

United States Patent and Trademark Office
Before the Patent Trial and Appeal Board

BOE Technology Group Co., Ltd.

(Petitioner)

v.

Optronic Sciences LLC,

(Patent Owner)

Inter Partes Review

No. IPR2024-01131 | U.S. Patent No. 7,226,801

Petitioner's Demonstratives

Claim Construction

Agreed Construction of “Layer” (All Claims)

Parties have agreed to the definition of “layer”

Parties Agreed Construction

“one or more material layers”

Ex. 1024, Patent Owner’s Reply Claim Construction Brief at 6; Reply at 7-9.

PO Sur-Reply does not address the “layer” construction.

PO Sur-Reply at 9.

Construction of “formed on” (all claims)

Patent Owner Abandoned Construction It Initially Offered

Petitioner’s Proposed Construction	PO’s Proposed Construction
Plain and Ordinary meaning, including both directly formed on and indirectly formed on	Plain and Ordinary meaning, which is “forming in a manner directly touching the below layer or substrate”

Reply at 10-13;
see generally Pet. at 23-27, 40, 54-61, 75.

POR at 29-38.

PO Sur-Reply does not address the “formed on” construction.

Sur-Reply at 9.

Construction of “predetermined angle” (all claims)

Patent Owner’s Ambiguous Narrowing Construction Has No Support

Petitioner’s Proposed Construction	Petitioner’s Proposed Construction
Plain and Ordinary meaning, “not limited to any particular range of angles”	Plain and Ordinary meaning, “not limited to any particular range of angles” but “requires a predetermination of the angle” such that “if a designer merely used a selected technique for making an opening without caring about what angle would result, this would not be a ‘predetermined angle’”

Reply at 13-14;
see generally Pet. at 3,-4, 23-27, 40, 54-61, 75.

POR at 38; Sur-Reply at 9.

Construction of “predetermined angle” (all claims)

POSITA Would Understand and Desire Certain Angles Based on Implementation

20 Q And so you would agree that a POSITA at
21 the time of the '801 patent would have understood
22 it to be desirable for the sidewalls of a via to

1 be as close to vertical as possible?

2 MR. CUMMINGS: Objection, form.

3 A What I state in paragraph 39: Primary use
4 of the via is to provide an electrical path. A
5 POSITA understood it's desirable for the sidewalls
6 of a via to be as close to vertical as possible in
7 order to minimize area requirements.

8 Q And so I'm -- I'm asking if you agree with
9 your statement in the middle of that sentence that
10 a POSITA understood it is desirable for the
11 sidewalls of a via to be as close to vertical as
12 possible.

13 MR. CUMMINGS: Objection, form.

14 A The statement is what it is. That's my
15 opinion.

EX 1025, Bretschneider Tr. at 98:20-99:15; Reply at 16

Construction of “predetermined angle” (all claims)

PO Expert Acknowledged a POSITA Would Select a Known Process

2 Q So, again, just -- just to -- so I
3 understand this, a POSITA, when looking to create
4 a via hole, would look to known processes that
5 have already been determined suitable for creating
6 that via hole?

7 MR. CUMMINGS: Objection, form.

8 A A POSITA would look to known processes
9 suitable for creating the via.

EX 1025, Bretschneider Tr. at 135:2-9;
Reply at 5

4 Q And just to run that back, a person of
5 skill in the art would look and choose the
6 appropriate methodology for their -- their needs
7 to create the via hole?

8 MR. CUMMINGS: Objection, form.

9 A They're going to look at processes that
10 have already been verified to produce suitable
11 vias in the material.

12 Q So they would use known processes to
13 create the vias?

14 A Again, a person of ordinary skill in the
15 art is not going to develop a new process.

16 Q So a POSITA would use a known process to
17 create the via holes?

18 A Yes.

EX 1025, Bretschneider Tr. at 116:4-18;
at see also *id.* 115:3-6, 117:21-118:12, 131:20-132:11, 132:2-9; Reply at 5

Kwak Discloses a Predetermined Angle

Photolithography Was a Known Method for Creating Angled Openings

16 Q Okay. And so just to be clear, in your
17 opinion, reading the '801 patent, the use of
18 photolithography methods is sufficient to create
19 the predetermined angles disclosed in the patent?

