

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 PRELIMINARY RESPONSE TO THE PETITION
FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 11,448,863**

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EXHIBIT LIST

Exhibit	Description
2001.	Declaration Of Dr. Mikael Lindstrand

I. INTRODUCTION

Petitioner failed to carry its burden of establishing, by a preponderance of the evidence, that any challenged claim of U.S. Patent No. 11,448,863 (the “’863 patent”) is unpatentable. The Petition asserts 6 grounds, but only grounds 1 and 2 address independent claims 1, 7, and 12. The remaining grounds address only dependent claims.

Petitioner failed to carry its burden to show that any combination of Fuhse847, Rich, and Fuhse925 teach or suggest the features of claim 3 or element [7d]. Those elements recite that “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.” The Petition asserts that Fuhse847 combined with Fuhse925 discloses these features, but Fuhse847 lacks any disclosure of randomness for any purpose and Fuhse925 only discloses varying the inclination of mirrors across an entire array. Fuhse925 does not disclose or suggest selecting sets of mirrors randomly. In its Decision Instituting *Inter Partes* Review of the ’863 patent, the panel noted that it was “not persuaded that the combination of Fuhse847, Rich, and Fuhse925 teaches the additional limitation of claim 3.” Decision, p. 24. That is the correct conclusion.

As explained in further detail herein, the Petitioner also failed to meet its burden to show that claim elements [1.a] and [12.b] are rendered obvious by the

asserted prior art. For example, as to element [1.a], the combination of Fuhse847 and Rich does not disclose or suggest assigning a first object to a first image display plane and a second object to a second image display plane. As to element [12.b], the combination of Fuhse847 and Rich does not disclose or suggest generating a design output file including an angular orientation.

For at least these reasons, and as more fully explained herein, the cited references do not teach or suggest all elements of the challenged claim and all six invalidity grounds should be rejected.

II. THE PARTIES AND THE TECHNOLOGY

Petitioner Giesecke + Devrient GmbH is a Germany-based limited liability company that, among other business, manufactures optical security features for banknotes.¹

Patent Owner Lumenco is a Colorado-based research and development company founded in 2012. Lumenco's business focuses on micro-optic, micro mirror, lighting, and screen technologies. Over the past decade, Lumenco has provided a broad array of optical security products to governments and private companies around the world. For example, in 2015 Lumenco entered into a development agreement with the United States Bureau of Engraving and Printing

¹ <https://www.gi-de.com/en/currency-technology/banknote-solutions>

(“BEP”). The collaboration lasted five years and involved micro-optical technologies for use on banknotes, which allowed the United States to test in its currency one of the most advanced micro-optic arrays available.

Beginning in the 2015 timeframe, Lumenco designed and developed a new micro mirror-based optical security feature. The optical security feature was designed for use in current and brand authentication. Lumenco’s internal code name for this feature was Dycyfer™. Lumenco developed software that was used to implement its novel design ideas and manufactured prototype micro mirror arrays to test and prove the operation of its ideas. Lumenco’s work on Dycyfer™ led to the patent application that issued as the ’863 patent. Lumenco’s patented micro mirror technologies have a wide array of applications across diverse markets and industries including banknote security, brand protection, lighting and screen technologies, and solar technologies, among others.

In April 2016, Lumenco presented its Dycyfer™ technology to the BEP’s Office of Technology Development as a potential technology for use in United States banknotes. Lumenco’s proposal informed the BEP that Lumenco had filed a United States patent application related to the aforementioned technology.

In early 2017, Lumenco introduced its Dycyfer™ technology and its micro mirror patent application to Petitioner. During Lumenco’s discussions with Petitioner, Petitioner requested information and a demonstration of those

technologies. Mark Raymond and Hector Porras, founders of Lumenco and the named inventors of the '863 patent, discussed Lumenco's imminent launch of the Dycyfer™ technology with G+D and were promptly invited to meet with G+D executives in Germany. In May 2017, Messrs. Raymond and Porras flew to Gmund, Germany to meet with Petitioner's executives Alfred Kraxenberger, Manfred Heim, Michael Rahm, and Christian Fuhse. During that meeting, Messrs. Raymond and Porras presented Lumenco's Dycyfer™ technology and the patent application that eventually issued as the '863 patent. Messrs. Raymond and Porras subsequently traded several emails with representatives of G+D before and after the May 2017 meeting regarding Lumenco's technology and inventions.

Petitioner eventually informed Lumenco that it was not interested in pursuing a license or partnership. Approximately one year later, Petitioner announced that it would be offering a new line of micro mirror optical security products. Those new products, marketed under the brand name Galaxy®, infringed and continue to infringe Lumenco's United States patents, including the '863 patent.

On January 21, 2021, Patent Owner sent Petitioner a letter notifying Petitioner of its infringement of several of Lumenco's patents. The infringement did not cease. Patent Owner eventually learned that Petitioner was importing infringing products into the United States and selling those products in the United States. In 2023, Patent Owner initiated patent infringement litigation against Petitioner asserting four of its

United States patents. *See* Petition, p. 1. Petitioner subsequently filed petitions for *inter partes* review of all four of those patents.

