

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. 10,317,691**

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EXHIBIT LIST

Exhibit	Description
2001.	January 21, 2021 Letter

I. INTRODUCTION

Lumenco, LLC (“Lumenco” or “Patent Owner”) respectfully submits this Preliminary Response (the “Response”) to the Petition for *Inter Partes Review* No. IPR2024-00837 (Paper 1) (the “Petition” or “Pet.”) of U.S. Patent No. 10,317,691 (the “’691 patent”) filed by Giesecke+Devrient GmbH, Giesecke+Devrient Currency Technology GmbH, and Papierfabrik Louisenthal GmbH (collectively, “G+D” or “Petitioner”).

Institution should be denied because the Petition fails to demonstrate a reasonable likelihood that any claim of the ’691 patent is unpatentable at least because Petitioner ***has not and cannot*** meet its burden to show that the references applied by the Petition, taken alone or in combination, teach or suggest independent claims 1, 6, and 12, or any of the challenged dependent claims.

First, Petitioner ***has not*** met its burden because the Petition fails to specify where each element of the challenged claims are found in the references, improperly leaving Patent Owner and the Board to figure out exactly how the prior art references could potentially map to claim elements [1d] and [1j] (and similarly worded claim elements [6d], [6h], [12d], and [12j]). For each of those elements, the Patent Owner ignores key language in the claim resulting in an incomplete mapping of the prior art.

Second, Petitioner ***cannot*** meet its burden because none of the cited prior art

references actually disclose the required limitations of claim elements [1d] and [1j]. Possibly recognizing that fact, the Petition analysis of the prior art includes little direct analysis of the references and instead merely repeats the claim language in conclusory fashion, as detailed below, as if the references actually disclosed the required claim limitations. As a result, Petitioner's arguments are fatally flawed and incomplete..

Nothing in the remainder of the Petition changes this result. For example, claims 6 and 12 contain similarly worded claim elements and, therefore, the failures as to claim elements [1d] and [1j] apply equally to the other claims. The remaining prior art combinations cited in the Petition also fail to change the result. None of the prior art references Petitioner cites—whether alone or in combination—disclose the key requirements of claims elements [1d] and [1j]. Indeed, the Petitioner relies on the remaining combinations for the purpose of other claim elements and the combinations change nothing in the flawed analysis of claim elements [1d] and [1j].

For these reasons and those set forth below, Patent Owner respectfully submits that institution should be denied because the Petition fails to demonstrate a reasonable likelihood that any of the claims are unpatentable.

II. FACTUAL BACKGROUND

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 range 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. 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.

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 early 2017, Lumenco introduced its proprietary Dycyfer™ banknote security technology and its micro mirror patent portfolio to Petitioner. During Lumenco's discussions with Petitioner, Petitioner requested information and a demonstration of those technologies, which Lumenco provided, but ultimately, Petitioner informed Lumenco that they were 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 '691 patent.

On January 21, 2021, Lumenco sent Petitioner a letter notifying Petitioner of

its infringement of the '691 patent. *See Exhibit 1001* ['691 patent]. 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. *See* Petition, p. 1. For jurisdictional reasons, Petitioner dismissed its original U.S. District Court complaint and brought a new suit in the United States Court of Federal Claims (the "USCFC"). In the USCFC complaint, Lumenco alleges that Petitioner imports and sells security threads and security patch technologies that infringe the '691 patent.

III. STATEMENT OF THE PRECISE RELIEF REQUESTED

Patent Owner requests that the Board deny institution of the Petition with respect to all challenged claims and all asserted grounds. A full statement of the reasons for the relief requested is set forth in Sections IV and V of this Response.

IV. THE PETITION SHOULD BE DENIED BECAUSE IT DOES NOT ESTABLISH A REASONABLE LIKELIHOOD OF SUCCESS ON ANY CHALLENGED CLAIM.

As detailed below, the Petition fails to demonstrate a reasonable likelihood that the Petitioner would prevail with respect to any claim of the '691 patent. The Petition challenges independent claims 1, 6, and 12 and dependent claims 3, 4, 5, 7, 9, 10, 11, 13 through four different §103 grounds, with further modifications based on the alleged knowledge of a POSITA. But the references and combinations thereof

fail to disclose key limitations of each challenged claim. Trial should not be instituted.

