

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG DISPLAY CO., LTD.,
Petitioner,

v.

PICTIVA DISPLAYS INTERNATIONAL LTD.,
Patent Owner.

Case No. IPR2024-01223

Patent No. 6,949,389

**PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO.
6,949,389 UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. § 42.100 *et seq.***

Second Petition, Asserting Prior Art Under Section 102(b)

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1001	U.S. Patent No. 6,949,389 (“the ’389 patent”)
1002	Certified File History for U.S. Patent No. 6,949,389
1003	Declaration of Vivek Subramanian, Ph.D. (Yamazaki and Weaver grounds)
1004	Declaration of Vivek Subramanian, Ph.D. (Kijima grounds)
1005	U.S. Patent Application Publication No. 2003/0206332 (“Yamazaki”)
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1007	U.S. Patent Application Publication No. 2003/0011300 (“Palanisamy”)
1008	U.S. Patent Application Publication No. 2002/0140347 (“Weaver”)
1009	U.S. Patent No. 6,866,901 (“Burrows”)
1010	Japanese Published Application No. H09-245964, certified translation (“Kijima”)
1011	Japanese Published Application No. H09-245964, original document
1012	U.S. Patent No. 6,198,217 (“Suzuki”)
1013	U.S. Patent No. 6,087,196 (“Sturm”)
1014	Japanese Published Application No. H10-41069, certified translation (“Fujimori”)
1015	Japanese Published Application No. H10-41069, original document
1016	International Publication No. WO 2001/08242 (“Duthaler”)
1017	U.S. Patent No. 6,660,409 (“Komatsu”)
1018	J. Birnstock et al., <i>Screen-Printed Passive Matrix Displays Based on Light-Emitting Polymers</i> , 78 Appl. Phys. Lett. 3905 (2001) (“Birnstock”)
1019	Complaint, <i>Pictiva Displays Int’l Ltd. v. Samsung Elecs. Co., Ltd., et al.</i> , 2:23-cv-00495-JRG (E.D. Tex. Oct. 19, 2023)
1020	U.S. Patent Application Publication No. US 2003/0062186 (“Boroson”)
1021	U.S. Patent No. 6,770,502 (“Cok”)
1022	U.S. Patent No. 6,214,631 (“Burrows-631”)

Exhibit No.	Description
1023	Jun Hyung Souk, <i>Advances and New Challenges in LCD</i> , International Meeting on Information Display Digest, 24 (2002) (“Souk”)
1024	<i>OLED Fundamentals: Materials, Devices, and Processing of Organic Light-Emitting Diodes</i> (Daniel J. Gaspar & Evgueni Polikarpov eds., 1st ed. 2015) (excerpted) (“Gaspar”)
1025	Takashi Ohta, <i>Next Generation AMLCD Production Technologies for Large Substrate</i> , International Meeting on Information Display Digest, 3 (2001) (“Ohta”)

I. INTRODUCTION

Samsung Display Co., Ltd. (“Petitioner”) petitions for *inter partes* review (“IPR”) seeking cancellation of claims 34-37, and 40-46 (the “Challenged Claims”) of U.S. Patent No. 6,949,389 (Ex.1001, “’389 patent”).¹

II. STANDING, MANDATORY NOTICES AND FEE AUTHORIZATION

Grounds for Standing: Pursuant to 37 C.F.R. § 42.104(a), Petitioner certifies that the ’389 patent is available for IPR and that Petitioner is not barred or estopped from requesting an IPR challenging the ’389 patent on the grounds identified in this petition.

Real Party-in-Interest: Petitioner identifies Samsung Display Co., Ltd., Samsung Electronics Co., Ltd., and Samsung Electronics America, Inc. as real parties-in-interest.

¹ As explained in Petitioner’s accompanying Explanation of Parallel Petitions, this petition is being filed as a second petition that relies only on prior art that qualifies under Section 102(b), in view of Patent Owner’s contention that the asserted claims of the ’389 patent may be entitled to an earlier right of priority.

Related Matters: Patent Owner² has asserted the '389 patent in litigation against Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. in *Pictiva Displays International Ltd. v. Samsung Electronics Co., Ltd.*, Case No. 2:23-cv-00495 (E.D. Tex.) and *Pictiva Displays International Ltd. v. Samsung Electronics Co., Ltd.*, Case No. 2:24-cv-00532 (E.D. Tex.).

Lead and Back-Up Counsel: Petitioner designates David A. Garr (Reg. No. 74,932, dgarr@cov.com) as lead counsel, of Covington & Burling LLP, One CityCenter, 850 Tenth Street, NW, Washington, DC 20001 (postal and hand delivery), telephone: (202) 662-6000, facsimile: (202) 662-6291.

Petitioner designates Scott Weidenfeller (Reg. No. 54,531, sweidenfeller@cov.com) as back-up counsel, of Covington & Burling LLP, One CityCenter, 850 Tenth Street, NW, Washington, DC 20001 (postal and hand delivery), telephone: (202) 662-6000, facsimile: (202) 662-6291.

Service Information: Service information is provided in the designation of counsel above. Petitioner consents to service of all documents via electronic mail at the email addresses above and at SDC-Pictiva-IPR@cov.com.

² In the litigation, defendants have challenged Pictiva's ownership of the '389 patent, and Pictiva has moved to amend the complaint in response.

Fee Authorization: The Office is authorized to charge all fees due in connection with this proceeding to Deposit Account No. 60-3160.

III. SUMMARY OF CHALLENGE

Petitioner requests IPR based on the following grounds:

- ***Ground I:*** Claims 34, 37, and 40 are obvious over Kijima in view of Suzuki;
- ***Ground II:*** Claim 35 is obvious over Kijima in view of Suzuki and Sturm;
- ***Ground III:*** Claim 36 is obvious over Kijima in view of Suzuki and Duthaler; and
- ***Ground IV:*** Claims 41-46 are obvious over Kijima in view of Suzuki and Fujimori.

The '389 patent was filed on May 2, 2002 and does not claim priority to any earlier application. As shown in the following table, the asserted references are all available as prior art under at least 35 U.S.C. § 102(b) (pre-AIA), and therefore qualify as prior art even if Patent Owner is able to establish an earlier right of priority.

Exhibit	Reference	Dates	Availability as Prior Art
Ex.1010 (translation) Ex.1011 (original)	Japanese Published Application No. H09- 245964 (“Kijima”)	Published Sept. 19, 1997	102(a), 102(b)

Exhibit	Reference	Dates	Availability as Prior Art
Ex.1012	U.S. Patent No. 6,198,217 ("Suzuki")	Filed May 8, 1998, issued March 6, 2001	102(a), 102(b), 102(e)
Ex.1013	U.S. Patent No. 6,087,196 ("Sturm")	Filed Jan. 28, 1999, issued July 11, 2000	102(a), 102(b), 102(e)
Ex.1016	International Publication No. WO 2001/08242 ("Duthaler")	Published Feb. 1, 2001	102(a), 102(b)
Ex.1014 (translation) Ex.1015 (original)	Japanese Published Application No. H10- 41069 ("Fujimori")	Published Feb. 13, 1998	102(a), 102(b)

None of these prior art references were cited or considered by the Examiner during prosecution of the '389 patent. The supporting declaration from Vivek Subramanian, Ph.D. (Ex.1004) was also not before the Examiner. Accordingly, the prior art and arguments in this Petition are not the same (or substantially the same) as those previously presented to the Office under 35 U.S.C. § 325(d).

IV. OVERVIEW OF THE '389 PATENT

The '389 patent relates to encapsulated organic light emitting diode ("OLED") devices and methods of forming them. "Encapsulation is a way to protect the OLED device from the damaging environmental effects—primarily from oxygen and moisture." '389 patent, 1:8-10.

The '389 patent describes "a cheaper and better method of encapsulation, called 'direct thin-film encapsulation'" that was supplanting use of glass

encapsulation for OLED devices. *Id.*, 1:10-13, 1:17-19. The patent explains that such “thin-film encapsulation is typically described as “a ‘polymer multi-layer’ (PML),” *id.*, 1:17-22, and depicts a prior art “typical PML structure 100” in Figure 1. *Id.*, 1:23-24:

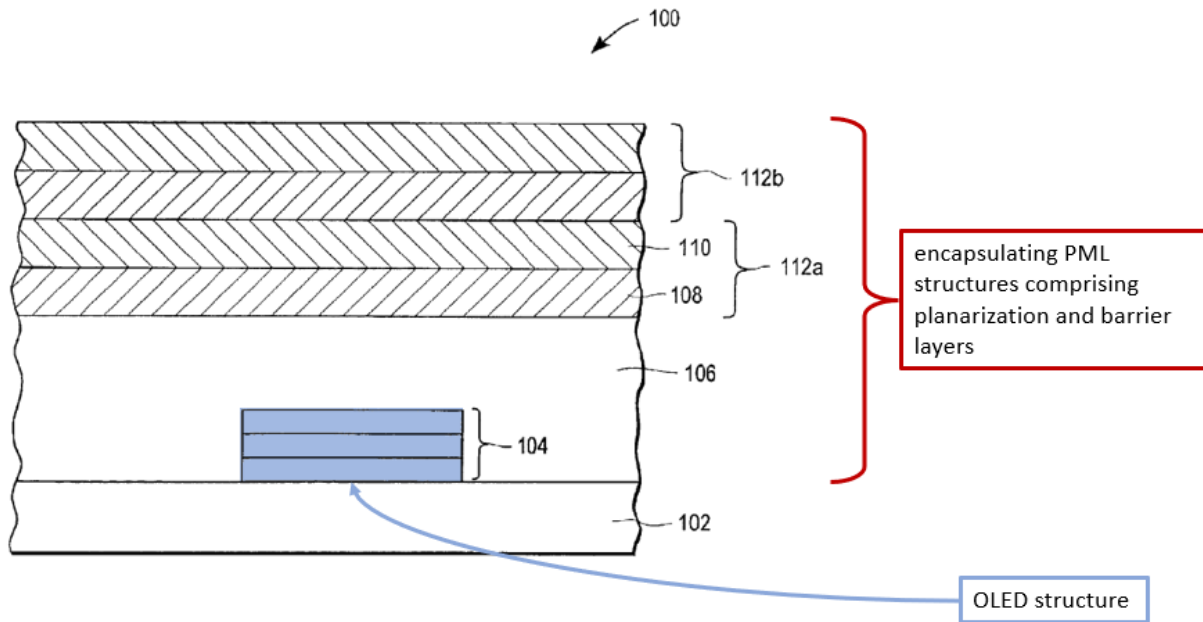


FIG. 1 (PRIOR ART)

Id., Fig. 1 (annotated). This PML “compris[es] alternating and repeating layers of an organic (usually an acrylate or the like) and a barrier layer.” *Id.*, 1:19-22. “Typically, for PML structures, a planarization layer 106 is formed on top of OLED structure 104” and the “[p]lanarization layer 106 typically is an organic layer.” *Id.*, 1:30-34. On top of the organic planarization layer, “[b]arrier layer 108 provides the necessary environmental isolation from the corrosive effects of oxygen and moisture.” *Id.*, 1:37-40.

The '389 patent emphasizes that “during the batch fabrication of many OLED devices upon a single large sheet of glass—such as shown as a top view in FIG. 2, ... several tens (or even hundreds) of OLED devices 202 may be so fabricated.” *Id.*, 1:63-65:

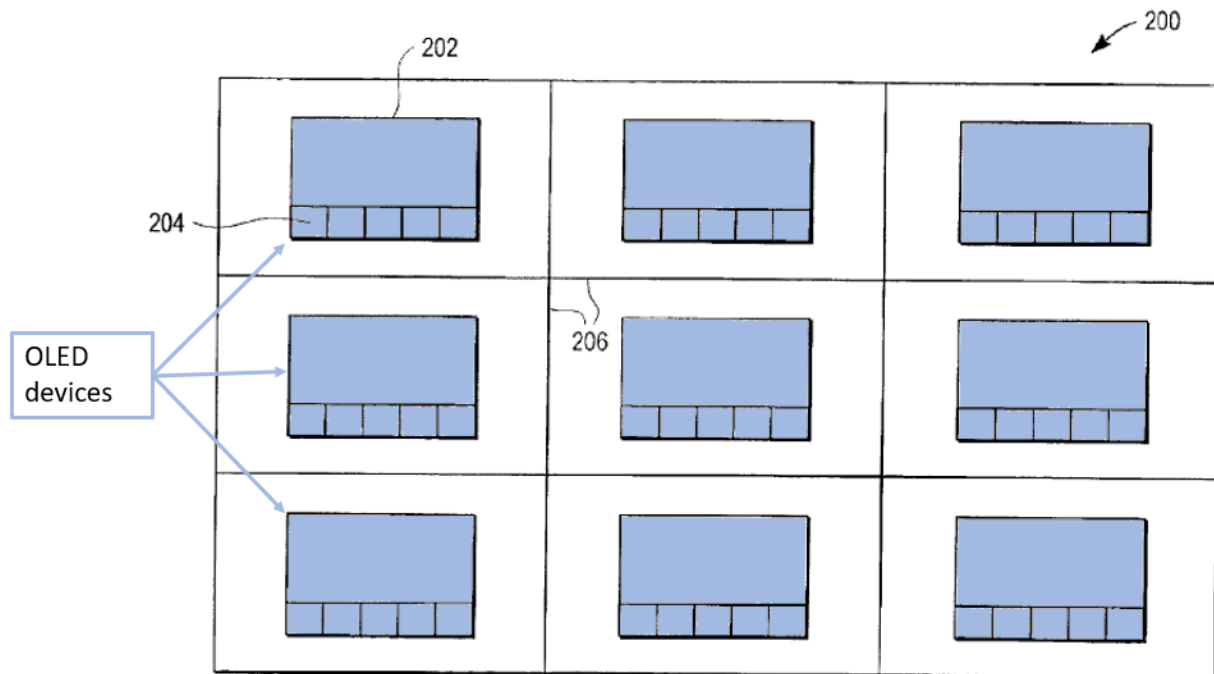


FIG. 2 (PRIOR ART)

Id., Fig. 2 (annotated). Conventionally, “the PML structure is deposited ... over the entire glass sheet.” *Id.*, 2:5-8. “After encapsulation, singulation is performed ... so that individual OLED devices 202 may be separated and further processed.” *Id.*, 2:12-16.

According to the '389 patent, “[t]he problem with this PML technique is that the only part of the device that requires encapsulation is the OLED structure itself—

and not, e.g., the electrical contact pads.” *Id.*, 2:17-28. “Another potential problem ... is that by having the PML layer over the scribe and break lines and/or the glue lines the integrity of the sealed package may be deteriorated, for example by delamination” *Id.*, 2:24-27.

One solution described by the '389 patent is to “selectively” deposit the organic planarization layer and/or the barrier layer over the OLED device. As shown in Figure 5, “organic layer 506 is deposited selectively,” “in a patterned fashion,” over an “OLED device 504 ... formed upon substrate 502,” *id.*, 6:53-58, and “barrier layer 508 may be selectively deposited” over the organic layer 506, *id.*, 7:3-6.