III. THE '863 PATENT

The '863 patent is directed towards sophisticated and robust optical security features using micro mirrors that generate multiplanar images (*i.e.*, the images appear to have optical depth) that are visible without specialized glasses or lighting and without the use of holographic imagery. **Exhibit 1001** ['863 patent], 1:20-27; 2:7-35; 2:65-3:14. This results in security features for banknotes and brand authentication that are practically, if not literally, impossible to replicate and that are substantially better than any prior existing technologies. *Id.*

The '863 patent describes a special technique that enables images to be “written” into one or more spatial planes using a micro mirror array. *Id.*, 2:39-64. The images appear above and below the plane of the security element on which the micro mirrors are located. *Id.* The generated images consist of several pixels. *Id.* A pixel is created by several micro mirrors directing the light to a specific point. *Id.*, 3:15-63. The micro mirrors that generate a pixel are referred to as a “set.” *Id.*, 5:14-6:13.

A method of generating pixels by means of multiple micro mirrors is graphically illustrated in Figure 4 of the '863 patent. *Id.*, 8:61-9:23. In the example of Figure 4, the micro mirrors are located at the bottom of the security element. *Id.*

As shown below, the light reflected by the mirrors is represented approximately by the arrows (423). *Id.* At their intersections, the reflected light creates the pixels (422) above the plane (420) of the security element. *Id.* Figure 4 also shows another plane (430) on which reflected light represented by the arrows (433) generates pixels (432). *Id.*

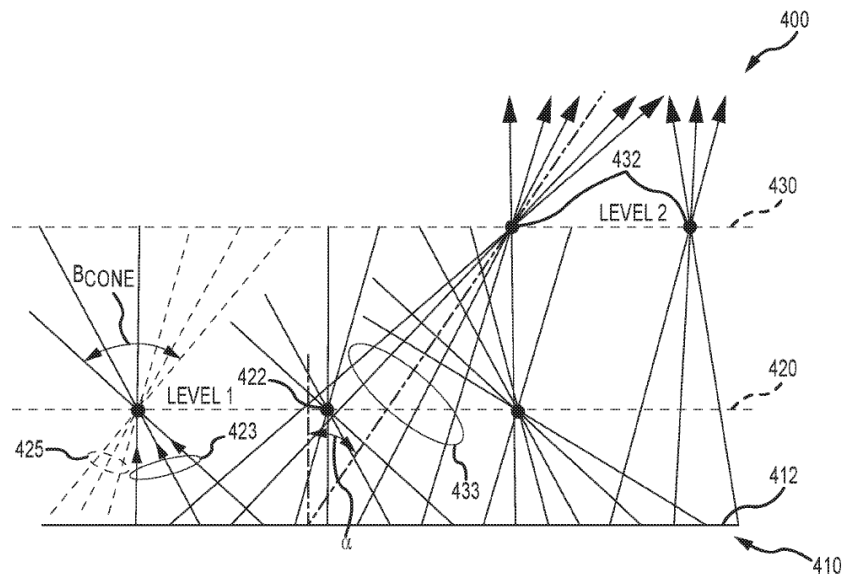


FIG. 4

Figure 2 of the '863 patent (reproduced below) shows an example of images generated by means of these pixels from a different perspective:

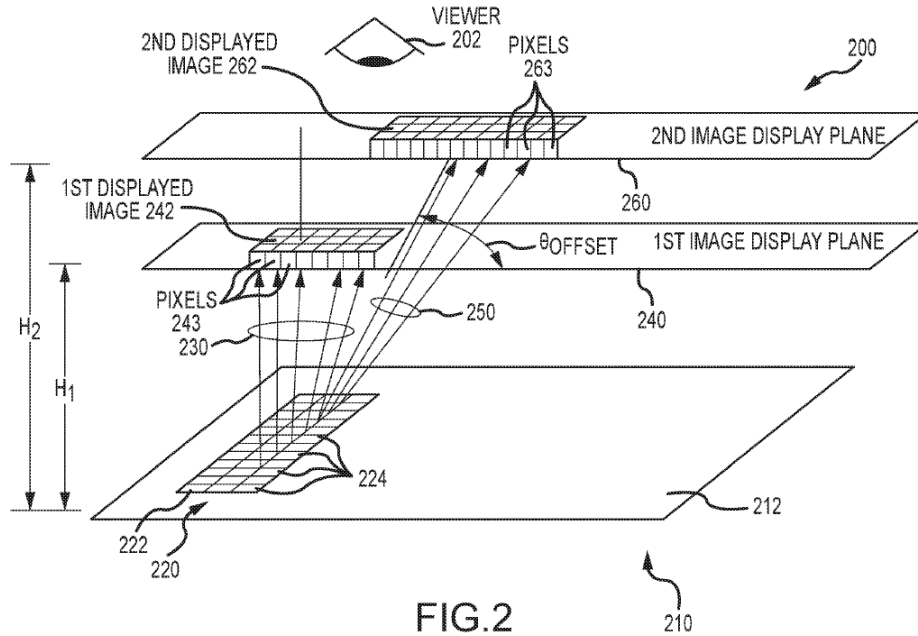


FIG.2

See also Exhibit 1001, 7:28-8:24. Figure 2 of the '863 patent also shows an example of multiple micro mirrors (224) and two images, first displayed image 242 on plane (240) and second displayed image 262 on plane (260) above the plane of the substrate (212) on which the micro mirrors are mounted. *Id.* The images consist of several pixels (243 and 263). *Id.*

The '863 patent illustrates three-dimensional pixels. Three-dimensional pixels are referred to in the art as “voxels.” For example, Figure 2 of the '863 patent illustrates a plurality of voxels 263, which are shown as three-dimensional cubes with depth, width, and height. Figure 1 of the '863 also illustrates a voxel with depth extending from the exemplary 3D display plane.