A. THE '691 PATENT

The '691 patent is directed towards optical security features that can produce multiplanar images (*i.e.*, the images appear to have optical depth) that are visible without the use of special glasses or aids. **Exhibit 1001** ['691 patent], 1:18-26. The '691 patent provides sophisticated and robust security features using complex pixel-mapped interlaced voxels and micro mirrors that generate multiplanar images without specialized glasses or lighting and without the use of holographic imagery. *Id.*, 2:4-32; 2:63-3:12; 26:56-28:11. 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 '691 patent describes a special technique that enables images to be “written” into one or more spatial planes using a micro mirror array. *Id.*, 2:36-62. 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.*, 3:13-62. The micro mirrors that generate a pixel are referred to as a “set.” *Id.*, 6:20-7:22.

A method of generating pixels by means of multiple micro mirrors is

graphically illustrated in Figure 4 of the '691 patent. *Id.*, 10:7-37. 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.*

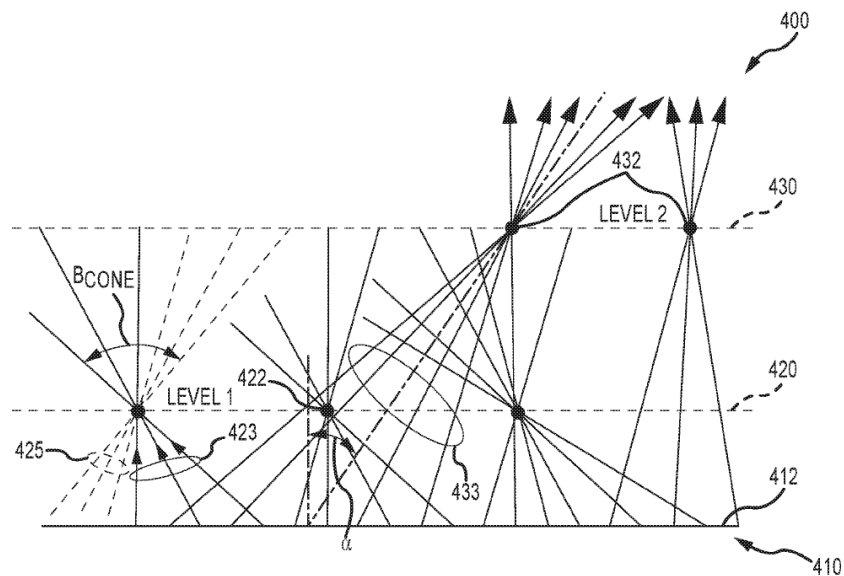
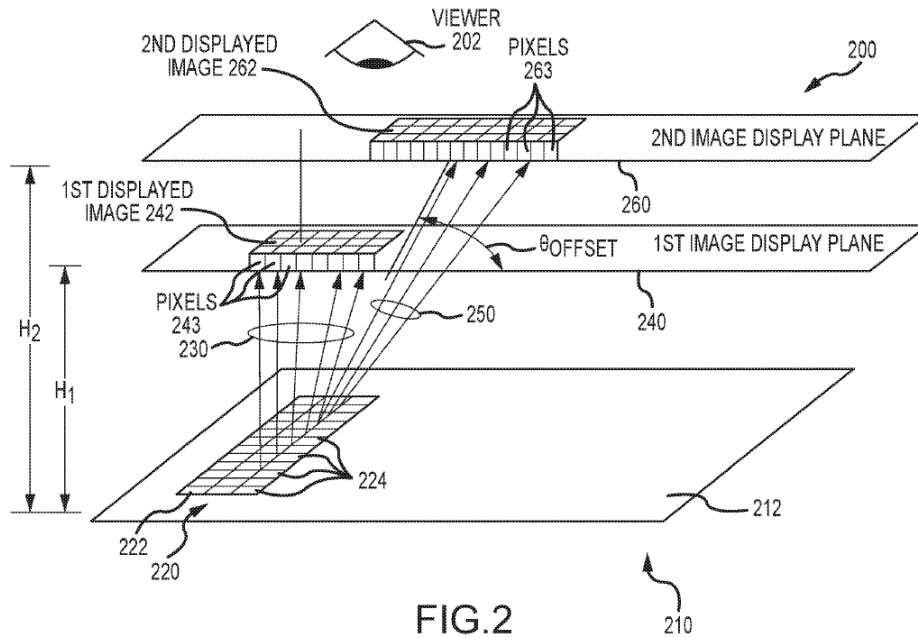


FIG.4

Figure 2 of the '691 patent (reproduced below) shows an example of images generated by means of these pixels from a different perspective:



See also Exhibit 1001 ['691 patent], 8:36-9:33. Figure 2 of the '691 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.*

Figure 3 of the '691 patent (reproduced below) “illustrates all the available micro mirrors in the cone base,” including the security element 220 which is “typically [] designed so that only a subset of these available mirrors 224 (such as 20 to 40 or more with 30 shown in use in FIG. 3 at 324) is used to write or display a particular pixel.” Exhibit 1001 ['691 patent], 9:34-38.