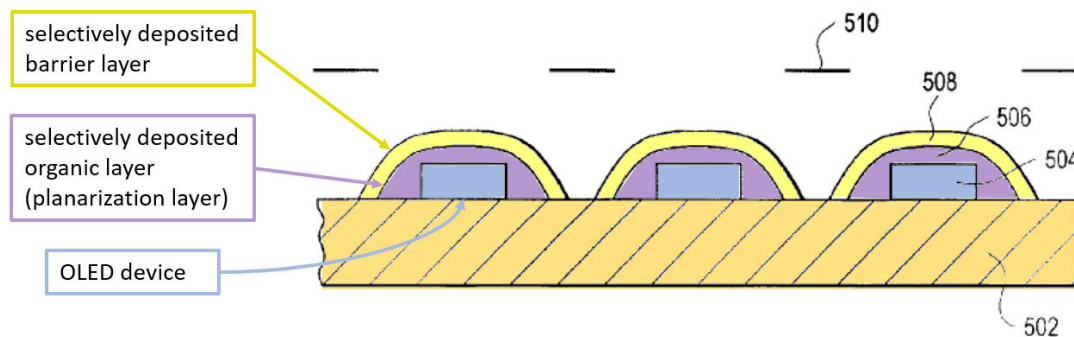
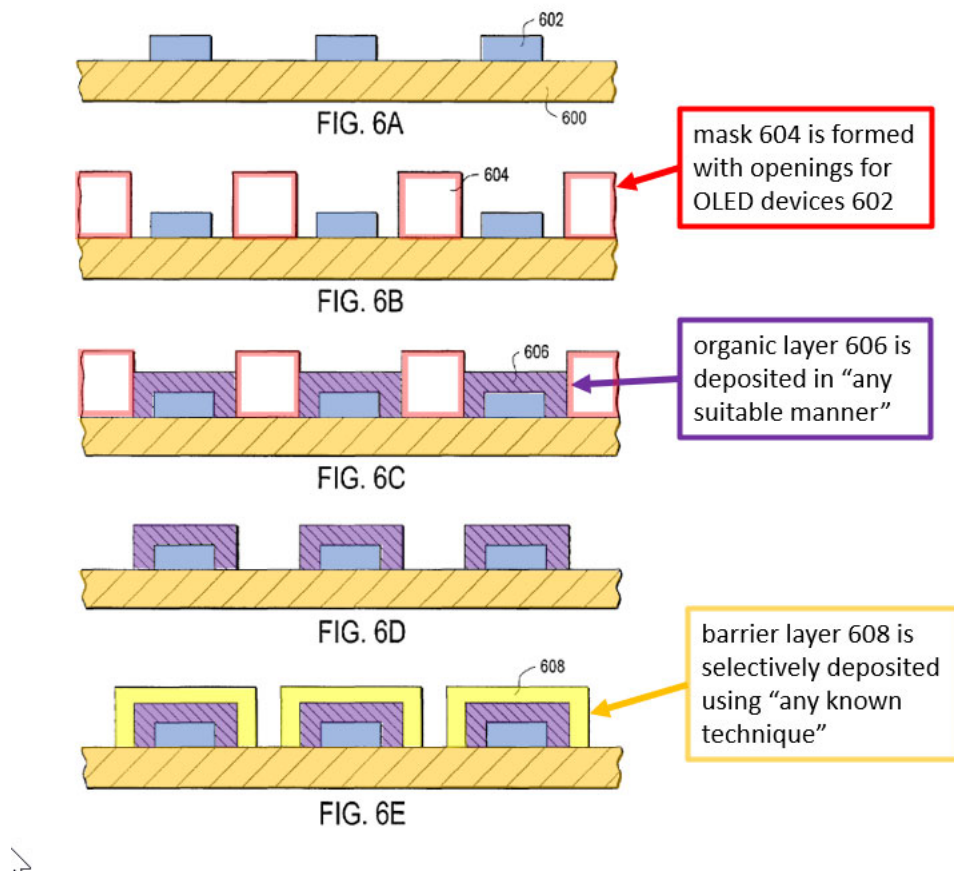


FIG. 5

Id., Fig. 5 (annotated).

The '389 patent also includes an embodiment, depicted in Figure 6 below, in which a “mask 604 is formed onto substrate 600 with mask openings for OLED devices 602.” *Id.*, 7:24-25. Then, “organic layer 606 is deposited in any suitable manner.” *Id.*, 7:54-55.



Id., Fig. 6 (annotated).

Independent claim 34 recites a method, as in Figure 5, in which at least one planarization layer and barrier layer are selectively deposited.

Independent claim 41 recites a method, as in Figure 6, in which a mask is used for depositing the planarization layer.

V. LEVEL OF ORDINARY SKILL

A person of ordinary skill in the art ("POSITA") for the '389 patent would have had a bachelor's degree in Electrical Engineering, Materials Science, or a related field, and at least one year of experience in display technologies. Ex.1004,

¶38. Additional education might compensate for a deficiency in experience, and vice-versa. *Id.*

VI. CLAIM CONSTRUCTION

A. “depositing by shadow mask, sputtering, ink jet deposition, screen printing evaporation”

Claim 40 omits a coordinating conjunction in its listing of deposition methods. However, the file history indicates that it should be interpreted to include an “or” as inserted below:

40. The method as recited in claim 34 wherein the step for selectively depositing at least one barrier layer further comprises depositing by shadow mask, sputtering, ink jet deposition, screen printing [*or*] evaporation.

As initially filed, the claim 40 recited:

40. (original): The method as recited in Claim 34 wherein the step for selectively depositing at least one barrier layer further comprises one of a group, said group comprising: depositing by shadow mask, sputtering, ink jet deposition, screen printing and evaporation.

Ex.1002, 399. An Examiner’s amendment subsequently altered the claim as follows:

In claim 40, at lines 2-3, **delete** “one of a group, said group comprising :” and at line 4, **replace** “and” with -- or --.

Id., 418; Ex.1004, ¶¶39-42.

B. “non-sucking to OLED substrate”

Claim 44 requires a “mask comprising a material *non-sucking* to OLED substrate.” The file history indicates that this reflects a typographical error in the as-issued patent. The claim during prosecution instead used the term “non-sticking”:

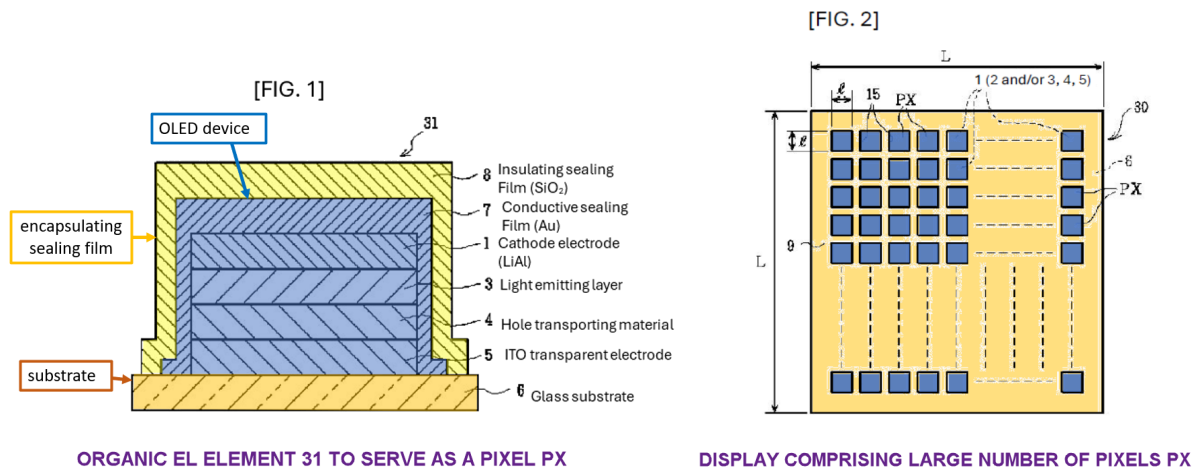
44. (original): The method as recited in Claim 41 wherein the step of depositing said mask further comprises depositing a mask, said mask comprising a material substantially **non-sticking** to OLED substrate over the areas in between the active areas.

Ex.1002, 400 (highlighting added). Accordingly, Petitioner has addressed the claim under the assumption that “*non-sucking* to OLED substrate” should be interpreted as “*non-sticking* to OLED substrate,” as well as under the alternative scenario in which the claim is applied as written. Ex.1004, ¶¶43-44.

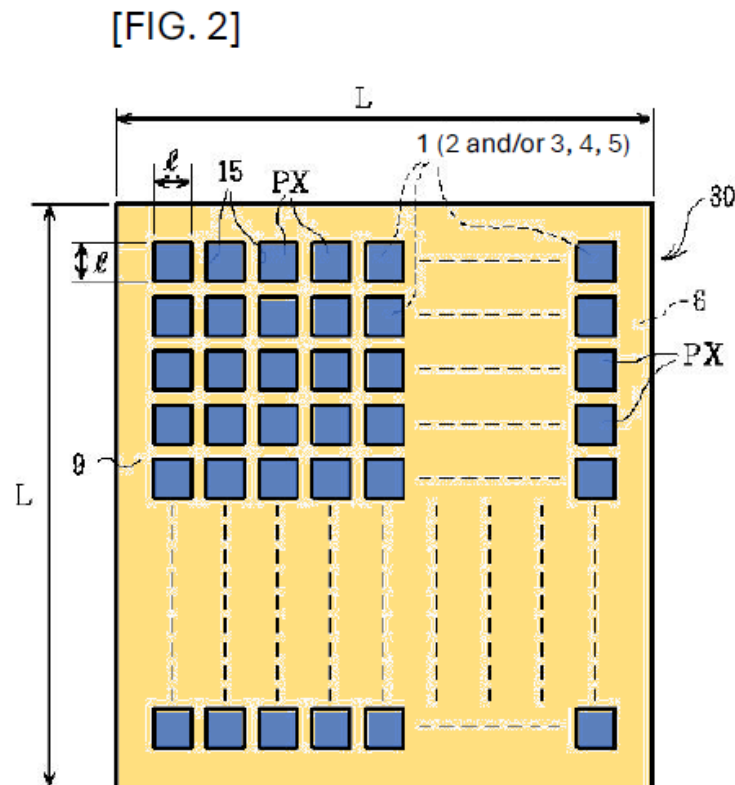
VII. OVERVIEW OF THE PRIOR ART

A. Kijima (Ex.1010)

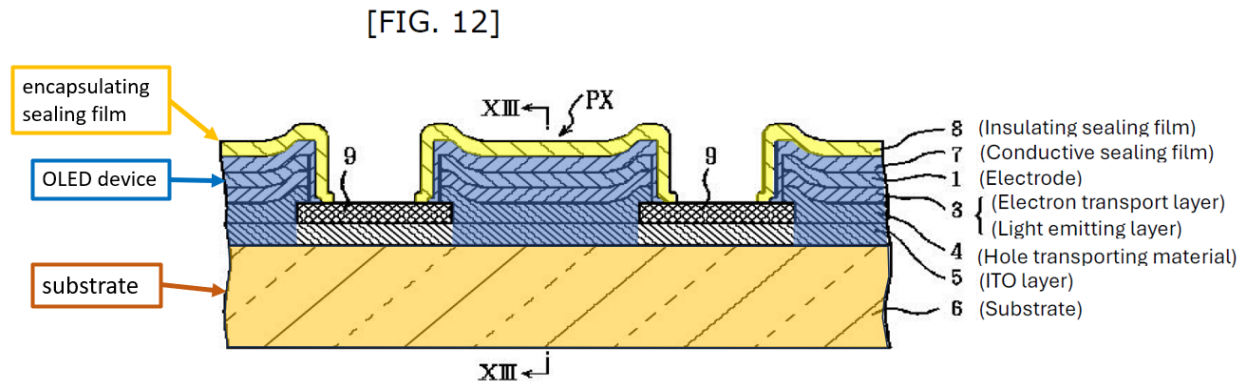
Kijima discloses techniques for encapsulating OLED devices using a selectively deposited “sealing film.” For example, as shown in Figure 1 below, Kijima discloses an “organic EL [electroluminescent] element 31” (e.g., a pixel) comprising an OLED device (blue) encapsulated by an “insulating sealing film 8” (green). Kijima, [0001], [0036]-[0038].



Id., Fig. 1 (annotated). The element of Figure 1 may be one of a plurality of pixels arranged in a “prescribed pixel pattern,” for use in a display, as shown in Figure 2.



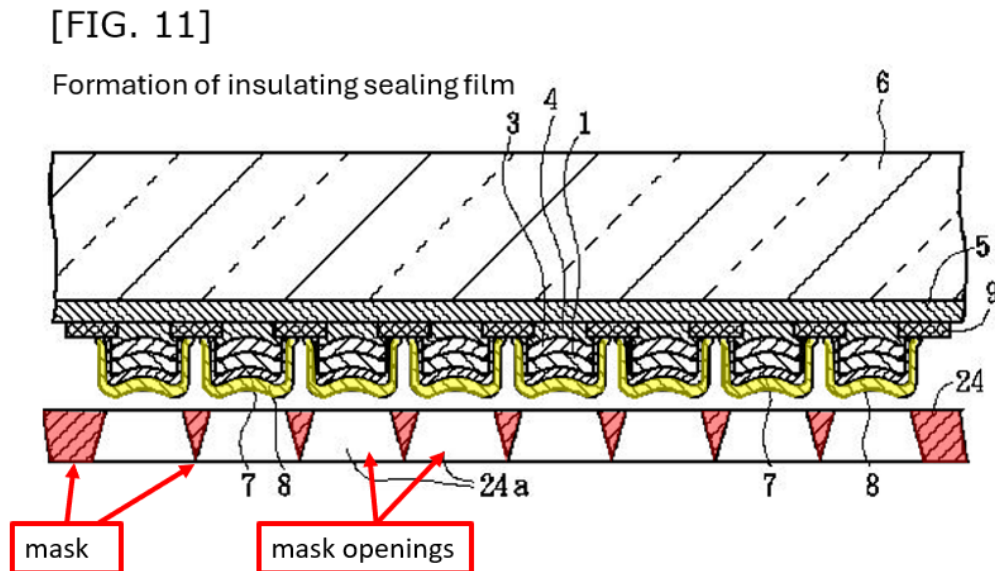
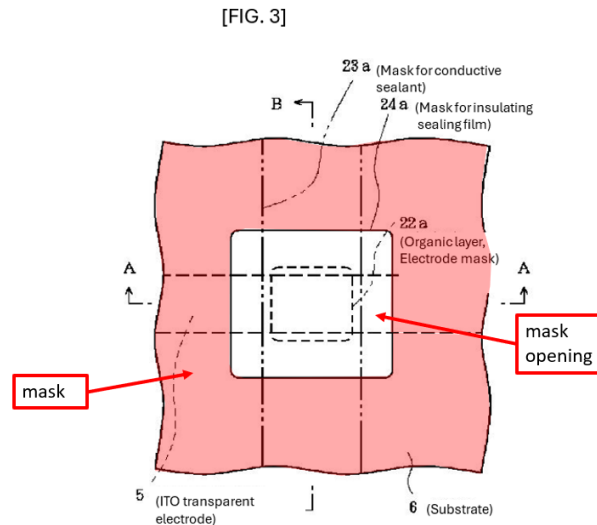
Id., Fig. 2 (annotated). Figure 12 of Kijima provides “an enlarged cross-sectional view” of the pixel PX and its adjacent pixels. *Id.*, [0053].



Id., Fig. 12 (annotated).

As discussed in the claim analysis below, Kijima’s insulating sealing film constitutes a barrier layer under the ’389 patent, and it would have been obvious to further include an organic planarization layer in view of Suzuki.

Kijima teaches use of a shadow mask (i.e., “deposition mask 24,” red) for selectively depositing the OLED device elements and the insulating sealing film 8, as shown in Figures 3 and 11 below. *Id.*, [0041], [0051].