20 MR. CUMMINGS: Objection, form.

21 A I will say that will allow you to
22 create -- the language is specific, a

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1 predetermined pattern. It's a -- a clear teaching
2 that you can precisely change and modify the
3 material.

EX1025 at 87:16-88:3;
see also id. at 84:5-22; Reply at 3.

12 Q All right. So organic material layers
13 were known prior to the '801 patent?

14 A Yes.

15 Q And using photolithography to pattern
16 organic material layers was also known prior to
17 the '801 patent?

18 A Again, that's photolithography.

19 Photolithography and organic material layers go
20 hand-in-hand.

EX 1025, Bretschneider Tr. at 74:12-20; Reply at 3

7 Q And the photolithography process you just
8 described, including the half-tone mask, was that
9 something that was known at the time of the '801
10 patent to a POSITA?

11 MR. CUMMINGS: Objection, form.

12 A I'll say the use of half-tone masks was
13 known before.

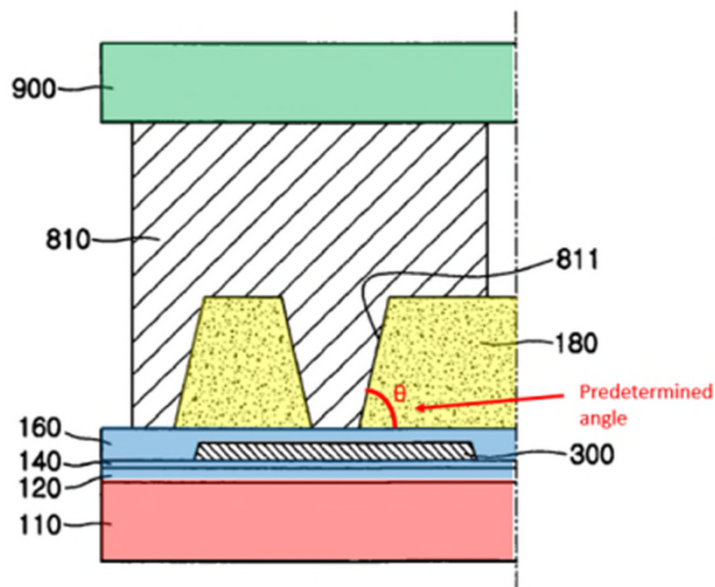
EX 1025, Bretschneider Tr. at 83:7-13; Reply at 3

Grounds 1-5: Kwak Grounds

Kwak Discloses a Predetermined Angle

Kwak Discloses a “Predetermined Angle” Under the Plain Meaning

FIG. 2D



Pet. at 28-29, EX1005, Fig 2D (annotated)
see also EX1005 at Figs 3A-C, 4A-4C,

layer 180) of via opening 811 form a predetermined angle. *Id.* Kwak consistently discloses implementing openings with the same, less-than-90° angle across its embodiments. *See, e.g.*, EX1005, Figs. 2B-D, 3A-C, 4A-C.

Pet. at 28,

FIG. 3A

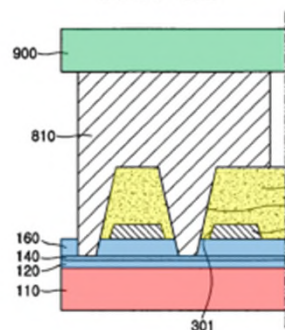


FIG. 3B

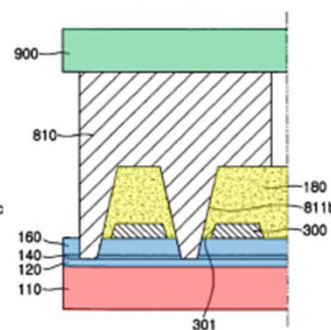
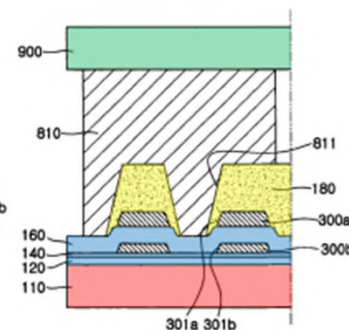


