

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

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GIESECKE+DEVRIENT GMBH,
GIESECKE+DEVRIENT CURRENCY TECHNOLOGY GMBH, AND PA-
PIERFABRIK LOUISENTHAL GMBH,
Petitioners,

v.

LUMENCO, LLC,
Patent Owner.

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

PETITIONERS' REPLY TO PATENT OWNER'S RESPONSE

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Ex. 1027	<i>Optics</i> , Hecht, 4th Edition (2002)
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I. INTRODUCTION

PO's rebuttal of Petitioners' and Dr. Hesselink's positions relies on misidentifying the positions and rebutting arguments that were not presented. Petitioners' positions either remain undisputed on the merits, or to the extent disputed, are disputed with unsupported attorney argument. The challenged claims are unpatentable.

II. GROUND 1: FUHSE847 IN VIEW OF RICH RENDERS OBVIOUS CLAIMS 1-2, 4-6, 12-14

A. Fuhse847 Teaches Element [1.a]

Limitation [1a] recites "assigning a first object in a starting digital image to a first image display plane and a second object in the starting digital image to a second image display plane." Pet. 88. PO disputes that Fuhse847 teaches element [1a] for two reasons. Both should be rejected.

1. PO Misconstrues Petitioners' Mapping

PO alleges that Petitioners map the "same" "body" in Fuhse847 to both **a first object** and **a starting digital image**, which violates "the presumption that different claim terms have different meanings." POR, 15. Not so. Specifically, PO mischaracterizes Petitioners' mapping, which separately identifies **a first object** and **a starting digital image**. Petitioners map the "body" (e.g., a body that represents a "motif") to **a first object**: "Fuhse847 teaches 'a body' (**a first object**) that may represent a certain motif, such as a two-dimensional or three-dimensional motif, as discussed below." Pet. 18 (citing EX1022, 10-11, 4, 7, 9; EX1003, ¶¶150-51).

Separately, Petitioners explain that the body satisfies **a starting digital image** when the body is “provided in 3D-CAD,” “depicted in ‘computer-aided technical drawing,’” or “depicted ‘through 3D laser scanning.’” Pet. 18-19. Petitioners identify three ways to satisfy the **starting digital image**, which includes the body, but the starting digital image is not the body itself: (1) “the body *may be provided in* 3D-CAD”; (2) “the body *may be depicted in* ‘computer-aided technical drawing’”; and (3) “the body *may be depicted* ‘through 3D laser scanning of real three-dimensional bodies.’” Pet. 18-19 (emphasis added).

A motif is not the same as a digital image that comprises a motif. Dr. Hesselink confirms and expands upon this position, and clearly articulates that the motif is depicted in, but is not the same as, a digital image. EX1003, ¶¶150-55. Dr. Hesselink first explains that the “body may be provided in **a starting digital image** that may be provided in a number of forms ... including, for example, in ‘3D-CAD (3D Computer Aided Design).’” EX1003, ¶¶152-53. Dr. Hesselink also explains that “Fuhse847 further teaches that the body may be depicted in ‘computer-aided technical drawing,’ which is another example of **a starting digital image**.” EX1003, ¶154. Dr. Hesselink further explains that “Fuhse847 further teaches that the body may be depicted in **a starting digital image** ‘through 3D laser scanning of real three-dimensional bodies’” and that “the purpose of such 3D laser scanning techniques

was so that a physical object could be represented by a digital image.” EX1003, ¶155.

Thus, far from the “same,” Petitioners and Dr. Hesselink clearly explain that the “body” is “provided in,” “depicted in,” or “represented by” a **starting digital image**.

This mapping is consistent with the claim and specification. The claim recites “a first object **in a** starting digital image,” meaning that the claim requires that the first object be “in” the starting digital image. The specification confirms this understanding by explaining that the **starting digital image** is “a digital image *of* objects.” EX1001, 11:50-58 (emphasis added).

2. Petitioners correctly identify first and second objects from a starting digital image

PO argues that Fuhse847 does not teach assigning first and second objects from a starting digital image. However, PO misconstrues Petitioners' positions.

As explained above, Petitioners identify a “body” (*e.g.*, a body that represents a “motif”) as a **first object**. Pet. 18-21; EX1003, ¶¶150-71. The body is “provided in” / “depicted in” / “represented by” a **starting digital image** (*e.g.*, a 3D-CAD file, computer-aided technical drawing, or digital image from a 3D laser scan). EX1003, ¶¶150-71. The body is then represented by “light spots” that form a “light spot image” in a “data set” that includes information such as the points in space, normal

vectors, colors, brightness, etc. of every light point. Pet. 19-20. A **first image display plane** is defined by producing light spot images with all the light spots in the light spot image having a fixed height. *Id.*

Fuhse847 further teaches multiple images are in different planes (*e.g.*, “foreground” and “background”), such as two different “two-dimensional” images such as “a font or a logo,” where the second image is from a **second object in the starting digital image**. Pet. 21-22; *see also* POR, 17, n2 (“The Petition notes that Fuhse847 teaches producing multiple images. Patent Owner agrees.”).