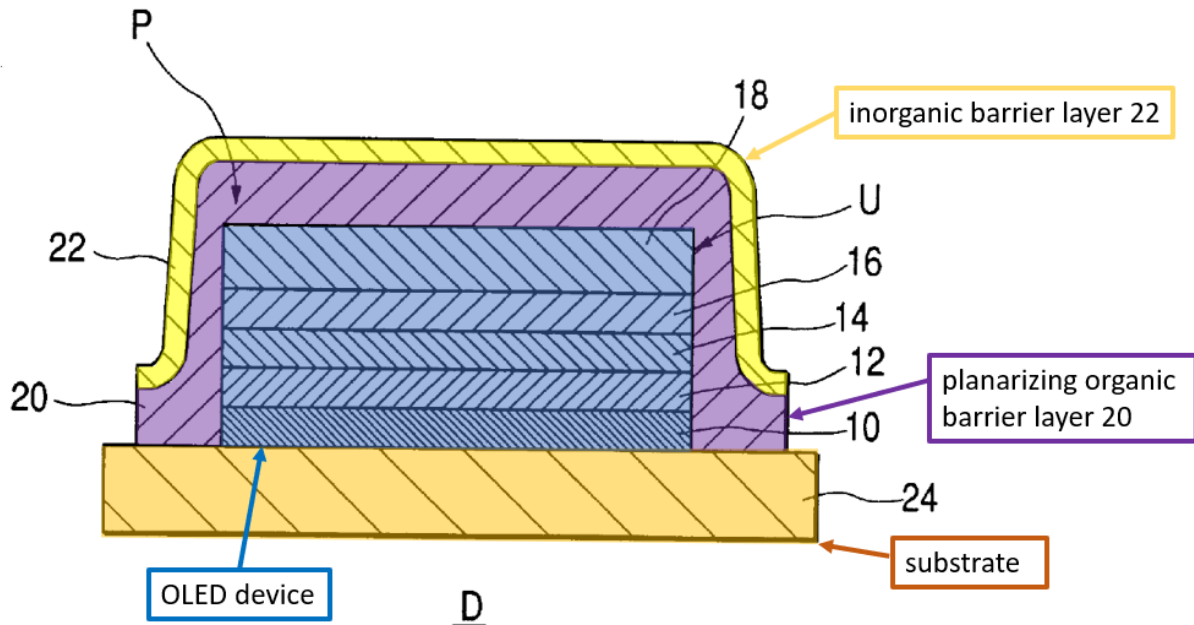
Id., Figs. 3 and 11 (annotated). Ex.1004, ¶¶45-49.

B. Suzuki (Ex.1012)

Suzuki discloses techniques for encapsulating OLED devices via a “protective double layer” that is “made of an organic barrier layer and an inorganic barrier layer.” Suzuki, [Abstract]. As illustrated in Figure 1 below, Suzuki discloses a method for forming a device including an “electroluminescence unit U” (i.e., an

OLED device, blue), *id.*, 5:38-54, which is encapsulated by a “protective layer P” composed of (i) a planarizing “organic barrier layer 20” followed by (ii) an “inorganic barrier layer 22.” Suzuki, 5:49-54.

FIG. 1



Id., Fig. 1 (annotated).

Suzuki teaches that its organic barrier layer serves to planarize the underlying electrode, explaining that the “organic barrier layer 20 ... covers defects ... and makes a smooth surface on the relatively irregular surface of the cathode 18.” *Id.*, 5:59-67. Suzuki further teaches that “it is preferred to cover the end faces” of the organic barrier layer 20 with the inorganic barrier layer 22. *Id.*, 7:30-34. Suzuki explains that its protective double layer serves to address a “serious problem” with

OLED devices—namely, the appearance of “dark spots” that “develop in the device by the presence of moisture entering from defective portions thereof.” *Id.*, 1:41-52.

As discussed in the claim analysis below, it would have been obvious to use Suzuki’s protective double layer in the encapsulation method of Kijima, resulting in a selectively deposited organic planarization layer in addition to a selectively deposited inorganic barrier layer. Ex.1004, ¶¶50-52.

C. Sturm (Ex.1013)

Consistent with the ’389 patent’s explanation that “selectively depositing the organic layer and the barrier layer may be accomplished in a variety of ways,” including “by inkjet deposition,” ’389 patent, 6:66-7:03, Sturm teaches methods “of fabricating semiconductor devices, such as OLED’s by ink-jet printing.” Sturm, 3:42-44. These methods entail “directly deposit[ing] the desired organic or other layers in the desired pattern using inkjet printing.” *Id.*, 5:17-19. Sturm discloses using this method to create selectively deposited “islands” of organic electroluminescent (EL) material, *id.*, 5:30-63; patterned OLED electrodes, *id.*, 5:64-6:18; patterned top contacts, *id.*, 6:19-28; and patterned insulators, *id.*, 7:3-12; Ex.1004, ¶53.

D. Duthaler (Ex.1016)

Duthaler teaches that several techniques can be used for depositing patterned circuit elements for electronic displays—including ink jet printing, screen printing,

and vacuum-based process using proximity or contact masks. Duthaler, 4:22-30, 11:5-12, 20:12-20. These are also consistent with the teachings of the '389 patent. '389 patent, 6:66-7:03; Ex.1004, ¶54.

E. Fujimori (Ex.1014)

Fujimori discloses an approach for manufacturing OLED display elements using a “mask attached to a substrate with magnetic force,” Fujimori, [0010], which allows for “favorable pattern processing accuracy,” *id.*, [0009] and can enable the manufacturing of displays with “much smaller pixel size than the range where pattern processing using a [conventional] mask is possible,” *id.*, [0008].

As Fujimori explains, conventional masks used in manufacturing organic electroluminescent elements make it “difficult to pattern the element with adequate accuracy.” *Id.*, [0007]-[0008]. Fujimori explains that its magnetic masking approach addresses that problem, by improving adhesion between the mask and substrate:

An important feature of the present invention is that the ***adhesion between the mask and the substrate is improved by magnetic force.*** This effect reduces the proportion of the area where the deposited material or other material wraps around, i.e., the portion deposited from the mask opening that bleeds to the shadow portion of the mask, ***achieving fine pattern processing not conventionally possible.***

Id., [0029].³

Fujimori’s technique may be used to deposit “portions involved in the light emission of the organic electroluminescent element, [and] may also be [applied to] non-light-emitting portions formed for the purpose of improving contrast, pattern accuracy, and electrical insulation of the portions involved in light emission.” *Id.*, [0023]; *see also id.*, [0027] (noting that an example of a “non-light-emitting portion[] to be patterned according to the present invention” is an “insulating layer”).

As discussed in the claim analysis below, it would have been obvious to use Fujimori’s magnetic masking approach in the encapsulation method of Kijima, resulting in a method that satisfies claims 41-46. Ex.1004, ¶¶55-58.

VIII. APPLICATION OF PRIOR ART TO THE CHALLENGED CLAIMS

A. Ground I: Claims 34, 37, and 40 Are Obvious Over Kijima in View of Suzuki

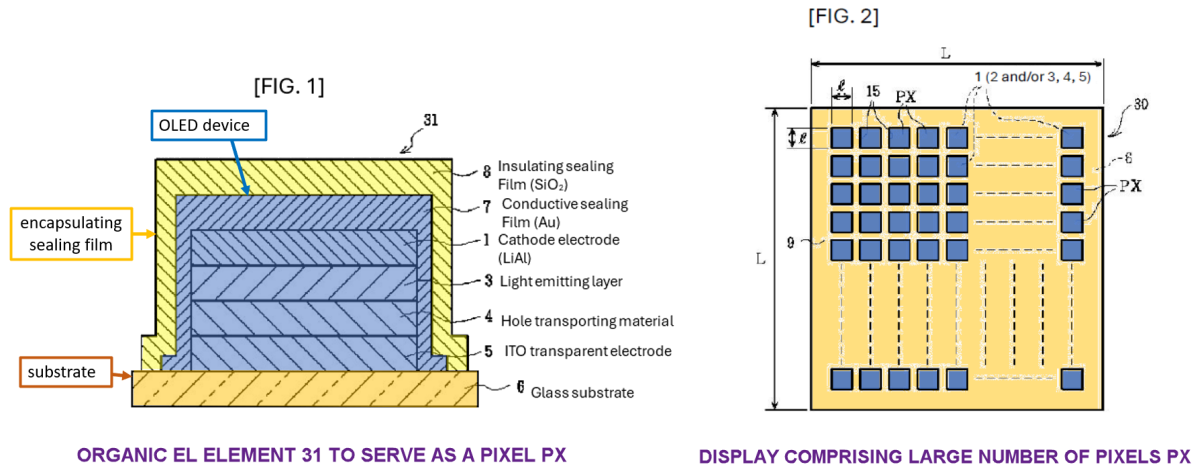
1. Independent Claim 34

- a. Element 34[Pre]: “A method of encapsulating a plurality of devices fabricated upon a substrate, the steps of said method comprising:”**

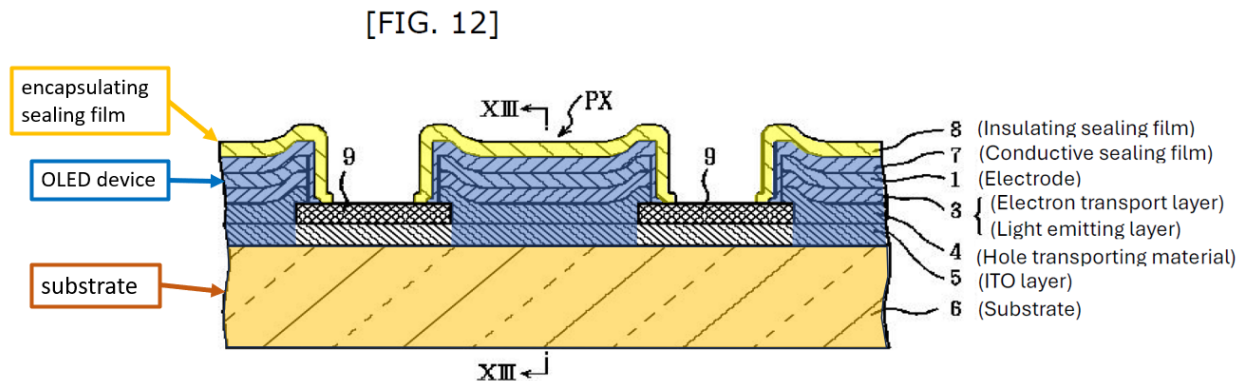
This element is satisfied by Kijima. Kijima discloses a *method of encapsulating* a plurality of OLED pixel *devices* which are *fabricated upon a substrate*.

³ All emphasis in quotations has been added by Petitioner unless otherwise noted.

Kijima is directed to methods for “producing an optical element suitable for an organic electroluminescent display.” Kijima, [0001]. This display includes a “large number of pixels PX formed in a dot pattern ... as depicted in FIG. 2,” where the pixels each comprise an organic EL element as shown in Figure 1, *id.*, [0036].



Id., Figs. 1, 2 (annotated). Figure 12 of Kijima provides “an enlarged cross-sectional view” of the pixel PX and its adjacent pixels. *Id.*, [0053].



Id., Fig. 12 (annotated).

Each of Kijima’s pixels PX comprises an OLED *device* (as shaded in blue above) that is *fabricated upon a substrate* (Kijima’s “substrate 6”). The OLED

includes a sequence of organic layers (e.g., hole transport layer 4 and light emitting layer 3), disposed between an ITO electrode 5 (on the bottom) and a cathode electrode 1 and conductive sealing film 7 (on the top).⁴

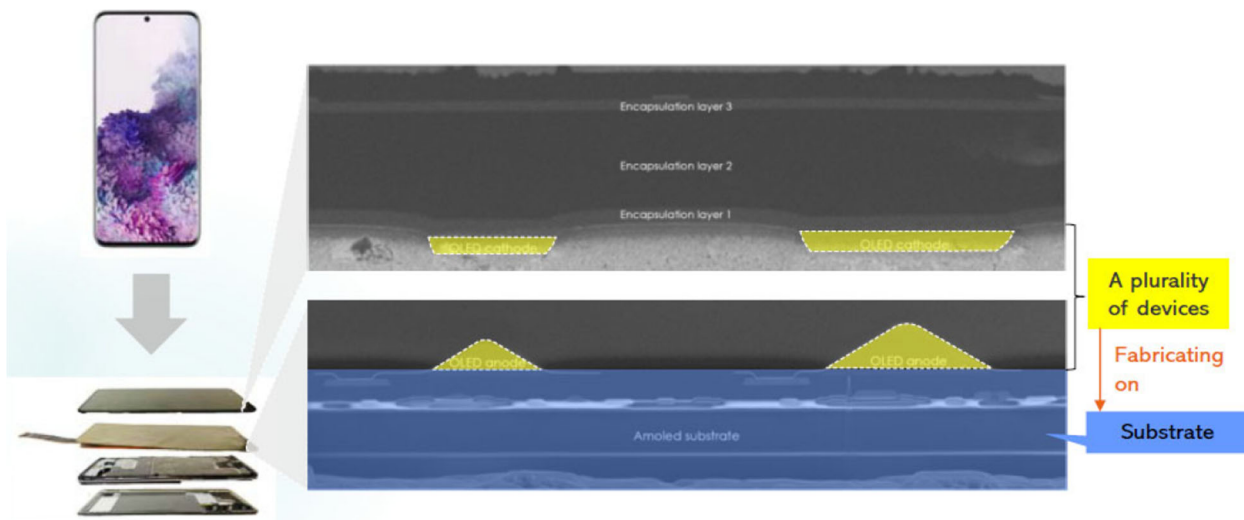
Accordingly, Kijima's display—which includes a “large number of pixels,” *id.*, [0036]—comprises a *plurality of* OLED pixel devices. Patent Owner's

⁴ Kijima notes that the “conductive sealing film 7” serves to prevent “degradation of the organic layer due to radiant heat during vapor deposition of the insulating sealing film 8.” Kijima, [0056]. However, a POSITA would have appreciated that conductive film 7 also functions together with electrode 1 to serve as a “negative electrode” to drive the OLED. Ex.1004, ¶63. As Dr. Subramanian explains, conductive film 7 is formed as a stripe (using mask 23a in Figure 3) (*see* Kijima, [0050]), whereas electrode 1 is formed as an island (using mask 22a in Figure 3) (*id.*, [0047]-[0049]); Ex.1004, ¶63. Thus, conductive film 7 is what is used to carry charge to electrode 1. This is illustrated in Figure 24, which depicts an “example of the aforementioned organic EL element” in which the organic layers are “disposed between the negative electrode 1 and the positive electrode 5, and these electrodes are arranged in a matrix of intersecting stripes.” Kijima, [0022]; Ex.1004, ¶63. In other words, conductive film 7 would be part of the striped “negative electrode 1” as illustrated in Figure 24.

infringement allegations in related litigation are based on the understanding that OLED pixels qualify as “devices” for this claim element.⁵

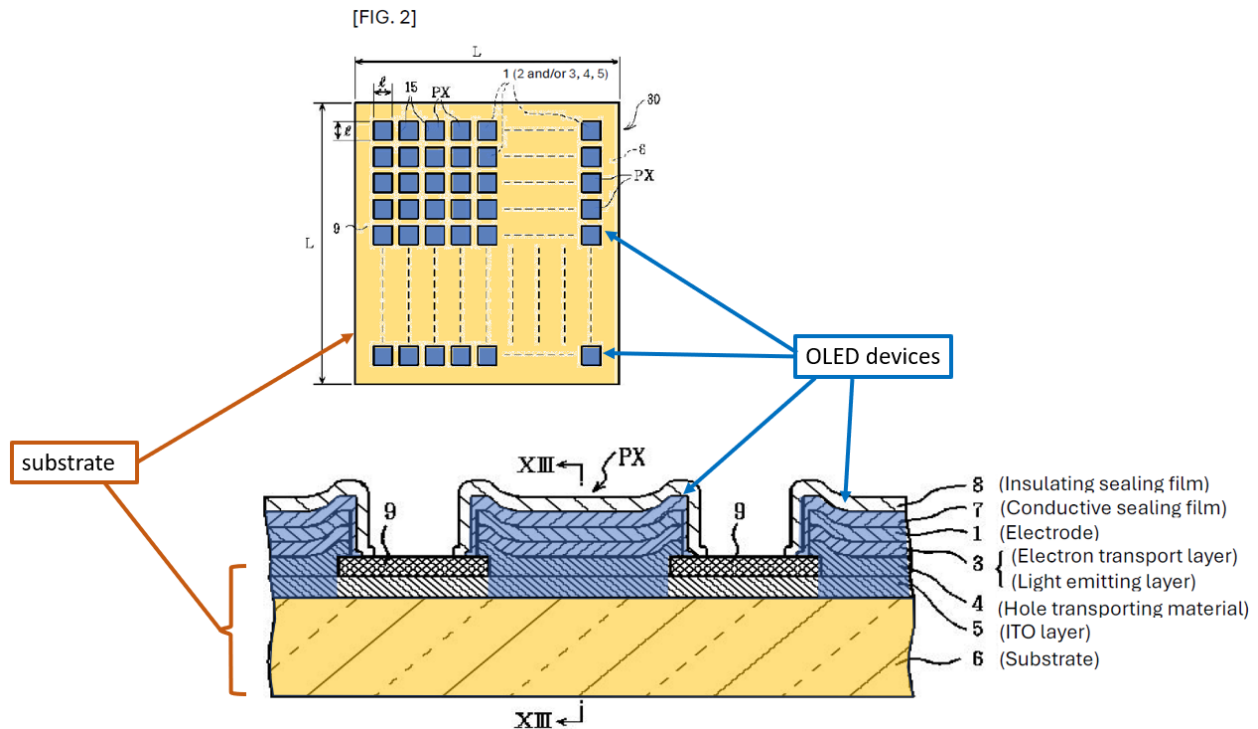
The OLED devices are each sealed by an “insulating sealing film 8” (shaded in green above). This sealing film is used for “preventing oxidation of the electrode 1 and degradation of the organic layer.” *Id.*, [0055]. That is, the insulating sealing film serves to *encapsulate* the devices. *See also id.*, [0025]-[0032], [0054]-[0055], [0058], [0064], [0068], [0072]. Ex.1004, ¶¶59-65.