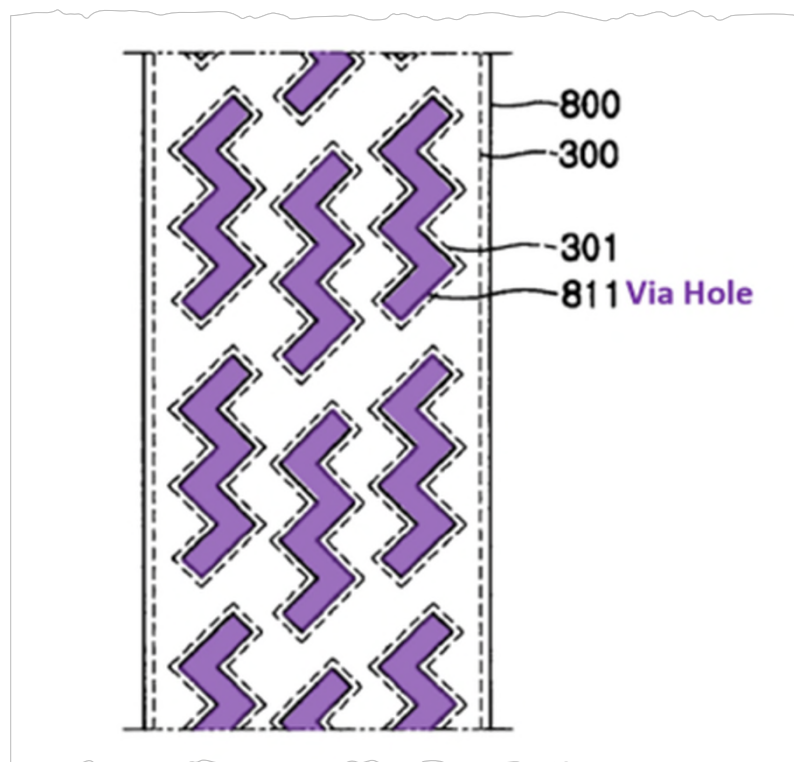
FIG. 4A



EX1005 at Figs 3A, 3B, 4A; Pet. at 26.

Kwak Discloses a Predetermined Angle

Kwak Discloses a “Predetermined Angle” Under the Plain Meaning



EX1005 at Fig. 5D, Pet. at 24-25, 28-29,

Kwak also teaches creating via hole 811 within specific parameters that define a predetermined angle. For example, “it is desirable for the cross-section of the via hole 811 to be smaller than that of the corresponding penetration hole 301.” *Id.*, 10:34-36. Thus, in addition to depicting angled sidewalls, Kwak also teaches increasing contact area via vertical or near vertical sidewalls and forming the angle under the constraints of the corresponding penetration hole.

Reply at 15.

Kwak Discloses a Predetermined Angle

Kwak Discloses a “Predetermined Angle” To a POSITA

20 Q And so you would agree that a POSITA at
21 the time of the '801 patent would have understood
22 it to be desirable for the sidewalls of a via to

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1 be as close to vertical as possible?

2 MR. CUMMINGS: Objection, form.

3 A What I state in paragraph 39: Primary use
4 of the via is to provide an electrical path. A
5 POSITA understood it's desirable for the sidewalls
6 of a via to be as close to vertical as possible in
7 order to minimize area requirements.

EX1025 at 98:20-99:7

112

1 Q So what I'm trying to figure out is, is a
2 near vertical sidewall desirable or not? Does a
3 POSITA care how close to vertical the sidewall is?
4 A Again, I believe I've stated my opinion
5 clearly in paragraph 39. They understand it's
6 desirable for them to be as close to vertical as
7 possible, and the reason is to minimize area
8 requirements.

EX1025 at 1112:1-8; see also *id.* at 101-10-15

Construction of “predetermined angle” (all claims)

PO Expert Acknowledged a POSITA Would Select a Known Process

2 Q So, again, just -- just to -- so I
3 understand this, a POSITA, when looking to create
4 a via hole, would look to known processes that
5 have already been determined suitable for creating
6 that via hole?