As Dr. Hesselink explains, “[a] POSITA would have further understood that they were both provided in the same **starting digital image**. For example, it was well-known that formats like 3D-CAD, ‘computer-aided technical drawing,’ and ‘3D laser scanning of real three-dimensional bodies’ could provide multiple objects in their images.” EX1003, ¶176. PO’s *only dispute* is whether Fuhse847 teaches that the first and second objects are from the *same* starting digital image. POR, 16-17. However, PO misconstrues Petitioners’ positions.

PO first alleges that the Petition argues that Fuhse847 teaches defining light spots “for every point in the digital image” for the first object, which presumably (although not explained) means that there is no second object in the digital image because all the points are used for the first image. POR, 16. This argument should

be rejected because it misconstrues Petitioners' position, and in fact, disingenuously uses a partial citation of the Petition to do so.

Petitioners argued that assigning the body in the starting digital image to a first image display plane is performed by defining light spots “for every point in the digital image *in data sets*.”¹ Pet. 19. Petitioners explain further that in Fuhse847, there is “a data set which describes the surface of the body.” *Id.* Nowhere in the Petition or in Fuhse847 does it state that every point in the digital image is for one object, and/or that there is one “data set” for each digital image.

PO's next argument misconstrues Petitioners' position in the same manner discussed in Section II.A.1. PO argues that the “Petition does not argue that the ‘second object’ is part of the same ‘body’ starting image as the ‘first object.’” POR, 16. Again, Petitioners do not argue that that the “body” is the claimed “starting digital image,” and PO's argument should be rejected for the same reasons as discussed in Section II.A.1.

PO also disagrees with Petitioners' argument, supported by Dr. Hesselink's opinion, that a POSITA would have understood that the first and second objects were provided in the same starting digital image. POR, 17-18. However, PO's arguments

¹ Plural, and not merely “for every point in the digital image.” POR, 16.

are not supported by its expert nor any other evidence, and “unsworn attorney argument ... is not evidence and cannot rebut” other evidence. *Gemtron Corp. v. Saint-Gobain Corp.*, 572 F.3d 1371, 1380 (Fed. Cir. 2009). Further, PO’s expert Dr. Lindstrand does not have any opinions on element [1.a], and PO’s attorney argument is insufficient to rebut Dr. Hesselink’s opinions as to what “POSITA would have further understood” and what was “well-known.” EX1003, ¶176. PO’s attorney argument only alleges failure of proof, and does not specifically rebut Petitioners’ argument, supported by Dr. Hesselink’s opinion. POR, 17-18. PO’s argument should be ignored or accorded little weight.

B. Fuhse847 Teaches Element [12.b]

Limitation [12b] recites “generating a design output file including an angular orientation and location coordinates in the array for each of the micro mirrors.” Pet. 90. PO alleges that Rich’s design output file does not disclose the “angular orientation” (POR, 19-20) or “location coordinates” (*id.*, 20-21) in the array for each of the micro mirrors. PO’s argument should be rejected because it misconstrues Petitioners’ argument, supported by Dr. Hesselink’s opinion. PO’s argument fails at least because Petitioners and Dr. Hesselink never exclusively relied on Rich for these claim features, which is the position PO rebuts. *See id.*, 19-21. In the Petition, element [12b] is substantively addressed in the highly similar element [1d]. Pet at 30-

32, 42. Petitioners and Dr. Hesselink relied on Rich for the claimed “design output file,” and identified data file 340. *Id.*, 30-31.

1. Angular Orientation

With respect to the “the angular orientation ... for each of the micro mirrors in the selected sets of the micro mirrors,” this claim language was already recited in the claim in elements [1b] and [1c], and already extensively discussed. *See* Pet. 23-30. For element [1b], Petitioners explained how Fuhse847 teaches “to select a set of micro mirrors in an array of the micro mirrors to display each of the pixels of the first object in the first image display plane and to display each of the pixels of the second object in the second image display plane.” *Id.*, 23-27. Further, Rich teaches “a processor of a computing device, executing code to provide an array design module that operates” to carry out Fuhse847’s teachings. *Id.*, 25-27.

Likewise for element [1c], Petitioners explained how Fuhse847 teaches “for each of the pixels, determining... an angular orientation of each of the micro mirrors in the selected sets of the micro mirrors” (*id.*, 28-29), and Rich teaches an “array design module” to do so (*id.*, 29-30).

Thus, for element [1d], “the angular orientation and location coordinates” in the combined system of Fuhse847 and Rich are orientations and coordinates for Fuhse847’s “micro mirrors in the selected sets of the micro mirrors.” Pet. 27. PO’s argument for element [12b] should be rejected because it wrongly identifies (and

then rebuts) Rich's "features" as the claimed micro mirrors, and then explains why these "features" alone don't satisfy the claims. POR, 19-21.