⁵ In its district court complaint (Ex.1019 ¶ 34), Patent Owner asserts that a Galaxy S20 smartphone includes a “plurality of ... OLED devices,” pointing to individual OLED pixels as the “devices”:



b. Element 34[a]: “fabricating a plurality of devices on a substrate;”

Kijima satisfies this element because it discloses *fabricating a plurality of OLED devices on a substrate*. As noted for the preamble above, Kijima discloses forming a plurality of organic EL elements which serve as pixels PX and comprise a *plurality of OLED devices* (blue), as illustrated in Figures 2 and 12 below. Kijima, [0036]. Kijima discloses *fabricating these OLED devices on a substrate*, i.e., glass substrate 6. *Id.*, [0037]-[0053].



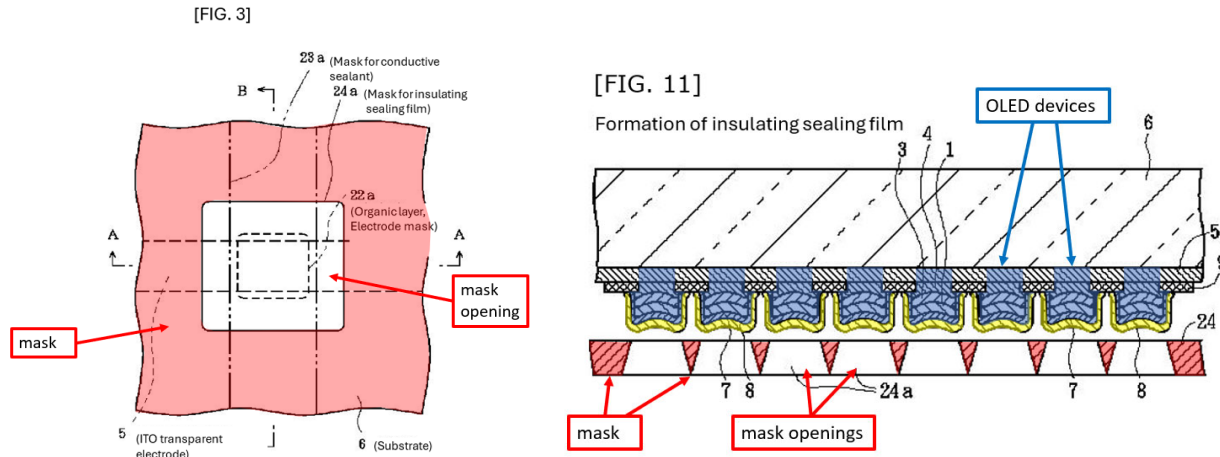
Id., Figs. 2, 12 (annotated). Ex.1004, ¶66.

c. Element 34[b]: “selectively depositing at least one planarization layer upon said devices; and”

This element is obvious based on Kijima in view of Suzuki. Kijima’s encapsulation approach entails selectively depositing an insulating sealing film upon its OLED devices. It would have been obvious to further use a selectively deposited organic planarization layer in view of Suzuki, which teaches the benefits of a “protective double layer made of an organic barrier layer and an inorganic barrier layer.” Suzuki, [Abstract].

As discussed above for Element 34[pre], Kijima discloses encapsulating its devices with an “insulating sealing film 8,” which is used for “preventing oxidation of the electrode 1 and degradation of the organic layer.” Kijima, [0055]; *see also id.*, [0025]-[0032], [0054]-[0055], [0058], [0064], [0068], [0072].

Kijima discloses selectively depositing this insulating sealing film. Kijima explains that the insulating sealing film 8 is deposited via a “vacuum deposition device 11” using “mask 24” (red) having “openings 24a.” *Id.*, [0040]-[0041]. Because deposition of the sealing film is restricted to the areas exposed by the mask openings 24a, the film is selectively deposited upon the OLED devices, as shown in Figure 11. *Id.*, [0051].



Id., Figs. 3, 11 (annotated).

Although Kijima uses a single inorganic layer for its sealing film,⁶ it was known by the time of the invention to encapsulate such OLED devices using a multi-layer encapsulation comprising both organic and inorganic layers, in order to provide increased protection from damaging environmental effects. For example, the '389 patent describes that it was “known in the art” to encapsulate OLED devices using a “polymer multi-layer” (PML) [technique] comprising alternating and repeating layers of an organic (usually acrylate or the like) and a barrier layer,” as depicted in “prior art” Figure 1 below. '389 patent, 1:17-29.

⁶ Kijima discloses a number of inorganic compounds that can be used as the material for the insulating sealing film, including “silicon monoxide (SiO), silicon dioxide (SiO₂), alumina (Al₂O₃), germanium dioxide (GeO₂), and aluminum nitride (AlN).” Kijima, [0095]; Ex.1004, ¶71.

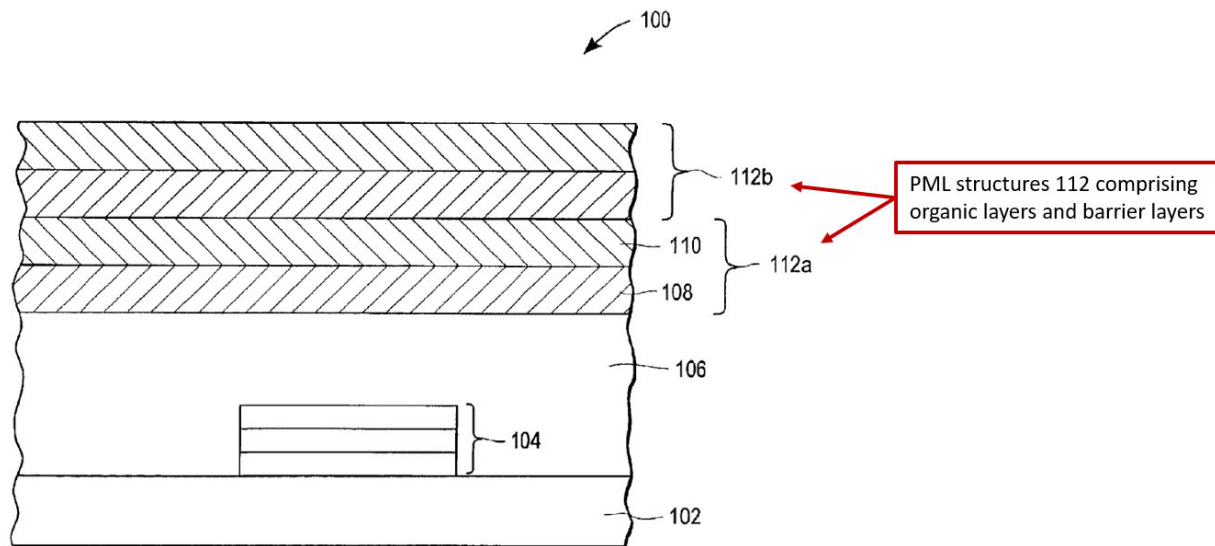


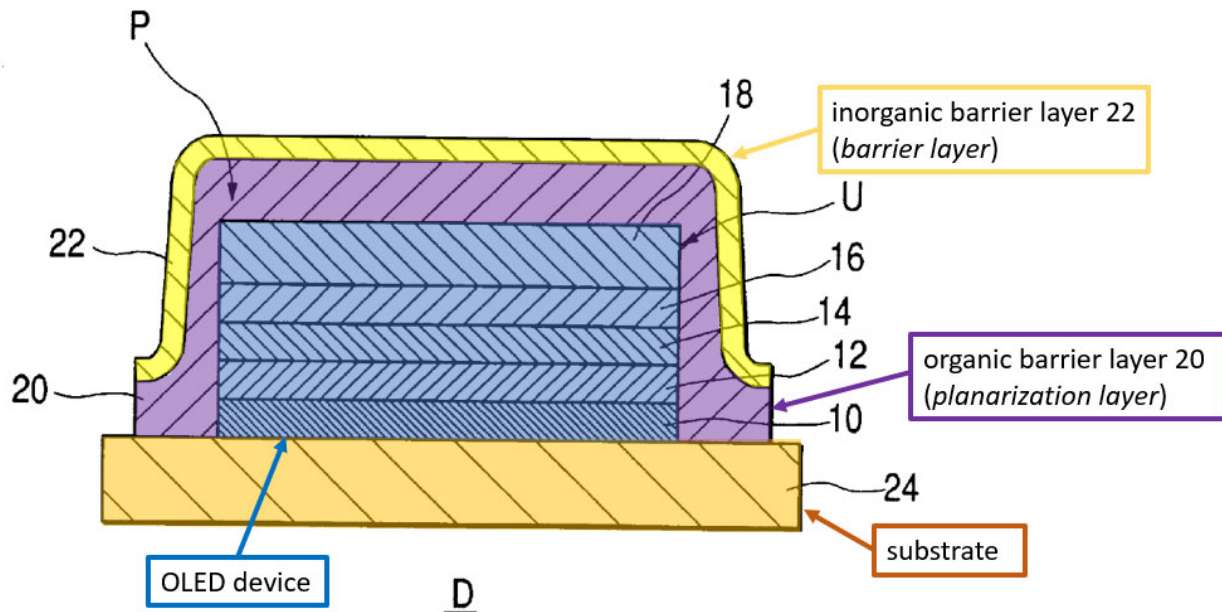
FIG. 1 (PRIOR ART)

Id., Fig. 1 (annotated). As other prior art references reflect, it was known that combining an organic layer with an inorganic layer can provide greater protection from environmental effects such as oxygen and moisture. *See, e.g.*, Komatsu (Ex.1017), 10:13-15 (disclosing a protective film comprising a “stacked layer structure of double layer, i.e. an organic material layer and an [inorganic] SiON layer”); Ex.1004, ¶¶67-73.

The Suzuki reference teaches such a “protective double layer made of an organic barrier layer and an inorganic barrier layer,” Suzuki, [Abstract], in an OLED structure very similar to that of Kijima. As illustrated in Figure 1 below, Suzuki discloses a method for forming a device including an “electroluminescence unit U” (i.e., an OLED device comprising an organic layer sequence between a pair of electrodes 10 and 18). *Id.*, 5:38-54. This OLED device is encapsulated by a

“protective layer P” composed of two layers: (i) an “organic barrier layer 20” followed by (ii) an “inorganic barrier layer 22.” *Id.*, 5:49-54.

FIG. 1



Id., Fig. 1 (annotated).

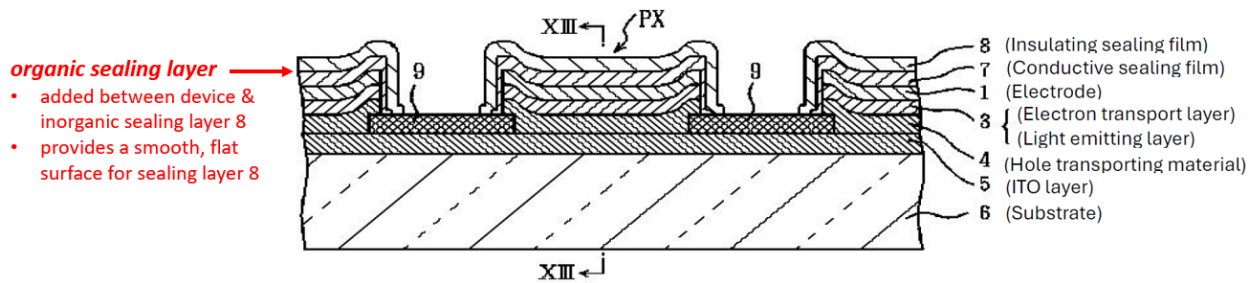
Suzuki explains that its “protective double layer,” *id.*, [Abstract], serves to address a “serious problem” with OLED devices—namely, the appearance of “dark spots” that “develop in the device by the presence of moisture entering from defective portions thereof,” *id.*, 1:41-52. “The protective layer P includes two layers including an organic barrier layer 20 covering defects or pinholes inevitably formed particularly in the uppermost cathode layer 18, and an inorganic barrier layer 22.” *Id.*, 5:51-54. That is:

The organic barrier layer 20, which exhibits good affinity for the metal or alloy cathode, covers defects in the electroluminescent unit U therewith and ***makes a smooth surface on the relatively irregular surface of the cathode 18***. Then, the inorganic barrier layer 22 is formed on the smooth surface of the organic barrier layer 20, thus ensuring the formation of the layer 22, which is substantially defect-free and dense. ***The thus formed double-layer structure can remarkably contribute to moisture proofing.***

Id., 5:59-67. Suzuki presents experimental results demonstrating that, its protective double layer approach yielded a device in which dark spots were prevented from enlarging compared to a device that is “protected only with [an] inorganic barrier layer.” *See id.*, Fig. 3 (comparing average diameter of dark spots for “device of invention” with device “protected only with inorganic barrier.”); Ex.1004, ¶¶74-78.

It would have been obvious at the time of the alleged invention to use such a “protective double layer” in Kijima’s selective encapsulation methods. Specifically, instead of using a single inorganic “insulating sealing film 8” as depicted in Kijima, it would have been obvious to use a “protective double layer made of an organic barrier layer and an inorganic barrier layer” (Suzuki, [Abstract]) in order to obtain the benefits as taught by Suzuki. As shown in following modification of Kijima’s Figure 12, this simple modification would entail adding a new organic sealing layer on top of Kijima’s OLED in order to form a smooth surface on which to deposit Kijima’s inorganic sealing film 8.

[FIG. 12]



Kijima, Fig. 12 (modified according to Suzuki).