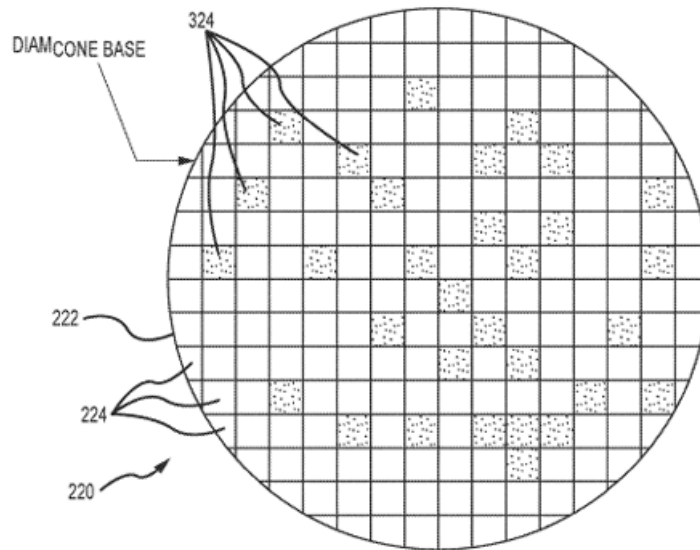


FIG.3

Importantly, the '691 patent discloses the micro mirror are randomly selected.

For example, the '691 patent states:

As will be explained below, the micro mirrors 324 in the set of pixel-providing micro mirrors are randomly chosen (by software or a program as discussed below) such that the mirrors 324 do not provide an obvious, regular pattern, and each pixel's set of micro mirrors 224 likely will have a very different pattern within a cone base or circular area of the surface 222 of the security element 220 (i.e., will not repeat the pattern shown in FIG. 3). Also, each of the micro mirrors 324 in the set used to provide a particular pixel 243 or 263 will be differently oriented so as to have the reflected light of all the mirrors 324 intersect at the X-Y-Z coordinates of the same pixel 243 or 263 in the appropriate one of the image display planes 240 or 260.

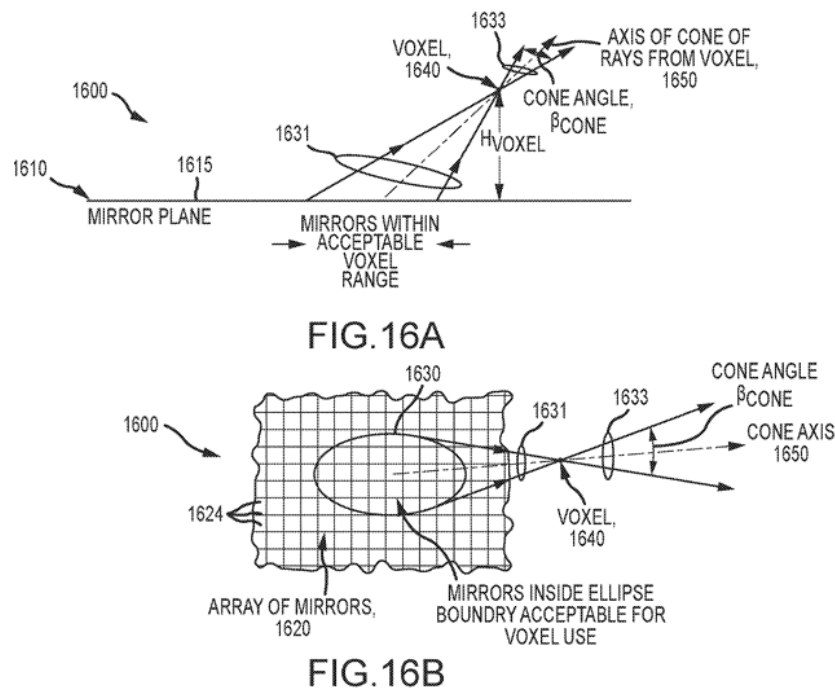
Exhibit 1001 ['691 patent], 9:50-62.