7 MR. CUMMINGS: Objection, form.

8 **A A POSITA would look to known processes**
9 **suitable for creating the via.**

EX 1025, Bretschneider Tr. at 135:2-9;
Reply at 5

4 Q And just to run that back, a person of
5 skill in the art would look and choose the
6 appropriate methodology for their -- their needs
7 to create the via hole?

8 MR. CUMMINGS: Objection, form.

9 **A They're going to look at processes that**
10 **have already been verified to produce suitable**
11 **vias in the material.**

12 Q So they would use known processes to
13 create the vias?

14 **A Again, a person of ordinary skill in the**
15 **art is not going to develop a new process.**

16 Q So a POSITA would use a known process to
17 create the via holes?

18 **A Yes.**

EX 1025, Bretschneider Tr. at 116:4-18;
at see also *id.* 115:3-6, 117:21-118:12, 131:20-132:11, 132:2-9; Reply at 5

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EX1025 at 87:16-88:3;
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10 patent to a POSITA?

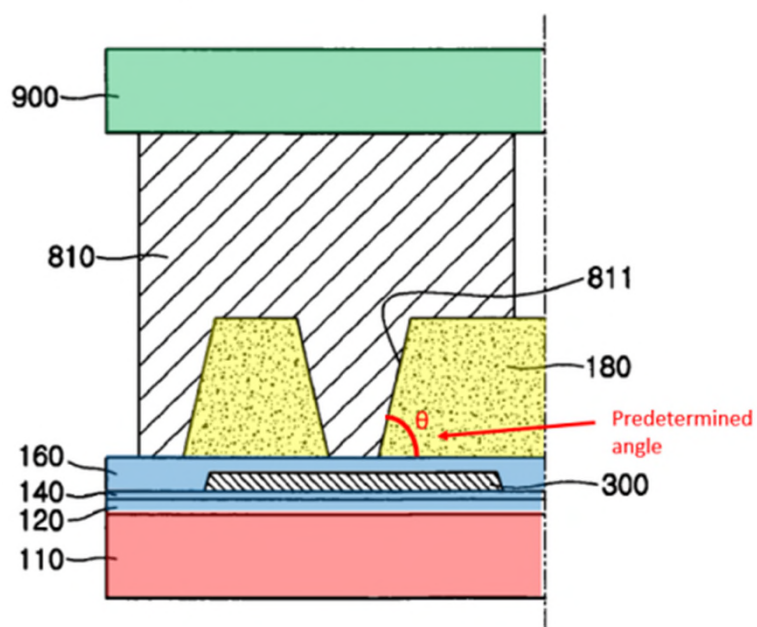
11 MR. CUMMINGS: Objection, form.

12 A I'll say the use of half-tone masks was
13 known before.

EX 1025, Bretschneider Tr. at 83:7-13; Reply at 3

Grounds 1 and 2 – Kwak (§§102/103)

FIG. 2D



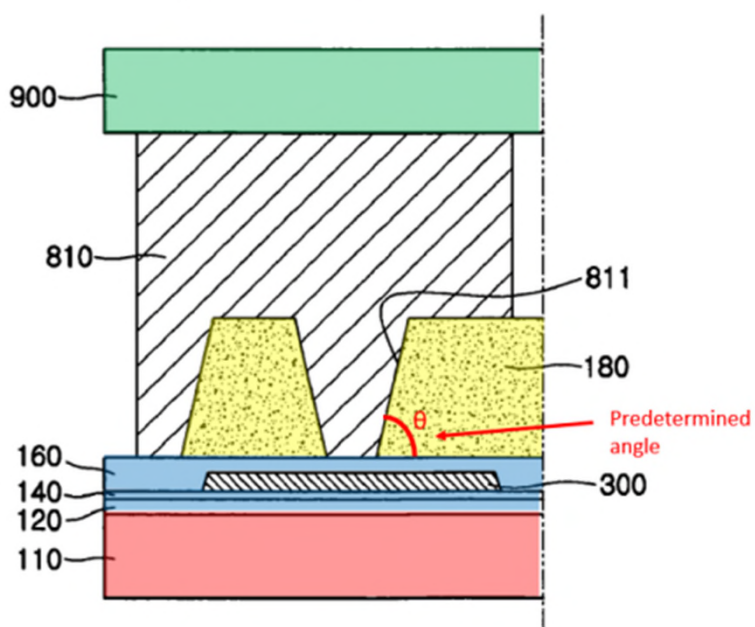
Ex. 1005; Pet. at 21-29 (Ground 1), 29-42 (Ground 2);
Reply at 1, 14-15 (Ground 1), 15-16 (Ground 2)