As Dr. Subramanian explains, a POSITA would have recognized that the underlying conductive film 7, which is formed of metal such as gold (and which functions together with electrode 1 to serve as a “negative electrode” to drive the OLED, as discussed in footnote 4 above), would be vulnerable to the known problems associated with the cathode surface discussed in Suzuki. *See* Suzuki, 5:52-57 (explaining that “defects or pinholes [are] inevitably formed” when manufacturing such OLED devices even “under very severely controlled conditions”); Kijima, [0056]; Ex.1004, ¶80. Indeed, this conductive film 7 has a visibly uneven surface as illustrated in Figure 12.

Thus, depositing such an organic sealing layer on top of Kijima’s OLED device would be beneficial for the same reasons that Suzuki discusses for its organic barrier layer 20. For example, the added organic sealing layer would help “cover defects” and smoothen surface irregularities of the underlying conductive element, and would thus flatten the contours of Kijima’s conductive layer 7 prior to depositing

the Insulating layer 8. Suzuki, 5:59–67; *see* Ex.1004, ¶81. A POSITA would also have appreciated, based on Suzuki’s teachings, that the added organic sealing layer would help prevent the adsorption of moisture through pinholes, and in turn reduce the formation or enlargement of dark spots on the display manufactured according to Kijima. *See* Suzuki, 5:38-58, Fig. 3.

Therefore, a POSITA would have appreciated that Suzuki’s “protective double layer” would further promote Kijima’s objective of “producing a long-life optical element that hardly experiences degradation of the organic layer and exhibits favorable stability.” Kijima, [0029]; Ex.1004, ¶¶79-82.

A POSITA would have had a reasonable expectation of success in adding an organic layer (as taught by Suzuki) to Kijima’s selective encapsulation method. Ex.1004, ¶83. Both Suzuki and Kijima disclose depositing their sealing/barrier layers by vacuum deposition. *See* Suzuki, 6:26-33, 7:20-22; Kijima, [0058]. A POSITA would have appreciated that the additional organic sealing layer, as shown in the above modification of Figure 12, could be readily deposited using the same selective deposition methods used in Kijima—i.e., “masks ... arranged in a vacuum deposition device 11,” Kijima, [0042]—using an additional mask with openings sized appropriately for the desired area of the organic layer. Ex.1004, ¶83. Kijima notes that “layers from the organic layers to the insulating sealing film were deposited continuously (in a vacuum integrated process) in the same vacuum

deposition device by simply changing the deposition mask.” Kijima, [0052]. Doing so would have constituted the application of known techniques (e.g., encapsulating an OLED pixel using Suzuki’s “protective double layer made of an organic barrier and an inorganic barrier layer formed on the [device] in this order,” Suzuki, [Abstract]) to a known device ready for improvement (e.g., Kijima’s encapsulated pixel, which already includes an insulating sealing film 8 made of inorganic material) to yield predictable results (reduction of pinhole defects and smoothing of the surface of Kijima’s conductive sealing film 7, and thereby further protecting the display against device degradation.). Ex.1004, ¶83. *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007) (“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.”).

Additionally, the Komatsu reference (Ex.1017) confirms that it was known to selectively deposit an organic encapsulation layer for encapsulating OLED devices, in teaching the use of screen-printing for selectively depositing a “protective film” used for an “organic electroluminescence device.” Komatsu, [Abstract], 14:42-43. In fact, Komatsu closely tracks Suzuki’s disclosure of a “protective double layer made of an organic barrier and an inorganic barrier layer,” Suzuki, [Abstract], in that Komatsu discloses a protective film comprising a “stacked layer structure of double layer, i.e. an organic material layer and an [inorganic] SiON layer,” Komatsu, 10:13-

15. Accordingly, Komatsu further supports that a POSITA would have been motivated to use a selectively deposited organic layer in Kijima's methods, and would have reasonably expected success in doing so. Ex.1004, ¶¶84-86.

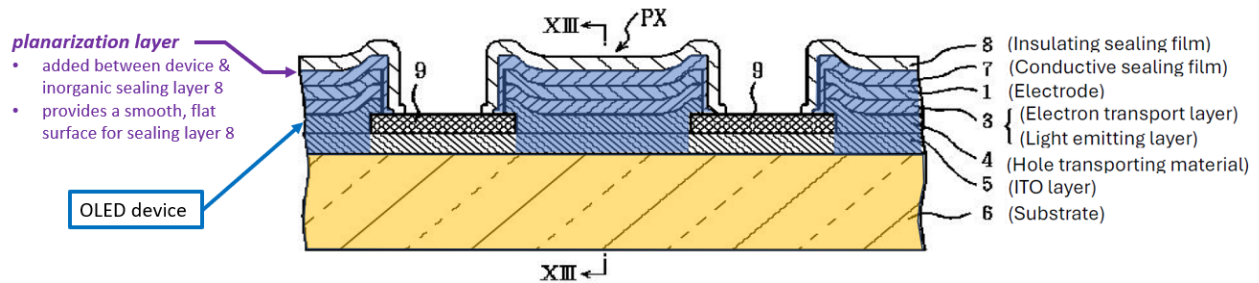
* * *

When such an organic layer (as taught by Suzuki) is used in Kijima's encapsulation method, this Element 34[b] is satisfied.

The organic sealing layer would constitute a *planarization layer* under the '389 patent. As Suzuki explains, such an organic layer "covers defects ... and makes a smooth surface" so that when the "inorganic barrier layer 22 is formed on the smooth surface" it is "substantially defect-free and dense." Suzuki, 5:60-64. This explanation is consistent with the '389 patent, 1:57-62 ("The barrier layer should ideally not contain any point defects (i.e., pin holes) That is primarily the reason that a planar organic layer is typically used as a substrate upon which the barrier layer is deposited.").

Finally, this layer would be *selectively deposited* upon the OLED devices because the layer would be deposited on top of the OLED's conductive sealing film 7, as discussed above and shown in Figure 12.

[FIG. 12]



Id., Fig. 12 (annotated); Ex.1004, ¶¶87-88.

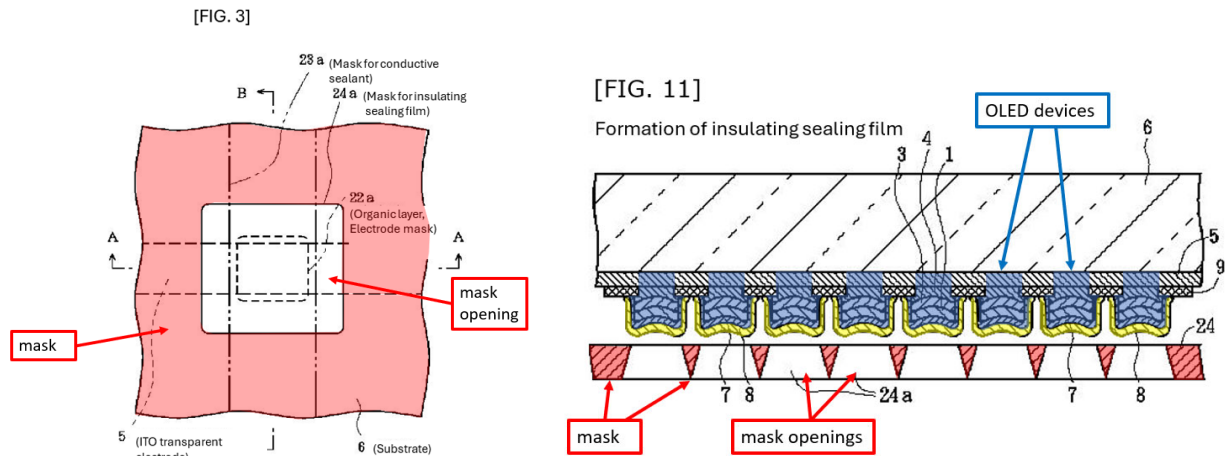
d. Element 34[c]: “selectively depositing at least one barrier layer over said planarization layer.”

Kijima’s encapsulation method as modified to use Suzuki’s “protective double layer” would satisfy this element because it would entail *selectively depositing at least one barrier layer*—namely, Kijima’s insulating sealing film 8—over *said planarization layer* (the organic sealing layer added in view of Suzuki).

Kijima’s insulating sealing film 8 constitutes a *barrier layer* under the ’389 patent. Kijima teaches that its “insulating sealing film 8 . . . further enhances the effects of preventing oxidation of the electrode 1 and degradation of the organic layer,” Kijima, [0055]—just like the barrier layer in the ’389 patent, which “provides the necessary environmental isolation from the corrosive effects of oxygen and moisture.” ’389 patent, 1:38-41.

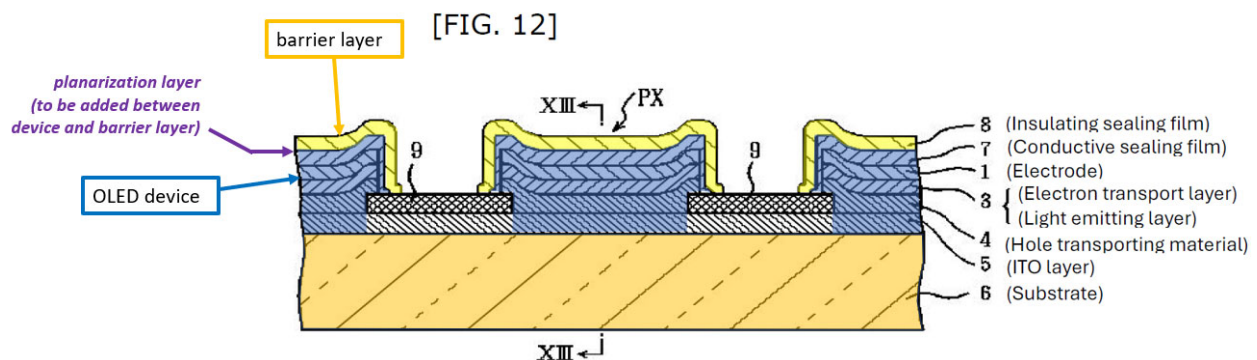
As discussed for Element 34[b], Kijima’s technique includes *selectively depositing* its insulating sealing film 8. Kijima explains that the insulating sealing film 8 is deposited via a “vacuum deposition device” using a “mask 24” (red) having

“openings 24a.” Kijima, [0040]-[0041]. Because deposition of the sealing film is restricted to the areas exposed by the mask openings 24a, the film is selectively deposited upon the OLED devices, as shown in Figure 11. *Id.*, [0051].



Id., Figs. 3, 11 (annotated).

Accordingly, when Kijima’s method is modified in view of Suzuki to add an organic sealing layer between the OLED device and insulating sealing film 8, the method would entail *selectively depositing at least one barrier layer* (insulating film 8) over said planarization layer (organic sealing layer), as shown below.



Id., Fig. 12 (annotated).

The selective deposition of the barrier layer (insulating film 8) in the above modification would be achieved in Kijima's vacuum deposition device by simply changing the deposition mask. *See* Kijima, [0052]; Ex.1004, ¶¶89-93.

2. Dependent Claim 37: “The method as recited in claim 34 wherein the step for selectively depositing at least one planarization layer further comprises depositing an organic layer through a shadow mask.”

Kijima's encapsulation method as modified to use Suzuki's “protective double layer” would satisfy this element because the deposition of the planarization layer would entail *depositing an organic layer* (the organic sealing layer added in view of Suzuki) *through a shadow mask*, using same selective deposition methods already used in Kijima.

As discussed for Element 34[b] above, Kijima discloses selectively depositing its insulating sealing film 8 via a “vacuum deposition device 11” using “mask 24” (red) having “openings 24a.” Kijima, [0040]-[0041]. Therefore, as also discussed for Element 34[b] above, it would have been obvious for the organic sealing layer to be selectively deposited using same selective deposition methods already used in Kijima—i.e., “masks ... arranged in a vacuum deposition device 11 as depicted in FIG. 4,” *id.*, [0042]—and using an additional mask with openings sized appropriately for the desired area of the organic layer. Kijima notes that “layers from the organic layers to the insulating sealing film were deposited continuously (in a

vacuum integrated process) in the same vacuum deposition device by simply changing the deposition mask.” *Id.*, [0052].

As a POSITA would understand, Kijima’s masks are *shadow masks*, in that they prevent the deposition of the material in the areas where mask is present, but allow the deposition of the material in the areas of the mask openings. *See* Ex.1004, ¶¶96; Burrows-631 (Ex.1022), 1:22-26 (“A ‘shadow’ mask is a mask having apertures through which material is deposited onto a substrate, as opposed to an optical mask, which is used to selectively expose photoresist on a substrate to radiation.”). Therefore, selectively depositing the organic sealing layer using Kijima’s deposition methods would constitute *depositing an organic layer using a shadow mask*. Ex.1004, ¶¶94-96.

3. Dependent Claim 40: “The method as recited in claim 34 wherein the step for selectively depositing at least one barrier layer further comprises depositing by shadow mask, sputtering, ink jet deposition, screen printing [or] evaporation.”

Kijima’s encapsulation method as modified to use Suzuki’s “protective double layer” would satisfy this element because Kijima teaches depositing of its inorganic sealing film (*barrier layer*) by *shadow mask, sputtering, and/or evaporation*.

Specifically, Kijima teaches that “the material for the insulating sealing film can be any material that can be vapor-deposited, and can be prepared by resistance

heating vapor deposition, electron beam heating vapor deposition, *sputtering*, or the like, using materials such as silicon monoxide (SiO), silicon dioxide (SiO₂), alumina (Al₂O₃), germanium dioxide (GeO₂), and aluminum nitride (AlN).” Kijima, [0095].

Further, as discussed for Element 34[c] above, Kijima discloses selectively depositing its insulating sealing film 8 via a “vacuum deposition device 11” using “mask 24” (red) having “openings 24a,” such that the deposition of the sealing film is restricted to the areas exposed by the mask openings 24a. *Id.*, [0040]-[0041], [0051], Figs. 3, 11. As a POSITA would understand, Kijima’s masks are *shadow masks* because they prevent the deposition of the material in the areas where mask is present, but allow the deposition of the material in the areas of the mask openings. *See* Ex.1004, ¶¶97-99; Burrows-631 (Ex.1022), 1:22-26.

B. Ground II: Claim 35 Is Obvious Over Kijima in View of Suzuki and Sturm

1. Claim 35: “The method as recited in claim 34 wherein the step for selectively depositing at least one planarization layer further comprises depositing by ink jet of an organic layer.”

Dependent claim 35 would have been obvious based on Kijima in view of Suzuki as applied to claim 34, and further in view of Sturm. Kijima’s encapsulation method as modified to use Suzuki’s “protective double layer” would entail *depositing an organic layer* (the organic sealing layer added in view of Suzuki). It would have been obvious to deposit this organic layer *by ink jet* in view of Sturm.

Although Kijima discloses selectively depositing its insulating sealing film 8 using “masks ... arranged in a vacuum deposition device 11,” Kijima, [0042], a POSITA would have recognized that there were other known methods for selectively depositing layers such as the organic sealing layer that serves as the claimed planarization layer, each of which had their own benefits and considerations.

Depositing by ink jet was among those known methods, as taught for example in Sturm. The ’389 patent acknowledges that “[i]t will be appreciated” that “many manners” can be used for depositing its organic planarization layer, including ink-jet printing:

It will be appreciated that there are many manners of depositing this organic layer upon the OLED device. For example, the layer could be either evaporated or flash evaporated. Alternatively, a liquid organic layer could be spun coated, dip coated, roll coated, spray-coated or blade coated—as is well known in the art. Additionally, other suitable printing technology could be employed, in particular, screen-printing or ***ink-jet printing***.

’389 patent, 4:48-55; *see also id.*, 7:3-5 (“In fact, generally any printing techniques suitable to deliver the desired planarization layer material can be used.”). The ’389 patent presumes that a POSITA would know how to employ ink jet technology to deposit the planarization layer because the patent does not provide any detail on how to use the ink jet technique. *Id.*, 4:53-55, 7:2-3, 7:14-17. *See Hybritech, Inc. v.*

Monoclonal Antibodies, Inc., 802 F.2d 1367, 1379-80 (Fed. Cir. 1986) (information which is well known in the art need not be described in detail in the specification).

