

**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.

IPR2024-01222

December 9, 2025



Pictiva EX2053
Samsung v Pictiva
IPR2024-01222

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Selectively Deposited OLED Encapsulation



(54) **ENCAPSULATION FOR ORGANIC LIGHT
EMITTING DIODES DEVICES**

34. A method of encapsulating a plurality of devices fabricated upon a substrate, the steps of said method comprising:

fabricating a plurality of devices on a substrate;
selectively depositing at least one planarization layer
upon said devices; and
selectively depositing at least one barrier layer over said
planarization layer.

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.

'389 Teaches Using Selective Deposition to Avoid Electrical Contact Pads and Scribe (Cutting) Lines



The 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. In fact, the contact pad must typically be exposed for electrical mating with external driver circuitry. So, at a minimum, additional processing must be performed for the removal of the PML structure over these areas.

Another potential problem with the current PML techniques 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 of the PML layer over these areas.

Areas that Need Not Be Covered

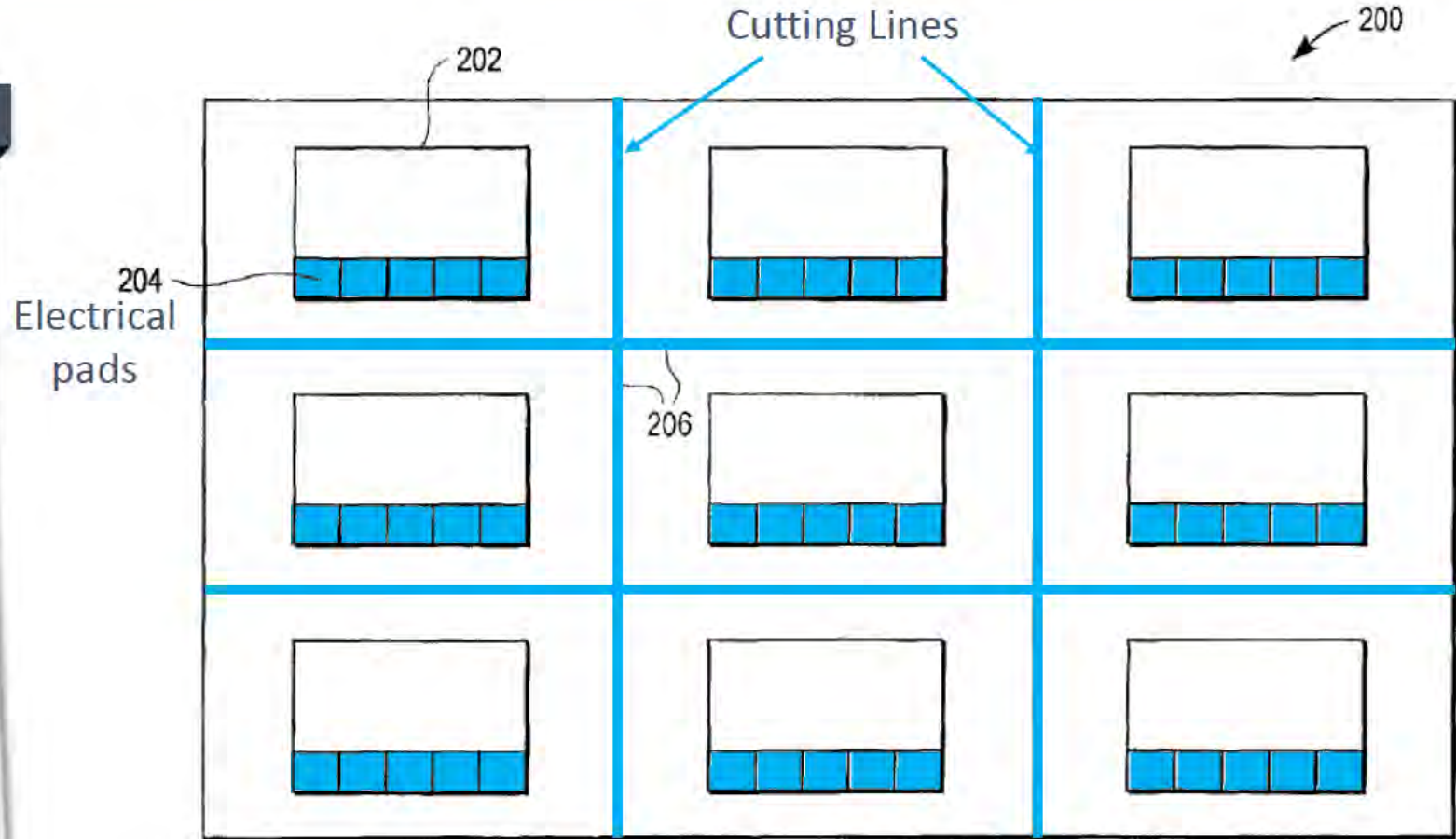
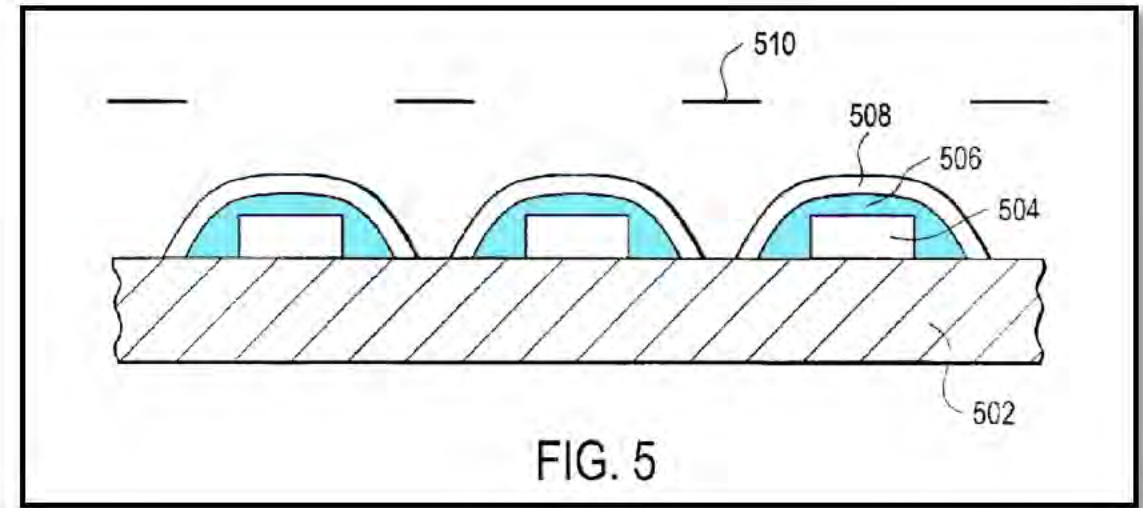


FIG. 2 (PRIOR ART)

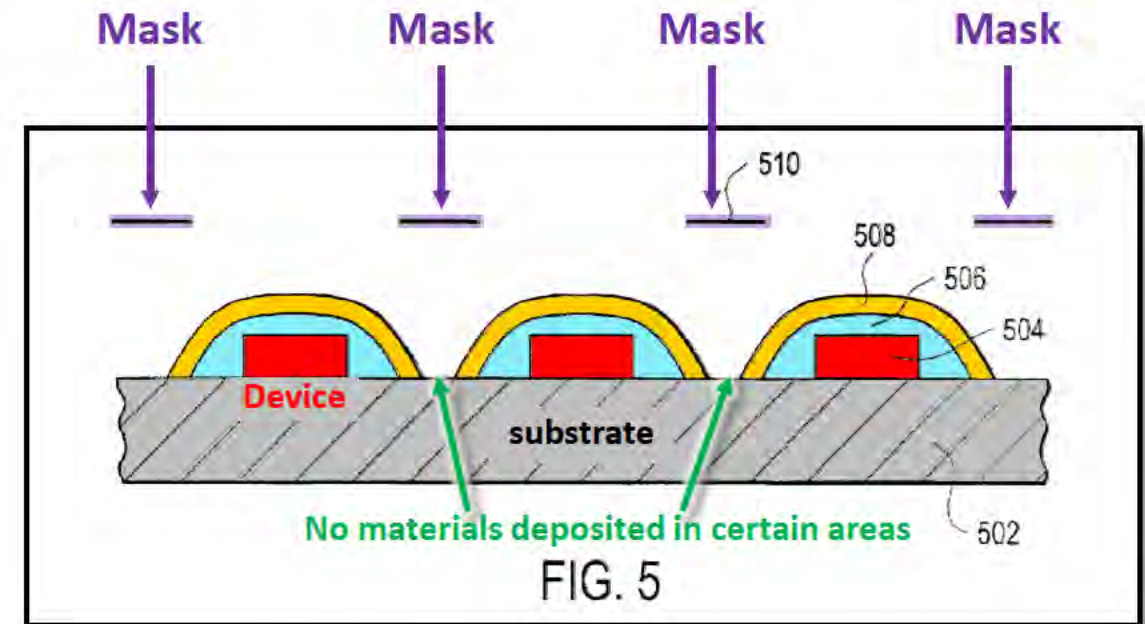
Inkjet Printing is an Example of Selective Deposition

FIG. 5 depicts another embodiment of encapsulation techniques in accordance with the present invention. In this embodiment, OLED device 504 is again formed upon substrate 502. Organic layer 506 is deposited in a patterned fashion as well as barrier layer 508. As organic layer 506 is deposited selectively; there may be no need to cure the layer. It should be appreciated that the cure and patterning aspects could be independent; —relating to the type of material and deposition technique of for the planarization layer. For example, if UV (or other)-curable liquids such as for PML or screen- or ink-jet print are used, then it is possible to cure. Alternatively, if evaporation of an organic through a mask is the relevant step, there may be no need to cure.



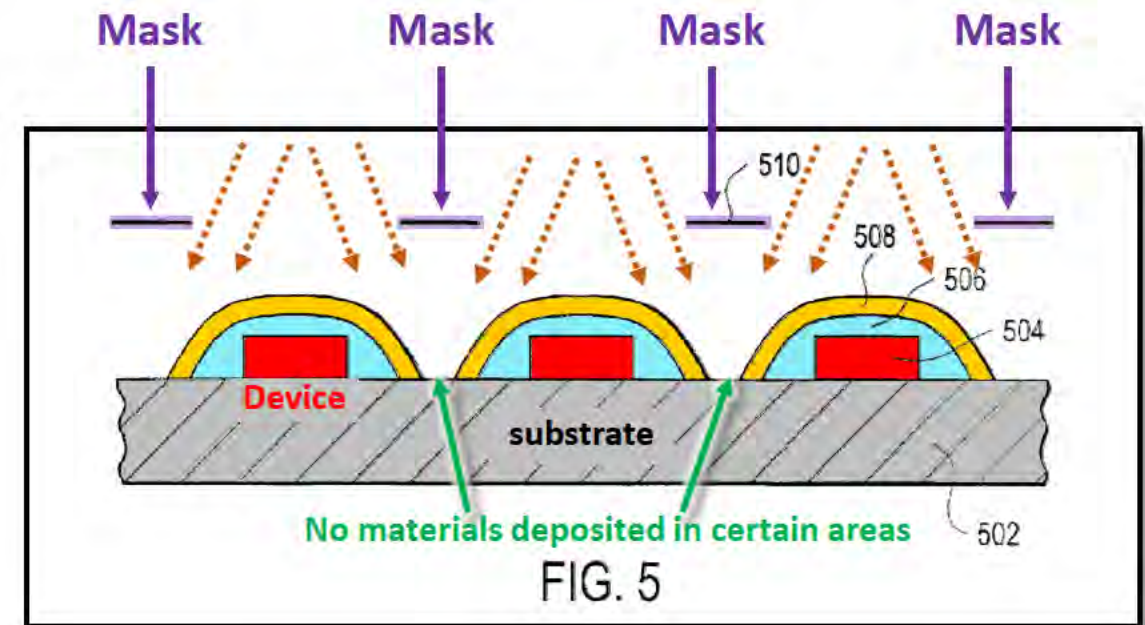
The manner of selectively depositing the organic layer and the barrier layer may be accomplished in a variety of ways. For example, organic layer may be selectively deposited through a shadow mask (as depicted as mask 510) or by ink jet deposition or other screen printing techniques. In fact, generally any printing techniques suitable to deliver the desired planarization layer material can be used. In similar fashion, barrier layer 508 may be selectively deposited. For alternative embodiments, it is possible to employ all options for selective deposition: same mask, different masks and also same mask with different substrate to mask distances (e.g. smaller distance for planarizing layer and then larger distance for barrier such that the barrier coverage is wider—because of slight non-directionality of and differences in the materials deposition).

In the case of printing, screen-printing, ink-jet-printing, the masks can either be not required (ink-jet) or possibly different from that used for a patterned sputter-deposited barrier layer deposition. For other embodiments, it may also be possible to partially cure the planarization layer, deposit the barrier layer and then complete the cure of the planarization layer, if necessary.



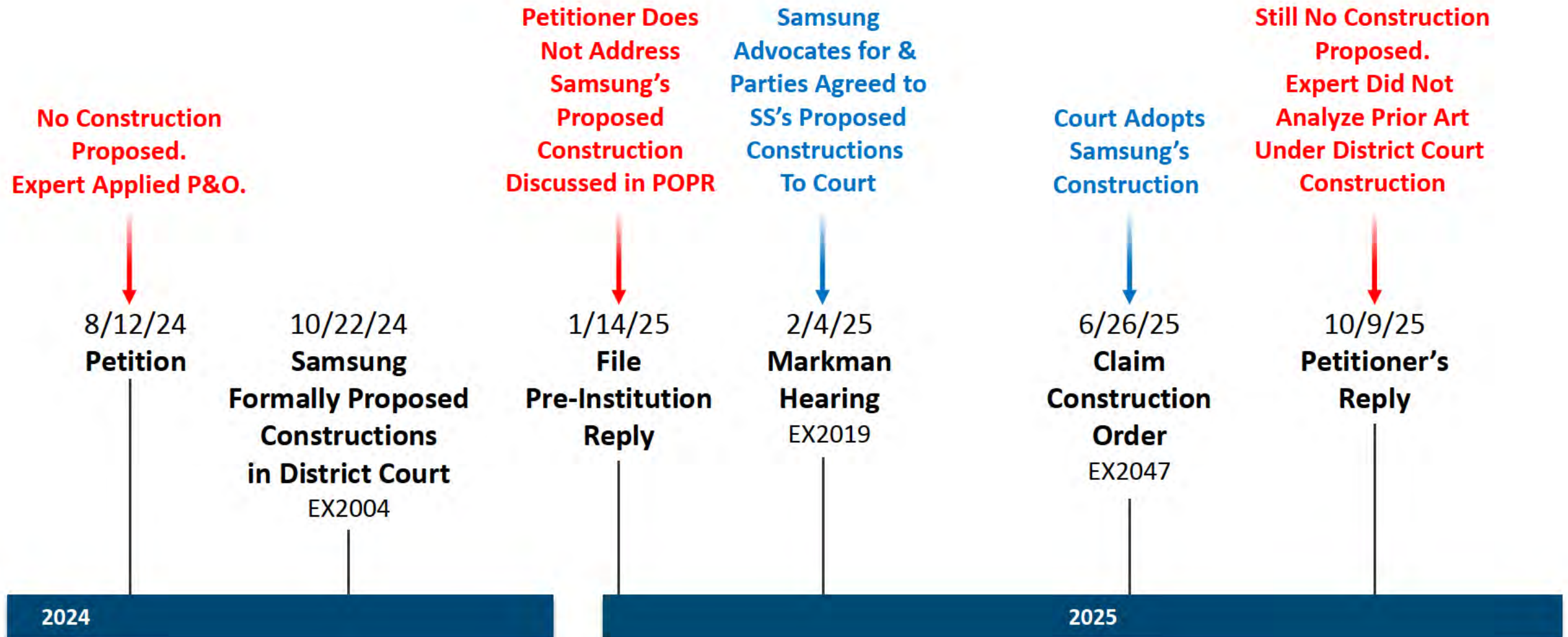
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Claim Construction

Timeline of Samsung's Claim Construction Positions for "Planarization Layer"



Claim Construction in the Parallel District Court



<p>“planarization layer” (’389 Patent, Claims 34, 35, 41, 46)</p>	<p>“a layer of material that planarizes such that the propagation of defects from one layer to another layer can be interrupted and the topography of the underlying layer is not reproduced.”</p>
<p>“selectively depositing” (’389 Patent, Claims 34, 35, 41)</p>	<p>“depositing a material in desired areas”</p>

EX2048 at 49; *see also id.*, 19, 20

Petitioner's Reply Does Not Explain Why It Proposed a Different Construction in the IPR



SAMSUNG

A. “Planarization Layer”

Pictiva urges the Board to adopt the parties’ agreed construction in the district court of “planarization layer”—namely “a layer of material that planarizes such that the propagation of defects from one layer to another layer can be interrupted and the topography of the underlying layer is not reproduced.” Ex. 2048, 18-19. As discussed below, the prior art clearly teaches a “planarization layer” regardless of whether this construction is adopted. Therefore, **Petitioner does not believe an express construction is necessary to resolve the parties’ disputes.**

Pet. Reply at 1

“Planarization Layer” Construction Is Based on Samsung’s Proposal



Pictiva’s Construction	Samsung’s Construction
plain and ordinary meaning, i.e., “a layer that can provide a planar surface”	“a layer of material that planarizes such that the propagation of defects from one layer to another layer is interrupted and the topography of the underlying layer is not reproduced”

In their briefing, the parties mainly disputed the last part of Samsung’s construction—whether a “planarization layer” must interrupt the propagation of defects from one layer to another. (Dkt. No. 134 at 4 (noting Pictiva’s agreement that a “planarization layer” “provide[s] a more planar (or flatter) surface”).) At the claim construction hearing, however, Pictiva indicated its agreement to Samsung’s construction. (*See* Hr’g Tr., Dkt. No. 186 at 40:24–25.)

EX2048 at 18; Sur-Reply 1; POR 18-21

Construction Supported by Intrinsic Evidence



The intrinsic record supports that construction. In the prosecution history, for example, the applicants explained how metals reproduce the topography of the underlying layer, and therefore cannot be used as a “planarization layer.” (’389 File History, Dkt. No. 143-10 at 16.) The applicants also distinguished a “sealing material 20” of U.S. Patent 6,590,157 because that material “it is not used to interrupt the propagation of defects from layer to another layer.” (’389 File History, Dkt. No. 143-12 at 11.) This is consistent with the specification, which explains a barrier layer “should ideally not contain any point defects (i.e. pin holes) in its surface—otherwise its usefulness as a barrier layer is severely compromised. That is primarily the reason that a planar organic layer is typically used as a substrate upon which the barrier layer is deposited.” (’389 Patent at 1:57–62; *see also id.* at 2:10–12 (describing the process as “primarily to avoid external partial/dirt-induced pinhole defects”); *id.* at 4:33–35 (“Such an organic layer might provide a planar structure on which to deposit a barrier layer and to substantially cover point defects (e.g. dirt particles) in lower layers”).)