More particularly with respect to the "angular orientation," Petitioners and Dr. Hesselink provided detailed explanation in element [1c] regarding how this limitation was satisfied by Fuhse847's (not Rich's) teaching, and the element [1d] mapping refers back to this discussion. See Pet. 28-29, 31. In particular, Fuhse847 explains how the normal vector n of the micromirrors satisfies the claimed **angular orientation** limitations such that "the normal vector n of the micromirrors is oriented such that reflected light ray $\vec{p}$ is directed towards the point (x_0, y_0, z_0) corresponding to one of the pixels." *Id.*, 28.

PO's argument amounts to an improper requirement that the combination of Fuhse847 and Rich satisfy bodily incorporation of Rich's "features" as the claimed micro mirrors into the system of Fuhse847, which incorrectly frames the obviousness test. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981) ("The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art."); *Axonics, Inc. v. Medtronic, Inc.*, 73 F.4th 950, 957 (Fed. Cir. 2023) ("a

skilled artisan may be motivated to combine particular features of different references, e.g., to secure some benefits at the expense of others, even when bodily incorporation would be impossible or inadvisable.”). PO has no dispute as to the combined teachings of Fuhse⁸⁴⁷ and Rich, and its arguments as to whether Rich’s “features” along satisfy claim limitations should be rejected.

2. Location Coordinates

With respect to the “location coordinates,” PO alleges that Rich only discloses a “pattern” of its array, but not “location” information. POR, 20-21. However, PO ignores Rich’s clear teaching of “a map to generate the pattern of features F₁, F₂, ... F_n on the surface 12 of the master 10.” Pet. 31; EX1039, 16:57-17:7; EX1003, ¶¶220-23. PO provides no credible argument that such a “map” would not include “location” information, which is the purpose of a map. Again, Dr. Lindstrand does not support PO’s arguments for element [12b], and therefore PO’s arguments are merely attorney argument about what information would be understood to be provided by this map. It is undisputed that Rich teaches features in an ordered array on the surface of the master (*see* FIG. 3A), and a “map” to pattern them. Pet. 31-32.

**III. GROUND 2: FUHSE847 AND RICH² IN VIEW OF FUHSE925
RENDERS OBVIOUS CLAIMS 3 AND 6-14****A. Claims 3 and 7 Are Taught**

Claim 3 and element [7d] recite “wherein each of the sets of micro mirrors are selected randomly from a plurality of the micro mirrors located in a base of a cone on a surface containing the array of micro mirrors.” Pet. 88. PO’s arguments again misconstrue Petitioners’ obviousness combination. The arguments should be dismissed.

1. Selecting a set of micro mirrors in an array

PO misleadingly argues that “Fuhse925 does not disclose the use of sets of mirrors that reflect light to a common point to create a pixel of an image” (POR, 22) and “light reflected by each facet 30 does not intersect with the light from any other facet” such that the claimed “selection of a set of mirrors” is disclosed (*id.*, 23- 24). However, Petitioners do not rely on Fuhse925 in the manner suggested, and as such, PO’s arguments are misdirection.

Fuhse847 in view of Rich teaches elements [1a] and [1b] concerning selecting a set of micro mirrors in an array to display first and second objects in the first and

² Ground 1 relies on the combination with Rich. Petitioners do not rely on Rich for elements of claims 3 and 7, and therefore, Rich is not addressed in this section for Claim 3.

second image display planes, respectively. Pet. 18-27 (elements [1a] and [1b]). The combination further teaches determining angular orientation of the selected sets of micro mirrors. *Id.*, 27-30 (element [1c]). *See also id.*, 12-17 (motivation to combine and reasonable expectation of success for Fuhse847 and Rich). Selecting micro mirrors and determining orientations for the objects in different display planes are undisputed for Fuhse847 in view of Rich.

Claim 3 adds that the sets of the micro mirrors are selected from “a base of a cone” and the selection is done “randomly.” Pet. 88. Petitioners rely on Fuhse847 for selection “from...a base of a cone on a surface containing the array of micro mirrors.” *Id.*, 58. This is also undisputed. Petitioners rely on Fuhse847 in view of Fuhse925 for *how* Fuhse847’s selection and relatedly orientation are done. *See id.*, 58; EX1003, ¶¶338-39. Petitioners are not relying on Fuhse925, much less bodily incorporating embodiments from Fuhse925, in the manner suggested by PO.

2. Random Selection

Fuhse847 in view of Fuhse925 teach all elements, and a POSITA would have been motivated to combine the references. Specifically, Fuhse847 in view of Fuhse925 teach that the micro mirrors are arranged according to a random distribution or a pseudorandom distribution, i.e., by random selection. Pet. 59; *see also In re Keller*, 642 F.2d at 425 (test for obviousness “is what the combined teachings of

the references would have suggested to those of ordinary skill in the art”). It is necessary to take in account the reasons why a POSITA would have combined the references (*see* Pet. 54-57), which PO does not dispute, for random selection.³

While Fuhse847 discloses micro-mirrors selected and oriented differently, Fuhse925 provides explicit detail of *how* to orient, and therefore select, each micro-mirror in Fuhse847.⁴ *Id.*, 55-56. The *how* is important. Fuhse925 discloses that each micro-mirror is rotated (i) about the x-axis extending through the body by an amount of the non-vanishing component $N_{\parallel}$, and (ii) about the y-axis extending through the body by an amount of $N_{\perp}$. *Id.*, 58-59 (citing EX1008, 9:1-31). The non-vanishing component $N_{\parallel}$ varies irregularly in the spreading range, especially according to a random distribution or a pseudorandom distribution. *Id.*, 59 (citing EX1008, 11:14-27).