As further explained in the patent, during the design process, a first image pixel is identified or selected to be generated by configuring a set of micro mirrors.

Id., 13:27-44; *see also* Figure 7 (flow diagram of an exemplary design method). A

micro mirror is randomly selected from a set of presently available micro mirrors, and then, this randomly selected micro mirror is marked as no longer available or “used” in generating the pixel in the image. *Id.* The micro mirrors continue to be selected until the pixel is created, and then, the next pixel in the image is created. *Id.* After a number of cycles of creating the pixels, all the mirrors are used depending on the image and mask patterns. *Id.*, 14:34-50. This random selection and arrangement provides significant security and anti-counterfeiting benefits.

Figures 16A and 16B of the '691 patent further show examples of a visual display assembly during its use of a single voxel:



A voxel is created so as to provide animation or 3D effects, where the 3D images appear to float in air relative the visual display. *Id.*, 21:14-23:50.

B. LEVEL OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art (a “POSITA”) in the relevant field, as of the date of alleged invention of the ’691 patent, would have had an undergraduate degree in electrical engineering, mechanical engineering, physics, or a similar field and at least 2 years of experience in micro-optic based security features..

C. CLAIM CONSTRUCTION

Patent Owner agrees that the terms do not require construction for purposes of evaluating the Petition.

D. GROUND 1 – THE COMBINATION OF FUHSE262 AND FUHSE925 DOES NOT RENDER OBVIOUS ANY OF CLAIMS 1, 4-7, AND 10-12

The combination of Fuhse262 and Fuhse925 (the “Ground 1 References”) does not render obvious any of claims 1, 4-7, and 10-12.

1. Independent Claim 1

The Ground 1 References do not render obvious claim 1, at least because they do not teach or suggest claim elements [1d] and [1j].

- i. [1.d] “wherein each of the sets of the micro mirrors providing the pixels for each of the differing ones of the images has a differing cone angle offset, wherein the cone angle offset is defined based upon a relative position of a cone axis for a cone of rays projected by the sets of the micro mirrors through each of the pixels,”*

Claim element [1d] recites, among other things, “wherein *each of the sets* of the micro mirrors providing the pixels for *each* of the differing ones of the images

has a differing cone angle offset.” (emphasis added). For at least the reasons discuss below, the Ground 1 references do not teach or suggest such a feature.

The Petition’s argument that Fuhse262 teaches element [1d] is based on a fundamental misreading of the claim language. Claim 1 recites an “array of micromirrors” (element [1a]) that operates to “*display[] a plurality of images* in a plane spaced a distance apart from the surface of the substrate, wherein *each of the images comprises a plurality of pixels.*” Element [1b]. “[T]he array of micro mirrors includes, for *each of the pixels of each of the images, a set of the micromirrors.* . . . oriented to reflect the ambient light toward a point on the plane corresponding to one of the pixels. . . .” Element [1c]. So claim 1 requires that each pixel of each image is formed by *a set* of the micromirrors. And, as recited in element [1d], “*each set of . . . micromirrors for each of the differing ones of the images has a differing cone angle offset.*”

The Petition argues that “a POSITA would understand that *there is a differing cone angle offset for each image* because the surface normals of each image, which dictate the cone of reflected rays and cone axis, are required to be different.” Petition, p. 41 (citations omitted; emphasis added). But element [1d] does not recite or require that the sets of micro mirrors for *each image* have different cone angle offsets—element [1d] instead recites that “*each of the sets of micro mirrors providing pixels . . . for each of the differing ones of the images* has a differing

cone angle offset.” Petitioner’s mapping improperly ignores that each “set” of micro mirrors for each of the images must have a differing cone angle offset. When read properly, element [1d] requires that (1) each set of micro mirrors that produce pixels for the first image has a different cone angle offset from the other sets for the first image **and**; (2) each set of micro mirrors that produce pixels for the second image has a different cone angle offset from the other sets for the second image. For at least that reason, the Petition fails to specify where each element of the claim is found in the Ground 1 References. The Petition should be denied for that reason alone. *See* 37 C.F.R. § 42.104(b)(4)–(5) (2012) (it is Petitioner’s burden to “specify where each element of the claim is found in the prior art patents or printed publications relied upon.”); *see also* *Intelligent Bio-Systems, Inc. v. Illumnia Cambridge*, 821 F.3d 1359, 1367 (Fed. Cir. 2016) (“It is of the utmost importance that petitioners in the IPR proceedings adhere to the requirement that the initial petition identify ‘with particularity’ the ‘evidence that supports the grounds for the challenge to each claim.’”) (quoting 35 U.S.C. § 312(a)(3) (2012)). Petitioner has not met that burden here, and the Petition should be denied.

