineering, or physics. FWD at 10-11. “The danger of defining the scope of the pertinent art too narrowly is that it may exclude experts with relevant technical backgrounds.” *Sonos, Inc. v. D&M Holdings*, 297 F.Supp.3d 501, 510 (D. Del. 2017). This is why factfinders generally agree that “[e]xperience and/or technical training may substitute for college education requirements.” *Flashmark Techs. LLC v. Gtech Corp.*, No. 2:06CV205, 2007 U.S. Dist. LEXIS 65317, at *4 n.2 (E.D. Tex. Sep. 2, 2007). A factfinder can easily determine from an expert’s curriculum vitae, resume, or the like whether course work undertaken is “similar” to what would be expected in the designated subjects. *See, e.g., Sprint Communs. Co. L.P. v. Vonage Holdings Corp.*, 500 F.Supp.2d 1290, 1344 (D. Kan. 2007). The Board’s refusal to do so here is unwarranted and legally incorrect.

of experience does not include any specific disclosure of experience with diffusive or ambient light features, nor does it mention optical security features. *Id.* at ¶31; *see also* Ex. 1003 ¶6. A disclosure of a general experience in “optics” does not necessarily include experience with diffusive light systems. *Id.* at ¶32. The more specific examples of Dr. Hesselink’s experience with optical systems likewise provide no disclosure of experiences with diffusive or ambient light features. *Id.* at ¶33; *see also* Ex. 1003 ¶7. Moreover, Dr. Hesselink’s entire declaration is based on the conclusion that the term “ambient light” as used in the ’863 patent “refers to parallel light” (Ex. 1003 ¶46)—a conclusion the Board expressly rejected. FWD at 11. For these reasons, Dr. Hesselink’s declaration either should have been afforded little weight or excluded completely.⁷ *Homeland Housewares, LLC v. Whirlpool Corp.*, 865 F.3d 1372, 1378 (Fed. Cir. 2017) (“[W]e must disregard the testimony of an expert that is plainly inconsistent with the record or ‘based on an incorrect understanding of the claim[s].’”).

⁷ The 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 and the repeated instances of resting obviousness rejections entirely on the testimony of Dr. Hesselink without providing any explanation of why Dr. Lindstrand’s testimony was discounted. If the Board had properly considered Dr. Lindstrand’s extensive experience with diffusive and ambient light systems, security holograms, and optical document security materials used on banknotes, it would have concluded that Dr. Lindstrand is a POSITA and given more weight to his testimony. *See* Ex. 2001 ¶¶5-17. When Dr. Lindstrand’s testimony is properly credited, all claims should have been confirmed patentable.

Date: December 22, 2025

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CERTIFICATION

The undersigned certifies that the foregoing Patent Owner's Request for Director Review, exclusive of the Table of Contents, Table of Authorities, and Mandatory Notices, is less than or equal to 15 pages.

Date: December 22, 2025

By: /s/ C. Matthew Rozier

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §42.6, the undersigned certifies that, on December 22, 2025, the foregoing Patent Owner's Request for Director Review 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 addresses:

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