IV. A POSITA AND THE GROUNDS OF ALLEGED OBVIOUSNESS

A. LEVEL OF ORDINARY SKILL IN THE ART

In the opinion of Patent Owner’s declarant, Dr. Lindstrand, a person of ordinary skill in the art (a “POSITA”) in the relevant field, as of the date of alleged invention of the ’863 patent, would have had an undergraduate degree in electrical engineering, mechanical engineering, physics, or a similar field and at least 2 years of experience with diffusive light micro-optic security features. *See Exhibit 2001*, ¶23.

Petitioner’s declarant, Dr. Hesselink, opines that 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 *Exhibit 1003*, ¶ 94).

The key differences in these two definitions are that, in Dr. Lindstrand’s opinion, a POSITA would have had 1) an undergraduate degree *in a field similar to* electrical or mechanical engineering or physics is sufficient and 2) 2 years of experience with *diffusive light* micro-optic security features. *See Exhibit 2001*, ¶23

As to the first difference, an undergraduate degree in a field similar to the electrical or mechanical engineering or physics, which would include at least computer science degrees with engineering coursework, more accurately reflects the level of ordinary skill in the art in the ’863 patent. *See Exhibit 2001*, ¶25. Dr.

Hesselink's proposal is overly restrictive and fails to account for the fact that university degree programs vary and that degrees other than those specifically identified by Dr. Hesselink would provide appropriate subject matter training that, when combined with at least two years of relevant experience, would establish a person as a POSITA for the '863 patent. *Id.*

As to the second difference, Dr. Lindstrand explains that targeted light systems using lasers or other focused light sources are fundamentally different from security features like those described in the '863 patent, which operate by reflecting diffuse ambient light. *Id.* at ¶27. The challenges and considerations in designing diffusive light systems differ greatly from those involved in designing systems that operate with focused, collimated light sources such as lasers. *Id.*

Lasers are high intensity collimated light sources. *Id.* In collimated light source systems, rays of light are parallel to each other and the direction and angle of those rays of light are controlled and predictable. *Id.* Such systems are ideal for well-defined problems in highly controlled environments with small and well-characterized sources of disturbance. *Id.* Rays of light from lasers are high-intensity and efficient, making their behavior more predictable than light in diffusive systems. *Id.* In collimated light source systems, the designer knows exactly where the light is coming from and can manipulate and control variables like intensity, beam size, etc. *Id.*

Diffusive light systems like those disclosed in the '863 patent, in contrast, are designed to work with ambient light, such as ambient outdoor light or light from indoor diffuse light sources, e.g., overhead lights or lamps. *Id.* at ¶28. The light rays from these sources are not collimated and present technical challenges not present with collimated light source systems. *Id.* Diffusive light scattering causes unintended light rays in positions and directions not desired. *Id.* This presents a number of challenges, e.g. positions that should appear deeply black appear instead 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 untargeted light rays. *Id.*

For at least these reasons, a person who had experience mainly with focused, collimated light systems would not necessarily understand the principles and challenges in diffusive light systems like those disclosed in the '863 patent. For that reason, a POSITA as to the '863 patent would have had at least 2 years of experience specifically with *diffusive light* micro-optic security features.

B. DR. HESSELINK IS NOT A POSITA

There is no evidence that Dr. Hesselink has any experience working with diffusive light systems like those disclosed by the '863 patent, much less the 2 or more years of experience that would be necessary to qualify as a POSITA for the '863 patent. Dr. Hesselink states: “My expertise is in ultra-high density optical data

storage, and optical information systems generally, as well as optical communication components, nano photonics, optics and optical systems, and optical interconnects.” Exhibit 1003, ¶ 6. This high-level summary of experience does not include any specific mention of experience with diffusive or ambient light features and does not mention optical security features. It is true that diffusive light micro mirror features are, broadly speaking, “optical systems.” But so are collimated light systems and a variety of other technologies. A POSITA would not understand a disclosure of general experience in “optics” to necessarily include experience with diffusive light systems. *See* Exhibit 2001, ¶32 .

Dr. Hesselink provides several more specific examples of his experience with optical systems. He states that he has experience with “3-D displays, including autostereoscopic holographic displays, 3-D up conversion display, 3-D displays for security applications, grating-based displays, as well as data analysis of complex 3-D flow visualizations using scanning laser systems, tomography, and mathematical topology,” as well as “3-D display and storage devices” and the use of “interferometry to determine the 3-shape of objects using optical and X-ray scanners.” Exhibit 1003, ¶ 7. None of the specific technologies detailed by Dr. Hesselink are diffusive light systems. *See* Exhibit 2001, at ¶33. For example, autostereoscopic holographic, 3-D up conversion, and grating-based display systems all use collimated light or other focused light sources, not ambient or diffusive light

sources. *Id.*

Dr. Hesselink appears to acknowledge that he has no *specific* experience with diffusive light systems like those described in the '863 patent. Instead, he admits that he believes he is qualified in view of his “broad knowledge of optics.” Exhibit 1003, ¶ 8. Elsewhere in his declaration, Dr. Hesselink. But a broad knowledge of optics does not qualify Dr. Hesselink as a POSITA as to the '863 patent. Specific knowledge of diffusive light micro-optic security features is required, and Dr. Hesselink does not describe any such experience.