Likewise, Duthaler (Ex.1016) explains that there were a number of known printing methods that could be used “to achieve a patterned material useful in an electronic device” such as electronic displays. Duthaler, 10:10-22, [Abstract]. These methods included “ink jet printing,” which “is a useful technique for precisely depositing small volumes of materials to form electronic components or component arrays.” *Id.*, 15:6-8; *see also id.*, 15:16-18 (“Since ink jets are well suited for precision dispensing of low viscosity fluids, they are also well suited to dispense semiconductor and dielectric materials, some of which are readily dissolved in select solvents.”).

Sturm specifically teaches methods “of fabricating semiconductor devices, such as OLED’s by ink-jet printing.” Sturm, 3:42-44. These methods entail “directly deposit[ing] the desired organic or other layers in the desired pattern using inkjet printing.” *Id.*, 5:17-19. Sturm discloses using this method to create selectively deposited “islands” of organic electroluminescent (EL) material, *id.*, 5:30-63; patterned OLED electrodes, *id.*, 5:64-6:18; top contacts of OLED, *id.*, 6:19-28; and patterned insulators, *id.*, 7:3-12.

As a POSITA would have recognized, using ink jet printing in the modified method of Kijima would have been advantageous because it entails selective

deposition of fine elements (e.g., Kijima discloses OLED pixels PX “with a size of $2\text{mm} \times 2\text{mm}$, Kijima, [0040]) for which precision dispensing ink-jet printing would be advantageous. A POSITA would have appreciated that there are other advantages for using ink-jet to selectively deposit an organic layer. For example, ink-jet printing is a non-contact deposition technique, and thus minimizes risk of contamination. Ink jet printing is also a directed deposition technique, which is very material efficient and limits the amount of waste generated compared to other deposition techniques. Similarly, the technique is conducive to depositing multiple coats, allowing for the deposition of thicker layers. Finally, the technique is scalable because large numbers of inkjet heads can be ganged together to rapidly print over large areas. *See* Ex.1004, ¶105; *see also* Ex.1016 (describing usefulness of ink-jet technique “for precisely depositing small volumes of materials to form electronic components or component arrays”), 15-16; Sturm, 2:9-62 (discussing advantages of the technique).

Accordingly, a POSITA would have been motivated to use *depositing by ink jet* as taught in Sturm to selectively deposit the organic sealing layer that serves as the *planarization layer* in the modified Kijima method. Although other selective deposition techniques have their own benefits, a POSITA would have recognized the benefits of using the ink jet as taught by Sturm—including reduction of contamination risk, efficient use of deposition material, and scalability. At a minimum, a POSITA would have understood that depositing by ink jet was one of a

finite number of predictable solutions for “deposit[ing] the desired organic or other layers in the desired pattern.” Sturm, 5:17-19.

A POSITA further would have reasonably expected success in using ink jet printing in the modified Kijima method. As Sturm teaches, such printing can be achieved using commercially available ink jet printers such as the “Canon PJ-1080A Color Ink-Jet Printer with a resolution of 640 dots per line” utilized in that reference. *Id.*, 3:45-47; *see also id.*, 3:53-55 (“The only modification to the ink-jet printer for printing OLED’s was to replace the ink cartridges with polymer solutions.”). Additionally, Sturm teaches that ink jet printing can be advantageously employed for selectively depositing organic EL layers, *id.*, 5:30-63, patterned insulators, *id.*, 7:3-12, and electrodes, *id.*, 5:64-6:18. Therefore, a POSITA would have appreciated that it could similarly be used for selectively depositing an organic sealing layer (as it is, like the organic EL layers discussed in Sturm, made from an organic polymer material), as well as the other patterned elements in Kijima’s organic EL element 31. Ex.1004, ¶¶100-107.

C. Ground III: Claim 36 Is Obvious Over Kijima in View of Suzuki and Duthaler

- 1. Claim 36: “The method as recited in claim 34 wherein the step for selectively depositing at least one planarization layer further comprises depositing by screen printing of an organic layer or depositing by gas nozzle.”**

Dependent claim 36 would have been obvious based on Kijima in view of Suzuki as applied to claim 34, and further in view of Duthaler. Kijima’s encapsulation method as modified to use Suzuki’s “protective double layer” would entail *depositing an organic layer* (the organic sealing layer added in view of Suzuki). It would have been obvious to deposit this organic layer *by screen printing* in view of Duthaler.

Although Kijima discloses selectively depositing its insulating sealing film 8 using “masks ... arranged in a vacuum deposition device 11,” Kijima, [0042], a POSITA would have recognized that there were other known methods for selectively depositing layers such as the added organic sealing film that serves as the claimed planarization layer, each of which had their own benefits and considerations.

Depositing by screen printing was among those known methods. The ’389 patent acknowledges that “[i]t will be appreciated” that “many manners” can be used for depositing its organic planarization layer, including “screen-printing.” ’389 patent, 4:48-55; *see also id.*, 7:1-5. The ’389 patent presumes that a POSITA would know how to employ screen printing technology to deposit the planarization layer

because the patent does not provide any detail on how to use the screen printing technique. *Id.*, 4:53-55, 7:2-3, 7:14-17.

Similarly, Duthaler (Ex.1015) explains that there were a number of known printing methods that could be used “to achieve a patterned material useful in an electronic device” such as electronic displays. Duthaler, 10:10-22, [Abstract]. These methods included “screen or stencil printing processes,” which “are low-cost, high-volume processes” that “may ... be used to lay down an encapsulation layer to protect, insulate, or otherwise contain the fabricated device.” *Id.*, 14:13-23.

A POSITA would have appreciated that the screen printing technique was suitable for depositing an organic layer in encapsulating an OLED device. Ex.1004, ¶112. Komatsu (Ex.1017) teaches the use of screen-printing methods for forming a “protective film” used for an “organic electroluminescence device.” Komatsu, [Abstract], 14:42-43. Komatsu closely tracks Suzuki’s disclosure of a “protective double layer made of an organic barrier and an inorganic barrier layer,” Suzuki, [Abstract], because Komatsu discloses a protective film comprising a “stacked layer structure of double layer, i.e. an organic material layer and an [inorganic] SiON layer,” Komatsu, 10:13-15. In describing one example of forming such a film, Komatsu discloses that:

An organic electroluminescence device was formed up to the formation of cathode . . . and a photopolymerizable epoxy resin . . . was applied to the upper surface of the device to any desired layer thickness by spin

coating or *screen printing*, followed by curing of the epoxy resin by a high pressure mercury lamp.” A SiON layer was formed thereon to a layer thickness of 0.5 um by ECR plasma sputtering, thereby forming an organic electroluminescence device protected by a protective film in a double layer structure of the cured epoxy resin layer and the SiON layer.

Komatsu, 14: 38-48. That is, Komatsu describes use of screen printing to form an organic encapsulation layer for an OLED device.

Duthaler describes how to perform the screen printing technique, discussing for example that “the screen printable ‘ink’ in this case” may “be used to lay down an encapsulation layer to protect, insulate or otherwise contain the fabricated device,” and “may be selected from any of the commercially available dielectric inks, either thermally or UV cured.” Duthaler, 14:20-23; Ex.1004, ¶113.

As a POSITA would have recognized, using the screen printing technique in the modified method of Kijima would have provided advantages, including low-cost and high throughput, as described in Duthaler. Duthaler, 14:13-23.

Accordingly, a POSITA would have been motivated to use *depositing by screen printing* as taught in Duthaler to selectively deposit the additional organic sealing film that serves as the *planarization layer* in the modified Kijima method. Although other selective deposition techniques have their own benefits, a POSITA would have recognized the benefits of using screen printing as taught by Duthaler—

including the ability of screen printing to deposit relatively thick organic layers due to its use of high-viscosity inks, and due to the substantial maturity of screen printing as a technique for depositing such layers in the electronics industry. Ex.1004, ¶115. At a minimum, a POSITA would have understood from Duthaler that depositing by screen printing was one of a finite number of predictable solutions for depositing organic planarization layer in the modified Kijima method.

A POSITA further would have reasonably expected success in using screen printing in the modified Kijima method. As Duthaler teaches, “[s]creen or stencil printing may also be used to lay down encapsulation layer to protect, insulate, or otherwise contain the fabricated device,” and that the ink “may be selected from any of the commercially available dielectric inks, either thermally or UV cured.” Duthaler, 14:20-23; Ex.1004, ¶¶108-16.

D. Ground IV: Claims 41-46 Are Obvious Over Kijima in View of Suzuki and Fujimori

Claims 41-46 would have been obvious over Kijima in view of Suzuki and further in view of the magnetic mask disclosures of Fujimori. These claims relate to a method of encapsulating a plurality of devices via at least one planarization layer and barrier layer (as in claim 34), but also specify particular requirements for using a mask when depositing the planarization layer.

Fujimori discloses an approach for manufacturing OLED display elements using a “mask attached to a substrate with magnetic force,” Fujimori, [0010], which

allows for “favorable pattern processing accuracy,” *id.*, [0009], and can enable the manufacturing of displays with “much smaller pixel size than the range where pattern processing using a [conventional] mask is possible,” *id.*, [0008]. As discussed below, it would have been obvious to use this specific masking approach in the modified method of Kijima, e.g. in order to improve accuracy and enable smaller pixel size. Ex.1004, ¶¶117-18.

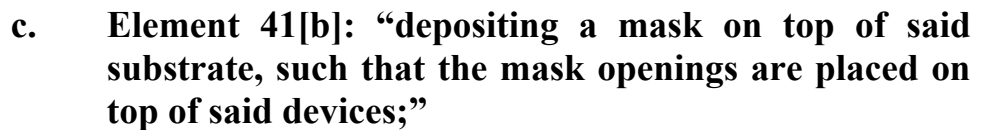
1. Independent Claim 41:

- a. Element 41[Pre]: “A method of encapsulating a plurality of devices fabricated upon a substrate, the steps of said method comprising:”**

This element is satisfied by Kijima for the same reasons as set forth above for identical Element 34[pre] in Ground I. Kijima discloses a *method of encapsulating* a plurality of OLED pixel *devices* which are *fabricated upon a substrate*. Ex.1004, ¶119.

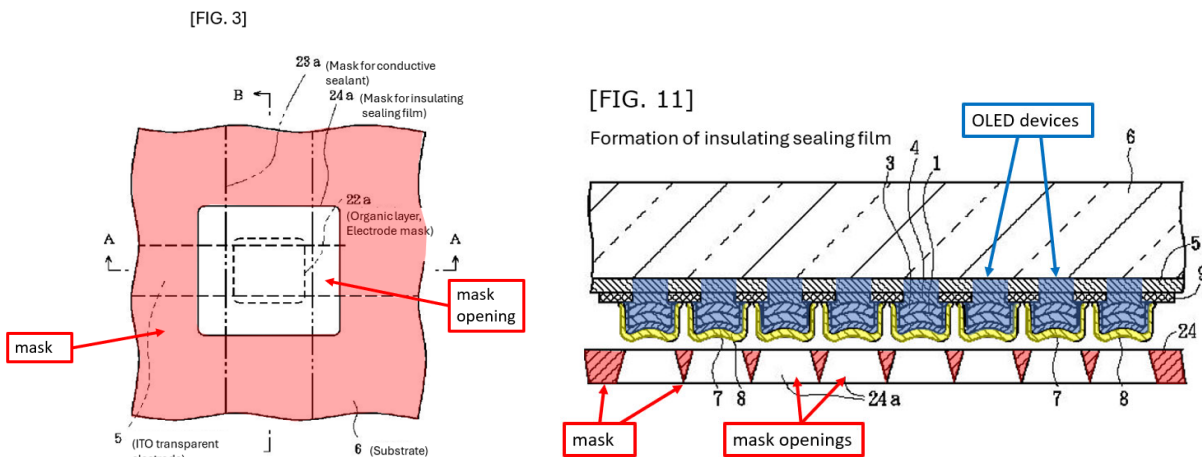
- b. Element 41[a]: “fabricating a plurality of devices on a substrate;”**

Kijima satisfies this element for the same reasons as set forth above for identical Element 34[a] in Ground I. As shown in Figures 2 and 12 below, Kijima discloses *fabricating a plurality of* OLED pixel *devices* (blue) *on a substrate* (Kijima’s “glass substrate 6”).



As discussed for Element 34[b] in Ground I above, Kijima’s encapsulation approach entails selectively depositing an insulating sealing film upon its OLED devices. It would have been obvious to further use a selectively deposited organic planarization layer in view of Suzuki, which teaches the benefits of a “protective double layer made of an organic barrier layer and an inorganic barrier layer.” Suzuki, [Abstract].

As discussed for Element 34[b] in Ground I above, it would have been obvious for this organic planarization layer to be selectively deposited using same selective deposition methods, and using the same deposition apparatus already used in Kijima—specifically, “masks ... arranged in a vacuum deposition device 11 as depicted in FIG. 4,” Kijima, [0042]. For example, Kijima explains that its insulating sealing film 8 is deposited using a “mask 24” (red) having “openings 24a” such that the deposition of the film is restricted to the areas exposed by the mask openings 24a as illustrated in Figures 3 and 11 below. *Id.*, [0040]-[0041], [0051].



Id., Figs. 3, 11 (annotated).

Although Kijima illustrates its vacuum deposition device 11 in Figure 4, it does not explain in detail how its masks are held in position on the substrate. A POSITA would have been motivated to use the masking approach disclosed in Fujimori.

Fujimori discloses a specific masking approach for manufacturing OLED display elements that uses a “mask attached to a substrate with magnetic force,” Fujimori, [Abstract], in order to “achieve favorable pattern processing accuracy,” *Id.*, [0009], particularly in the case of advanced displays with fine pattern pitches (i.e., small pixel spacing, where the “pitch” is the distance between the centers of adjacent pixels).

As Fujimori explains, conventional masks used in manufacturing organic electroluminescent elements make it “difficult to pattern the element with adequate accuracy.” *Id.*, [0007]-[0008]. That is:

[W]ith conventional methods, the finer the pattern is, the more the position of the deposited material wrapping around the shadow of the mask cannot be ignored, making it difficult to pattern the element with adequate accuracy. This is a major problem that can cause a short in the elements and crosstalk due to increased leakage current.

Id., [0008]. Accordingly, Fujimori discloses a method in which OLED elements are “formed through a mask attached to a substrate with magnetic force.” *Id.*, [0010]. This allows for increased precision, enabling the processing of “fine patterns” with small pixel pitches:

An important feature of the present invention is that the adhesion between the mask and the substrate is improved by magnetic force. This effect reduces the proportion of the area where the deposited material or other material wraps around, i.e., the portion deposited from the

mask opening that bleeds to the shadow portion of the mask, achieving fine pattern processing not conventionally possible.

Id., [0029].

Fujimori explains that “a pattern pitch of 2 mm is a suitable example for the mask.” Fujimori, [0035]; *see also id.*, [0024] (disclosing that “[a]lthough the shape and size of pixel varies depending on the display method, such as segmental or dot matrix, a pixel size of 2 mm square or smaller is preferable”).

Accordingly, a POSITA would have been motivated to use Fujimori’s magnetic masking approach in the modified system of Kijima, in order to improve accuracy and enable smaller pixel size. Given the need for precision used in the pixels of Kijima, a POSITA would have been motivated to use the magnetic masking of Fujimori to maintain robust alignment between the mask and the underlying substrate during deposition to prevent errors due to offsets. Ex.1004, ¶130.