In other words, and as explained by Dr. Hesselink, such randomness of the non-vanishing component $N_{\parallel}$ would result in the randomly selected pattern of the

³ The teaching of the combined references is the correct focus for “random selection” (*see* Pet. 54-60), which the Decision Granting Institution respectfully does not address. *See* Paper 8, 21-25. This Reply further explains mapping in the Petition.

⁴ Fuhse925 discloses reflective facets 30, which are akin to micro-mirrors in Fuhse847. Pet. 58.

micro-mirrors. EX1003, ¶¶340-42; *see also*, Pet. 59. Varying the non-vanishing component for the micro-mirrors of Fuhse847 to form a pattern as taught by Fuhse925 would result in “sets of micro mirrors [that] are selected randomly” as required by the claim. *Id.* While a POSITA would have understood that Fuhse847 discloses orienting the mirror surface in the x and y axes to achieve the normal vector n , a POSITA would have looked to Fuhse925 for how the vector “is chosen independently” and “varies randomly or pseudorandomly.” Pet. 54-56, 59-60; EX1003, ¶¶329, 340-41; EX1008, 11:14-27.

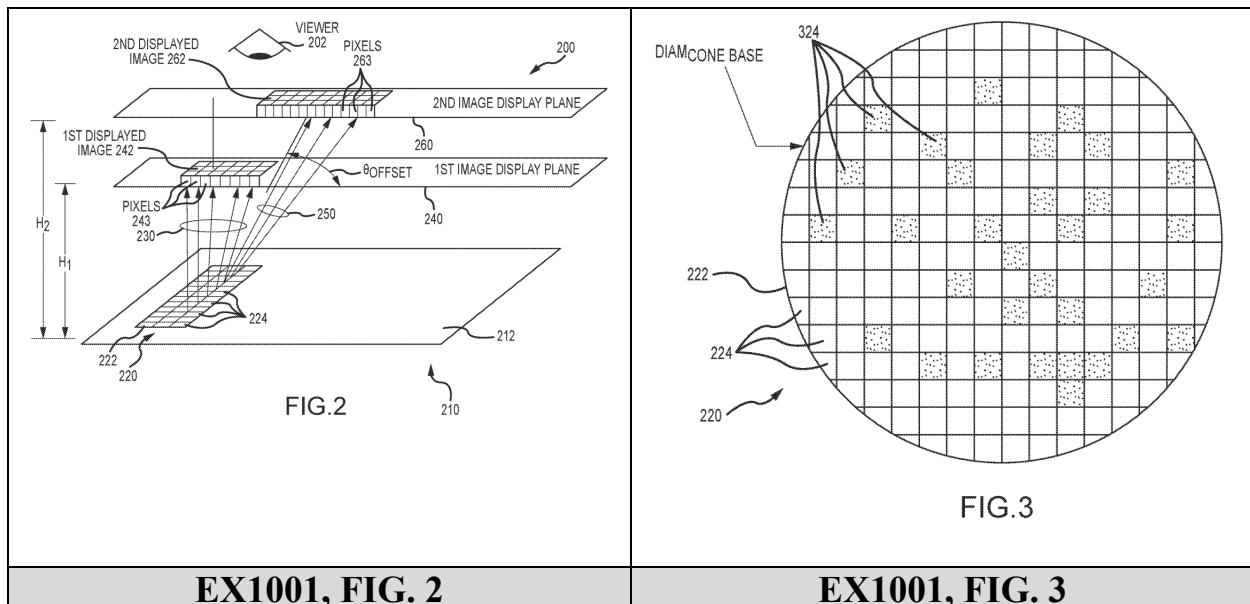
Dr. Hesselink identifies further evidence of the random selection. EX1003, ¶342; *see also*, Pet. 60. A POSITA would have understood random selection of the micro mirrors based on disclosure by Fuhse925 that the “additional parallel component $N_{//}$ ensures that a viewer still sees the line 16 floating at the depth T even if he tilts the security element upward or downward about the x-axis by a certain angle within the second angle range.” Pet. 54-56, 59-60; EX1003, ¶¶340-42; EX1008, 9:27-31).

3. PO’s Counter Arguments Lack Merit

PO avoids the teaching of the combination. Instead, PO narrowly imparts limitations not required by the claims, and in fact, that are inconsistent with specification, to avoid the combination. These arguments lack merit.