“planarization layer”

“a layer of material that planarizes such that the propagation of defects from one layer to another layer can be interrupted and the topography of the underlying layer is not reproduced”

Claim Construction Order (EX2048) at 19, 49

Interrupting Defect Propagation (File History)

With respect to claim 1, the Applicants submit that the proposed combination does not disclose “hardening said at least one planarization layer in a patterned manner such that the hardened region substantially covers said device” as recited in claim 1. On pages 3-4 of the Office Action, the Examiner concedes that *Ghosh* “do not teach hardening or curing said at least one planarization layer 21 in a patterned manner such that the hardened region substantially covers said devices 3.” *Boroson* also does not disclose “hardening the planarization layer” as recited in claim 1.” On page 4 of the Office Action, the Examiner refers to the “sealing material 20” of *Boroson* as a planarization layer; however, this “sealing material 20” is not a planarization layer since it is not used to interrupt the propagation of defects from one layer to another layer (see Applicants’ specification at page 7, lines 16-21). Rather than being a planarization layer, the “sealing material 20” of *Boroson* is an adhesive that is used to bond the “encapsulation enclosure 30” to the “substrate 10”. See *Boroson* at col. 8, lines 36-42. In addition, the “sealing material 20” of *Boroson* is not hardened “in a patterned manner such that the hardened region substantially covers said device” (underline added) as recited in claim 1. The “sealing material 20” of *Boroson* is not deposited “upon said devices” as specified by claim 1; rather, as shown in Fig. 5B of *Boroson*, the “sealing material 20” is deposited around the electronic device such that the sealing material surrounds the electronic device. See *Boroson* at col. 9, lines 29-30. Therefore, since the “sealing material 20” is deposited around the electronic device rather than upon the device, the “sealing material 20” does not cover the device.

Additionally, a wet-processable and post-processing curable organo-metallic compounds such as spin-on glasses might suffice. Such an organic layer might provide a planar structure on which to deposit a barrier layer and to substantially cover point defects (e.g. dirt particles) in lower layers. It is generally desirable that the organic layer be deposited in sufficient quantity so that any such layer is no longer “conformal” to the point defect – i.e. any point defects are not geometrically projected upwards into layers deposited above. Such a first organic layer might also serve to protect the underlying OLED from potential damage due to the deposition of the first barrier layer.

EX1002 (FH), 52 (Specification page 7, lines 15-22); POR 19

EX1002(FH), 371; POR 19

Interrupting Defect Propagation (File History & Specification)

Prosecution History

Additionally, a wet-processable and post-processing curable organo-metallic compounds such as spin-on glasses might suffice. Such an organic layer might provide a planar structure on which to deposit a barrier layer and to substantially cover point defects (e.g. dirt particles) in lower layers. It is generally desirable that the organic layer be deposited in sufficient quantity so that any such layer is no longer “conformal” to the point defect – i.e. any point defects are not geometrically projected upwards into layers deposited above. Such a first organic layer might also serve to protect the underlying OLED from potential damage due to the deposition of the first barrier layer.

EX1002, 52 (Specification page 7, lines 15-22); POR 19

Specification

Additionally, a wet-processable and post-processing curable organic-metallic compounds such as spin-on glasses might suffice. Such an organic layer might provide a planar structure on which to deposit a barrier layer and to substantially cover point defects (e.g. dirt particles) in lower layers. It is generally desirable that the organic layer be deposited in sufficient quantity so that any such layer is no longer “conformal” to the point defect—i.e. any point defects are not geometrically projected upwards into layers deposited above. Such a first organic layer might also serve to protect the underlying OLED from potential damage due to the deposition of the first barrier layer.

EX1001, 11, 4:32-43; POR 19

No Reproduction of Topography of Underlying Layer



Moreover, the metal studs 5 cannot be used as a planarization layer because the metal studs 5 do not provide a flat surface. The metal studs 5 are formed by depositing a copper containing metal. See *Palmans*, column 4, lines 56-57. Metals, and copper in particular, that are evaporated onto a layer do not cover-up the imperfections of the underlying layer, but rather, the metals reproduce the topography of the underlying layer. Therefore, metals cannot be used as a planarization layer.

EX1002, 18; POR 19-20

Second Function Is to Ensure Flatter Surface Even When There Are No Defects

Mr. Pak

SDC Counsel

SAMSUNG

- “Yes, Your Honor. I see these two functions as being related but distinct.”
- “So the first is about the defects. ...

The second function is about smoothing out the underlying contour of what's there. And that -- ***even in situations where you have no defects, you could have OLED devices that protrude from the surface, and when you try to put a barrier layer on top of that OLED structure now you're folding -- you're creating folds and creases in that barrier layer.***

So the second function is about smoothing out the surface before you put down the barrier layer. So there I do think it's appropriate to maintain 'is not reproduced' because the whole point of the planarization layer from that standpoint is to flatten out the surface contour.”

2nd function
must be met
even where
there are no
defects

Two Prongs Are Separate Requirements

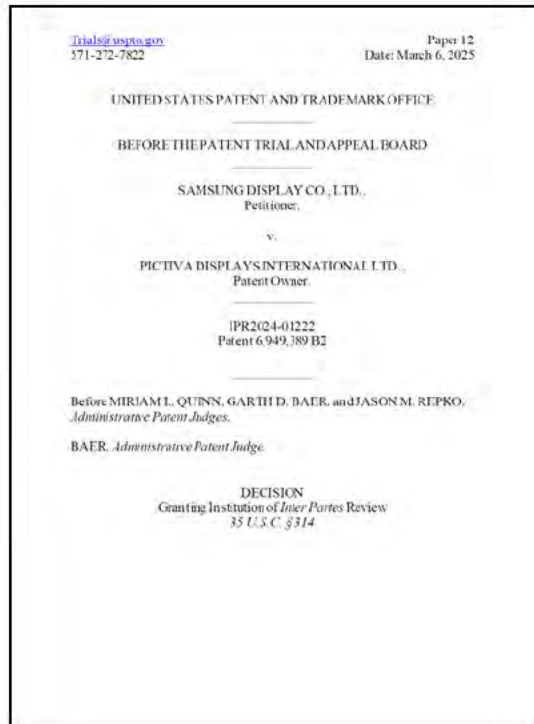
Mr. Pak
SDC Counsel

SAMSUNG

“So to us, Your Honor, these -- both of these functions were highlighted during prosecution to distinguish over just putting barrier layers on top of each other, for example, and that's because **these two functions--shielding defects from traveling upwards and then providing a substantially smoother surface--are both important aspects of the planarization layer**, and that's the reason why we proposed the language, Your Honor.

EX2019, 38:13-20; POR 21; Sur-Reply 1

Institution Decision's Position on Claim Construction Inconsistent with Post-Institution Precedential Decision



2. “planarization layer” and “selectively depositing”

Patent Owner asserts we should construe “planarization layer” and “selectively depositing” the same as “Petitioner’s real parties-in-interest (“Samsung”) propose in the district court.” Prelim. Resp. 18–19. Specifically, Patent Owner asserts, “Samsung proposes in the district court that “planarization layer” means “a layer of material that planarizes such that the propagation of defects from one layer to another layer is interrupted and the topography of the underlying layer is not reproduced.”” *Id.* at 19. “Samsung also proposes that “selectively depositing” means “depositing a material in only desired areas, such that no additional processing must be performed for removing unwanted material.”” *Id.*

We decline to adopt these constructions at this juncture. Despite what Samsung may have asserted in related district court proceedings, Petitioner has not proposed the same constructions here. Pet. 10–11. Furthermore, absent sufficient explanation addressing the merits of Samsung’s district-court constructions, we decline to adopt them simply because Samsung asserted them elsewhere.

Paper 12 at 11-12

Burden is on Petitioner to Justify Why It Proposed Different Constructions

'389 Invention Predates the IPR2024-01222 References

Pichler Karl (ITC)

From: Pichler Karl (ITC)
Sent: Thursday, February 08, 2001 4:28 PM
To: Frischknecht Kyle (ITC)
Cc: Proulx George (ITC); Pakbaz Hash (ITC)
Subject: RE: Meeting with Dr. John Affinito

Hi Kyle,

-----Original Message-----

From: Frischknecht Kyle (ITC)
Sent: Thursday, February 08, 2001 11:26 PM
To: Pichler Karl (ITC)
Cc: Proulx George (ITC)
Subject: RE: Meeting with Dr. John Affinito

Hi Charlie:

I have also previously considered spin coating the acrylate layer; however, I haven't yet thought up a reasonable method for keeping the electrical pins free of the coating. Performing a subsequent laser ablation seems less than optimum. I anticipate that vapor deposition through a shadow mask will keep the pins free of the coating; therefore, I have been quite partial to the vapor deposition method. Also, I am not too sure if scribing through the multilayer is a good idea; therefore, I anticipate that masking the area for the scribe lines will be a good practice. Obviously, photolithography after cathode deposition (for a "lift-off" technique) doesn't look very promising. Although there will certainly be many equipment issues with PML, it very well may be that vapor deposition through a shadow mask is the easiest method for producing an array of small displays on a large plate of glass. If you are really opposed to the vapor/mask method, I guess we could consider printing techniques (Screen/Inkjet), but when you get down to the details, these methods will have their respective equipment issues as well. Any thoughts on masking for spin coating?

Kyle

Hi all,
Just a small and CONFIDENTIAL point to be aware of in the future should we need it:
While working with PML encapsulation at FED (eMagin) I and others there discussed and stressed that LML, i.e. spinning in inert conditions a carefully outgassed cross-linkable solution onto the 8" wafers with subsequent cross-linking and barrier layer sputtering should be perfectly feasible and avoid many equipment issues with PML. I do not know if this was actually tried there after I left and/or if a patent was filed. These discussions happened probably from around mid 1999 onwards.
Charlie

-----Original Message-----

1

Pictiva EX2006-p. 1
Samsung v Pictiva
IPR/2024-01222

1

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Hi Kyle,

YES, I believe there may be a combination technique with spin-coating that I believe should work (also discussed at FED and I have been considering filing a patent for a long time - lack of time). **Spin-, roll- or whatever-coat, cross-link/cure and then sputter the dielectric barrier through a mask over the OLED area only**, i.e. leave the contact pads, scribe lines, etc. free from the barrier and then stick the whole thing in, for example, a plasma asher and ash-off the organic where there is no dielectric barrier film. I have a patent from CDT-time (for a completely different purpose) that shows that just a few (say around 10 or more Angstroms) of good sputtered dielectric (e.g. AlOx) act as a perfectly good oxygen plasma ash barrier. Alternatively, I have been thinking if we could deposit the organic liquid layer (via flash-evaporation, spin- or roll-coat or whatever) and then do the UV cross-linking through a mask. The idea is that after this we may be able (don't know if this will work, never tried) to thermally evaporate or somehow spray/wash off the non-cross-linked molecular organic film and then sputter the dielectric also through a mask or alternatively make the contacts first and then sputter the dielectric. In addition, the non-cross-linked organic may be volatile enough so laser ablation becomes perfectly feasible - not sure. This may also have the advantage that the mask-cross-linking should provide a smooth transition from the regions with to those without the organic layer (instead of a sharper step). These are all just 'undeveloped' ideas without really having thought through them in detail to spot serious bottlenecks and certainly I have not done any practical trials whatsoever (other than the thin oxide as ash barrier). Just a note: the reason why I was originally thinking of spinning the layer was that this could very easily added on to e.g. a Satella via a separate spin-chamber without the need to custom-build a flash-evaporator for the organic.

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1

Pictiva EX2006-p. 1
Samsung v Pictiva
IPR2024-01222

Conception As of February 2001

Element	Evidence
34[pre] & 34[a]	“[I]t very well may be that vapor deposition through a shadow mask is the easiest <i>method for producing an array of small displays on a large plate of glass.</i> ”
34[b]	<ul style="list-style-type: none">• “I anticipate that vapor deposition through a shadow mask will keep the pins free of the coating; therefore I have been quite partial to the vapor deposition method. Also ... I anticipate that masking the area for the scribe lines will be a good practice.”• “[I]t very well may be that <i>vapor deposition through a shadow mask</i> is the easiest method for producing an array of small displays on a large plate of glass.”• “we could consider printing techniques (Screen/Inkjet).”• “Any thoughts on masking for spin coating”?
34[c]	“Spin-, roll- or whatever-coat, cross-link/cure and then <i>sputter the dielectric barrier through a mask over the OLED area only</i> , i.e. leave the contact pads, scribe lines, etc. free from the barrier and then stick the whole thing in, for example, a plasma asher and ash-off the organic where there is no dielectric barrier film.”
35 & 36	“we could consider printing techniques (Screen/Inkjet).”

Combined Selective Deposition Steps Conceived

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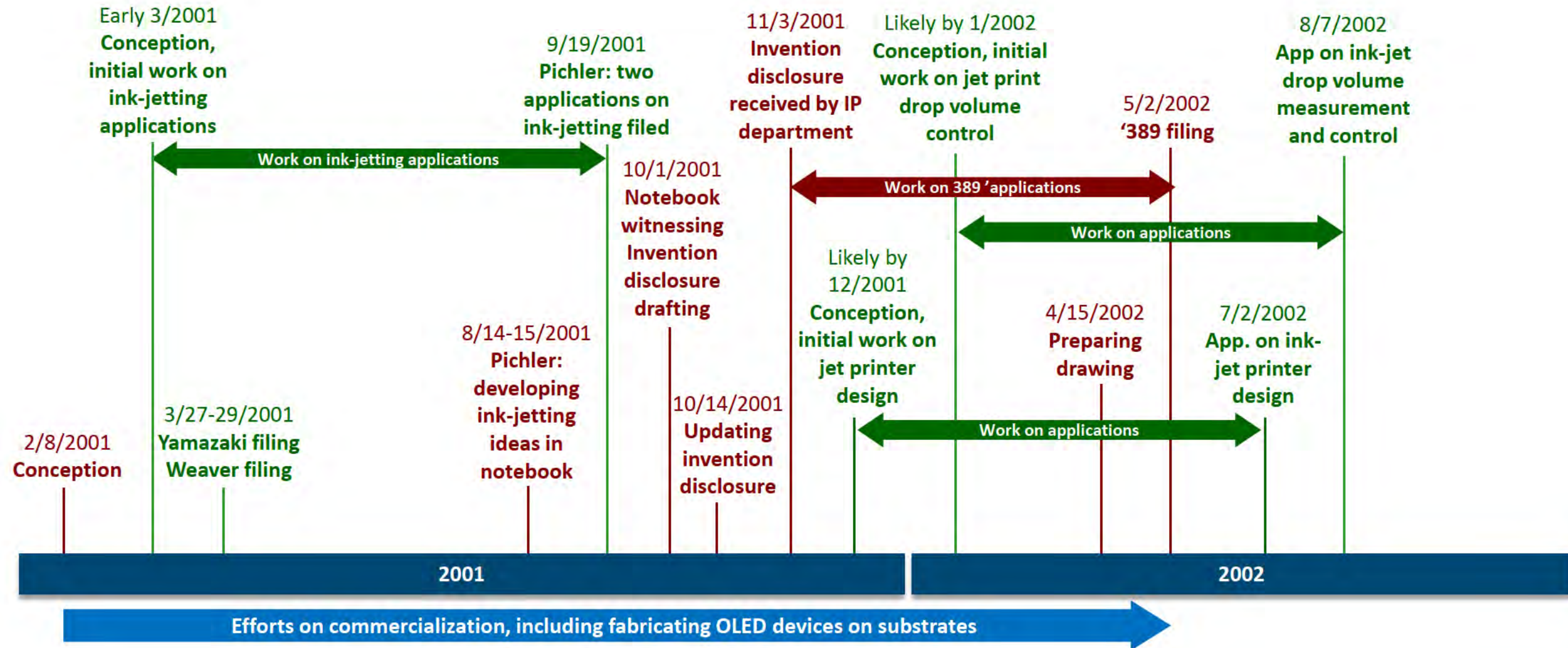
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Reasonably Continuous Diligence



Reasonably Continuous Diligence



Dr. Antoniadis
Expert Witness

SAMSUNG

Q. Okay. And you mentioned that at the time, Dr. Frischknecht was working on encapsulation of the OLED devices?

A. Yes.

Q. What else was he working on?

A. He was working on glass-glass encapsulation. Glass-glass encapsulation was the best-known method at that time that we were using.

Q. Understood. But what else was he working on besides the encapsulation project?

A. I think he was very focused on this encapsulation because we had some serious issues that we had to address. It was not a slam dunk to do glass-glass. The thin film encapsulation was one of his activities after the glass-glass, the number two, you could say, activity.

Reasonably Continuous Diligence



Dr. Antoniadis
Expert Witness

SAMSUNG

THE WITNESS: So let me step back a little bit. We had R&D activities on many programs. Thin film encapsulation, flexible substrate, full-color inkjet printing, full color means RGB full-color displays. Those were secondary projects.

The most important project for all of us was to help the manufacturing to introduce the products in the market. And introducing the products in the market was very stressful for all of us. So encapsulation and the performance of the displays under certain testing conditions had to be met. So very frequently, many of us will stop everything we were doing and we would focus on this.

EX2031, 220:7-21; POR 11; Sur-Reply 26

Reasonably Continuous Diligence



“periods of inactivity within the critical period do not automatically vanquish a patent owner's claim of reasonable diligence. For example, ***in Monsanto, we held that substantial evidence supported the jury's presumed finding that an inventor was reasonably diligent where there was no corroborating evidence of any activity for a series of months***”

Perfect Surgical Techniques, Inc. v. Olympus America, Inc., 841 F.3d 1004, 1009 (Fed. Cir. 2016)

Reasonably Continuous Diligence



- Criticized the Board for rejecting inventor's testimony that "he 'performed approximately four to six surgeries per week' and worked 'roughly 80 hours' per week"
- Normal work load should be considered when determining whether the invention was abandoned or unreasonably delayed

Perfect Surgical Techniques, Inc. v. Olympus America, Inc., 841 F.3d 1004, 1009-1010 (Fed. Cir. 2016)

Yamazaki Grounds

Yamazaki Grounds Do Not Render Obvious the Challenged Claims

- **Petition does not discuss why Yamazaki discloses a “planarization layer” as properly construed**
- Prior art does not teach “selectively depositing at least one barrier layer over said planarization layer” that is selectively deposited upon a plurality of devices
- Insufficient evidence and reason given for why a POSITA would have extended Yamazaki’s method to encapsulate multiple devices

34 b. selectively depositing **at least one planarization layer** upon said devices; and

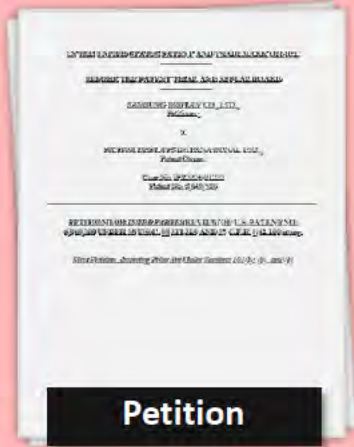
Court's Construction

“planarization layer”

“a layer of material that planarizes such that the propagation of defects from one layer to another layer can be interrupted and the topography of the underlying layer is not reproduced”

Claim Construction Order (EX2048) at 49.