Moreover, the Ground 1 References would not disclose element [1d] even if Petitioner’s flawed understanding of that element was correct (which it is not). As noted above, Petitioner and its declarant Dr. Hesselink mistakenly believe that element [1d] requires that “***there is a differing cone angle offset for each image.***”

Petition, p. 41 (citing Ex. 1003, ¶ 172). But the Ground 1 References also fail to disclose or suggest that “there is a differing cone angle offset for each image.”

In relevant part, the Petition argues that:

Because the normals of the micromirrors for each image pixel are exclusive of each other (i.e., each image has a distinct range of normal values to ‘separate’ the images) (EX1006, ¶0115), **each of the sets of the micro mirrors providing the pixels for each of the differing ones of the images has a differing cone angle offset**. Thus, a POSITA would understand that there is a **differing cone angle offset** for each image because the surface normals of each image, which dictate the cone of reflected rays and cone axis, are required to be different. EX1003, ¶172.

Petition, p. 41 (emphasis in original). This argument suffers from two fatal deficiencies. *First*, ¶0115 of Fuhse262 does not expressly state that the normals of the micromirrors for each image pixel “are exclusive of each other,” and neither the Petition nor Dr. Hesselink’s declaration provide any explanation for how that paragraph supports the conclusory statements in the Petition. Indeed, Dr. Hesselink’s declaration is a near-verbatim copy of the paragraph in the Petition. For this reason, Dr. Hesselink’s testimony should be rejected, and the Petition should be denied because Petitioner has not met its burden to explain how the Fuhse262 discloses element [1d]. 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”); *see also Skky, Inc. v. MindGeek s.a.r.l.*, 859 F.3d 1014, 1022 (Fed. Cir. 2017) (affirming the Board’s rejection of conclusory expert testimony in holding

that “the Board is not required to credit [Petitioner’s] expert evidence simply because [Petitioner] offered it.”).

Second, ¶ 0115 of Fuhse262 simply does not disclose or suggest that “the normals of the micromirrors for each image pixel are exclusive of each other (*i.e.*, each image has a distinct range of normal values to ‘separate’ the images).” Instead, the paragraph cited by the Petition discloses that “ $n_y > c_1$ for image A, $c_1 < n_y < c_2$ for image B, $n_y < c_2$ for image C,” where n_y is “the y-component of the normal vector” and c_1 and c_2 are two numerical values where $c_1 < c_2$. Petition, pp. 39-40 (citing EX1006, ¶¶ 0114-0115). In other words, Fuhse262 discloses that n_y is greater than c_1 for images A, B, and C, and n_y is less than c_2 for each of images A, B, and C. In other words, ***n_y is between c_1 and c_2 for images A, B, and C.*** Therefore, ¶ 0115 actually discloses that the normals for each image pixel are ***not exclusive*** with each other and, instead, ***can and do overlap***. ¶0115 also makes it clear that the normal values for images A, B, and C ***can even be identical to each other***. The Petition’s reliance on FIG. 9(a) Fuhse262 is likewise flawed and should be disregarded because: (1) FIG. 9(a) as it appears in Fuhse262 shows only one set of mirrors for a single pixel 110, it does not show multiple sets of mirrors, much less sets of mirrors for two different images; and (2) Dr. Hesselink’s markup of FIG. 9(a) is based on his flawed understanding of the equation in ¶ 0115 of Fuhse262. Put simply, there is no teaching or suggestion in Fuhse262 that the sets of mirrors for each image each

have a different cone angle offset, as would be required even under Petitioner's oversimplified interpretation of element [1d].

For at least these reasons, Fuhse262 does not teach or suggest element [1d] whether analyzed under the actual claim language or Petitioner's improper rewrite of the claim language. Fuhse925 does not remedy the deficiencies of Fuhse262 with respect to element [1d], and the Petition does not so assert. Thus, the Ground 1 References, whether taken alone or in combination, do not teach or suggest element [1d].