First, PO (i) criticizes that “each of the mirrors of Fuhse925 are the same width and are arranged in even increments, one next to the other,” and (ii) makes the unsupported argument that they “are arranged in a regular, obvious, grid pattern.” POR, 25. Again, PO creates misdirection with arguments concerning embodiments of Fuhse925 that are irrelevant to the combination. *See* Section III.A.1. These arguments should be dismissed.

Regardless, as to (i), having the same width, arranged next to each other with even increments is irrelevant and belied by the '863 patent. For example, shown below are micro mirrors 224 (FIG. 2) and micro mirrors 324 (FIG. 3) with precisely the “identical lengths and widths” that PO alleges cannot satisfy the claim limitation. POR, 25.



In fact, there are no embodiments showing varying micro mirror widths within an array. If anything, the specification supports Petitioners' position. Fuhse847 and Fuhse925 are compatible as both disclosed micro-mirrors having the same dimensions, which is consistent with the '863 patent. Pet. 57.

As to (ii), PO makes the unsupported argument that Fuhse925 discloses a “regular, obvious, grid pattern” of micromirrors for the proposition that the micro-mirrors are not randomly selected. POR, 25 (citing EX1008, 7:33-36).⁵ Again, PO creates misdirection with arguments concerning embodiments of Fuhse925 that are irrelevant to the combination. *See* Section III.A.1. These arguments should be dismissed.

Regardless, as an initial matter, Fuhse925 only discloses the dimension of the base area. There is no disclosure in Fuhse925 of a regular, obvious, grid pattern. It is the '863 patent that states with respect to Figure 3 that “the micro mirrors 324 in the set of pixel-providing micro mirrors are randomly chosen such that the mirrors 324 do not provide an obvious, regular pattern.” EX1001, 8:39-44. However, this does not mean the opposite is true—that an “obvious, regular grid pattern” (as PO

⁵ Fuhse925, 7:33-36: “As shown in the detailed section 24 in FIG. 3, the depiction region 22 is provided with a plurality of reflective, planar facets 30 that have, for example, a base area of 15 μm ×15 μm and a maximum height of a few micrometers.”

puts it) means that the micromirrors were not randomly selected. It is legally improper for PO to impart a baseless requirement on the claims that a “obvious, regular grid pattern” (in PO’s opinion) cannot result from the claimed random selection. *See IQRIS Techs. LLC v. Point Blank Enters.*, 130 F.4th 998 (Fed. Cir. 2025) (“Even when all embodiments in the written description depict a pull cord that is directly pulled, our precedent counsels against reading this requirement into the claims when the claims do not expressly require as much.”) In fact, the “pattern” in Figure 3 of the ’863 Patent is analogous to the “random distribution or a pseudorandom distribution” of Fuhse925 explained and shown in Figure 3 of Fuhse925 (*see* POR, 25).

Dr. Lindstrand repeated PO’s argument and dismissed them. *See* EX2001, 80-81. When asked whether it was his “opinion that laying micro mirrors out in a regular grid indicates no random selection,” Dr. Lindstrand stated that “I would say that it indicates nothing with regard to the selection process, whether random or non-random.” EX1055, 143:11-144:7. Indeed, it is PO’s unsupported opinion that Fuhse925 discloses a “obvious, regular grid pattern” (it does not), which Dr. Lindstrand confirmed does not indicate the selection process. PO’s argument should be dismissed.

Third, PO argues that “Fuhse925 cannot possibly disclose that the mirrors for producing a pixel or an image are selected randomly from the set of available mirrors, as required by claim 3, because every single one of the mirrors of Fuhse925 is

used to reflect light for the images created by Fuhse925's optical security feature.”

POR, 26. In other words, PO interprets the claim to require there be unused micro mirrors, such that not “every single one of the mirrors of Fuhse925 is used to reflect light for the images.” *Id.* Again, Petitioners do not rely on Fuhse925 for the selected micro mirrors, and thus, PO's arguments are misdirection and should be dismissed.

Regardless, Dr. Lindstand confirmed that PO's overly narrow interpretation, explaining that “the essential part is that you select the micro mirrors on the random basis and you don't use every micro mirrors.” EX1055, 149:9-12. However, there is no requirement in the claim that less than “every single one of the mirrors” must be used. PO and Dr. Lindstrand provide no support that less than all micro mirrors must be used for there to be random selection.

**B. Fuhse847 and Rich in view of Fuhse925 Render Obvious
Claim 4**

Claim 4 depends from claim 3, not claim 1, but was mistakenly listed under Ground 1 (Fuhse847 in view of Rich, which does not address claim 3) instead of Ground 2 (Ground 1 in further view of Fuhse925, which does address claim 3). *See* Pet. 35; EX1003, ¶¶241-42.

Should the Board find claim 3 unpatentable, claim 4 should also be found unpatentable. Petitioners explained how the additional limitations of claim 4 are

satisfied by Fuhse847 alone, which was not disputed by PO.⁶ *See* Pet. 35; EX1003, ¶¶241-42. Thus, the position for claim 4 would have been identical whether listed in Ground 1 or 2. The Petition also makes clear that Ground 2 “is the same as Ground 1, but additionally relies on Fuhse925’s teachings regarding orientation of its micro-mirrors.” Pet. 54.