The Petition Argues that Yamazaki Discloses “Planarization Layer”



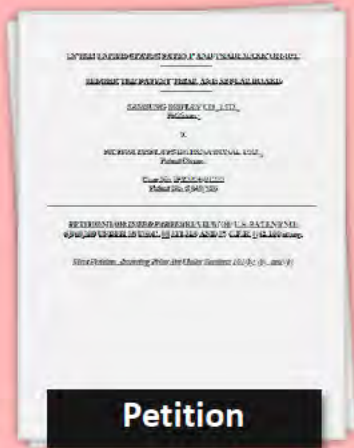
SAMSUNG

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

Applying Yamazaki’s methods to encapsulate a plurality of OLED display panels would satisfy this element, because Yamazaki’s encapsulation methods entail *selectively depositing at least one planarization layer—namely, cover layer 1105/1407—upon its OLED display (device).*

Pet. 26

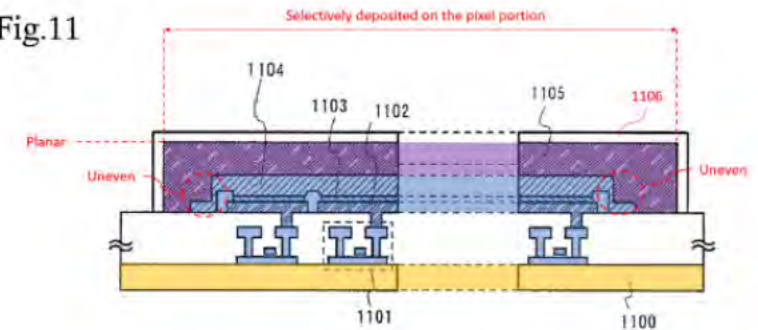
The Analysis of “Planarization Layer” Focuses Only On Flatter Top Surface



SAMSUNG

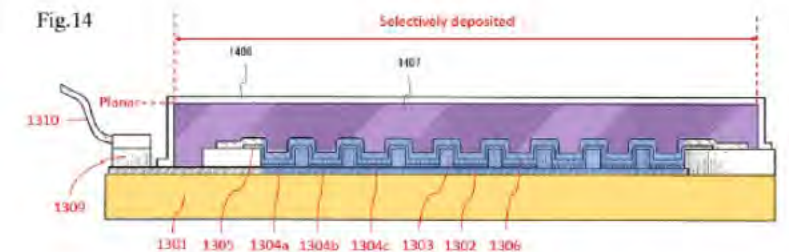
Further, Yamazaki's cover layer 1105 constitutes a *planarization layer*. For example, the reference teaches that “[a]s a material for forming the cover layer 1105 made of an organic resin, it is appropriate to use a material that ... has *planarity*.” Yamazaki, [0178]. And as evident in Figure 11 above, the top of the cover layer 1105 is planar (flat), whereas the underlying cathode 1104 has uneven surfaces. Thus, Yamazaki teaches that the uneven surfaces are planarized (flattened) by the cover layer. Indeed, it was known to use such an organic layer to “make[] a smooth surface on the relatively irregular surface of the cathode” when forming OLED devices. Suzuki, 5:59-62; Ex.1003, ¶94.

Fig.11



Further, this cover layer 1407 constitutes a *planarization layer*, because the top surface of cover layer 1407 is flat (i.e., planar) even though the underlying structure is uneven and thus the addition of layer 1407 results in a planar surface topography. Ex.1003, ¶¶94-97.

Fig.14



Pet. 26-28

Dr. Subramanian Applied a Different Construction of “Planarization Layer”



Dr. Subramanian
Expert Witness

SAMSUNG

4 So your understanding of the
5 planarization layer is a layer that increases the
6 planarity of the surface; is that correct?

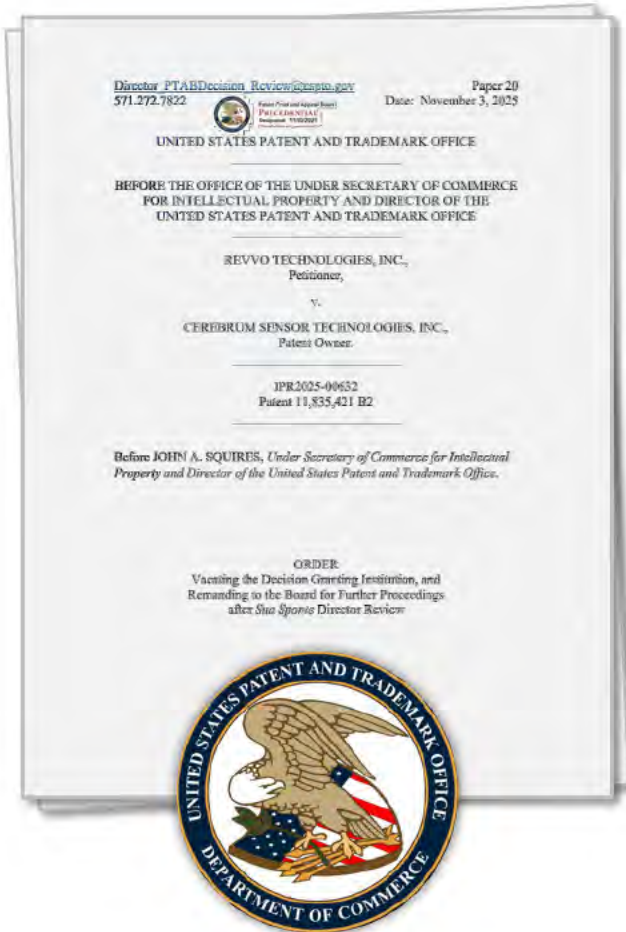
7 A. Relative to what it was pre-imposition
8 of the planarization layer, yes, that's a reasonable
9 description of it. I mean, that's a certainly
10 reasonable characteristic of it.

11 Q. That is the understanding applied in
12 your analysis of this '389 patent; is that correct?

13 A. As a general statement, yes. As you

EX2020 (First Subramanian Dep.) at 18:4-18; POR 58

Deviation from District Court Construction Must Be Explained

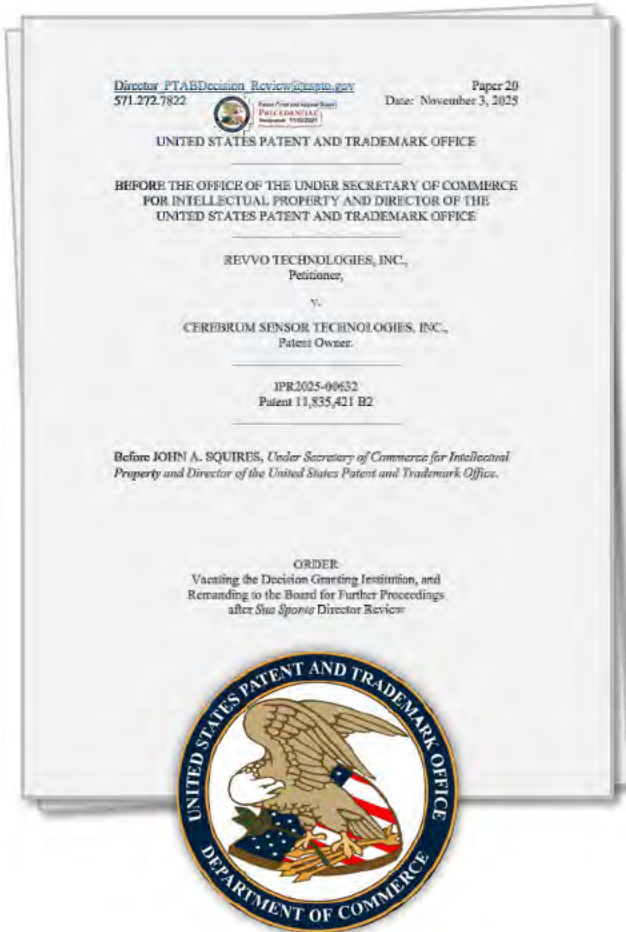


“[A]lthough a petitioner is not necessarily precluded from arguing different claim construction positions before a district court and the Board, ***the petitioner must explain sufficiently why the different positions are warranted***, even in instances that do not implicate Section 112(f).”

“Simply noting that the petitioner is adopting a patent owner’s claim construction proposals from district court, however, is not a sufficient reason for advancing different positions in the two forums.”

Revvo Technologies, Inc. v. Cerebrum Sensor Technologies, Inc.,
IPR2025-00632, Paper 20 at 5 (Squires November 3, 2025) (precedential)

Deviation from District Court Construction Must Be Explained



- “The Board’s claim construction rules are designed to ensure that the Board correctly construes claim terms and to minimize inconsistency in claim construction between forums.”
- The rules “discourage petitioners from seeking broader construction at the Board to support a patentability challenge while seeking narrower constructions in litigation to avoid infringement liability”
- “Allowing petitioner to continue this practice [proposing different claim constructions in the two forums] does not further the Office’s goal of ‘providing greater predictability and certainty in the patent system’”

Revvo Technologies, Inc. v. Cerebrum Sensor Technologies, Inc.,
IPR2025-00632, Paper 20 at 4 (Squires November 3, 2025) (precedential)

Improper New Argument in Reply



SAMSUNG

Similarly, a POSITA would appreciate Yamazaki's cover layer "planarizes such that the propagation of defects from one layer to another layer can be interrupted," as the construction further specifies. For example, it was known that "it is inevitable that some pinholes or defects" will be formed on the cathode of OLED devices (such as in Yamazaki). Suzuki 5:41-45. And it was known that an organic layer (like Yamazaki's cover) may be used to "make[] a smooth surface on the relatively irregular surface of the cathode," to facilitate encapsulation. Pet. at 27 (citing Suzuki, 5:59-62; Ex.1003, ¶94); *see also* Ex.1032 ¶14. Thus, a POSITA would recognize that the "planarity" of Yamazaki's cover layer would ensure that defects will be filled in or smoothed over and thereby not propagated. Ex.1032 ¶14. At a minimum, this would have been obvious, given the known benefits of using such a layer to form a smooth surface over such defects. Accordingly, Yamazaki teaches or at a minimum suggests a planarization layer under the district court construction.

Inherency a new argument; and property not inherent

Obviousness a new argument

Yamazaki Does Not Mention "Defects"



Dr. Subramanian
Expert Witness

SAMSUNG

And does Yamazaki actually mention defect at all?

A Please bear with me. I'm going to have to open Yamazaki.

No, I don't believe so. I did a quick search and I didn't see the word "defect" appear in Yamazaki.

EX2050, 10:7-13; Sur-Reply 3

Defect Propagation is Not Inherent in PMLs



Dr. Subramanian
Expert Witness

SAMSUNG

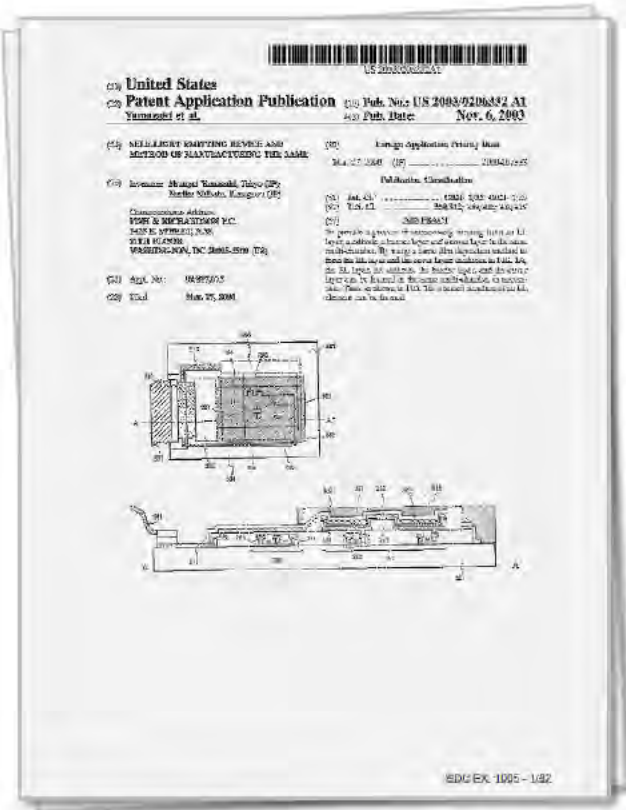
Q So, do PMLs inherently have planarization layers?

A Inherently? So, I mean -- I guess given the breadth of the question, which means I don't know what the device it's being applied to. I guess, I -- I don't know how to answer that question.

But, I guess, conceptually it's possible to have a PML where it doesn't have a planarization layer. So, for example, both the polymer layer and the -- the alternating inorganic layer would not be planarizing in function.

EX2050, 68:16-69:2; Sur-Reply 3

Yamazaki Uses Non-Permeable Materials to Address H₂O/O₂ Permeation



[0178] As a material for forming the cover layer 1105 made of an organic resin, it is appropriate to use a material that has a high degree of hardness, is unlikely to allow substances such as moisture and oxygen to permeate, and has planarity. To be more specific, organic resins such as epoxy resin, acrylic resin, polyimide, polyamide, and silicon resin are preferable. Because the cover layer 1105 is formed using the ink jet method, it can be selectively formed on the pixel portion.

EX1005, [0178]; POR 28-29; Sur-Reply 3

As properly construed, interruption of defect propagation resulting from planarization

Yamazaki Contains No Disclosure of Defects



Dr. Subramanian
Expert Witness

SAMSUNG

13. A POSITA would also understand that Yamazaki's cover layer 1105/1407 would interrupt the propagation of defects from one layer to another layer. As I explained previously, Yamazaki teaches that "[a]s a material for forming the cover layer 1105 made of an organic resin, it is appropriate to use a material that ... has planarity." Yamazaki, [0178]. Thus, Yamazaki teaches that the material used to form the cover layer would smooth out uneven surfaces below it. As a POSITA would recognize, smoothing out uneven surfaces in this way would prevent any defects from the underlying surfaces to be propagated to layers above.

No support

No explanation of why Suzuki's disclosure applies to Yamazaki

14. As the prior art teaches, it was within the knowledge of a POSITA that that such an organic layer could be used to "make[] a smooth surface on the relatively irregular surface of the cathode" when forming OLED devices. Suzuki, 5:59-62. Indeed, as Suzuki explains, "it is inevitable that some pinholes or defects" will be formed when forming the cathode. Suzuki 5:41-45. Thus, Yamazaki teaches that a material with "planarity" is appropriate for the cover layer 1105/1407, such that defects will be filled in or smoothed over and thereby not propagated. Based on these teachings of Yamazaki, a POSITA would understand that Yamazaki's cover layer 1105/1407 interrupts the propagation of defects from one layer to another layer, and does not reproduce the topography of the underlying layer.

Alleged Common Knowledge Requires Evidentiary Support



- “[D]efficiencies of the cited references cannot be remedied by the Board’s general conclusion about what is ‘basic knowledge’ or ‘common sense’ to one of ordinary skill in the art”
- Rejecting Board’s unsupported contention that “‘it is basic knowledge that communication in trusted environments is performed over trusted paths’ and, ... verifying the trusted command in UNIX over a trusted path is ‘nothing more than good common sense.’”

In re Zurko, 258 F.3d 1379, 1383, 1385 (Fed. Cir. 2001)

Suzuki Differs from Yamazaki



Dr. Subramanian
Expert Witness

SAMSUNG

Q And you are not saying that Yamazaki has the same material sets or topology as in Suzuki; correct?

A No, I'm not.

And Yamazaki is not using the same manufacturing methods as Suzuki either; correct?

A They're certainly not identical, I agree with that.

EX2050, 18:18-21, 18:23-19:1; Sur-Reply 4

Suzuki Differs from Yamazaki



Dr. Subramanian
Expert Witness

SAMSUNG

Q So, for example, Yamazaki uses inkjet printing and electric field application methods specifically for its cover layer; correct?

A Those are two specific techniques that it calls out, yes.

Q Okay.

Suzuki doesn't mention either; correct?

A I agree with that, that's true.

EX2050, 20:3-10; Sur-Reply 4

Organic Layer Deposition Introduces Particles, i.e., Defects



Dr. Antoniadis
Expert Witness

SAMSUNG

Q. When you said "the original work was detrimental to the OLED devices," what do you mean exactly?

A. I don't know all the details, but when you deposit the inorganic layers, the inorganic layers typically are done at elevated temperatures. So if you're not careful with the inorganic layer, you can affect the performance of the OLEDs.

Now, the thin film encapsulation includes also an organic layer. And when you put the organic layer down, you introduce particles and managing these particles could be an issue.

So these are the two different areas that I recall that at the early stages the industry struggled.

EX2031, 40:16:41:7; Sur-Reply 4

Yamazaki's Inkjet Printing Uses Dissolved Polymer Resins



Dr. Subramanian

Specification

And is the organic resin considered to be a polymer type or it's more like small molecule?

A So, it depends on the resin -- I mean, the resin is usually a mixture.

But certainly the backbone of the resin is usually a polymer.

EX2050, 60:19-24; Sur-Reply 23

[0178] As a material for forming the cover layer 1105 made of an organic resin, it is appropriate to use a material that has a high degree of hardness, is unlikely to allow substances such as moisture and oxygen to permeate, and has planarity. To be more specific, organic resins such as epoxy resin, acrylic resin, polyimide, polyamide, and silicon resin are preferable. Because the cover layer 1105 is formed using the ink jet method, it can be selectively formed on the pixel portion.

EX1005, [0178]

Solid Polymer Resin Could Form Particulates When Solvent Evaporates

'389's Inkjet Printing Uses UV-Curable Monomer Liquids, not Dissolved Solids



Mr. Humphrey
Expert Witness



pictiva displays

⁹ In contrast to the solvent-based approaches in these papers, the '389 patent contemplated depositing monomer liquids (without solvent). EX1001, 6:61-62.

EX2046, p. 31 n.9; Sur-Reply
13, 23; POR 37 n.3

deposition technique of for the planarization layer. For example, if UV (or other)-curable liquids such as for PML or screen- or ink-jet print are used, then it is possible to cure.