Perhaps because of his lack of experience with diffusive light systems, Dr. Hesselink's opinions are based on an incorrect understanding of the technology described in the '863 patent. 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. That statement is categorically false. *See* Exhibit 2001, ¶35. A POSITA would understand that “ambient light” as used in the art and in the '863 patent specifically refers to non-collimated light, i.e., an environment where light rays are scattered and diffused. *Id.* at ¶36. Ambient light environments often involve light rays from multiple sources and light from those sources is often intentionally diffused. *Id.* at ¶37. Ambient light refers to, for example, the lighting conditions in an indoor office environment with multiple overhead light sources, natural light entering through windows, etc. *Id.* In such

systems light rays engage the security features from a variety of directions—the rays are most certainly *not* all parallel to each other. *Id.*

As discussed in the previous section, the design and implementation of security features for diffusive, ambient light environments involves unique considerations and challenges as compared with collimated light environments in which the light rays are parallel to each other. Dr. Hesselink’s declaration makes clear that he does not recognize any difference between those two fundamentally different environments. Dr. Hesselink’s misunderstanding about the nature of ambient light systems makes him unqualified to offer opinions regarding the ’863 patent.

C. CLAIM CONSTRUCTION

Patent Owner and Petitioner agree that the terms do not require construction for purposes of evaluating the Petition. *See* Pet. at p.13 and POPR at p.10.

D. GROUND 1 – THE PETITION FAILED TO PROVE THAT FUHSE847 AND RICH RENDER OBVIOUS ANY OF CLAIMS 1-2, 4-6, AND 12-14.

Petitioner failed to satisfy its burden of proving obviousness of claims 1-2, 4-6, and 12-14 in view of Fuhse847 and Rich (the “Ground 1 References”).

1. Independent Claim 1

The Ground 1 References do not render obvious claim 1, at least because they do not teach or suggest claim element [1.a].

- i. [1.a] “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;”

The Petition argues that Fuhse847 teaches element [1.a]. Petition, p. 18 (citing Exhibit 1003). Fuhse847 fails to teach or suggest element [1.a] for several reasons.

Fuhse847 does not teach or suggest identifying first and second objects from *a single starting digital image* to two different planes, as required by element [1.a]. Reference to the specification of the '863 patent is helpful for context and understanding of this element. The '863 patent discloses a “design program to allow an operator to generate a design of an array of micro mirrors for displaying a particular image(s) when provided in a security element.” '863 patent, 9:64-10:1. “To allow the design program **630** to generate the array design **650**, a user typically initially *chooses a digital image 660 as a base or starting image* for creating an anti-counterfeit or authentication image to be displayed in one or more planes or levels relative to the array of micro mirrors.” *Id.*, 10:35-39 (emphasis added), FIG. 6 (identifying base/start image 660). The user then chooses one or more images/objects *from that starting image* and assign those images/objects to different levels or planes of a resulting image that the user wants to display using the array of micro mirrors.” *Id.*, 10:39-47.

In other words, the design program of the '863 patent: 1) takes, as an input, a photograph or other existing image (the starting image); 2) allows a user to select

individual objects from within that starting image that the user wishes to be displayed by a micro mirror security feature array; and 3) outputs coordinates and other information that can be used to manufacture a micro mirror array that displays the chosen objects when subjected to ambient light.

Turning back to the claim itself, element [1.a] recites a *single* “starting digital image” because the claim recites assigning “a first object in *a* starting digital image” and “a second object in *the* [i.e., the same] starting digital image.” So, in claim 1, the first object and second object are both assigned *from the same starting digital image*.

The Petition argues that the “body” disclosed by Fuhse847 is both “the first object” (“Fuhse847 teaches ‘a body’ (**a first object**)”) and “the starting digital image” (“[t]his body satisfies **a starting digital image**”) of element [1.a]. Petition, p. 18 (emphasis in original). This mapping of the same “body” to two different claim terms is improper because it ignores the presumption that different claim terms have different meanings. *See Anderson Corp. v. Fiber Composites, LLC*, 474 F.3d 1361, 1370 (Fed. Cir. 2007); *Rembrandt Techs, LP v. Cablevision Sys. Corp. (In re: Rembrandt Techs, LP, Patent Litig.)*, 496 F. App’x 36, 45-46 (Fed. Cir. 2012). The Petition does not allege that the prosecution history or specification of the ’863 patent override this presumption. The Petition therefore fails to show that Fuhse847 teaches or suggests a separate “first object” and “a starting digital image,” and should

be rejected for that reason alone.

Fuhse847 also fails to disclose or suggest assigning two different objects, i.e., a first object and a second object, from the “body” or from any other single starting digital image. The Petition argues that Fuhse84 “teaches **assigning** the body in the starting digital image **to a first image display plane** by defining ‘light spots’ for every point in the digital image.” Petition, p. 19 (bolding in original; underlining added). In doing so, the Petition admits that Fuhse847 discloses selecting a starting digital image and assigning **that entire digital image** (“for every point in the digital image”) to a display plane, not assigning different images from the starting digital image to different planes, as required by element [1.a].