Thus, claim 4 should have been listed under Ground 2, and the position of claim 4 is sufficiently clear for the Board to evaluate. The listing of claim 4 in Ground 1 is a harmless typographical or clerical error, and should be treated as such. In this situation, the Board’s customary practice is to note the typographical error and evaluate the substance of the petition’s contentions, which it has routinely done in almost identical situations to the present one. *See, e.g., Analog Devices, Inc. v. Xilinx Inc.*, IPR2020-01624, Paper 38, at 2 n.3 (May 3, 2022) (“Petitioner includes claims 16 and 17 in this ground even though these claims depend from claim 15, for which Petitioners additionally rely on Huang. We treat this as a typographical error and relist the grounds to account for the correct claim dependency.”); *Informatica Corp. v. Protegrity Corp.*, CBM2015-00010, Paper 48, at 37 n.8 (May 9, 2016)

⁶ Further, claim 8, which depends from independent claim 7, is essentially the same as claim 4 and was correctly listed in Ground 2. Pet. 64. PO also did not contest claim 8. *See* POR, 27.

("[The petition and reply] contain[] typographical errors as to the numbering of some dependent claims. ... Our decision reflects the corrected numbering of the dependent claims."); *Microsoft Corp. v. D3d Techs.*, IPR2021-00878, Paper 39, at 57 (Nov. 28, 2022) ("We find that based on the arguments and evidence of record, Petitioner's reference to Getty in the Petition appears to be a typographical error and we treat it as such."); *ZTE Corp. v. WSOU Investments, LLC*, IPR2021-00699, Paper 33, at 32 n.15, 67 n.28 (Oct. 14, 2022) ("Petitioner's claim construction chart includes an apparent typographical error ... We view this as harmless error."), ("One sentence in Petitioner's analysis appears to have a typographical error ... We view this as harmless error and interpret Petitioner's contentions based on the entirety of Petitioner's analysis...").

IV. GROUNDS 2-6: CLAIMS 6, 8-20 ARE RENDERED OBVIOUS

The POR has not addressed the merits of Grounds 2-6 for claims 6, 8-20. POR, 27-31. Accordingly, these claims are unpatentable for the reasons presented in the Petition. *See* Pet. 54-80.

V. POSITA

A. Level of Ordinary Skill in the Art

According to Dr. Hesselink, a POSITA "would have had a minimum of an undergraduate degree in electrical engineering, mechanical engineering, or physics and at least 2 years of experience in micro-optic based security features." Pet. 11 (citing EX1003, ¶¶88-94). PO proposes to modify the level of skill in two ways: (1)

the undergraduate degree of the POSITA may be in “a similar field,” and (2) the experience of a POSITA must be specifically in “diffusive light” micro-optic based security features. POR, 8-10. Both modifications should be rejected, and Petitioners' level of ordinary skill should be adopted.

With respect to the undergraduate degree, PO's argument is limited to an unsupported conclusion that other degrees in “a similar field” “would provide appropriate subject matter training.” POR, 8-9. However, PO doesn't specify what that training is. To the contrary, Dr. Hesselink explained that his identified degrees – electrical engineering, mechanical engineering, or physics – “would provide engineers in the field with a baseline knowledge of the optical and mechanical design principles underlying micro-optic based security features” and would be “sufficient exposure to optics principles to then work or conduct research in that area in academia or industry.” EX1003, ¶90. PO never explains how any other degree in a “similar” field would also provide the necessary “baseline knowledge of the optical and mechanical design principles underlying micro-optic based security features.” *Id.* Notwithstanding, PO nor its expert Dr. Lindstrand never explain how Dr. Lindstrand's degree in computer science qualifies as a similar field. POR, 9; EX2001, ¶23.

PO's argument that the experience of a POSITA must be specifically in “diffusive light” micro-optic based security features should also be rejected.

First, as Dr. Hesselink explained, a person with at least 2 years of experience in micro-optic based security features would be familiar with the problems typically encountered in the field, and correctly understood that the “patent concerns micro-optic design.” EX1003, ¶¶91-93. PO offers no evidence to rebut this assertion.

Second, PO is wrong that these patents are about “diffusive light,” let alone to the extent that “diffusive light” exclusively defines the field of invention. The claims of the '863 patent recite a security feature that can be used with ambient light, not diffusive light. In fact, the term “ambient light” is exclusively used by the '863 patent to describe the incident light environment, including in the claims, abstract, and specification.

While PO never states what “diffusive light” is, PO appears to present a dichotomy of all light as either “diffusive” or “collimated” (which PO defines as “rays of light are parallel to each other and the direction and angle of those rays of light are controlled and predictable”). POR, 8-10. PO hints that ambient light falls into “diffusive light systems,” as it uses terms such as “diffuse ambient light.” *Id.*, 9.