Droplet Merge to Form a Planarization Layer

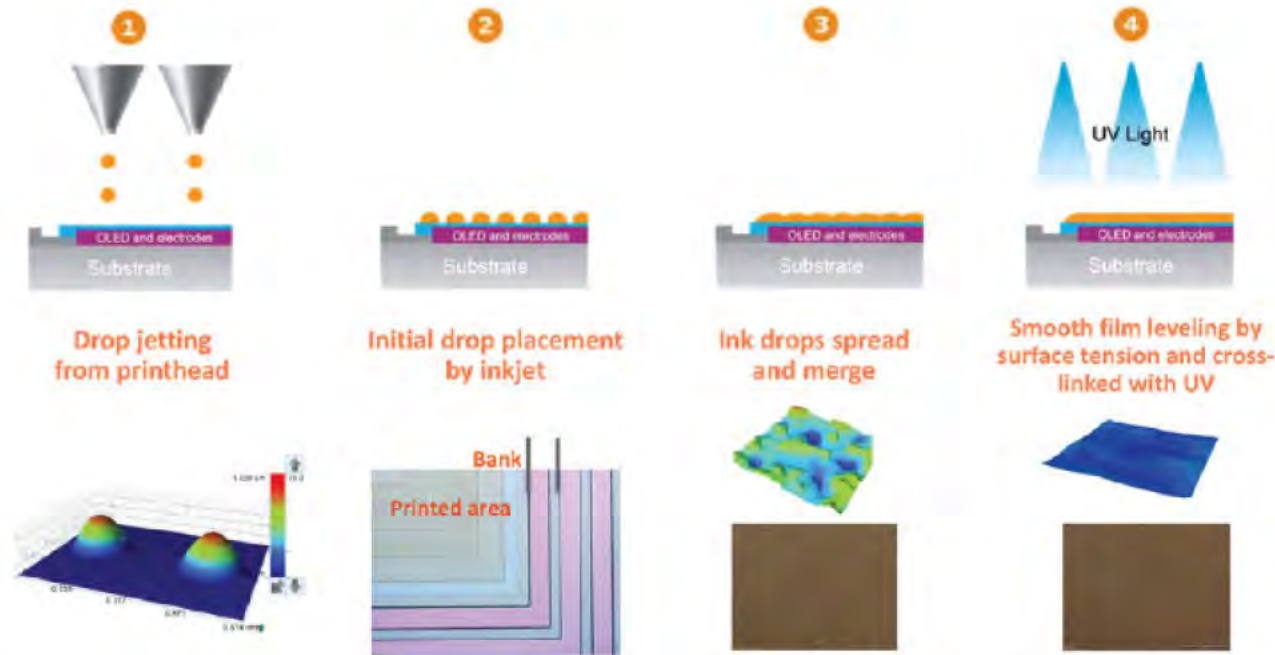


Mr. Humphrey
Expert Witness



pictivadisplays

66. As shown below, to form an organic encapsulant layer through inkjet printing, the ink drops have to spread and merge and the resulting film then must level to obtain a planar film.



EX2030_Moro2021_Large_Scale_Manufacturing_of_Polymer_Planarization_Layers, Fig. 2); *see also* EX2034_Kateeva2017_Presentation,⁷ p.16.

EX2046, para. 66;
Sur-Reply 8

Planarity More Difficult to Obtain Over a Large Area

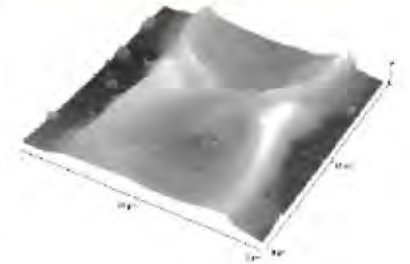
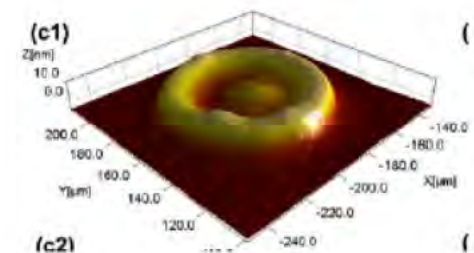


Mr. Humphrey
Expert Witness



pictivadisplays

67. The larger the printed area, the higher the likelihood for there to be defects in the film, such as non-planarity, pinholes, cracks, etc., *e.g.*, because it becomes more likely that not all the droplets spread and merge properly and/or because it becomes more difficult for the entire film to level. For example, while there were reports (after the invention dates) of overcoming the coffee-ring effects⁸ to form flat films over $100\mu\text{m} \times 100\mu\text{m}$ areas, those articles do not suggest the same solution could yield smooth films over areas 3+ orders larger. See EX2023, Figs. 2, 4-5; EX2036_s41467-023-43014-7_Large_area_inkjet_2023, Figs. c0-c1; EX2039 (ams-OSRAM0000167) ($19.97\text{mm} \times 11.97\text{mm} \sim 240\text{mm}^2$ active area of a display versus 0.22mm^2 pixel area).⁹ Additionally, as the encapsulant areas increase, solvent trapping and outgassing in subsequent process steps become more likely, which in turn negatively affect the resulting film's flatness, porosity and ability to decouple defects.



EX2046, para. 67;
Sur-Reply 8

Coffee Ring Effect Known Before 389 Patent



Dr. Subramanian
Expert Witness

SAMSUNG

Q And was the coffee-ring effect known at the time of the '389 patent?

A Oh, for sure the coffee-ring effect was described, I don't remember when, but many years before that.

EX2050, 129:18-22; Sur-Reply 13

Suzuki and Yamazaki Specify Materially Different Organic Layer Thicknesses

Yamazaki

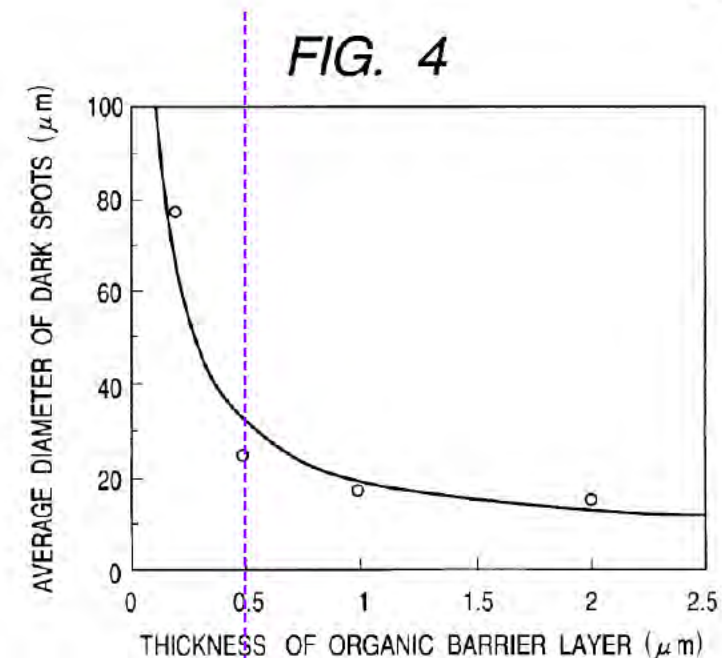
[0177] Provided on the EL layer 1103 is a cathode 1104 formed using the evaporation method. Note that it is appropriate to use a material that has a small work function, such as MgAg and Al—Li, for forming the cathode 1104. After forming the cathode 1104, the ink jet method is again used to form a cover layer 1105 made of an organic resin film evenly on the pixel portion. Preferably, the film thickness of the cover layer 1105 formed is between 10 nm and 300 nm.

EX1005, [0177]; POR 27

Suzuki

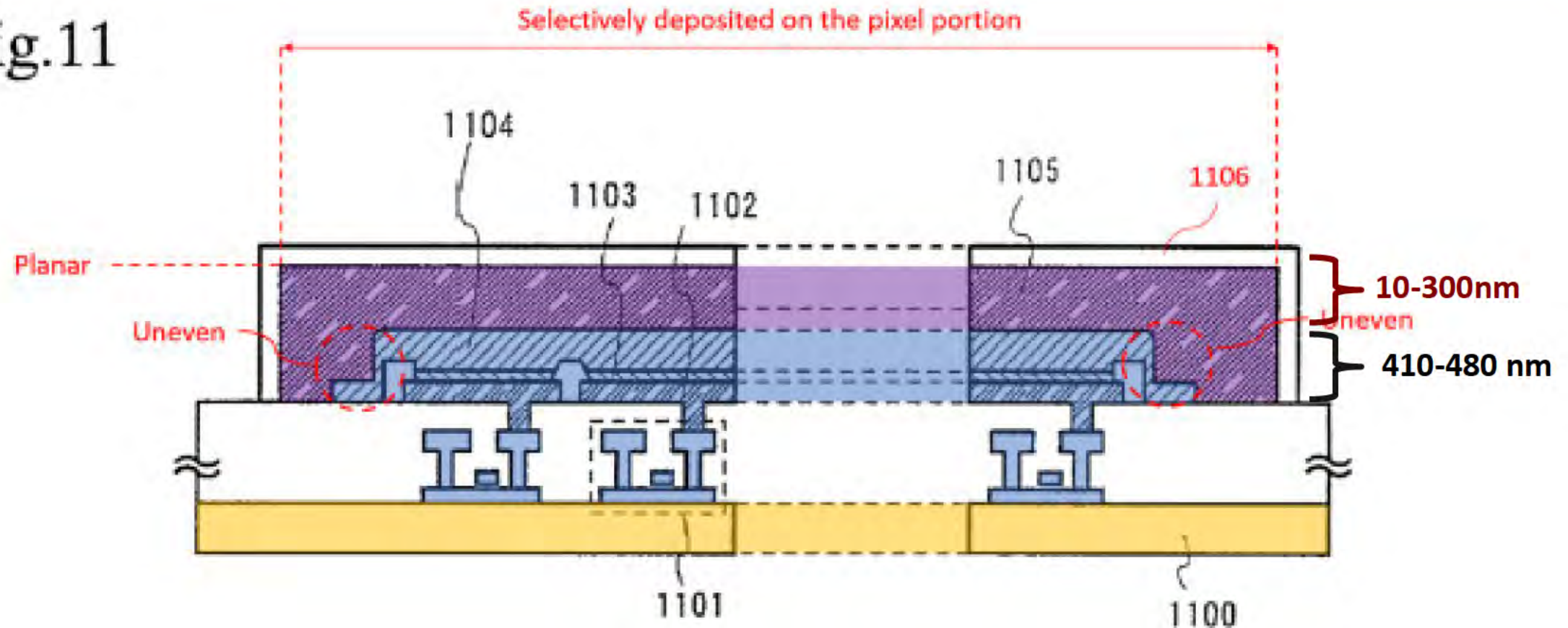
organic layer structure of the electroluminescent unit U. The organic barrier layer 20 should preferably be formed in a thickness of 0.5 μm or over in order to ensure good coverage of the unit U and to effectively intercept moisture therewith.

EX1012, 7:11-14



Yamazaki's Cover Layer Thinner Than Device Thickness (Scale of Defects)

Fig.11

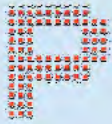


Sur-Reply 6; EX2050, 32:6-33:24; EX1005, [0129], [0139], [0178]

Defect Shielding Unlikely at Yamazaki's Film Thickness



Mr. Humphrey
Expert Witness

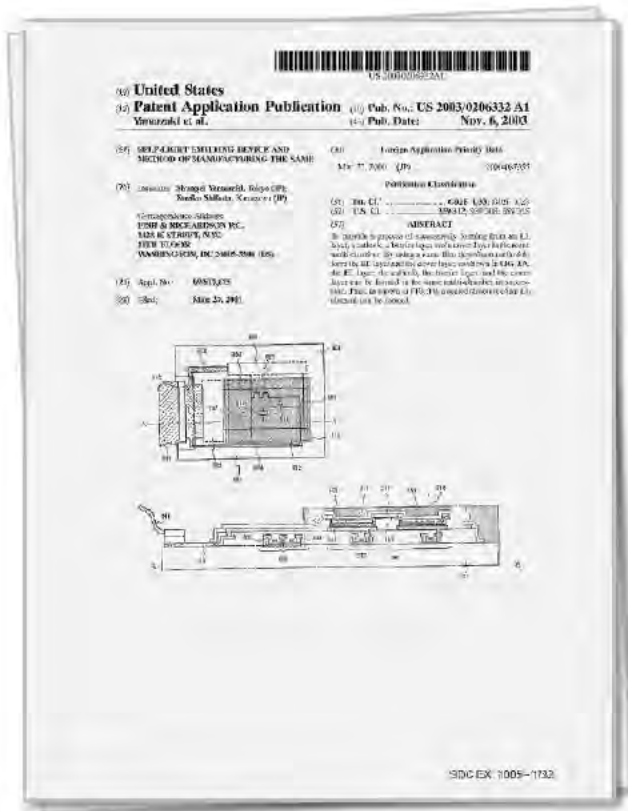


pictiva displays

43. Indeed, at the preferred range of thicknesses of 0.01-0.3 μm , the organic layer would be too thin to fully encapsulate particulates that could occur in manufacturing. *Cf.*, '389, 4:36-40. Thus, a person of ordinary skill in the art would recognize that the cover layers 1105 and 1407 were not designed to decouple defects. Rather, their ability to protect against moisture and oxygen originates from their property of being materials that are “unlikely to allow[] substances such as moisture and oxygen to permeate.” Yamazaki, [0178]. That is, it is the oxygen and moisture permeation rate through the material(s), as opposed to the layer's effectiveness in decoupling defects in barrier layers, that resulted in reduced oxygen and moisture permeation (if any).

EX2046, para. 43; Sur-Reply 6; POR 28

Yamazaki [0090] Involved a Different Configuration



[0090] In the present invention, after forming a barrier layer 45 that is made of an inorganic film such as silicon nitride, tantalum oxide, or carbon, a cover layer 46 that is made of an organic resin film is formed by using the electric field application method explained in FIG. 1C. A preferred viscosity of the organic resin liquid that is used for forming the cover layer 46 at this point is set between 1×10^{-3} and 3×10^{-2} Pa·s. In addition, the film thickness of the cover layer formed at this point is preferably $0.1 \mu\text{m}$ to $20 \mu\text{m}$. However, it is possible to make the film thickness thereof thicker than the above stated range by repeating the application and drying processes.

- **Cover layer over barrier layer, not barrier layer over cover layer as required**
- **Organic layer deposited using electric field application method, not inkjet printing**

No Pre-Invention Disclosure of Sufficient Thickness of Organic Layer in Yamazaki



Dr. Subramanian
Expert Witness

SAMSUNG

17. I understand that Mr. Humphrey has also suggested that Yamazaki's inkjet printing and electric field application methods would not be sufficient to "decouple" defects in lower layers while still maintaining planarity. POR at 29-30. I do not agree, because these methods were known to form sufficiently thick layers. For example, in my own lab I have used inkjet printing to build layers that are many microns thick. It is also well known that screen printing can be used to print layers that are tens of micrometers thick. For example, another paper referencing the work described in Ex. 2023 specifies thicknesses of up to 2.5 μm for the inkjet printed gold layer. *See, e.g.,* Ex. 1028 at 3 ("Good step coverage is achieved for gold lines up to 2.5 μm thick," and "Three layers of dielectric are needed to ensure isolation, which results in an average film thickness of 3 μm .").

→ 2003 article

→ 2004 article

No Pre-Invention Disclosure of Sufficient Thickness of Organic Layer in Yamazaki



Dr. Subramanian
Expert Witness

SAMSUNG

Q So, Exhibit No. 2023 was after the filing date of the '389 patent fair?

A Yes, that's fair.

Q And Exhibit No. 1028 was -- is a paper published in 2004, actually December 2004; correct?

A Yes, that's correct.

Q Okay.

So it's also after the filing dates of the '389 patent?

A Yes, that's true.

EX2050, 53:15-17, 53:25-54:6; Sur-Reply 7

EX2023 Does Not Concern Planarization Layer



Dr. Subramanian
Expert Witness

SAMSUNG

Q In paragraph 17 you mention that in your lab you have used inkjet printing to build layers that are many microns thick.

Do you see that?

A Yeah.

Q That's not for encapsulation layers, is it?

A No. That particular work was not for encapsulation. That was for multilayer interconnects.

Q Okay.

A Actually, I should rephrase that.

It was for encapsulation but not for OLEDs. It was for encapsulation of interconnects.

Q Okay.

This is not for OLED encapsulation?

A That's fair.

Q And it is not for OLED planarization encapsulation?

A That's also fair. This work was not about OLEDs.

EX2050, 95:17-96:12; Sur-Reply 7

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

389-1.60

EX1028 Does Not Concern Planarization Layer



Dr. Subramanian
Expert Witness

SAMSUNG

Q And let's look at Exhibit No. 1028. I don't think that has anything to do with the planarization layer for OLEDs either; correct?

A That's true as well.

EX2050, 96:13-16; Sur-Reply 7

Mr. Humphrey's Testimony Does Not Support an Inference that Yamazaki Discloses a Planarization Layer



Mr. Humphrey
Expert Witness



pictiva displays

Q: Does the – do all PMLs include a planarization layer that meets the construction in Paragraph 19?

A: **In conception** I believe **yes**.

Q: Why is that?

A: Because that is **known to be a function of polymer multi-layers**, and in relation to thin film encapsulation.

EX1035, 82:22-83:8

“That is, even though the term ‘planarization layer’ does not appear in the email communications, **the reference to ‘PML’ and the inventors’ general understanding of the structures and functions of ‘PML’** indicates that the inventors had conceived the concept of an organic ‘planarization layer’ as part of their conception. *See also, e.g.,* EX1001-’389 Patent, 1:17–22, 1:30–36, 1:41–44.”

EX2046, para. 154

No Pre-Invention Disclosure of Planarization Layer Over a Relatively Large Area



Dr. Subramanian
Expert Witness

SAMSUNG

19. Further, even at Sturm's stated thickness for depositing an EL layer, it would have been well within the skill of a POSITA to make "[e]ight or more passes" as Mr. Humphrey suggests, to generate an appropriately thick layer. Pictiva and Mr. Humphrey similarly overstate the "difficulty" of using inkjet techniques to form a layer on "a relatively large area." POR at 30. It is in fact a particular strength of printing techniques such as inkjet that they scale well to larger areas, because of the ability to use a large number of heads in parallel. See, e.g., Ex. 1029 at 2 (describing use of "ganged" print heads). Indeed, any alleged "precision" issues with inkjet would not increase with scale, as Pictiva and Mr. Humphrey appear to suggest, because the primary limit on precision of printing in inkjet is simply the precision limits imposed by droplet ejection from the nozzle itself, which is entirely unrelated to the size of the substrate on which material is being printed; in other words, the precision of inkjet printing will be the same on both small and large substrates.

Dec. 2002, after May
2002 filing date

EX1032, para. 19

EX1029 (SPIE Proceeding) Published After '389 Filing Date



Dr. Subramanian
Expert Witness

SAMSUNG

So, you don't have any -- you are not questioning the authenticity of the date that's written here which was 4 November 2002, that's when the proceeding was published; correct?

A That's correct.

Q Okay.

And that's also after May second, 2002, which is the '389 filing date; correct?

A Yes, that's right.