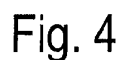
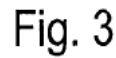
- ii. ***[1j] “wherein each of the micro mirrors in each of the sets for the micro mirrors is selected randomly from available micro mirrors in the base of the cone coplanar with the surface of the substrate, whereby each of the micro mirrors in each of the sets for the micro mirrors is selected randomly.”***

The Ground 1 References do not teach or suggest element [1j]. Specifically, the Ground 1 References do not teach or suggest at least that “each of the micro mirrors in each of the sets for the micro mirrors ***is selected randomly from available micro mirrors in the base of the cone***” or that “each of the micro mirrors in each of the sets for the micro mirrors ***is selected randomly.***” The Petition admits that Fuhse262 does not disclose or suggest such features, and instead points to Fuhse925. Petition, pp. 48-49. But Fuhse925 also fails to disclose or suggest these “random selection” features, either expressly or inherently.

As a threshold matter, the “sets of micromirrors” referenced in element [1j]

were first introduced in element [1c]. That element recites that “the array of micro mirrors includes, for each of the pixels of each of the images, a set of the micro mirrors each having a reflective surface oriented to reflect the ambient light toward a point on the plane corresponding to one of the pixels.” In other words, each pixel of each image displayed by the visual display assembly is created by a set of micromirrors. Each set of pixel-producing micro mirrors includes at least two micro mirrors. Element [1g]. The at least two micro mirrors in each set of pixel-producing micromirrors are located within a base of a cone, the apex of which is the pixel displayed by those mirrors. Elements [1d] and [1i]. So, when read in context, element [1j] recites that each of the at least two micro mirrors that form each set of pixel-producing micro mirrors is selected randomly from the available micromirrors located within the base of the cone for that particular set of micromirrors.

Fuhse925 does not expressly disclose such a feature, and the Petition does not argue otherwise. *See generally*, Petition, pp. 48-51. As an initial matter, 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:



EX1008, 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. 49-50. As shown in FIG. 4, 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.*

More importantly, Fuhse925 fails to disclose random selection of mirrors, whether for inclusion in a set or otherwise. 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. 50. The Petition relies on this disclosure of random variation of the parallel component $N_{\parallel}$ for limitation [1j].

Specifically, the Petition argues that

“[A] POSITA would understand that 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 nonvanishing component $N_{\parallel}$ would result in a randomness of the orientation vector N of each reflective facet 30 on the surface of the substrate. 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 (**the micro mirrors is [sic] arranged in a random pattern**).

Each facet 30 is coated with a reflective coating thereby forming micro mirrors [] arranged in a random pattern. EX1003, ¶203. Because the facets 30 are arranged 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**.

Petition, p. 50 (citations omitted) (emphasis in original). This argument fails because the Petition falsely equates use of the word “random” in reference to an inclination component, with a requirement in the claims that the micro mirrors in each set of micro mirrors be “selected randomly from available micro mirrors.” These are fundamentally different. For example, while Patent Owner agrees that Fuhse925 discloses that the $N_{\parallel}$ 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].¹ At best, Fuhse925 reflects choosing random angles (e.g., inclination components) when laying out the mirrors—the mirrors themselves are not selected for any purposes, and certainly are not selected randomly. Nor does Fuhse925 teach arranging micro mirrors in a random pattern—in fact, Fuhse925 teaches the exact opposite.

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.

¹ It is unclear why the phrase “the micro mirrors is arranged in a random pattern” is bolded in this paragraph in the Petition. The Petition generally adopts a convention of bolding verbatim claim language when used in the argument, presumably to draw attention to which passages of the Petition are directed to a particular claim element. But the phrase “the micro mirrors is arranged in a random pattern” does not appear in element [1j] or anywhere else in claim 1.

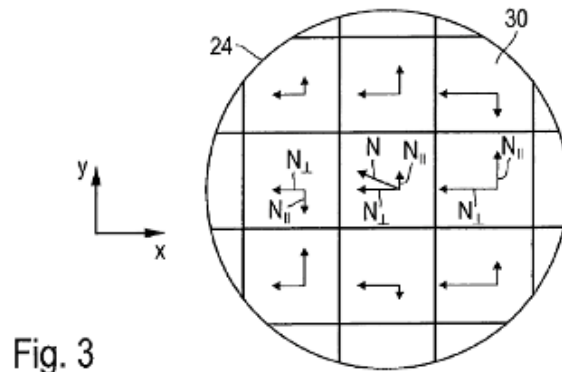


Fig. 3

EX1008, 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.” *See* Petition, p. 50.