This dichotomy is false, and PO's apparent characterization of ambient light as synonymous with diffuse light is also false. For example, PO admits that “outdoor light” is ambient (POR, 10), but upon cross-examination, Dr. Lindstrand admitted that for someone on earth, sunlight is “best approximated as a parallel light source.” EX1055, 96:1-7, 98:10-20. In fact, basic properties of ambient light make clear that

ambient light environments contain significant parallel light components emanating from the source. EX1055, 96:12-97:19.

Not only does the general term “ambient light” refer to environments with parallel light, the intrinsic record confirms that as used in the ’863 patent, “ambient light” refers to the parallel components of light, as those are generally the components that form the images. For example, Figure 1 of the ’863 patent depicts ambient light 130 striking the reflective upper surface 124 of the micro mirror 120 *with a single angle β* . EX1001, 6:39-55. As PO’s expert Dr. Lindstrand agreed “the ambient light would not just strike the center of the surface, it would strike the entire surface” (EX1055, 112:15-21), and Dr. Lindstrand explained that there are “parallel” light rays of ambient light ray 130 “that fall into the area of the micro mirror” and “[a]ll those end up in the written pixel area within that space.” EX1055, 118:21-119:3. Dr. Lindstrand further annotated Figure 1 below (EX1055) to show the parallel incident light “with the exact same angle of incidence, beta.” EX1055, 119:11-17.

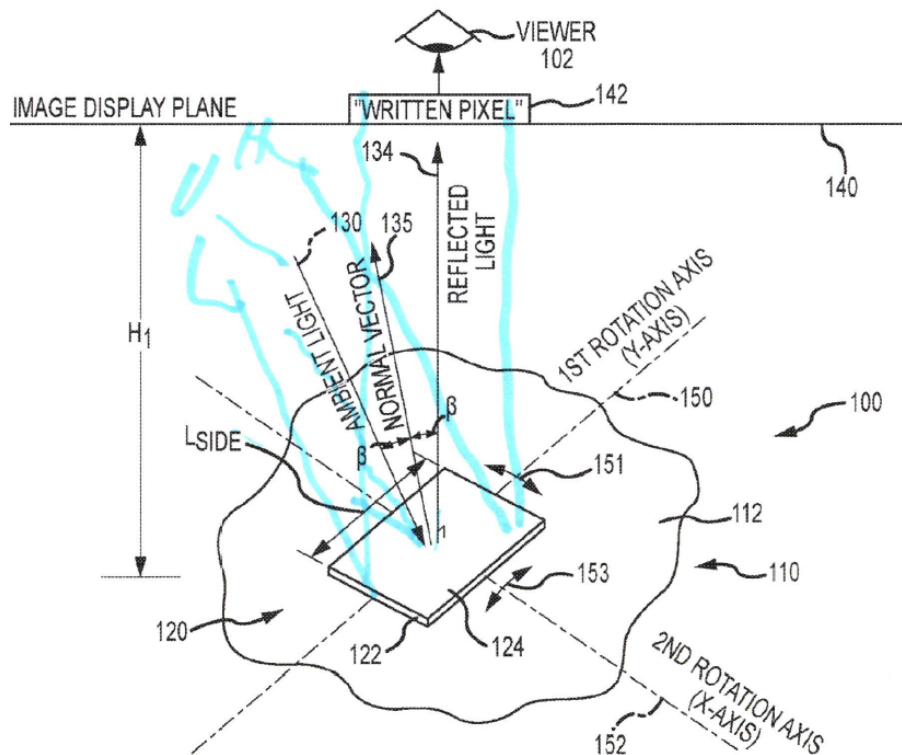


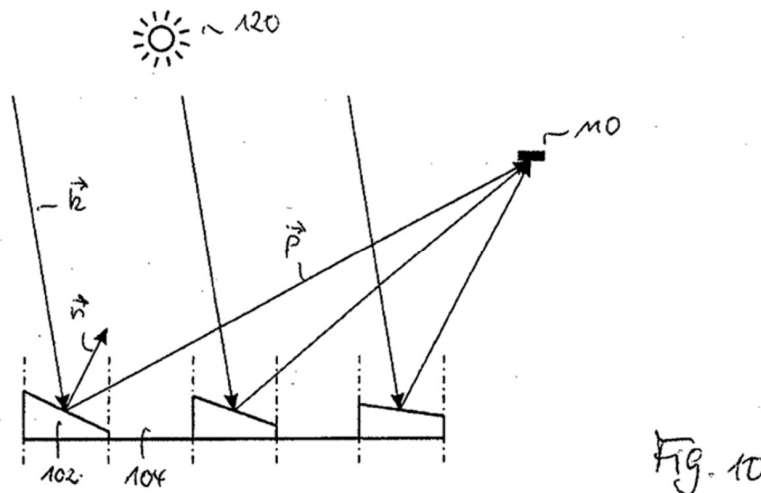
FIG.1

EX1055, 3.