EX2050, 57:10-18; Sur-Reply 7

No Pre-Invention Disclosure of Planarization Layer Over a Relatively Large Area



Dr. Subramanian
Expert Witness

SAMSUNG

19. Further, even at Sturm's stated thickness for depositing an EL layer, it would have been well within the skill of a POSITA to make "[e]ight or more passes" as Mr. Humphrey suggests, to generate an appropriately thick layer. Pictiva and Mr. Humphrey similarly overstate the "difficulty" of using inkjet techniques to form a layer on "a relatively large area." POR at 30. It is in fact a particular strength of printing techniques such as inkjet that they scale well to larger areas, because of the ability to use a large number of heads in parallel. See, e.g., Ex. 1029 at 2 (describing use of "ganged" print heads). Indeed, any alleged "precision" issues with inkjet would not increase with scale, as Pictiva and Mr. Humphrey appear to suggest, because the primary limit on precision of printing in inkjet is simply the precision limits imposed by droplet ejection from the nozzle itself, which is entirely unrelated to the size of the substrate on which material is being printed; in other words, the precision of inkjet printing will be the same on both small and large substrates.

Large number of heads in parallel does not address whether inkjet can provide a planar layer over a large area

EX1032, para. 17; Sur-Reply 7-8

EX1029 Does Not Concern Planarization Layer



Dr. Subramanian
Expert Witness

SAMSUNG

A But Exhibit No. 1029, I'm really just pointing to it for the use of ganged heads, showing that you could put multiple heads in parallel to get high speed printing.

And it specifically does talk about polymer LED display printing in section seven, which is on the second to last page of Exhibit No. 1029.

Q And is it used for the encapsulation layer?

A So, with respect to what he shows here, I think he's only using it for the light-emitting polymer layer, not for encapsulation.

That's what these figures are. These figures are -- specifically figure 17. And then figure 18 is an analysis of figure 17. That's light-emitting polymer print, not encapsulation.

EX2050, 97:1-16; Sur-Reply 7

Yamazaki Grounds Do Not Render Obvious the Challenged Claims

- Petition does not discuss why Yamazaki discloses a “planarization layer” as properly construed
- **Prior art does not teach “selectively depositing at least one barrier layer over said planarization layer” that is selectively deposited upon a plurality of devices**
- Insufficient evidence and reason given for why a POSITA would have extended Yamazaki’s method to encapsulate multiple devices

Selectively Deposited OLED Encapsulation



(54) **ENCAPSULATION FOR ORGANIC LIGHT
EMITTING DIODES DEVICES**

34. A method of encapsulating a plurality of devices fabricated upon a substrate, the steps of said method comprising:

fabricating a plurality of devices on a substrate;
selectively depositing at least one planarization layer
upon said devices; and
selectively depositing at least one barrier layer over said
planarization layer.

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.

None of Yamazaki, Ghosh and AAPA Disclose Element 34(c)

Reference	What is Missing
Yamazaki	Barrier layer deposited over a planarization layer that is deposited upon a single device
AAPA	Barrier layer not selectively deposited
Ghosh	Barrier layer not selectively deposited

For Multiple Devices, Barrier Layer in Prior Art Deposited Non-selectively

Yamazaki Does Not Disclose Depositing a Barrier Layer Over Multiple Devices



Dr. Subramanian
Expert Witness

SAMSUNG

You don't contend that Yamazaki either expressly or inherently discloses fabricating a plurality of devices on a substrate, do you?

A. No, I do not.

For the purposes of that combination, I am doing it in various ways; either based on the knowledge of one of skill in the art, or with respect to specific secondary references.

EX2020, 26:13-20, POR 31

AAPA Does Not Disclose “Selectively Depositing” A Barrier Layer Over Multiple Devices

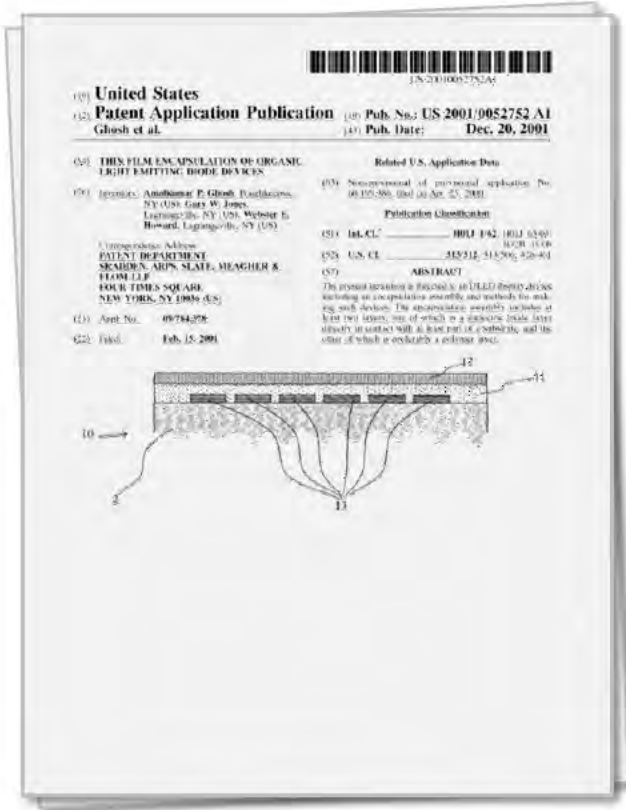


The problem with this PML technique is that the only part of the device that requires encapsulation is the OLED structure itself—and not, e.g., the electrical contact pads. In fact, the contact pad must typically be exposed for electrical mating with external driver circuitry. So, at a minimum, additional processing must be performed for the removal of the PML structure over these areas.

Another potential problem with the current PML techniques 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 of the PML layer over these areas.

Ghosh Does Not Disclose “Selectively Depositing” A Barrier Layer Over Multiple Devices

“The second encapsulation layer 22 in FIG. 3 is formed of one or more oxide layers and is deposited by ALE or ALD. In this second embodiment, **the oxide layer 22 is formed over both the encapsulation layer 21 and the exposed portions of the substrate 2**. The areas of oxide layer 22 that are laid down over the exposed portions of the substrate 2 form a seal and barrier to water so that there is much less possibility of moisture permeating from the edges of the display.”



Ghosh Does Not Disclose “Selectively Depositing” A Barrier Layer Over Multiple Devices

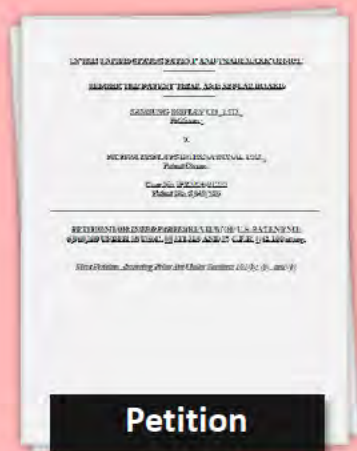


With respect to claim 34, the Applicants submit that the proposed combination does not disclose “selectively depositing at least one barrier layer over said planarization layer” as recited in claim 25. In *Ghosh*, the “second encapsulation layer 22” (in the Office Action, the Examiner refers to this layer as the “barrier layer”), is nonselectively deposited using either atomic layer epitaxy or atomic layer deposition. See, e.g., *Ghosh* at ¶0027. *Boroson* also does not disclose selectively depositing a barrier layer. For these reasons, claim 34 is patentably distinguishable over the proposed combination. Claim 37 depends from claim 34. Accordingly, it is patentable over the proposed combination of *Ghosh* and *Boroson* for at least the reasons set forth above with respect to claim 34.

EX1002, 376; POR 32

**For Multiple Devices, Even When Organic Layer is Selectively Deposited,
Barrier Layer Not Selectively Deposited**

Ghosh Does Not Disclose “Selectively Depositing” A Barrier Layer Over Multiple Devices



SAMSUNG

During prosecution of the '389 patent, the Examiner applied Ghosh in rejecting claim 34 (among others), explaining that Ghosh teaches a “method of encapsulating a plurality of devices fabricated upon a substrate,” that comprises “*fabricating a plurality of devices 3 (i.e. OLED) on a substrate 2 (Fig.3)*”; depositing and patterning “at least one planarization layer 21”; and “selectively depositing at least one barrier layer 22 ... over the patterned planarization layer.” Ex.1002, 292. The applicants overcame this rejection, arguing that “[i]n *Ghosh*, the ‘second encapsulation layer 22’ (in the Office Action the Examiner refers to this layer as the ‘barrier layer’) is nonselectively deposited” *Id.*, 376. However, the applicants did not dispute that Ghosh teaches a method of encapsulating a plurality of OLED devices fabricated upon a substrate (or that Ghosh’s method comprises selectively depositing at least one planarization layer), *see id.*; Ex.1003, ¶¶54-58.

Pet. 14; POR 32

Yamazaki Confirms Selective Deposition of Barrier Layer is Exception

Embodiment 1

[0089] It is to be noted that the above-mentioned EL layer is inferior to heat, and therefore it is desirable that the cathode 43 is formed at a the possible lowest temperature (preferably within the temperature range from room temperature to 120° C.). Accordingly, plasma CVD and sputtering are observed as desirable film deposition methods. Further, the substrate completed up to this point is referred as an active matrix substrate throughout the present specification.

Embodiment 2

[0141] A barrier layer 353 is further formed thereon so that the active matrix substrate that is completed up to the formation of the protective electrode 352 is not exposed to the open air. In Embodiment 2, tantalum oxide is used as the material for forming the barrier layer 353. However, an inorganic material such as a silicon nitride, an aluminum nitride, or a carbon, specifically a DLC, may be used. The barrier layer 353 is formed by employing sputtering in Embodiment 2, although a film deposition method performed at room temperature such as plasma CVD can also be employed.

Embodiment 3

[0183] As shown in FIG. 11, after the formation of the cover layer 1105, a barrier layer 1106 is formed by sputtering to cover the cover layer 1105. In Embodiment 3, the barrier layer 1106 is formed of a carbon film, specifically a DLC (Diamond Like Carbon) film. However, the material for forming the barrier layer 1106 is not necessarily limited thereto, but materials such as tantalum oxide, aluminum nitride, or silicon nitride may also be used. It is note that the barrier layer 1106 is formed selectively using a shadow mask.

Embodiment 4

[0201] After the formation of the protective electrode 1306, a barrier layer 1307 made of an inorganic material is formed. It is appropriate here to use inorganic materials such as silicon nitride, tantalum oxide, aluminum nitride, or carbon (specifically a DLC film). The barrier layer can be formed by plasma CVD, sputtering, or evaporation. A silicon nitride film is formed by sputtering as the barrier layer 1307 in Embodiment 4. At this point, a preferable film thickness of the barrier layer 1307 is between 10 nm and 100 nm.

- Prior Art Used Non-Selective Deposition Unless Specified
- Even in non-selective deposition embodiments, removal steps are not metioned because those are standard procedures.

EX1005, [0089], [0141], [0183], [0201]; Sur-Reply 11

Petitioner Fails to Demonstrate “Selectively Depositing” under Its Interpretation



Dr. Subramanian
Expert Witness

SAMSUNG

Q. What does "selectively depositing" mean?

A. I mean, in general here, selectively depositing would refer to putting down material in a spatially specific way.

So that you could deposit the material where you wanted, and it won't be where you don't, so that you don't need to do a subsequent removal step to remove it from unwanted regions.

EX2020, 20:2-9; POR 23

Masked Deposition Alone Does Not Guarantee Selective Deposition According to Samsung's Expert



Dr. Subramanian
Petitioner's expert

SAMSUNG

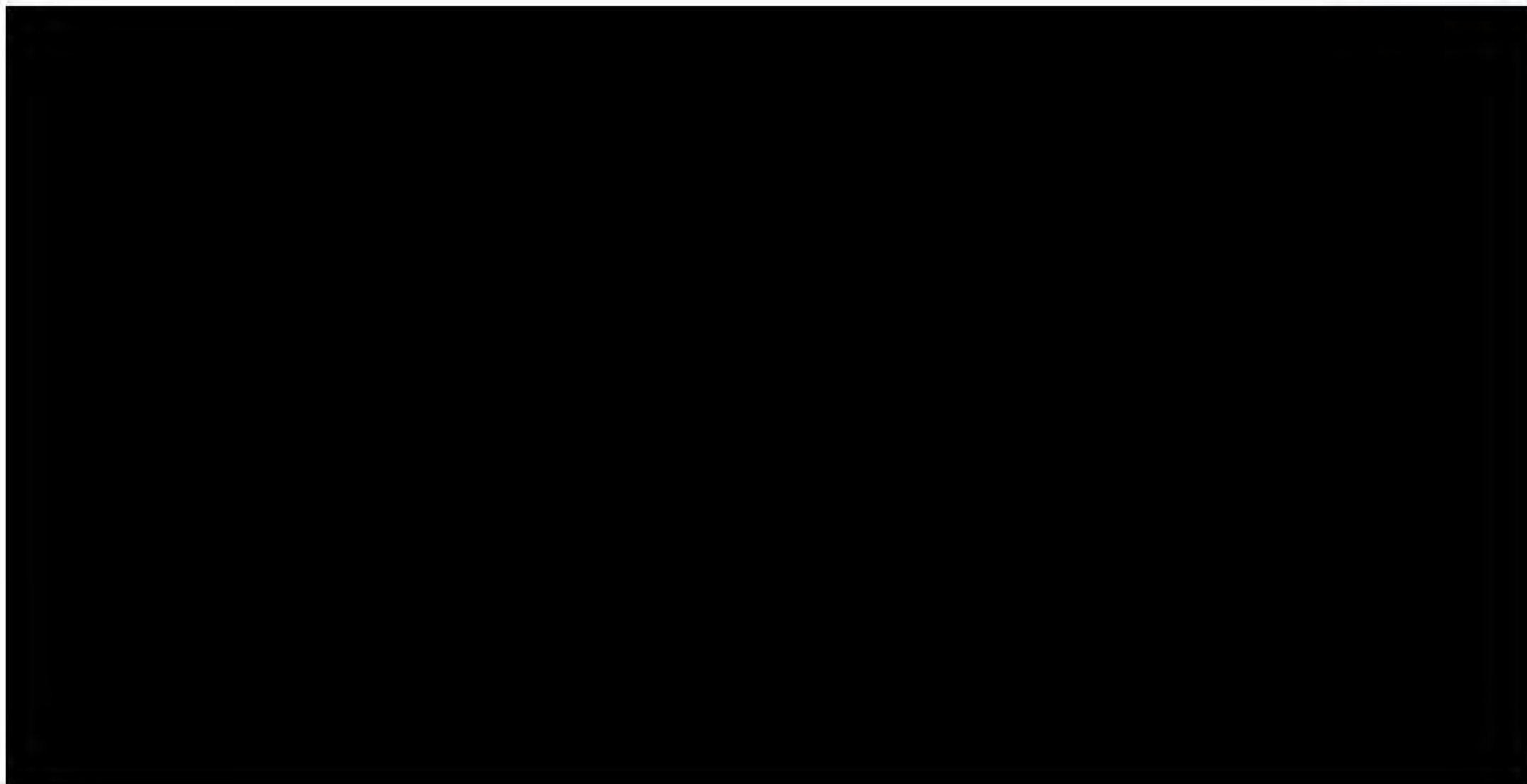
What if the deposition is done with a shadow mask, and the material bleeds under -- into the shadow. Is that selective deposition?

A. Again, it depends on the context.

If you have accounted for the bleeding, which by the way is, again, very well-characterized, it may be that you have designed the mask to account for the bleeding in which case, if you don't have to do a subsequent removal, it could be selective.

On the other hand, if the follow-on to your hypothetical is that -- it is in unwanted regions, and therefore, I will follow that up with a removal process, whether it be an ash laser ablation or some other removal process, then it would not be selective.

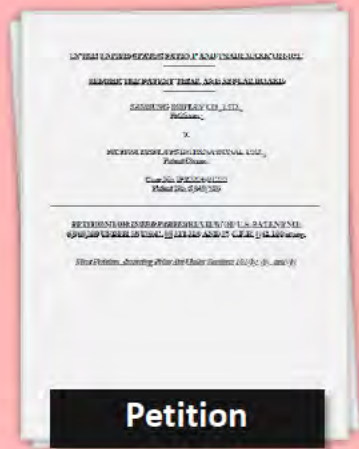
EX2020, 23:2-17; POR 23



Yamazaki Grounds Do Not Render Obvious the Challenged Claims

- Petition does not discuss why Yamazaki discloses a “planarization layer” as properly construed
- Prior art does not teach “selectively depositing at least one barrier layer over said planarization layer” that is selectively deposited upon a plurality of devices
- **Insufficient evidence and reason given for why a POSITA would have extended Yamazaki’s method to encapsulate multiple devices**

Petition Does Not Discuss Why a POSITA Would Have Selectively Deposited A Barrier Layer Over Multiple Devices



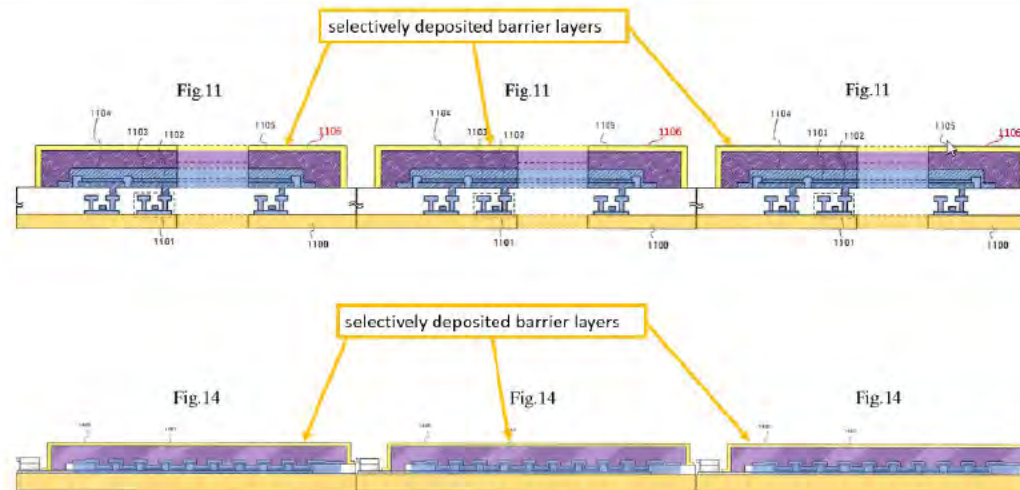
Petition

SAMSUNG

Yamazaki further discloses *selectively depositing* the barrier layer 1106 over the cover layer 1105 (*planarization layer*). “It is note[d] that the barrier layer 1106 is formed *selectively* using a shadow mask.” *Id.*, [0183]. This selective deposition is also evident in Figure 11, which shows that the barrier layer is formed only on a certain portion of the underlying structure.

Barrier layer 1408 is *selectively deposited* over the cover layer 1407 (*planarization layer*). As shown in Figure 14, the barrier layer is formed only on a certain portion of the underlying structure.