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 element [1j], 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* EX1008.

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 concluded 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, and it should do so here. 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 element [1j]. Fuhse262 does not remedy the deficiencies of Fuhse925 with respect to element [1j], and the Petition does not so assert. Thus, the Ground 1 References, whether taken alone or in combination, do not teach or suggest element [1j].

2. Independent Claim 6

As noted by the Petition, independent claim 6 is similar to independent claim 1. Petition, p. 52. As relevant to this response, element [6d] contains all the limitations recited in element [1d]. *Id.*, p. 53 (relying on arguments for element [1d]). And element [6h] contains all the limitations recited in element [1j]. *Id.*, p. 54 (relying on arguments for element [1j]). As discussed above in Section IV(D)(1), the Ground 1 References, taken alone or in combination, do not teach or suggest limitations [1d] or [1j]. For the same reasons, the Ground 1 References do not teach or suggest limitations [6d] or [6h].

3. Independent Claim 12

As noted by the Petition, independent claim 12 is similar to independent claim

1. Petition, p. 54. As relevant to this response, element [12d] contains all the limitations recited in element [12d]. *Id.*, p. 55 (relying on arguments for element [1d]). And element [12j] contains all the limitations recited in element [1j]. *Id.*, p. 57 (relying on arguments for element [1j]). As discussed above in Section IV(D)(1), the Ground 1 References, taken alone or in combination, do not teach or suggest elements [1d] or [1j]. For the same reasons, the Ground 1 References do not teach or suggest elements [12d] or [12j].

4. Dependent Claims 4, 5, 7, 10, and 11

Claims 4, 5, 7, 10, and 11 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 4, 5, 7, 10, and 11. For at least that reason, the Ground 1 References do not render obvious claims 4, 5, 7, 10, and 11. Claims 4, 5, 7, 10, and 11 are therefore patentable for at least the same reasons as Claim 1.

E. GROUND 2 – THE COMBINATION OF FUHSE262, FUHSE925, AND JORDAN DOES NOT RENDER OBVIOUS ANY OF CLAIMS 1, 4-7, AND 10-12

The combination of Fuhse262, Fuhse925, and Jordan (the “Ground 2 References”) does not render obvious any of claims 1, 4-7, and 10-12. The only difference between Ground 1 and Ground 2 is Ground 2’s addition of Jordan. Jordan is applied in Ground 2 only to the preamble of each independent claims. Petition,

pp. 60-62. Jordan does not remedy the deficiencies of Fuhse262 and Fuhse925 as to elements [1d], [1j], [6d], [6h], [12d], and [12j] or dependent claims 4, 5, 7, 10, and 11, and the Petition does not so assert.

Claims 1, 4-7, and 10-12 are therefore patentable for at least the same reasons as those detailed with respect to Ground 1.

F. GROUNDS 3 AND 4: CLAIMS 3, 9, AND 13 ARE NOT RENDERED OBVIOUS UNDER 35 U.S.C. §103 BY FUHSE262 IN VIEW OF FUHSE925, AND FUHSE172 (GROUND 3), OR FUHSE262 IN VIEW OF FUHSE925, JORDAN, AND FUHSE172 (GROUND 4)

Claim 3 depends from and add limitations to claim 1. Claim 9 depends from and add limitations to claim 6. Claim 13 depends from and add limitations to claim 12. As noted above, neither Fuhse262, Fuhse925, and Jordan, taken alone or in combination, teach or suggest the limitations of claims 1, 6, or 12, and therefore do not render obvious claims 1, 6, or 12. Fuhse172 does not remedy the deficiencies of Fuhse262, Fuhse925, and Jordan with respect to claims 1, 6, and 2, and the Petition does not so assert.

For at least these reasons, the neither the Ground 3 or Ground 4 References render obvious claims 3, 9, and 13. Claims 3, 9, and 13 are therefore patentable for at least the same reasons as claims 1, 6, and 12, respectively.

V. CONCLUSION

Patent Owner requests that the Board deny institution of the Petition.

DATED: August 29, 2024

Respectfully submitted,

By: /C. Matthew Rozier/
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CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), I hereby certify that the foregoing Patent Owner's Preliminary Response contains 5085 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: August 29, 2024

Respectfully submitted,

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6, the undersigned certifies that August 29, 2024, 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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