This deficiency of Fuhse847 is further illustrated in Petitioner’s purported mapping of the “second object in the starting digital image.” The Petition does not argue that the “second object” is part of the same “body” starting image as the “first object.” Petition, p. 21. Instead, the Petition argues only that selection of the “second object” is “satisfied by the same teachings discussed above [with respect to the first object.” *Id.* But repeating the original selection process for the “second object” would necessarily involve using a new “body,” i.e., a new “starting digital image.” Fuhse847 does not disclose assigning two different objects from *the same*

starting digital image, as required by element [1.a].²

The Petition’s attempts to remedy the deficiencies of Fuhse847 with expert testimony also fail. Acknowledging that Fuhse847 does not expressly disclose assigning first and second objects from the same starting digital image, the Petition argues that a POSITA would understand that the two images of Fuhse847 “were both provided in the same starting digital image.” Petition, p. 22 (citing Exhibit 1003, ¶ 176). The only explanation provided for this conclusory statement is that it was allegedly “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. Petition, p. 22; Exhibit 1003, ¶ 176. Patent Owner does not deny that CAD images can contain multiple objects. But Petitioner fails to explain how the mere knowledge that an image can contain multiple objects would cause a POSITA to read Fuhse847 as disclosing that first and second objects from the same image can be assigned to different planes.

A teaching of assigning different objects in a single image to different planes in a micro mirror-generated display does not follow from the simple understanding that a CAD image can *contain* multiple objects, and the Petition does not explain

² The Petition notes that Fuhse847 teaches producing multiple images. Patent Owner agrees. But there is no disclosure whatsoever in Fuhse847 suggesting that image A and image B can be originate from the same starting digital image—Fuhse847 discloses only taking in an *entire* master image and assigning a plane *to the entire master image*. Exhibit 1022, pp. 9-10.

why a POSITA would have been motivated to make that logical leap based on the disclosures of Fuhse847. Dr. Hesselink’s conclusory testimony does not shed any light on the Petition’s bald assertion especially where, as here, both Petitioner and Dr. Hesselink admit elsewhere that Fuhse847 expressly discloses that “*every point* in the [starting] digital image,” i.e., the entire starting digital image, is assigned to a first image display plane. Petition, p. 19; Exhibit 1003, ¶ 156 (citing Fuhse847, pp. 9-10, 28). Dr. Hesselink’s testimony on this point should be rejected. 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”).

For at least these reasons, Fuhse847 does not teach or suggest element [1.a]. Rich does not remedy the deficiencies of Fuhse847 with respect to element [1.a], and the Petition does not so assert. Thus, the Ground 1 References, whether taken alone or in combination, do not teach or suggest element [1.a].

2. Dependent Claims 2, 4, 5, and 6

Claims 2, 4, 5, and 6 depend from and add limitations to claim 1. As noted above, the Ground 1 References, alone or in combination, do not teach or suggest the limitations of claim 1, and therefore do not render obvious claims 2, 4, 5, and 6.

3. Independent Claim 12

The Ground 1 References do not render obvious claim 1, at least because they do not teach or suggest claim element [12.b].

i. **[12.b] “generating a design output file including an angular orientation and location coordinates in the array for each of the micro mirrors; and”**

The Petition argues that Fuhse847 in view or Rich renders obvious element [12.d]. Petition, pp. 30-32. First, the Petition argues that Rich teaches a design output file that includes “the orientation of the features.” *Id.*, pp. 30-31. The Petition argues that this disclosure of Rich teaches that the design output file of Rich discloses the “angular orientation . . . for each of the micromirrors.” *Id.* But, although Rich uses the word “orientation,” that use is in the context of determining the orientation of a surface of a 3d object, not of individual micro mirrors in a set of micro mirrors, as required by element [12.b].

In relevant part, Rich recites “an orientation of the features can correlate to an orientation of the surface S of the 3D object 50 at the one or more corresponding points.” Petition, p. 31; **Exhibit 1039**, 17:1-4. The “features” in this passage are “features of intensity corresponding to non-holographic elements on the optical product 10’.” Exhibit 1039, 16:64-66. Thus, the term “orientation” as used in the cited passage of Rich does not mention or relate to an “angular orientation,” as required by element [12.b]. Instead, the cited passage discloses only determining an orientation of the *intensity* of the features of a 3d object 50. *Id.*

Moreover, even if the “orientation” referred to by the relevant passages of Rich did refer to an “angular orientation,” Rich still would not teach or suggest an

output file that includes “an angular orientation . . . for each of the micromirrors,” as required by element [12.b]. Rich discloses only that the “orientation of the features can correlate to an orientation of the surface S of the 3d object 50.” *Id.* at 17:2-3. Thus, contrary to Petitioner’s arguments, this passage does not disclose that the data output file includes the angular orientation of mirrors—the passage discloses only that the orientation of certain features can “correlate” to the existing surface S of a 3d object. To the extent Rich is considered to disclose angular orientations at all, that disclosure refers only to a general correlation of a 3D object 50 as a whole. For at least these reasons, Rich does not disclose “generating a design output file *including an angular orientation* . . . in the array for each of the micro mirrors,” as required by element [12.b].

Rich also fails to teach or suggest “generating a design output file including . . . *location coordinates* in the array for each of the micro mirrors.” Rich discloses only that the data file is a “map to generate the *pattern* of features F1, F2, . . . Fn on the surface 12 of the master 10.” Petition, p. 31. Rich does not disclose that the data file includes specific information on the location of each individual feature on the array, only the “pattern” of those features is defined and no coordinates are disclosed. Dr. Hesselink’s declaration provides no additional explanation of how the mere disclosure of a pattern would suggest to a POSITA that the data file of Rich includes “location coordinates,” as required by element [12.b]. For at least these reasons,

Rich does not teach or suggest element [12.b]. Fuhse847 does not remedy the deficiencies of Rich with respect to element [12.b], and the Petition does not so assert. Thus, the Ground 1 References, whether taken alone or in combination, do not teach or suggest element [12.b].