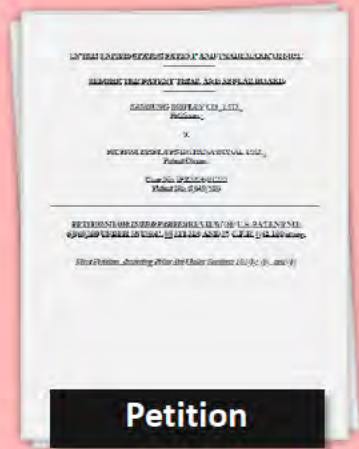
Also no disclosure of selective deposition in this embodiment



Also no disclosure of selective deposition in this embodiment

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Petition Discusses Only Why a POSITA Allegedly Would Have Fabricated Multiple Devices on a Substrate



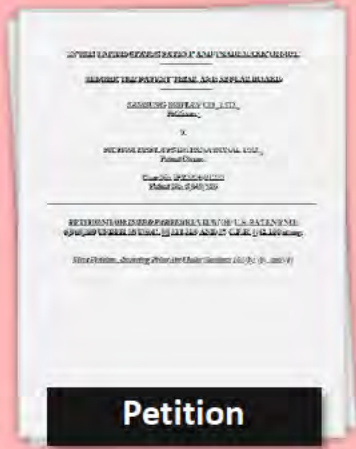
SAMSUNG

It would have been obvious to use Yamazaki's methods for *encapsulating a plurality* of such devices in batch fabrication. A POSITA would have known that flat panel displays, such as the OLED panels in Yamazaki, were conventionally manufactured in bulk on a large sheet of substrate, in order to reduce costs, increase throughput, and increase yield. Ex.1003, ¶¶73-80.

A POSITA would have been motivated to use batch fabrication when applying the methods of Yamazaki's Figures 11 and 14 for *encapsulating a plurality* of OLED display panel devices on a large sheet of substrate because such batch fabrication was the conventional mode of manufacturing display panels for OLEDs. A POSITA also would have recognized the known benefits of batch manufacture. Ex.1003, ¶¶84-85.

But Barrier Layer May Be Non-Selectively Deposited Over Multiple Devices

No Evidence of Reasonable Expectation of Success of Encapsulating Multiple Devices with Selective Deposition of A Barrier Layer



SAMSUNG

A POSITA would have had a reasonable expectation of success in using batch fabrication when applying Yamazaki's encapsulation methods because, as the '389 patent admits, it was conventional to use batch fabrication to manufacture OLED display devices with thin-film encapsulation. See '389 patent, 1:63-2:12. In addition, Ghosh, like Yamazaki, is directed to encapsulation of an OLED display device with multiple thin-film layers, where at least the first encapsulation layer 21 is selectively deposited—i.e., “patterned to leave exposed a portion of the substrate surface in between the individual OLED devices.” Ghosh, [0032].

**Not Conventional to Selectively Deposit a Barrier Layer
When There Were Multiple Devices**

Reply Still Does Not Explain Why a POSITA Would Have Selectively Deposited a Barrier Layer Over Multiple Devices in View of Prior Art



SAMSUNG

2. A POSITA would have selectively deposited a barrier layer.

The Petition explained that a POSITA would have used Yamazaki's encapsulation to manufacture a plurality of devices, as taught, for example, by Ghosh. Pet. at 19-23. The result of that modification of Yamazaki is a selectively deposited barrier layer over a plurality of devices. *Id.* Pictiva seeks to complicate the Petition's theory by suggesting that a POSITA would necessarily make a further modification in view of Ghosh. POR at 31-38. Pictiva's arguments fail.

Yamazaki expressly discloses that its "barrier layer 1106 is formed selectively using a shadow mask," Yamazaki, [0183]; Pet. at 29-32, and its figures further illustrate this:

Reply Still Does Not Explain Why a POSITA Would Have Selectively Deposited a Barrier Layer Over Multiple Devices in View of Prior Art



SAMSUNG

Pictiva argues that because Yamazaki “does not involve multiple devices on a substrate” a POSITA would have looked to references like the AAPA or Ghosh for their teachings on depositing a barrier layer. POR at 32. This argument ignores that the Petition specifically relied upon Ghosh for its teachings relating to batch fabrication, not for its teachings on depositing a barrier layer. Pet. at 20-23; Ex.1032 ¶¶22-23. Indeed, the Petition and Dr. Subramanian explained known benefits of such batch manufacture, and that a POSITA would have had a reasonable expectation of success. Pet. at 22-23; Ex.1003, ¶¶84-86; *see also* Ex.1032 ¶¶22-23.

Yamazaki's Equipment Used for Encapsulating Single Devices



United States
Patent Application Publication
Yamazaki et al.

Pub. No.: US 2003/0206332 A1
Pub. Date: Nov. 6, 2003

(2) SELF-LIGHT-EMITTING DIODE METHOD OF MANUFACTURE

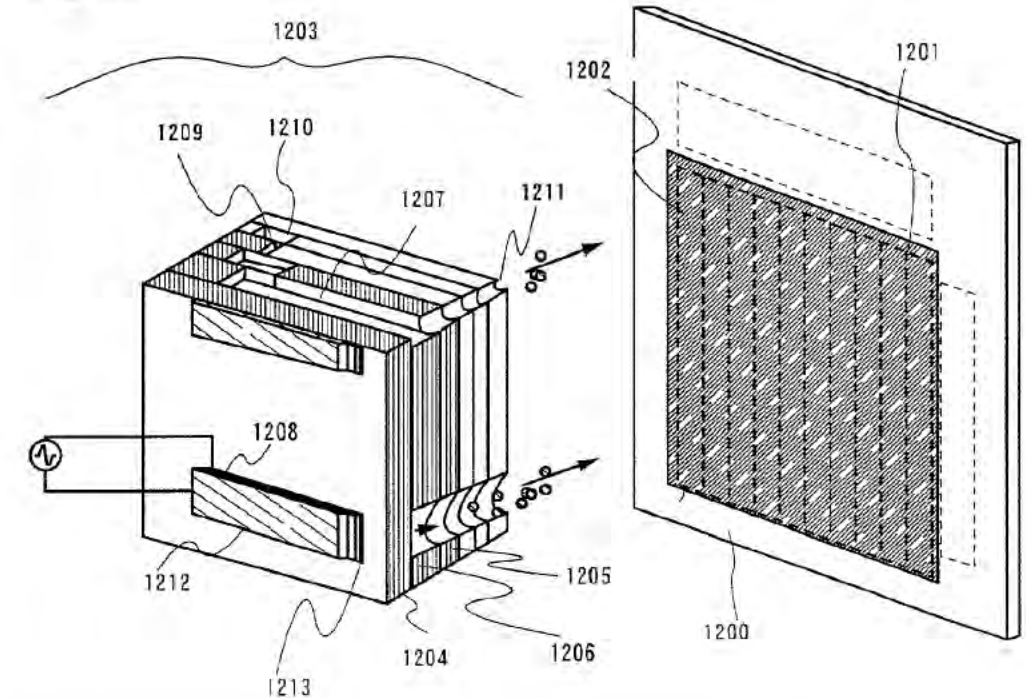
71. ADDRESS: Shantel Yumard, Inc.
North, Atlanta, Georgia
ATTENTION: ADVERT
818 E. BILKINGTON PK.
DEPT. 10, SUITE 101, N.W.
10110 KENNEDY
WASHINGTON, DC 20001-5000

1/1/20	Amey, Ben	199/117,175
1/1/20	Amey, Ben	199/117,175

[0179] Shown in FIG. 12 is the method of forming a cover layer 1202 on a pixel portion 1201 on an active matrix substrate 1200 by using the ink jet method. Note that, the application liquid for forming the EL layer and the organic resin liquid for forming the cover layer are discharged from a head 1203 in the structure shown here. Note that in the Piezo method known for the ink jet method, there are types, one being the MLP (Multi Layer Piezo) type and the other being the MLChip (Multi Layer Ceramic Hyper Integrated Piezo Segments) type. The head 1203 shown here is one

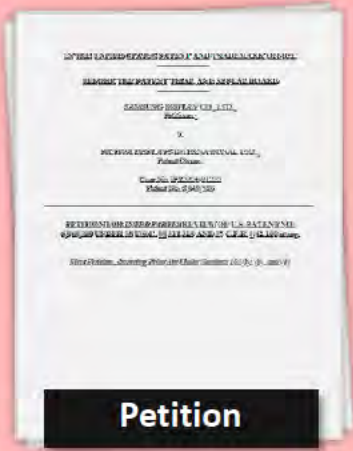
EX1005 [0179]; POR 34; Sur-Reply 14

Fig.12



No Evidence that Yamazaki's Method Could be Extended to Multiple Devices

No Evidence that Yamazaki's Method Ready for Batch Manufacturing



SAMSUNG

It would have been obvious to use Yamazaki's methods for *encapsulating a plurality* of such devices in batch fabrication. A POSITA would have known that flat panel displays, such as the OLED panels in Yamazaki, were conventionally manufactured in bulk on a large sheet of substrate, in order to reduce costs, increase throughput, and increase yield. Ex.1003, ¶¶73-80.

A POSITA would have been motivated to use batch fabrication when applying the methods of Yamazaki's Figures 11 and 14 for *encapsulating a plurality* of OLED display panel devices on a large sheet of substrate because such batch fabrication was the conventional mode of manufacturing display panels for OLEDs. A POSITA also would have recognized the known benefits of batch manufacture. Ex.1003, ¶¶84-85.

Yamazaki's Method Too Immature as a Starting Point for Encapsulating Multiple Devices



Mr. Humphrey
Expert Witness



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1. Yamazaki's Methods Are Too Immature to Use a Starting Point for "Reduce[d] Costs, Increase[d] Throughput, and Increase[d] Yield"

56. As the Board noted, "Petitioner relies on Yamazaki as a starting point to show that encapsulating a plurality of devices on substrate with selectively deposited planarization and barrier layers as recited in the challenged claims was known in the prior art." D.I. 16. But as noted above, Yamazaki discloses encapsulating a single device on a substrate, not multiple devices on a substrate. *See* ¶¶ 48-49 above. Yamazaki would therefore not be regarded as a starting point for encapsulating a plurality of devices on a substrate.

EX2046, para. 56; POR 34

Yamazaki's Method Too Immature as a Starting Point for Encapsulating Multiple Devices



Mr. Humphrey
Expert Witness



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58. A person of ordinary skill in the art would immediately recognize that reduced costs, increased throughputs and increased yields are concerns specific to manufacturing and commercialization. In that context, a person of ordinary skill in the art would not have looked to Yamazaki's experimental processes, because Yamazaki's methods are far from ready for manufacturing. Just like methods for making a one-of-a-kind product are unlikely suitable for mass production, one would not look to Yamazaki when they were looking for manufacturing methods amenable to reduced costs, increased throughputs and increased yields at the time of the invention.

EX2046, para. 58; POR 34

Yamazaki Requires the Same Deposition Method for EL and Cover Layer

(57)

ABSTRACT

To provide a process of successively forming from an EL layer, a cathode, a barrier layer and a cover layer in the same multi-chamber. By using a same film deposition method to form the EL layer and the cover layer, as shown in FIG. 1A, the EL layer, the cathode, the barrier layer, and the cover layer can be formed in the same multi-chamber in succession. Thus, as shown in FIG. 1B, a sealed structure of an EL element can be formed.

[0035] As thus explained, because the same method is used in forming the EL layer and the cover layer, the layers may be selectively formed only at the desired positions and may be processed in the same chamber.

SUMMARY OF THE INVENTION

[0011] The multi-chamber employed for the purpose of attaining the above object is a film deposition device which has an application chamber for forming the EL layer and the cover layer made of an organic material by the ink jet method or the electric field application method, an evaporation chamber for forming the cathode by evaporation, and a sputtering chamber for forming the barrier layer made of silicon nitride or tantalum oxide.

[0179] Shown in FIG. 12 is the method of forming a cover layer 1202 on a pixel portion 1201 on an active matrix substrate 1200 by using the ink jet method. Note that, the application liquid for forming the EL layer and the organic resin liquid for forming the cover layer are discharged from a head 1203 in the structure shown here. Note that in the Piezo method known for the ink jet method, there are types, one being the MLP (Multi Layer Piezo) type and the other being the MLChip (Multi Layer Ceramic Hyper Integrated Piezo Segments) type. The head 1203 shown here is one

EX1005, Abstract, [0011], [0035], [0179]; POR 34-37; Sur-Reply 12, 14

Different Challenges for Inkjet Printing of EL and Cover Layer



Dr. Antoniadis
Expert Witness

SAMSUNG

hit. We're talking about inkjet printing red, green, and blue materials. I'm looking at converse, comparison versus TFE. The technology is very different. So to print red, green, and blue, all that materials, the nozzle technology is very different.

Printing the TFE, it requires a completely different inkjet printing technology.

As a matter of fact, it's made by a different vendor. So the throughput of materials in one is totally incompatible with the other and vice versa.

The placement accuracy is very different. So let's make sure that we make the distinction that developing, let's say, TFE, doesn't qualify you for full color and vice versa, developing full color doesn't qualify you for TFE. These are different engines, right, so you cannot infer one from the other.

EX2031, 142:1-19; POR 34-35; Sur-Reply 13-14

Inkjet Printing for EL and Cover Layer Is “Very Different”



Dr. Antoniadis
Expert Witness

SAMSUNG

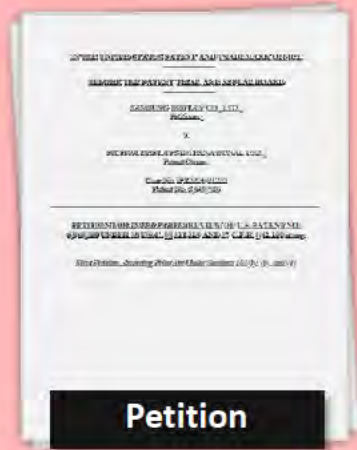
Q. Are you saying that the inkjet printing technology for TFE encapsulation is very different than the inkjet printing technology for the OLED pixel areas?

A. Yes. Yes. That's a good question. Very different indeed. And the proof to this is

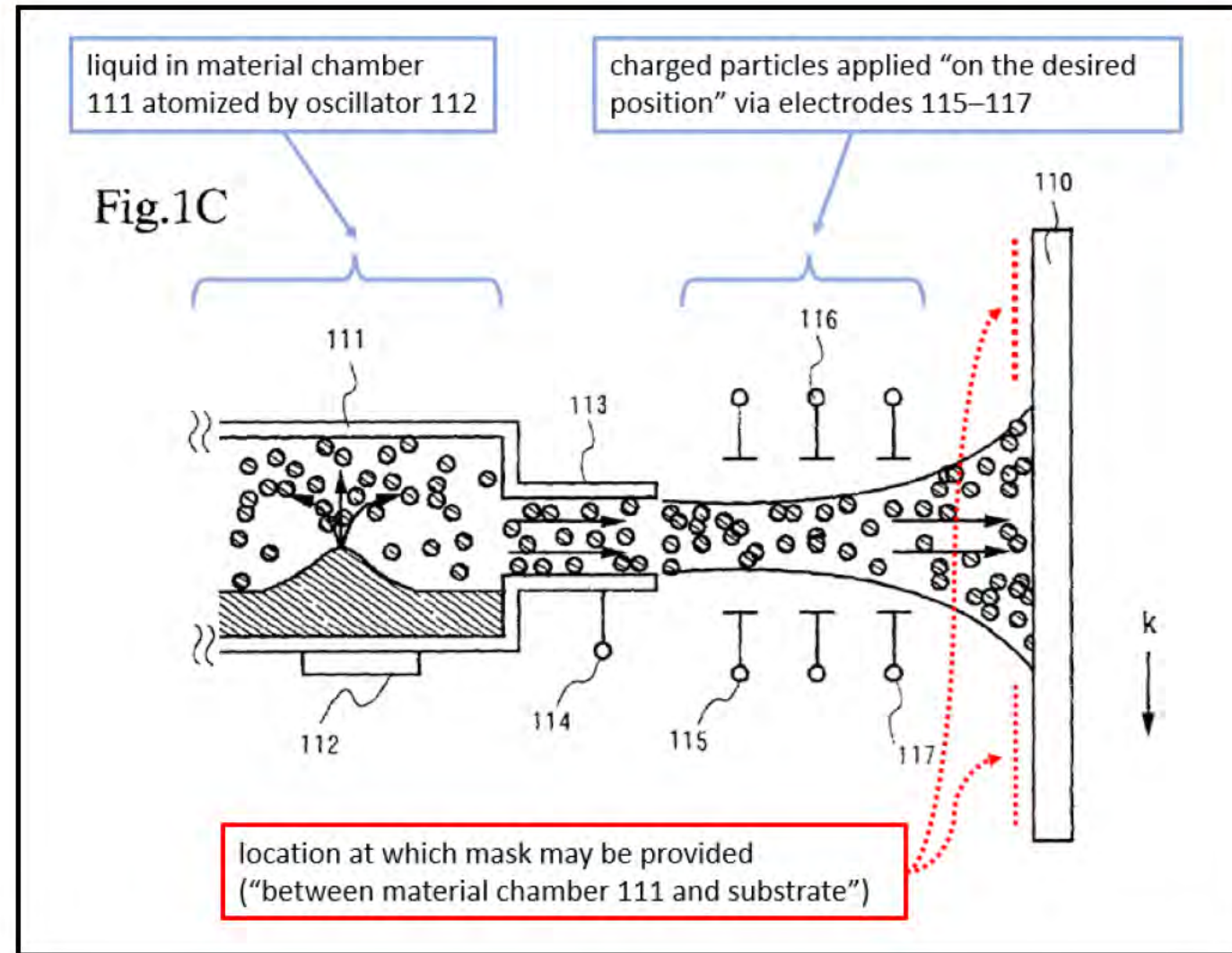
EX2031, 142:20-25; POR 34-35; Sur-Reply 13-14

Yamazaki Plus Fujimori

Petitioner's Own Theory Places a Mask Some Distance Away from Substrate



SAMSUNG



No Evidence that Improved Adhesion Would Benefit Yamazaki



Mr. Humphrey
Expert Witness



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93. Fujimori proposes using “a mask attached to a substrate with magnetic force” to improve adhesion between the mask and the substrate in order “to achieve fine pattern processing with the mask.” EX1014, [0009]-[0010]. As a preliminary matter, Yamazaki’s mask is not intended to be adhered to the substrate. For example, Yamazaki mentions in passing that “a mask may be provided between the material chamber 111 and the substrate to thereby control the positions on the substrate at which the application liquid is via the mask.”

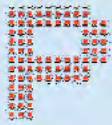
Yamazaki, [0086]. Providing a mask “between the material chamber ... and the substrate” would indicate to a person of ordinary skill in the art that the mask is not in contact with the substrate, but placed some distance away from the substrate. If the mask is not even in contact with the substrate, then there would be no reason to improve the adhesion between the mask and the substrate. That is, there is no reason to use Fujimori’s mask to supposedly improve adhesion.

EX2046, para. 93; POR 44

The State of Art Indicates Non-Obviousness



Mr. Humphrey
Expert Witness



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94. Additionally, despite the proposed benefits of using a magnetically adhered mask, which was known in the art since the 1970s, I have never known of an instance where a magnetically attached shadow mask was used in connection with an electric field application method, such as that described in Yamazaki. Similarly, electrostatic chucks commonly used in the display industry to accurately align and secure substrates, especially for masked film deposition processes, are not commonly used in conjunction with magnetic masks to my knowledge.