Additionally, a POSITA would have reasonably expected success in using Fujimori’s magnetic masking approach in the modified system of Kijima. Fujimori explains that the “[p]atterned portions” of the EL element formed with its mask include “the portions involved in the light emission of the organic electroluminescent element, but may also be non-light-emitting portions formed for the purpose of improving the contrast, pattern accuracy, and electrical insulation of the portions involved in light emission according to need, and therefore are not

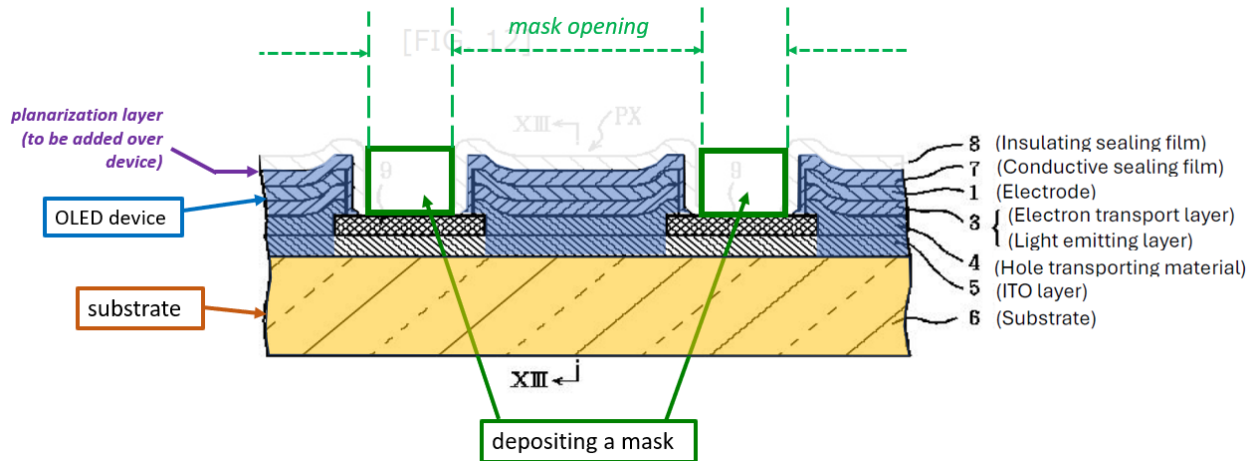
particularly limited.” Fujimori, [0023]. For example, Fujimori’s mask is suitable for organic light-emitting layers, *id.*, [0024]-[0025], electrodes, *id.*, [0026], and “non-light-emitting portions to be patterned ... [which] are not particularly limited,” *id.*, [0027]. Further, Fujimori contemplates using its masking method for applications having a 2 mm-pixel pattern pitch, and Kijima likewise discloses a “(pixel) PX with a size of 2 mm x 2 mm”. Kijima, [0040].

Thus, a POSITA would have appreciated that Fujimori’s masking approach could be readily used in the modified Kijima method, which entails using masks for selectively depositing the organic elements, electrodes, and sealing films, Kijima [0047]-[0052]. Kijima notes that “layers from the organic layers to the insulating sealing film were deposited continuously (in a vacuum integrated process) in the same vacuum deposition device by simply changing the deposition mask.” *Id.*, [0052]. Accordingly, a POSITA would have appreciated that the modification entails depositing the additional organic sealing layer (per Suzuki’s teachings) by using an additional mask in Kijima’s vacuum deposition device, as explained above for Element 34[b] in Ground I. Ex.1004, ¶¶121-32.

* * *

When Fujimori’s magnetic masking approach is used in the modified Kijima method, this element 41[b] would be satisfied. That is, using Fujimori’s masking technique to selectively deposit the added organic sealing layer would entail

depositing a mask (Fujimori's mask, which is adhered to a substrate via magnetic force) *on top of said substrate* (Kijima's "glass substrate 6") *such that the mask openings are placed on top of said devices* (Kijima's OLED devices), as shown below.



Kijima, Fig. 12 (annotated).

Applying Fujimori's magnetic masking approach would constitute depositing a mask on top of said substrate. Fujimori teaches that its mask is adhered to the underlying substrate by magnetic force, explaining that:

[W]hen the mask is affixed with mechanical contact, the magnetic force should be adequate to obtain the mask adhesiveness required, and if the mask is affixed with magnetic force, the ***magnetic force should be adequate for mask adhesion*** and positional affixing.

Fujimori, [0030]; *see also id.*, [Abstract] ("An organic electroluminescent element ... is formed through a mask *attached to a substrate* with magnetic force."), [0009] ("An object of the present invention" is "to provide a method to achieve adequate

adhesion between the mask and the substrate.”), [0037] (“[I]t is advantageous to use a mask with high planarity in order to achieve uniform adhesion between the mask and the substrate.”).

Adhering the mask in this manner constitutes *depositing a mask* within the meaning of the ’389 patent. Indeed, the ’389 patent explains, in describing ways through which the “mask 604 is deposited,” that its mask 604 “could be made of magnetic material and thus held by magnetic forces.” ’389 patent, 7:47-49, 7:54-55. Moreover, dependent claim 42 specifies that the “step of depositing” recited in this Element 41[b] may “comprise[] ... depositing a ... magnetically held mask.” *Id.*, cl. 42.

Finally, applying Fujimori would result in depositing the magnetic mask *such that mask openings are placed on top of said devices*. In operation, Fujimori teaches that “[o]rganic material or electrode material flying toward the substrate in vapor deposition or the like is deposited on the substrate through the mask opening placed in front of the substrate to achieve the [desired] patterning of the organic electroluminescence element corresponding to the mask opening shape.” *Id.*, [0028]. Accordingly, a POSITA would have appreciated that using Fujimori’s magnetic masking approach to deposit the additional organic sealing layer of the Kijima modification entails situating the mask openings to be on top of the OLED devices, such that the organic material would “fly[] toward [Kijima’s] substrate in vapor

deposition . . . *through the mask opening[s]* in front of the substrate to achieve” the intended selective deposition of the organic sealing layer as shown in the Kijima modification. See Ex.1004, ¶¶133-36.

d. Element 41[c]: “depositing at least one planarization layer upon said mask and said plurality of devices;”

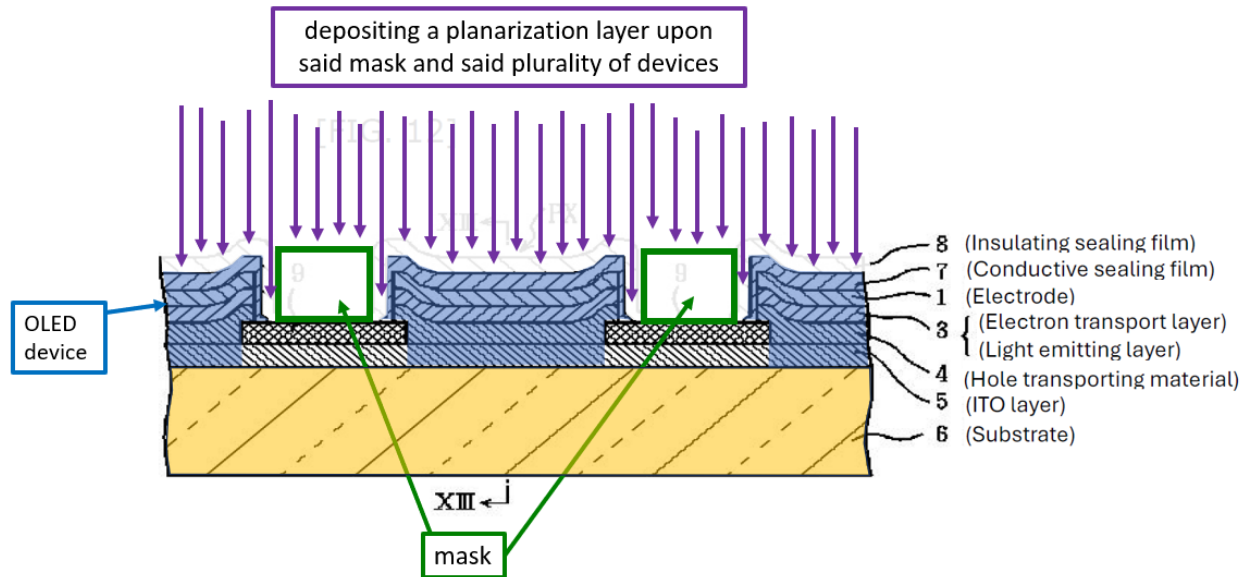
The modified Kijima method would satisfy this element because it would entail *depositing at least one planarization layer* (the organic sealing layer added in view of Suzuki) *upon said mask* (the magnetic mask used pursuant to Fujimori) *and said plurality of devices* (Kijima’s OLED devices).

Fujimori describes that material is deposited through the mask openings:

Organic material or electrode material ***flying toward the substrate in vapor deposition*** or the like ***is deposited on the substrate through the mask opening*** placed in front of the substrate to achieve the [desired] patterning of the organic electroluminescence element corresponding to the mask opening shape.

Fujimori, [0028].

Depositing the added organic sealing layer in this manner would entail depositing a *planarization layer upon said mask and said plurality of OLED devices* because the material for the planarization layer (i.e., the organic sealing layer added in view of Suzuki) is deposited on the mask and through the openings to the underlying OLED devices, as illustrated in the following annotation to Fig 12:



Kijima, Fig. 12 (annotated); Ex.1004, ¶¶137-41.

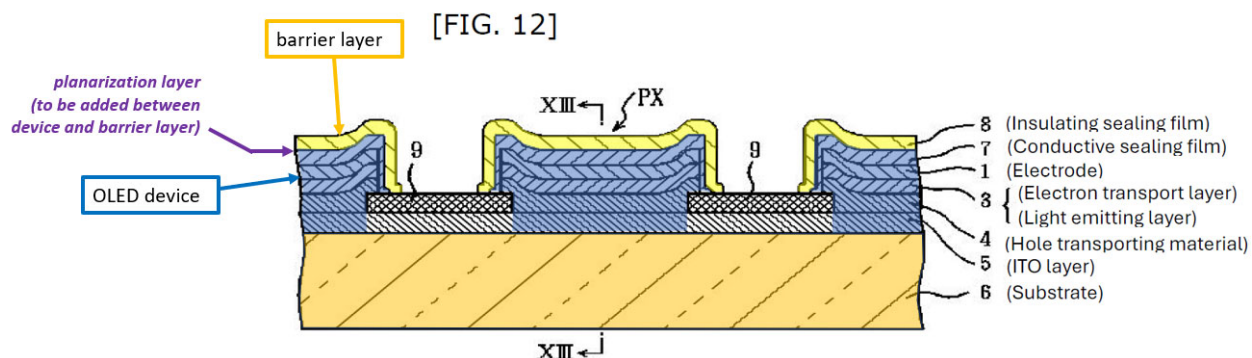
e. Element 41[d]: “removing said mask from said substrate; and”

The modified Kijima method would satisfy this element. After the organic planarization layer is formed, *removing said mask from said substrate* would be necessary or at a minimum obvious. As a POSITA would understand, such deposition masks are removed after deposition is complete, as opposed to being part of the finished device. This understanding is supported by the disclosures of Kijima and Fujimori.

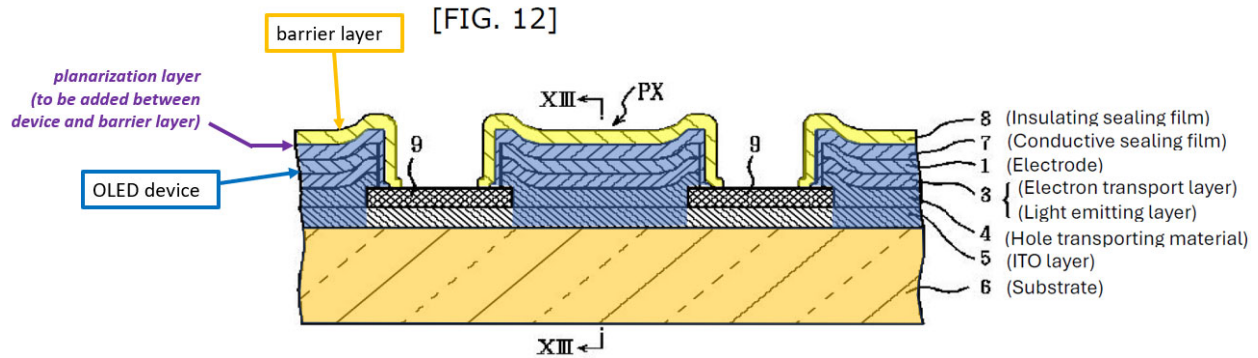
For example, Kijima teaches that masks are used during the deposition process (e.g., for the organic layer, electrode, conductive sealant, and insulating sealing film), but are not part of the completed EL element shown in Figures 1 and 12. Similarly, Fujimori contemplates that its magnetic mask would be adhered only

temporarily because it explains that an “electromagnet,” which “can electrically control the switching of magnetic field”—i.e., turn it off and on—“is particularly suitable in the present invention.” Fujimori, [0033]. Likewise, Fujimori discusses removing the mask before the next step in the process in its Embodiment 4. *Id.*, [0050] (“Subsequently, the mask for the light-emitting layers was removed and 20 nm of Alq3 was deposited on the entire surface of the substrate as a light-emitting layer covering layer 43.”).

Additionally, the modified Kijima method entails adding an inorganic insulating sealing film 8 on top of the organic sealing layer, as discussed for example in Element 34[c] for Ground I above. Further, Suzuki teaches that “it is preferred to cover the end faces” of its organic barrier layer 20 with the inorganic barrier layer 22. Suzuki, 7:30-34. Thus, in the proposed modification, in order to ensure that this inorganic sealing film 8 surrounds the top and sides of the underlying organic sealing film, a mask with larger openings would need to be used for the inorganic sealing film (as compared with the organic sealing film). A POSITA would have been motivated to use such a mask, in order to ensure that the device is properly encapsulated with a protective double layer on the top and sides, as shown in modified Figure 12 below. Indeed, Kijima discloses that, before depositing the inorganic sealing film 8, “the mask was changed to deposition mask 24” with larger openings 24a, in order to “form an insulating sealing film 8 ... as depicted in FIG.



f. Element 41[e]: “selectively depositing at least one barrier layer over said planarization layer.”



Kijima, Fig. 12 (annotated); Ex.1004, ¶145.

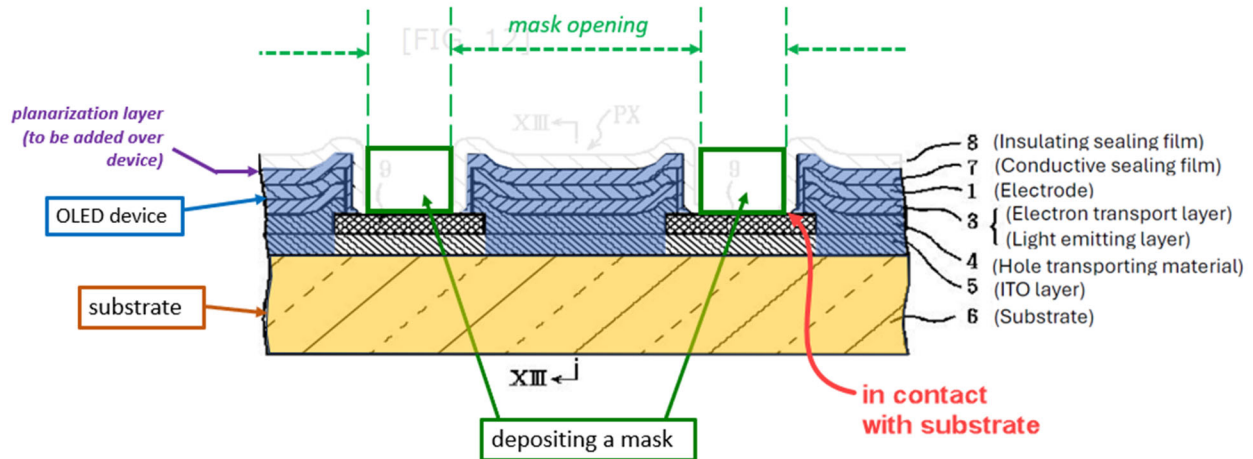
2. **Dependent Claim 42:** “The method as recited in claim 41 wherein the step of depositing said mask further comprises depositing a stamp mask, depositing a laminated film-mask, depositing a vacuum mask, or magnetically held mask.”