4. Dependent Claims 13 and 14

Claims 13 and 14 depend from and add limitations to claim 12. As noted above, the Ground 1 References, alone or in combination, do not teach or suggest the limitations of claim 12, and therefore do not render obvious claims 13 and 14.

E. GROUND 2: THE PETITION FAILED TO PROVE THAT FUHSE847 AND RICH IN VIEW OF FUHSE925 RENDERS OBVIOUS ANY OF CLAIMS 3 AND 6-14

Fuhse847, Rich, and Fuhse925 (the “Ground 2 References”), taken alone or in combination, do not render obvious claims 3 and 6-14.

1. Dependent Claim 3

Claim 3 depends from and add limitations to claim 1. As noted above with respect to Ground 1, Fuhse847 and Rich, taken alone or in combination, do not teach or suggest the limitations of claim 1, and therefore do not render obvious claim 3. Fuhse925 does not remedy the deficiencies of Fuhse847 and Rich, and the Petition does not so assert. Thus, the Ground 2 References, whether taken alone or in combination, do not teach or suggest claim 3.

The Ground 2 References also fail to teach or suggest the features of claim 3 because those references, whether taken alone or in combination, do not teach or

suggest “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,” as required by claim 3. *See Exhibit 2001*, ¶ 77

As a refresher, the “sets of micromirrors” referenced by this element were first introduced in element [1b]. *See id.* at ¶ 76. That element recites that “an array design module that operates 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.* In other words, each pixel of the first object and each pixel of the second object is created by a set of micro mirrors. *Id.* So, when read in context, claim 3 requires that each of the at micro mirrors that form each set of pixel-producing micro mirrors is selected randomly from the available micromirrors located within the base of a cone for that particular set of micromirrors. *Id.*

The Petition argues that Fuhse925 suggests this “random selection” element of claim 3. But Fuhse925 does not expressly disclose such a feature, and the Petition does not argue otherwise. *See generally*, Petition at pp. 58-60; *see also Exhibit 2001*, ¶ 77. Fuhse925 does not disclose the use of sets of mirrors that reflect light to a common point to create a pixel of an image and, again, the Petition does not argue otherwise. *Id.* The optical security assembly of Fuhse925 consists of a plurality of facets 30, i.e., mirrors:

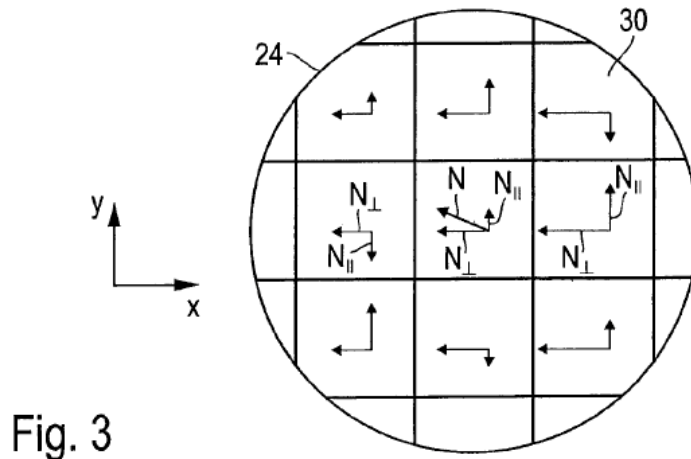


Fig. 3

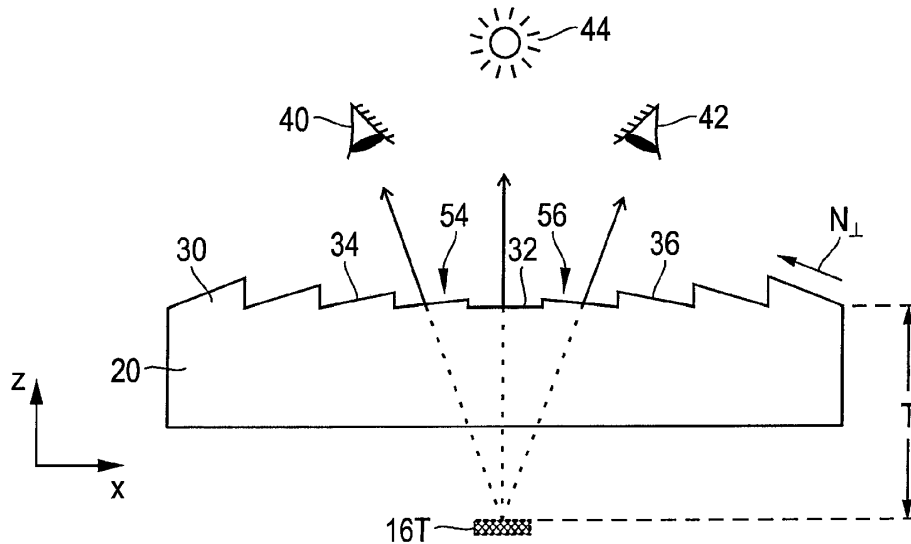


Fig. 4

Exhibit 1008, 7:33-36; FIGS. 3-4. Each facet 30 is angled, and the angle is defined by two components—a “component $N_{\parallel}$ parallel to the line 16 and a normal component $N_{\perp}$ perpendicular to the line 16[T].” *Id.*, 7:37-42, FIG. 3; Petition, pp. 58-59. As shown in FIG. 4 of Fuhse925, reproduced above, each facet 30 reflects light in a single direction defined by the two inclination components. *Id.*, 7:43-46. The light reflected by each facet 30 does not intersect with the light from any other

facet, Fuhse925 does not disclose that pixels are created, and ***Fuhse925 does not disclose the use or selection of a set of mirrors for any purpose***, much less for creating a pixel. *See generally, id.*