EX2046, para. 94; POR 47-48

The State of Art Indicates Non-Obviousness



Mr. Humphrey
Expert Witness



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95. I understand that Dr. Subramanian had used magnetic masks and had separately used methods similar to Yamazaki's electric field application method, but never the two together. EX2020_2025-05-30_Final, 73:10-74:1. I also understand that Dr. Subramanian testified that he was not aware of anyone ever combining electric field application method with a magnetic mask in OLED or other application, at the time of the invention or since then, whether in commercialization or in research. EX2020_2025-05-30_Final, 70:6-74:1. Thus, it appears that his experience is similar to mine. In my view, the fact that no POSITAs or even experts have ever combined the use of a magnetic mask with an electric field application, despite the passage of more than 24 years since the invention, is a strong indication that the combination is not obvious.

EX2046, para. 95; POR 48

The State of Art Indicates Non-Obviousness



Dr. Subramanian
Expert Witness

SAMSUNG

Q. So you have never seen anyone using the combination of electric field application method together with a magnetic shadow mask, even after the priority date?

A. Certainly, I cannot, off the top of my head, recall any singular piece of art that has those.

Again, it's not something I specifically found in my analysis because I was doing an obviousness analysis, and the combination was sufficient.

But I have not found a singular piece of art that has both of them in the same piece of art.

EX2020, 70:6-19; POR 47-48

The State of Art Indicates Non-Obviousness



Dr. Subramanian
Expert Witness

SAMSUNG

You are familiar with this field;
correct? The OLED field?

A. Yes, very much so.

Q. Are you aware of any group that actually
uses that combination in their research?

A. Not that I can specifically recall, but
again, I haven't looked.

EX2020, 71:11-17; POR 47-48

The State of Art Indicates Non-Obviousness



Dr. Subramanian
Expert Witness

SAMSUNG

Are you aware of any, like,
industrial practice in which the electric field
application, together with the magnetic shadow mask
are used in combination?

A. Again, your question is specific to
OLEDs; correct?

Q. Sure.

A. Again, my answer is the same. I
couldn't say one way or another, and I certainly
haven't looked.

Q. Okay.

What about outside of the field of
OLEDs?

A. My answer would be the same. I don't
know. I haven't looked.

EX2020, 72:1-15; POR 47-48

The State of Art Indicates Non-Obviousness



Dr. Subramanian
Expert Witness

SAMSUNG

Have you used magnetic masks in any of your deposition?

A. Yes.

Q. Have you ever used electrical field application method?

A. Not the same electric field application method shown in Figure 1C, but methods that are somewhat similar, yes.

Q. Okay.

Do you use masks in those application methods?

A. Yes.

Q. But you've never used a magnetic one?

A. That's correct. Not in that.

EX2020, 73:10-74:1; POR 47-48

EM Interactions Complicate Deposition



Mr. Humphrey
Expert Witness



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97. This is not surprising because the addition of a magnetic field to the back of the substrate (in order to hold the masks) would have a complicated and unpredictable effect on the flight path of the charged particles of the organic materials to be deposited. For instance, Samsung states that the “electromagnet” used to adhere the mask “can electrically control the switching of the magnetic field.” Pet. 52. But that electromagnet and the associated force would be expected to alter the force operating on the charged particles. The electromagnet would affect the trajectory of the charged particles to be deposited on the substrate and there is no indication that the resulting combined forces could be controlled to reliably deposit the cover layer to the selected spots.

EX2046, para. 97; POR 46

No Evidence a POSITA with One-Year of Relevant Experience Could Handle the Complexity



Mr. Humphrey
Expert Witness



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distance from the magnet as well as the angle. As a result, there would not only be particle-to-particle variation within a material stream but also a time-dependent variation as the particles fly from the material chamber towards the substrate, to the back of which a magnetic is attached at certain places. This would introduce unpredictable change in the particles' trajectories, making it impractical to control the positions at which the particles will be deposited. This is particularly problematic given the fine scales on which the pixels are distributed.

100. That is why Fujimori does not disclose or suggest that its magnetic mask and the attendant magnets used to adhere the mask would be suitable for any and all deposition methods. In particular, Fujimori never mentions the electric field application method or ink-jet method as a suitable deposition method with its modified masks. See EX1014, [0041] (evaporation), [0044] (same), [0046] (same), [0050] (same). Thus, a person of ordinary skill in the art would not view applying the magnetic mask to Yamazaki's electric field application method as applying a known method to a similar application case with predictable results.

EX2046, para. 99-100; POR 46

No Evidence a POSITA with One-Year of Relevant Experience Could Handle the Complexity for Selective Deposition



Mr. Humphrey
Expert Witness



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distribution for their velocities. *Id.*, 77:9-78:8. But there is not just a single Gaussian distribution, but multiple distributions dependent on the number of nozzles. They might differ from one another by only a small amount, but on top of those small deviations, you also have to add in the deviation from the added magnetic field. Thus, the particle-to-particle variations, the nozzle-to-nozzle variations, and the pass-to-pass variations, among other variations, just multiply over multiple devices. A small deviation for a single area could develop into a major problem when dealing with multiple devices on a substrate. For example, a 99.9% per-ejection accuracy rate would correspond to a 36.8% defect-free rate over a 1000 ejections; whereas the defect-free rate increased to 90.5% with a 99.99% per-ejection accuracy rate.

EX2046, para. 101; POR 46-47

Weaver Grounds

Weaver Grounds Do Not Render Obvious the Challenged Claims

- **Petition does not discuss why Weaver discloses a “planarization layer” as properly construed**
- Weaver does not teach “selectively depositing” planarization layer or barrier layer
- Weaver in view of Palanisamy does not disclose or suggest inkjet printing a planarization layer

34 b. selectively depositing **at least one planarization layer** upon said devices; and

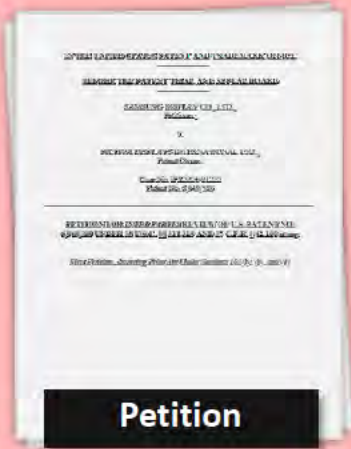
Court's Construction

“planarization layer”

“a layer of material that planarizes such that the propagation of defects from one layer to another layer can be interrupted and the topography of the underlying layer is not reproduced”

Claim Construction Order (EX2048) at 49.

The Petition Does Not Analyze “Planarization Layer” as It Proposes in District Court



SAMSUNG

This planarizing layer 151a constitutes a *planarization layer* because it is used to form a smooth planar surface. Weaver explains that its “planarizing layers” are made from a “layer of planarizing material,” which “mean[s] a material that forms a smooth planar surface upon application, rather than forming a surface that reflects irregular contours of the underlying surface.” *Id.*, [0035].

Pet. 71

Samsung Argues that the "Topography" Requirement Is to Prevent Creases and Cracks in the Barrier Layer

Mr. Pak

SDC Counsel

SAMSUNG

MR. PAK: So when you don't reproduce the topography of the underlying layer, for example, here we see a much flatter smoother contour with the planarization layer, so when you put the metal layer on top of that, it doesn't have the sharp creases and cracks, so it's much less likely that the barrier layer itself will have defects and cause air or moisture to seep through.

So to us, Your Honor, these -- both of these functions were highlighted during prosecution to distinguish over just putting barrier layers on top of each other, for example, and that's because these two functions--shielding defects from traveling upwards and then providing a substantially smoother surface--are both important aspects of the planarization layer, and that's the reason why we proposed the language, Your Honor.

EX2019, 38:6-20; Sur-Reply 1

The "Topography" Requirement Must Be Met Even When There Are No Defects in the Underlying Layer

Mr. Pak

SDC Counsel

SAMSUNG

MR. PAK: Yes. We do believe from an engineering standpoint it is important. Because if you remember, the barrier layer is actually protecting the underlying OLED device from moisture and air, so even if there are no defects underneath that layer, if there are cracks that form or creases that form that over time causes air or moisture to seep into the OLED device, you have an issue. And that's the reason why this technique that the patentee was trying to improve upon requires a planarization layer that smoothes out the surface before you put down the barrier layer so that the barrier layer can be thin but it's being put down in a flat fashion so it doesn't have creases and cracks because it doesn't have to follow the contour of the OLED device underneath it.

Weaver Contains No Disclosure of Defects



Dr. Subramanian
Expert Witness

SAMSUNG

Now, does Weaver mention defects?

A Weaver doesn't specifically use the words "defects."

He does say in paragraph 35, "By planarizing material is meant a material that forms a smooth planar surface upon application, rather than forming a surface that reflects irregular contours of the underlying surface."

So that would cover both intentional and unintentional topography, including defects.

But it's true that he doesn't specifically use the word "defects" here.

EX2050, 132:13-24; Sur-Reply 16

Defects Do Not Necessarily Exist in Weaver



Dr. Subramanian
Expert Witness

SAMSUNG

Q Does "irregular contours" necessarily mean there was a defect?

A No. But as I said it would cover both intentional and unintentional irregularities.

EX2050, 132:25-133:3; Sur-Reply 16

Weaver's Organic Layers Follow the Topography of the Underlying Layers

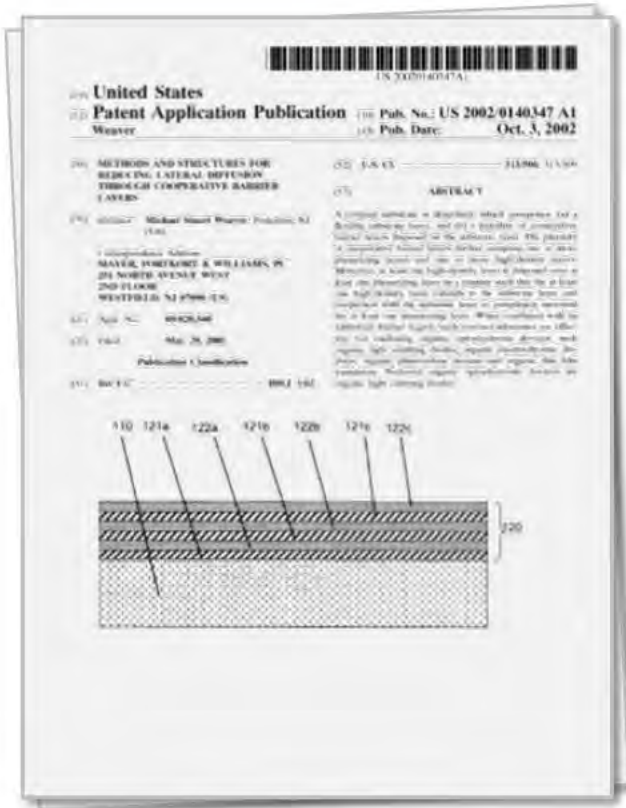
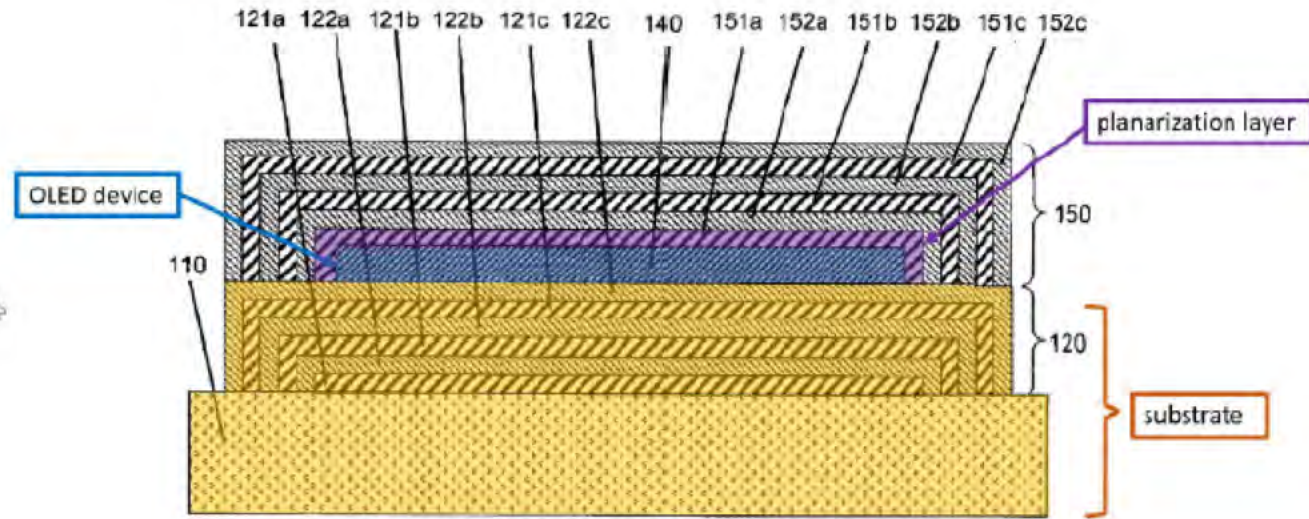


Fig. 6

- **Layers 151a-c Follow the General Contours of 152a-c**
- **Folds and creases that exist in underlying layers also exist in alleged planarizing layers and barrier layers above**
- **No evidence of ability for reduced cracks and creases**

POR 55-58

Weaver's Organic Layers Follow the Topography of the Underlying Layers



Mr. Humphrey
Expert Witness



pictiva displays

116. Additionally, Weaver actually follows the topology of the underlying layers, and therefore also does not meet the requirement that “the topography of the underlying layer and/or structure is not reproduced” in the agreed-to construction.

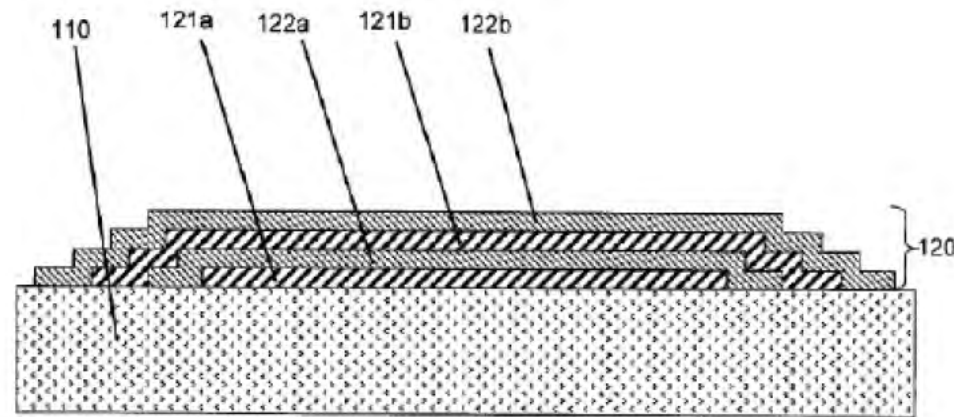


Fig. 5

EX2046, para. 116; POR 56-57

Weaver's Organic Layers Follow the Topography of the Underlying Layers



Mr. Humphrey
Expert Witness



pictiva displays

117. For example, in Figure 5 above, planarizing layer 121a follows the surface topology of the underlying substrate 110 and the planarizing layer 121b follows the topology of high-density layer 122a. For instance, where the high-density layer 122a has steps along the edges of the deposition, so does 121b. And where the substrate has a general flat topology (except for unintentionally created surface irregularity), the planarizing layer also has that topology. In other words, Weaver's "planarizing layer" reproduces the topology of the underlying layer.

Similarly in Figure 6 below as well as in Figure 7, layers 151a-c follow the topology of the underlying layers 140, 152a-b respectively.

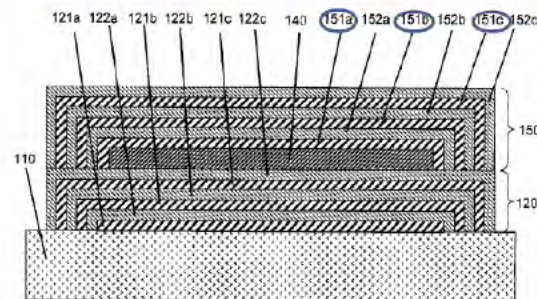


Fig. 6

EX2046, para.
117; POR 56-57

Weaver Ground Does Not Render Obvious the Challenged Claims

- Petition does not discuss why Weaver discloses a “planarization layer” as properly construed
- **Weaver does not teach “selectively depositing” planarization layer or barrier layer**
- Weaver in view of Palanisamy does not disclose or suggest inkjet printing a planarization layer

Final Configuration Does Not Establish Selective Deposition



Mr. Humphrey
Expert Witness



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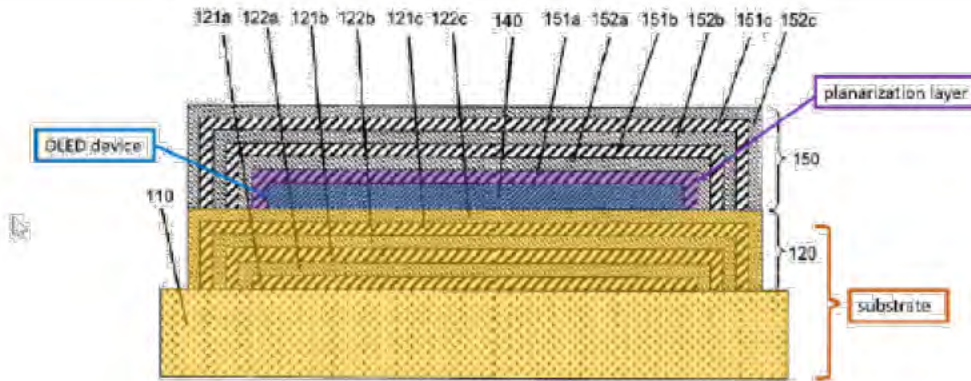


Fig. 6

119. The final configuration does not inform how that configuration is obtained. For example, the same configuration in Figure 6 can be obtained through non-selective deposition followed by patterned etching, as was well known. *E.g.*, EX1001, 2:21-23 (discussing “additional processing ... for the removal the PML structure over [certain] areas”), EX1006-Ghosh, [0032] (patterning to expose substrate surfaces can be done by “ablation ... following layer formation”).