Using Fujimori’s magnetic masking approach to selectively deposit the planarization layer in Kijima (as discussed for claim 41) would satisfy the additional requirements of this claim, as it would entail *depositing a ... magnetically held mask*. As discussed for Element 41[b] above, Fujimori teaches that its mask is adhered to the underlying substrate by magnetic force. *See* Fujimori, [Abstract], [0009], [0030], [0037]; Ex.1004, ¶146.

3. **Dependent Claim 43:** “The method as recited in claim 41 wherein the step of depositing said mask further comprises depositing said mask such that said mask is in contact with said substrate.”

Using Fujimori’s magnetic masking approach to selectively deposit the planarization layer in Kijima (as discussed for claim 41) would satisfy the additional

requirements of this claim, as it would entail *depositing said mask* (Fujimori's mask) *such that said mask is in contact with said substrate*, as shown below.



Kijima, Fig. 12 (annotated).

As discussed for Element 41[b] above, Fujimori teaches that its mask is adhered to the underlying substrate by magnetic force. *See* Fujimori, [0030], [Abstract]. Fujimori explains that the mask is “*attached to a substrate* with magnetic force,” *id.*, [0010], and that the invention “provide[s] a method to achieve adequate *adhesion between the mask and the substrate*,” *id.*, [0009]. These disclosures indicate that the mask is in contact with an underlying substrate. Ex.1004, ¶148. Fujimori specifically discusses that the mask may be in “mechanical contact” with a substrate:

[W]hen the mask is *affixed with mechanical contact*, the magnetic force should be adequate to obtain the mask adhesiveness required, and

if the mask is affixed with magnetic force, the magnetic force should be adequate for mask adhesion and positional affixing.

Fujimori, [0030].

Additionally, Fujimori addresses the need “to prevent the mask from damaging the organic layer and the like deposited on the substrate when the manufacturing surface of the organic electroluminescent element and the mask are adhered to each other,” Fujimori, [0038], explaining that this function can be achieved by “coating the entire surface of the mask with a relatively flexible material such as a resin,” *id.*, [0039]. These disclosures underscore that the mask is physically adhered to an underlying substrate—that is, the resin coating is used to prevent damage that would occur due to the mask being *in contact* with the substrate.

Further, the mask is “in contact” with the Kijima substrate in a manner consistent with the ’389 patent’s disclosure, even if it is not in immediate contact with Fujimori’s bottom-most “substrate 6.” The ’389 patent distinguishes masks that are merely above (but not in physical contact with) the underlying layers (e.g., Fig. 5, element 510), with masks that are deposited so as to be *in contact* with the underlying layers (Fig. 6B, element 604), and describes a benefit of the latter approach:

The mask might be such that it could be brought into contact with the OLED sufficiently well so that the encapsulation organic is confined

over the desired areas and does not seep under the areas where the encapsulation organic is not desired (e.g. contact pads).

'389 patent, 7:41-46. Fujimori's mask is "brought into contact with the OLED" in the manner described in the '389 patent, as shown in the annotation above. Thus, when Fujimori's mask is used to selectively deposit the planarization layer in Kijima, the mask is *in contact with* Kijima's substrate. See Ex.1004, ¶¶147-50.

- 4. Dependent Claim 44: "The method as recited in claim 41 wherein the step of depositing said mask further comprises depositing a mask, said mask comprising a material substantially non-sucking [or non-sticking] to OLED substrate over the areas in between the active areas."**⁷

Using Fujimori's magnetic masking approach to selectively deposit the planarization layer in Kijima (as discussed for claim 41) would satisfy the additional requirements of this claim because Fujimori teaches or suggests that the magnetic

⁷ As noted in the claim construction section above, the file history indicates that "non-sucking" reflects a typographical error, since the claim during prosecution instead used the term "non-sticking." Accordingly, Petitioner has addressed the claim under the assumption that "*non-sucking* to OLED substrate" should be interpreted as "*non-sticking* to OLED substrate," as well as under the alternative scenario in which the claim is applied as written.

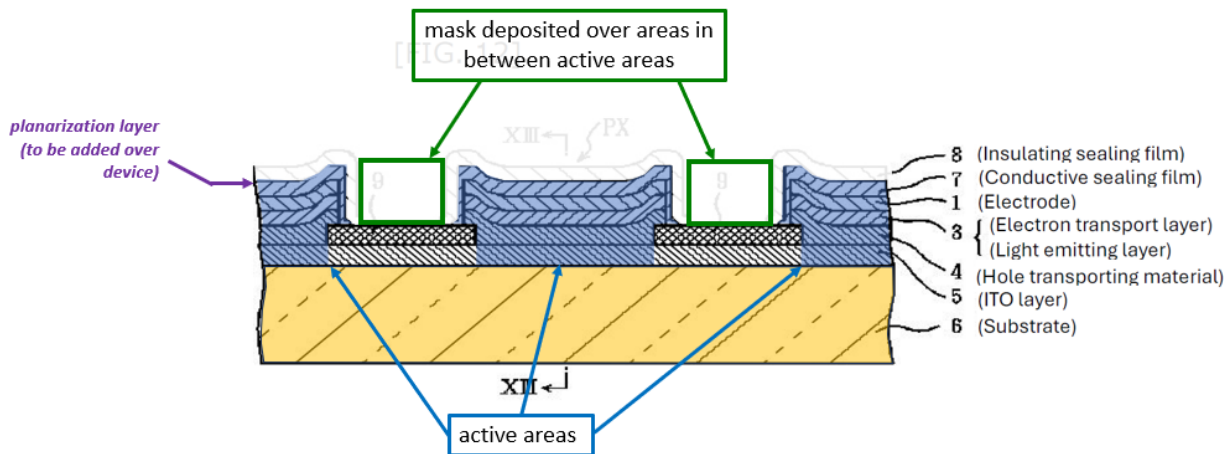
mask comprises *a material substantially non-sucking [or non-sticking] to OLED substrate over the areas in between the active areas.*

As an initial matter, given that the mask is to be removed from the substrate as discussed for Element 41[d] above, it would have been obvious to use a material that does not stick to the substrate to enable removal without damaging the substrate. Ex.1004, ¶152.

Additionally, as noted for Claim 43 above, Fujimori discloses “coating the entire surface of the mask with a relatively flexible material such as a resin,” Fujimori, [0039], in order “to prevent the mask from damaging the organic layer and the like deposited on the substrate when the manufacturing surface of the organic electroluminescent element and the mask are adhered to each other,” *id.*, [0038]. Fujimori also explains that the material of the mask itself may include “rubber or resin.” *Id.*, [0034]. A POSITA would have understood that the resin should be a material that is *substantially non-sticking* to the substrate in order to avoid damaging the substrate when the mask is removed.

The resin would also be a material that is *substantially non-sucking* to the substrate, as the '389 patent uses “suck” to refer to magnetic adhesion, *see* '389 patent, 7:48-49 (“magnet ... that ‘sucks’ the mask to the substrate”). A resin is not a material that is fixed by magnetic force and thus does not “suck” in the sense used in the '389 patent.

Finally, a POSITA would understand that the *substrate* on which the devices are formed (i.e., Kijima's "glass substrate 6") would be an *OLED substrate* (because it is a substrate on which OLED devices are formed), and that Fujimori's magnetically held mask would be in contact with the substrate *in between* the OLED devices comprising the *active areas* (e.g., areas that emit light), as shown in the illustration below. Therefore, a POSITA would understand Fujimori to teach (or at least strongly suggest) that the mask comprises a material substantially non-sucking [or non-sticking] *to OLED substrate over the areas in between the active areas*.



Kijima, Fig. 12 (annotated); Ex.1004, ¶¶151-55.

5. **Dependent Claim 45: “The method as recited in claim 41 wherein the step of depositing said mask further comprises depositing a mask, said mask comprising a metal, a ceramic, a plastic, a polymer, PTFE, or poly-siloxane.”**

Using Fujimori's magnetic masking approach to selectively deposit the planarization layer in Kijima (as discussed for claim 41) would satisfy the additional

requirements of this claim because Fujimori teaches that the magnetic mask *compris[es] a metal, a plastic, and/or a polymer.*

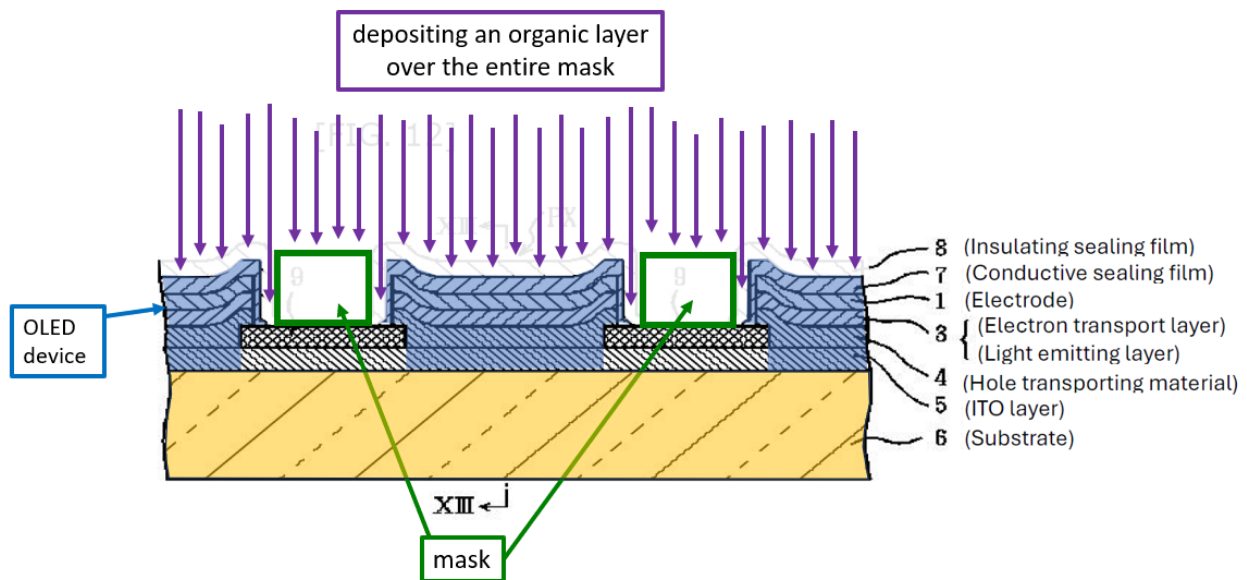
Specifically, Fujimori teaches that the mask “desirably contains ... at least one of the magnetic elements Fe, Co, and Ni” (all of which are metals) and that “[i]t is favorable to fabricate the mask from [magnetic] materials molded into thin sheets, but it is also possible to use rubber or resin mixed with magnetic powder.” Fujimori, [0034]. Additionally, as discussed for Claim 43 above, Fujimori discloses “coating the entire surface of the mask with a relatively flexible material such as a resin.” *Id.*, [0039]. Fujimori thus discloses that the mask *compris[es] a metal* (e.g., Fe, Co, or Ni), *a plastic* (e.g., resin), and/or *a polymer* (e.g., rubber or resin). Ex.1004, ¶¶156-57.

6. Dependent Claim 46: “The method as recited in claim 41 wherein the step of depositing at least one planarization layer further comprises depositing an organic layer over the entire mask.”

Using Fujimori’s magnetic masking approach to selectively deposit the planarization layer in Kijima (as discussed for claim 41) would satisfy the additional requirements of this claim because a POSITA would understand that depositing the *planarization layer* (the organic sealing layer added in view of Suzuki) entails *depositing an organic layer over the entire mask.*

As explained for element 41[c] above, the organic material for the added organic sealing layer is deposited on the mask and through the openings to the

underlying OLED devices, as illustrated in the below annotation. *See* Fujimori, [0028] (“Organic material . . . flying toward the substrate in vapor deposition or the like is deposited on the substrate through the mask opening placed in front of the substrate to achieve the [desired] patterning of the organic electroluminescence element corresponding to the mask opening shape.”). A POSITA would understand this to entail depositing an organic layer over the entire mask (and at a minimum this would be obvious) because the layer would need to be deposited over the entire mask in order to ensure that the layer is formed for the OLED elements in each pixel of the display. Ex.1004, ¶¶158-59.



Kijima, Fig. 12 (annotated).

IX. DISCRETIONARY DENIAL IS INAPPROPRIATE UNDER *FINTIV*

The Board should decline to exercise its discretion to deny institution under 35 U.S.C. § 314(a) and *Apple Inc. v. Fintiv, Inc.*, IPR2020-0019, Paper 11 (P.T.A.B.

Petition for *Inter Partes* Review of U.S. Patent No. 6,949,389

Mar. 20, 2020) (precedential). While the '389 patent is asserted in *Pictiva Displays International Ltd. v. Samsung Electronics Co., Ltd., et al.*, Case No. 2:23-cv-00495 (E.D. Tex.) (the “-495 matter”) and *Pictiva Displays International Ltd. v. Samsung Electronics Co., Ltd.*, Case No. 2:24-cv-00532 (E.D. Tex.) (the “-532 matter”), those cases remain in a very early stage.

In the -495 matter, in which Pictiva previously sued the same two Defendants, infringement contentions were served on March 11, 2024. The court issued its initial scheduling order on April 17, 2024, scheduling a trial for August 2025. *See* Ex.1029 (Docket Control Order).

Accordingly, the parties have made no material investments in the parallel litigation. Discovery has only just begun in the -495 matter; the deadline to substantially complete document production is December 24, 2024. No depositions have taken place, and the claim construction process has not begun. Additionally, this Petition is being filed approximately five months after the service of infringement contentions in the -495 matter and one month after the filing of the Complaint in the -532 matter, demonstrating that Petitioner has acted with diligence in preparing its patent challenge. Finally, Patent Owner will need to narrow the asserted claims in advance of any trial, *see* Ex.1029 at 1, and Petitioner has challenged claims not asserted by Patent Owner, such that a trial could not resolve all of Petitioner’s claim challenges. Discretionary denial is further inappropriate

because this Petition presents compelling evidence of unpatentability, for the reasons discussed in Section VIII, above.

X. CONCLUSION

Petitioner respectfully requests *inter partes* review and cancellation of the challenged claims 34-37 and 40-46 of the '389 patent.

Petition for *Inter Partes* Review of U.S. Patent No. 6,949,389

Date: August 12, 2024

Respectfully submitted,

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CERTIFICATION UNDER 37 C.F.R. § 42.24(D)

I certify that the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 6,949,389 complies with the type-volume limitation of 37 C.F.R. § 42.24 and contains 11,128 words based on the word count indicated by the word-processing system used to prepare the paper, and excluding those portions exempted by § 42.24(a).

Date: August 12, 2024

/David A. Garr/

David A. Garr (Reg. No. 74,932)

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 42.6 and 42.105, I hereby certify that the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 6,949,389 under U.S.C. §§ 311–319 and 37 C.F.R. § 42.100 *et seq.*, together with its supporting exhibits, Power of Attorney, and Explanation of Parallel Petitions was served by FedEx Priority Overnight, a means at least as fast and reliable as Priority Mail Express®, on the following correspondence address of record for patent owner:

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