Fuhse925 discloses that the normal component $N_{\perp}$ “increases or decreases monotonically, with the distance of the respective facet from the target curve. *Id.*, 10:64-11:1, FIG. 4 (showing the $N_{\perp}$ angle component of the facets 30 increasing from the midpoint of motif region 20 toward the edges of that region). The parallel component $N_{\parallel}$ of each facet can vary randomly. *Id.*, 11:14-18; Petition, p. 59. The Petition relies on this disclosure of random variation of the parallel component $N_{\parallel}$ for claim 3. Specifically, the Petition argues that:

Fuhse925 teaches that the orientation vector N of each reflective facet 30 is defined by two inclination components – a normal component $N_{\perp}$ and a non-vanishing parallel component $N_{\parallel}$ – whereby the non-vanishing component $N_{\parallel}$ varies irregularly in the spreading range, especially according to a random distribution or a pseudorandom distribution. *See* Fuhse925 at 3:3-16, 9:1-31, 11:14-27. Because the non-vanishing component $N_{\parallel}$ is one inclination component of the orientation vector N of each reflective facet 30, the randomness of the non-vanishing component $N_{\parallel}$ would result in a randomness of the orientation vector N of each reflective facet 30 on the surface of the substrate. It therefore follows that the randomness of the orientation vector N of each reflective facet 30 is the result of a random pattern of the reflective facets 30. *Id.*; EX1003, ¶240.

Each facet 30 is coated with a reflective coating thereby forming micro mirrors arranged in a random pattern. As the facets 30 are arranged in according to a random distribution or a pseudorandom distribution, a POSITA would understand that making a selection of a subset of micromirrors from the plurality of micromirrors formed on the facets

30 would make for **a random selection**. *Id.*

Petition, pp. 58-29 (emphasis in original). While Patent Owner agrees that Fuhse925 discloses that the $N_{||}$ inclination component can vary randomly throughout the entire field of mirrors, neither the cited disclosure nor any other disclosure of Fuhse925 teaches or suggests random *selection of mirrors*, much less random selection of mirrors within a base of a cone, as required by element [1j].

As shown in FIG. 4, each of the mirrors of Fuhse925 are the same width and are arranged in even increments, one next to the other. This is also shown in FIG. 3, which shows facets 30 laid out in a regular grid with each facet 30 having identical lengths and widths of 15 micro meters.

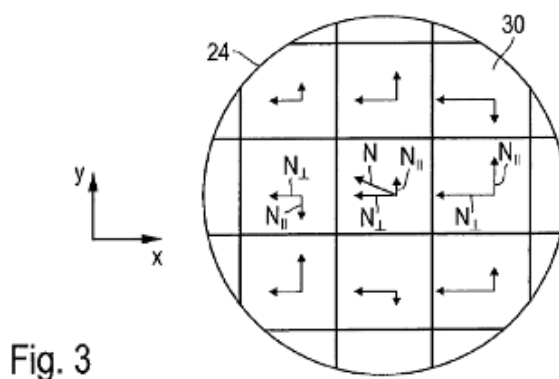


Exhibit 1008, 7:33-36; FIG. 3. The height of the facets can vary, but the facets are arranged in a regular, obvious, grid pattern. *Id.*, 7:33-36. For at least these reasons, there is no support in Fuhse925 for the Petition’s conclusory argument that “[a] POSITA would understand that it therefore follows that the randomness of the orientation vector N of each reflective facet 30 is the result of a random pattern of

the reflective facets 30.” Petition, p. 59.

Moreover, 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. Fuhse925 does not disclose any selection of a subset of the micromirrors, whether random or otherwise. *See generally* Exhibit 1008.

In essence, Petitioner has done nothing more than find a reference that uses the word “random” in a context completely divorced from the actual language of claim 1 and hired any expert to say that, because the reference uses the word “random” and mentions mirrors, claim 1 of the ’691 patent is therefore obvious. The PTAB routinely rejects exactly these type of conclusory and unsupported obviousness arguments. Dr. Hesselink’s declaration adds nothing to the analysis; it merely repeats, verbatim, the conclusory and unsupported argument in the Petition, and should therefore be disregarded. *See* 37 C.F.R. § 42.65(a).

For at least these reasons, Fuhse925 does not teach or suggest claim 3. Neither Fuhse847 or Rich remedies the deficiencies of Fuhse925 with respect to claim 3, and the Petition does not so assert. Thus, the Ground 2 References, whether taken alone or in combination, do not teach or suggest claim 3.

2. Dependent Claim 6

Claim 6 depends from and add limitations to claims 1. As noted above with respect to Ground 1, Fuhse847 and Rich, taken alone or in combination, do not teach or suggest the limitations of claim 1, and therefore do not render obvious claim 6. Fuhse925 does not remedy the deficiencies of Fuhse847 and Rich, and the Petition does not so assert. Thus, the Ground 2 References, whether taken alone or in combination, do not teach or suggest claim 6.

3. Independent Claim 7

The Ground 2 References, taken alone or in combination, do not render obvious claim 7 at least because they do not teach or suggest element [7d].