EX2046, para.
119; POR 59

Figure 8 Describes Processes for Encapsulating “Substrate Material,” Not Devices



Mr. Humphrey
Expert Witness



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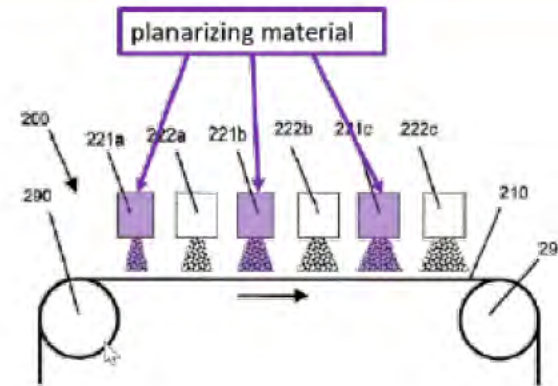
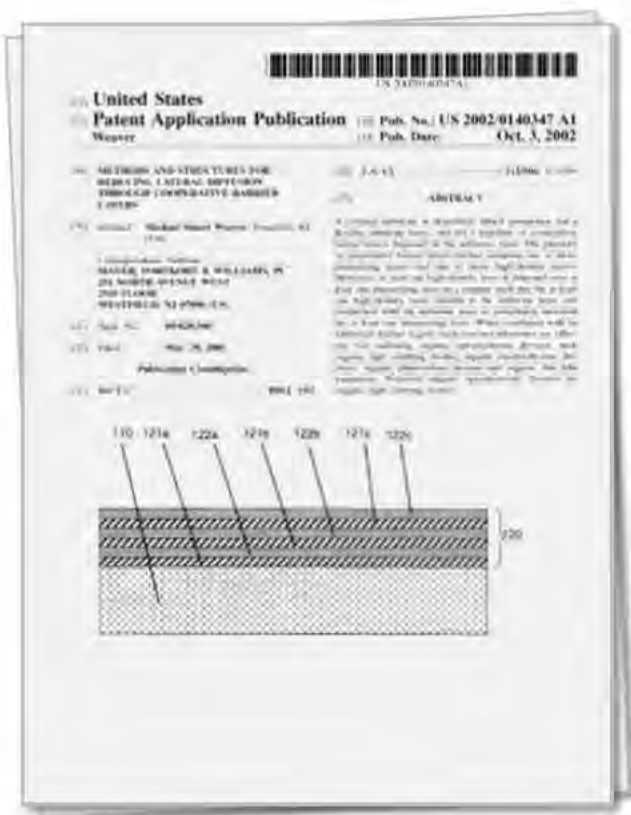


Fig. 8

122. But as Weaver makes clear, Figure 8 (and Figure 9) as well as [0057]-[0059] relate to forming barrier region 120s over the substrate to form a covered substrate, not about sealing the OLED structure 140. For example, Weaver states, “FIG. 8 is a schematic diagram of an apparatus for forming the covered substrate of Fig. 2” [0022]; see also [0023] (Fig. 9 is also for illustrating “forming the covered substrate Fig. 2”). Figure 2, “is a cross-sectional view of a covered substrate ...” and Figure 2 does not have any device above the covered substrate.

EX2046, para.
119; POR 59

Figure 8 Describes Processes for Encapsulating “Substrate Material,” Not Devices



[0054] The formation of planarizing and high-density layers over a substrate material will now be discussed in connection with **FIGS. 4a-4g, FIG. 8** and **FIG. 9**. Referring now to **FIG. 4a**, a first planarizing material layer **121a** is first deposited on a substrate **110**. (As previously noted, a high-density layer can be deposited first, rather than a planarizing layer). Subsequently, as shown in **FIG. 4b**, a first high-density material layer **122a** is deposited over the first planarizing material layer **121a**. The area covered by the first high-density material layer **122a** is sufficiently larger than the area of the first planarizing material layer **121a**, such that the first high-density material layer **122a** completely covers the first planarizing material layer **121a** and extends to the substrate **110** on all sides. In this way the first high-density material layer **122a** and the substrate **110** together act to completely enclose the first planarizing material layer **121a**.

EX1008, [0054];
POR 60-62

Figure 8 Describes Processes for Encapsulating “Substrate Material,” Not Devices

[0057] Deposition of progressively larger cooperative barrier layers can be achieved in a number of ways. Preferred techniques are continuous techniques such as web-based processing techniques. An apparatus 200 containing various rolls (only rolls 290 are shown) for material movement, material cooling and so forth, as well as other components such as ultraviolet curing lights, is illustrated in FIG. 8. Using this apparatus 200, a web of substrate 210 is passed under several deposition sources 221a-c and 222a-c within a web-coating apparatus. In this embodiment, sources 221a-c are used for the deposition of materials for planarizing layers, while sources 222a-c are used for the deposition of materials for high-density layers. Preferred sources are thermal evaporation, sputtering, PECVD and electron beam sources for the high-density layers, and thermal evaporation, organic vapor phase deposition (OVPD), chemical vapor deposition (CVD), spraying and flash evaporation sources for the planarization layers.

[0058] An arrow indicates the direction of substrate 210 movement within apparatus 200. Deposition source 221a, is first used to deposit first planarizing material layer 121a. Then, deposition source 222a is used to deposit first high-density material layer 122a, deposition source 221b is used to deposit second planarizing material layer 121b, deposition source 222b is used to deposit second high-density material layer 122b, deposition source 221c is used to deposit third planarizing material layer 121c, and deposition source 222c is used to deposit third high-density material layer 122c.

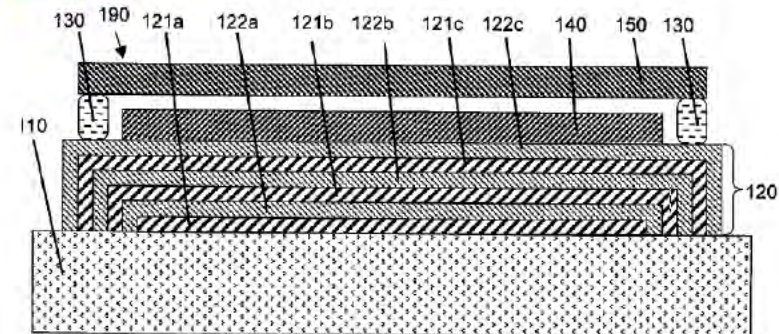


Fig. 4g

EX1008, [0057]-[0058]; POR 60-62

- Layers 121a-c and 122a-c are for covering substrate materials
- Structure 150 are for encapsulating devices

Encapsulating Substrates Differs from Encapsulating Devices



Mr. Humphrey
Expert Witness



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125. But unlike substrates before any device attachment in Figures 2, 4g and 5, which do not contain any circuitry elements and need to leave uncovered electrical contact pads and are therefore more tolerant of positional misalignment, the barrier region 150 in Figure 6 may need to take these into consideration. There is no evidence that Weaver's progressive deposition technique could handle the more demanding sealing of OLED devices.

EX2046, para. 125; POR 62

Weaver's Web-Based Process in Figure 8 is Roll-to-Roll Process



Dr. Subramanian
Expert Witness

SAMSUNG

Q And Weaver's web process is also called roll-to-roll process?

A It doesn't have to be. But it is certainly true that one way of describing -- one way of implementing a web-based process is roll-to-roll. Not all web-based processes are necessarily roll-to-roll.

Q What about the steps shown in figure eight is that roll-to-roll?

A It appears to be. It doesn't show it completely, because it doesn't show the input and output, so to speak.

Q Yeah.

A But it certainly would be consistent with a roll-to-roll process.

EX2050, 134:15-135:4; Sur-Reply 19

Undisputed: Selective Deposition of Barrier Layer Unavailable for Roll-to-Roll Process Even in 2015

Inkjet Technology For OLED SSL Mass Production



Conor Madigan, PhD, President
January 28, 2015

Exhibit
6

06/04/2025

File: E2100
Samsung v. Kateeva
IPR2014-01772

Applying Direct Coated TFE to R2R

- Inkjet already well suited to R2R – so same approach applies well for the organic layer
 - Kateeva roadmap includes R2R
- For the inorganic layer the only option in R2R is blanket coating followed by removal material at the end of the process (Option 2 stack)
- There are a variety of ways to do this: (1) laser (if it is fast and clean enough); or (2) IJP etch mask and dry etch

Weaver Ground Does Not Render Obvious the Challenged Claims

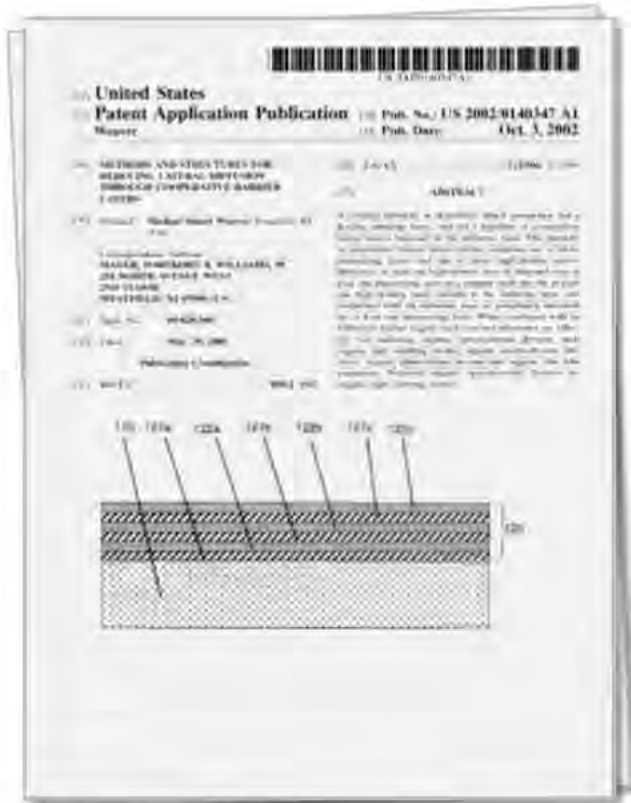
- Petition does not discuss why Weaver discloses a “planarization layer” as properly construed
- Weaver does not teach “selectively depositing” planarization layer or barrier layer
- **Weaver in view of Palanisamy does not disclose or suggest inkjet printing a planarization layer**

Neither Weaver Nor Palanisamy Discloses Inkjet Printing of a Planarization Layer

Reference	What is Missing
Weaver	<ul style="list-style-type: none">• No inkjet printing• No claimed planarization layer
Palanisamy	No disclosure of planarization layer under any definition

Weaver + Palanisamy Does Not Render Obvious Claim 35

Weaver Does Not Disclose Inkjet Printing



[0057] Deposition of progressively larger cooperative barrier layers can be achieved in a number of ways. Preferred techniques are continuous techniques such as web-based processing techniques. An apparatus 200 containing various rolls (only rolls 290 are shown) for material movement, material cooling and so forth, as well as other components such as ultraviolet curing lights, is illustrated in FIG. 8. Using this apparatus 200, a web of substrate 210 is passed under several deposition sources 221a-c and 222a-c within a web-coating apparatus. In this embodiment, sources 221a-c are used for the deposition of materials for planarizing layers, while sources 222a-c are used for the deposition of materials for high-density layers. Preferred sources are thermal evaporation, sputtering, PECVD and electron beam sources for the high-density layers, and thermal evaporation, organic vapor phase deposition (OVPD), chemical vapor deposition (CVD), spraying and flash evaporation sources for the planarization layers.

EX1008, [0057];
POR 60-62

Palanisamy Does Not Disclose Using Inkjet Printing to Deposit Planarization Layer



[0021] To overcome these and other problems, the passivation may be selectively applied. In other words, the passivation may be selectively applied to the areas coated by the OLED while excluding areas where passivation would be undesirable, such as the areas proximate to the contacts 28. One selective, passivation deposition technique, shown in FIG. 3, involves an ink jet printer 44 to selectively apply passivation to areas 42 while leaving areas 40 over the display panel 20 uncovered. The ink jet printer 44 is capable of applying the passivation material through a nozzle 46 at a very high rate. In this way, passivation may be selectively applied.

EX1007, [0021];
POR 64

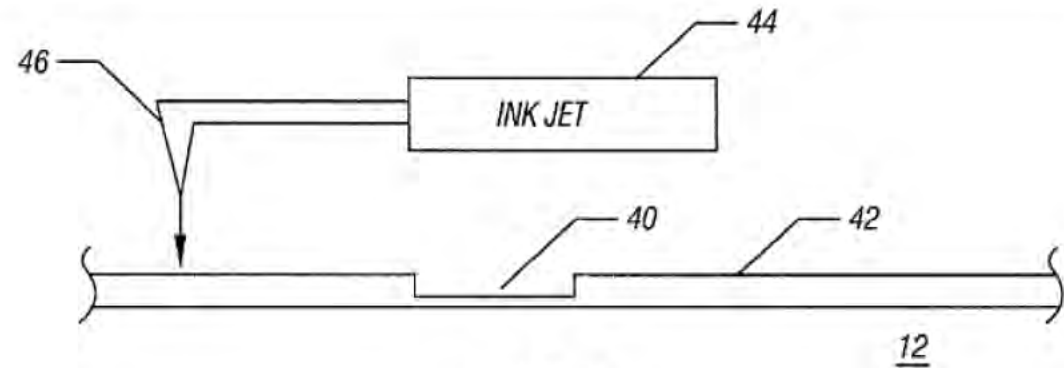


FIG. 3

Palanisamy's Passivation Layer is Not a Planarization Layer



Dr. Subramanian
Expert Witness

SAMSUNG

But I do have the two declarations from this matter in front of me. And it's true for -- from my reply declaration I do not contend that Palanisamy teaches planarization with respect to the layer in question.

THE WITNESS: So with respect to Exhibit No. 1003, for this matter --

MS. ZHONG: Uh-huh.

THE WITNESS: -- I do not specifically use any teachings of Palanisamy to claim that Palanisamy is teaching planarization.

EX2050, 93:16-20, 94:6-11; Sur-Reply 22-25

BACK-UP SLIDES

Samsung's Claim Construction Expert Confirmed the District Court Claim Construction for Planarization Layer is Correct



Dr. Schubert
Expert Witness

SAMSUNG

56. One characteristic of the “planarization layer” is that the layer of material planarizes. The '389 patent makes clear throughout that the material in the “planarization layer” acts to add a layer on top of another layer that makes the surface more “planar,” or flatter. In the

EX2002 (Schubert Decl.) at ¶ 56.

Samsung's Claim Construction Expert Confirmed the District Court Claim Construction for Planarization Layer is Correct

First Planarization Prong

Propagation of defects from one layer to another can be interrupted



Dr. Schubert
Expert Witness

SAMSUNG

57. Another well-accepted characteristic of a planarization layer that goes hand in hand with planarizing is that the layer of material interrupts the propagation of defects from one layer to another layer. *See, e.g., '389 patent at 4:33-41* (“It should be appreciated that layer 304 could

EX2002 (Schubert Decl.) at ¶ 57.

58. A layer of material that does not have this smoothing over property is not a planarization layer. *The applicants stated that a material cannot be a “planarization layer” where*

EX2002 (Schubert Decl.) at ¶ 58.

Samsung's Claim Construction Expert Confirmed the District Court Claim Construction for Planarization Layer is Correct

Second Planarization Prong Topology of underlying layer is not reproduced



Dr. Schubert
Expert Witness

SAMSUNG

59. The applicants also stated “metals cannot be used as a planarization layers” because “[m]etals . . . that are evaporated onto a layer do not cover-up the imperfections of the underlying layer, but rather the metals reproduce the topography of the underlying layer.” Nov. 24, 2003 Response to Non-Final Rejection at 16. Thus, the applicants made clear that the “planarization layer” they claimed could only encompass a layer that “cover[s]-up the imperfections of the underlying layer” and that does not “reproduce the topography of the underlying layer.”

EX2002 (Schubert Decl.) at ¶ 59.

Dr. Subramanian Agrees the District Court Construction of “Planarization Layer” is Reasonable



Dr. Subramanian
Expert Witness

SAMSUNG

Samsung’s district court constructions are “generally reasonable claim constructions.”

EX2020 (First Subramanian Dep.) at 212:9-213:9

The district court’s construction of “planarization layer” is “certainly a reasonable construction”

EX2049 (Second Subramanian Dep.) at 27:12-28:17

Mr. Humphrey Agrees With (and Applied) the District Court Claim Construction for Planarization Layer



Mr. Humphrey
Expert Witness



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25. In my opinion, the agreed construction of “planarization layer” is consistent with the ’389 patent and prosecution history, and therefore I have applied that construction below in Section VI, which addresses whether the cited prior art discloses the recited “planarization layer.” I may also refer to certain

EX2018 (Humphrey Decl.) at ¶ 25.

Duthaler Does Not Use Inkjet Printing for OLED Encapsulation



Mr. Humphrey
Expert Witness



pictiva displays

116. Duthaler also does not suggest using inkjet for depositing the organic sealing layer. Duthaler discloses “an addressing device for an electronic display,” and “printing an encapsulant for protecting a portion of the addressing device.” EX1016-Duthaler, 2:5-6, 2:13-30, 21:24-25:22. Duthaler, however, does not discuss OLED displays, but electrophoretic displays. *Id.*

EX2047 (Humphrey Decl.) at ¶¶ 116-117 (citing EX2024, 2)

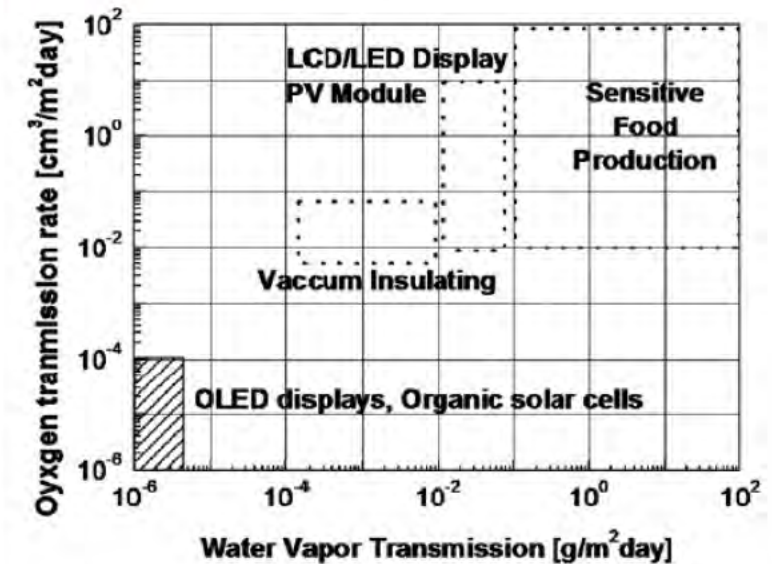


Figure 1. Barrier requirements for different applications.

Subramanian Confirmed That Duthaler's Inkjet Printing Is Not For OLED Materials



Dr. Subramanian
Expert Witness

SAMSUNG

But Duthaler doesn't really use inkjet printing for the OLED portion.

It's for some other circuits; right? That we agree.

A Given that Duthaler is really focused on the circuit elements that control the display, not on the light-emittance elements itself.

And in certainly looking at the figures, that appears to be true.

EX2050 (Second Subramanian Dep.) at 98:23-100:6

Sturm Discloses Inkjet Printing of EL Layer



SAMSUNG

Pictiva disputes that a POSITA would have deposited Weaver's organic layer using inkjet printing. POR at 63-71. Pictiva largely repeats criticisms of the use of inkjet to selectively deposit encapsulation layers generally, which fail for the same reasons described for Grounds I-II. Pictiva again points to Sturm's disclosures relating to the thickness of its inkjet printed layer, but as Dr. Subramanian explains, Sturm was focused on depositing an EL layer, not an encapsulation layer. Ex.1032

Sturm Does Not Use Inkjet Printing to Deposit a Sealing/Encapsulation Layer