Figure 1 of the '863 patent further depicts that the “same angle, β , as [] formed between the normal vector 135 and the reflected light 134.” EX1001, 6:48-50. As Dr. Lindstrand agreed, this is a consequence of the Law of Reflection, which states that the angle of incidence and angle of reflectance of a mirror are the same. EX1055, 109:7-20, 106:1-107:6, 65:5-66:12; EX1003, ¶38. Accordingly, incident light at different angles would not form the pixel, as it does not satisfy the Law of Reflection.

There has been no evidence, opinion, or position put forth that incoming light at all different angles (i.e., what is presumed to be understood from PO's use of the term "diffuse light") is used to form light for a pixel.

This is also consistent with Fuhse847, which explains that "[t]he position of the mirror surfaces, i.e., the normal vector n , is to be determined in such a way that the **light incident from a specified direction k** is reflected onto the focal point (x_0, y_0, z_0) for all micromirrors 102 assigned to light spot 110," as shown below.



EX1006, ¶¶95-97, FIG. 10; Pet. 26-27. Tellingly, PO does not dispute that Fuhse847 satisfies "ambient light" as recited in the claims.

B. Dr. Hesselink is a POSITA

PO's argument that Dr. Hesselink is not a POSITA is flawed and should be rejected. POR, 11-13.

First, as an initial matter, PO only argues that Dr. Hesselink is not a POSITA under its definition that requires “diffusive light.” PO does not dispute that Dr. Hesselink is a POSITA under his definition. Thus, if the Board agrees with Petitioners’ POSITA definition, or at least agrees with the arguments above that restricting the field of invention to “diffusive light” is not only overly narrow but contrary to the intrinsic evidence, PO’s argument can be ignored.

Second, even if the Board were to adopt PO’s definition of a POSITA, PO’s arguments that “Dr. Hesselink is not a POSITA” should still be ignored because PO waived any ability to exclude Dr. Hesselink’s opinions based on lack of qualifications (*e.g.*, under F.R.E. 702). *See* POR, 11-13. PO failed to object to Dr. Hesselink’s testimony by filing objections which preserves the right to motion to exclude Dr. Hesselink’s testimony. *See Keep Truckin, Inc. v. Innovative Global Systems, LLC*, IPR2020-00692, Paper 29, at 44 (Aug. 16, 2021) (“Petitioner never moved to exclude [expert’s] declaration (Exhibit 2006) and thereby waived any argument that he is not ‘qualified as an expert by knowledge, skill, experience, training, or education [to] testify in the form of an opinion or otherwise’ under Federal Rule of Evidence 702.”); *Runway Safe Group AB v. Earthstone International, LLC*, IPR2019-01490, Paper 49, at 79 (Feb. 17, 2021); *Repro-Med Systems, Inc. v. EMED Technologies Corporation*, IPR2015-01920, Paper 65, at 87 (Jan. 12, 2017).

Third, even if the Board adopts PO's POSITA level and considers its arguments not waived, these arguments should be rejected because Dr. Hesselink clearly does have at least 2 years of experience with diffusive light micro-optic security features. EX1003, ¶¶5-9 (e.g., describing experience with optics and displays for security, founding three high-technology companies, working on repairing the Hubble Space Telescope). PO simply lists other experiences (*see* POR, 11-12), but never cross-examined Dr. Hesselink about his experience with diffusive light micro-optic security features. *See Apple Inc. v. Zipit Wireless, Inc.*, IPR2021-01130, Paper 30, at 41 (Dec. 20, 2022) (noting that "Patent Owner did not depose [Petitioner's expert] or ask him about his [relevant] experience" in rejecting its motion to exclude Petitioners' expert as not skilled in the art).

Fourth, even if the Board adopts PO's POSITA definition and considers its arguments not waived, and does not find Dr. Hesselink to satisfy PO's definition, his testimony should still be given weight because experts in IPR proceedings are "not required to have the exact experience in [the] adopted definition of the level of ordinary skill." *Varian Medical Systems, Inc. v. Best Medical International, Inc.*, IPR2020-00072, Paper 71, at 21 (April 23, 2021); USPTO, Patent Trial and Appeal Board Consolidated Trial Practice Guide (Nov. 2019), *available at* <https://www.uspto.gov/TrialPracticeGuideConsolidated> ("TPG"), p. 34 ("There is ...

no requirement of a perfect match between the expert's experience and the relevant field.”).

VI. CONCLUSION

The Board should find all challenged claims unpatentable.

Dated: May 15, 2025

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CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that foregoing **Petitioners' Reply to Patent Owner's Response**, exclusive of the parts exempted as provided in 37 C.F.R. §42.24(c), contains 5,596 words and therefore complies with the type-volume limitations of 37 C.F.R. §42.24(a).

Dated: May 15, 2025

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CERTIFICATE OF SERVICE

The undersigned certifies that on May 15, 2025, a true and correct copy of the foregoing **Petitioners' Reply to Patent Owner's Response** was served by electronic mail on Patent Owner's counsel of record listed below, pursuant to its Mandatory Notices.

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