Element [7d] contains all the limitations recited in claim 3. Petition, p. 63 (relying on arguments for claim 3 to argue obviousness of element [7d]). As discussed above with respect to claim 3, the Ground 2 References, taken alone or in combination, do not teach or suggest claim 3 at least because they do not teach or suggest that each of the sets of micro mirrors is “selected randomly.” For the same reasons, the Ground 2 References do not teach or suggest element [7d], and claim 7 is not obvious in view of the Ground 2 References.

4. Dependent Claims 8-11

Claims 8-11 depend from and add limitations to claim 7. As noted above, the Ground 2 References, taken alone or in combination, do not teach or suggest the limitations of claim 7, and therefore do not render obvious claim 7. Thus, the

Ground 2 References, whether taken alone or in combination, do not teach or suggest claims 8-11.

5. Independent Claim 12

The Ground 2 References, taken alone or in combination, do not render obvious claim 12.

As discussed above with respect to Ground 1, Fuhse847 and Rich, taken alone or in combination, do not teach or suggest claim 12 at least because they do not teach or suggest element [12.b]. Fuhse925 does not remedy the deficiencies of Fuhse847 and Rich, and the Petition does not so assert. Petition, p. 65. Thus, claim 12 is not obvious in view of the Ground 2 References.

6. Dependent Claims 13-14

Claims 13-14 depend from and add limitations to claim 12. As noted above, the Ground 2 References, taken alone or in combination, do not teach or suggest the limitations of claim 12 and therefore do not render obvious claim 12. Thus, the Ground 2 References, whether taken alone or in combination, do not teach or suggest claims 8-11.

F. GROUND 3: THE PETITION FAILED TO PROVE THAT FUHSE847 AND RICH (GROUND 1) IN VIEW OF SAUVAGE-VINCENT RENDERS OBVIOUS ANY OF CLAIMS 15-18

Fuhse847, Rich, and Sauvage-Vincent (the “Ground 3 References”), taken alone or in combination, do not render obvious claims 15-18. As discussed above with respect to Ground 1, Fuhse847 and Rich, taken alone or in combination, do not

render obvious claim 12. Sauvage-Vincent does not remedy the deficiencies of Fuhse847 and Rich, and the Petition does not so assert. Petition, p. 68. Thus, claim 12 is not obvious in view of the Ground 3 References.

Claims 15-18 depend from and add limitations to claim 12. Thus, the Ground 3 References, whether taken alone or in combination, do not teach or suggest claims 15-18.

G. GROUND 4: THE PETITION FAILED TO PROVE THAT FUHSE847, RICH, AND FUHSE925 (GROUND 2) IN VIEW OF SAUVAGE-VINCENT RENDERS OBVIOUS ANY OF CLAIMS 15-18

Fuhse847, Rich, Fuhse925, and Sauvage-Vincent (the “Ground 4 References”), taken alone or in combination, do not render obvious claims 15-18. As discussed above with respect to Ground 2, Fuhse847, Rich, and Fuhse925, taken alone or in combination, do not render obvious claim 12. Sauvage-Vincent does not remedy the deficiencies of Fuhse847, Rich, and Fuhse925, and the Petition does not so assert. Petition, pp. 74-76. Thus, claim 12 is not obvious in view of the Ground 4 References.

Claims 15-18 depend from and add limitations to claim 12. Thus, the Ground 4 References, whether taken alone or in combination, do not teach or suggest claims 15-18.

H. GROUND 5: THE PETITION FAILED TO PROVE THAT FUHSE847 AND RICH (GROUND 1) IN VIEW OF MORFORD RENDERS OBVIOUS ANY OF CLAIMS 19-20

Fuhse847, Rich, and Morford (the “Ground 5 References”), taken alone or in combination, do not render obvious claims 19-20. As discussed above with respect to Ground 1, Fuhse847 and Rich, taken alone or in combination, do not render obvious claim 12. Morford does not remedy the deficiencies of Fuhse847 and Rich, and the Petition does not so assert. Petition, pp. 76-79. Thus, claim 12 is not obvious in view of the Ground 5 References.

Claims 19-20 depend from and add limitations to claim 12. Thus, the Ground 5 References, whether taken alone or in combination, do not teach or suggest claims 19-20.

I. GROUND 6: THE PETITION FAILED TO PROVE THAT FUHSE847, RICH, AND FUHSE925 (GROUND 2) IN VIEW OF MORFORD RENDERS OBVIOUS ANY OF CLAIMS 19-20

Fuhse847, Rich, Fuhse925, and Morford (the “Ground 6 References”), taken alone or in combination, do not render obvious claims 19-20. As discussed above with respect to Ground 2, Fuhse847, Rich, and Fuhse925, taken alone or in combination, do not render obvious claim 12. Morford does not remedy the deficiencies of Fuhse847, Rich, and Fuhse925, and the Petition does not so assert. Petition, pp. 79-80. Thus, claim 12 is not obvious in view of the Ground 6 References.

Claims 19-20 depend from and add limitations to claim 12. Thus, the Ground
6 References, whether taken alone or in combination, do not teach or suggest claims
19-20.

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), I hereby certify that the foregoing Patent Owner's Preliminary Response contains 6709 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: February 18, 2025

Respectfully submitted,

By: /C. Matthew Rozier/

C. Matthew Rozier

Registration No. 63,429

Counsel for Patent Owner

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6, the undersigned certifies that February 18, 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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