While Kwak does not identify a numerical value for its angles, a POSITA would have been aware of common manufacturing methods and the design choices involved and would have understood that openings with an angle less than 60° and even less than 30° were possible and how they would be implemented. EX1003, ¶116. A POSITA would have understood, as demonstrated by the state of the art disclosed in prior art references, that the openings in Kwak's protective layer would utilize an angle less than 60° and even as low as 20° - 30° . *Id.*; see IV.C (Vaganov), IV.D (Kim), IV.E (Yamazaki 366), IV.F.

Pet. at 33-34.

Ground 3 – Kwak and Vaganov

FIG. 2D



Ex. 1005; Pet. at 21-29 (Ground 1), 29-42 (Ground 2);
Reply at 1, 14-15 (Ground 1), 15-16 (Ground 2)

Vaganov describes techniques that were well-known in the art for creating a variety of predetermined angles, including 90° , $54^\circ 44''$, 45° , and $35^\circ 16''$. *See id.*, 10:23-12:42, 12:46-52, Figs. 36-55. The reference also teaches that the dimensions and angles of any given opening are determined by the processes used and by design considerations. *Id.*, 5:14-22, 10:23-51, 12:46-53. Vaganov explains that no

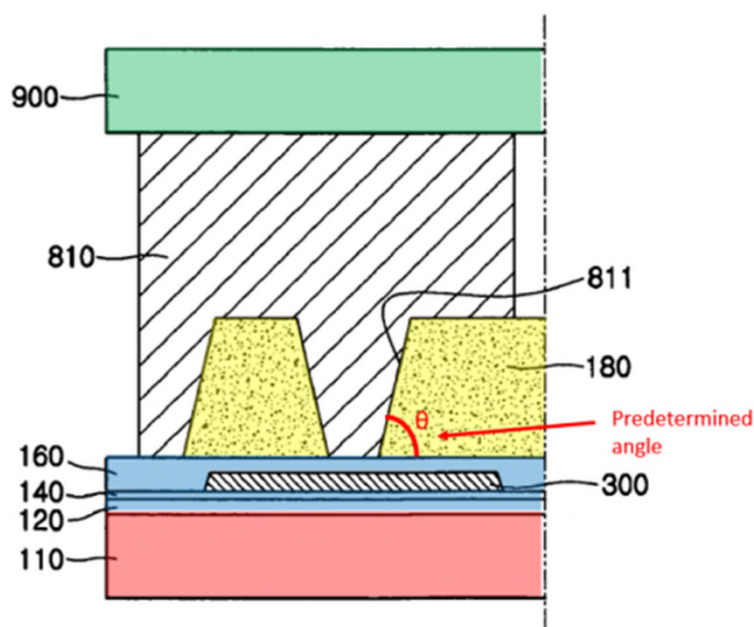
Petition at 10-11; *see also id.* at 42-46 (Ground 3)

references, and its own expert testified to the contrary. Dr. Bretschneider admitted that Vaganov teaches using photolithography, a technique known for years before the '801 patent, for etching organic material. EX1025 at 27:16-28:18, 74:12-20; *see also id.* 82:12-83:13 (explaining that photolithography processes for creating predetermined angled openings in an organic layer were known prior to the '801 patent), 84:17-85:6 (same), 87:16-88:3 (same). 89:14-20; 215:2-17.

Ex 1007; Reply at 3; *see also id.* at 17.

Ground 4 – Kwak and Kim

FIG. 2D



Ex. 1005; Pet. at 21-29 (Ground 1), 29-42 (Ground 2);
Reply at 1, 14-15 (Ground 1), 15-16 (Ground 2)

Kim describes forming openings in an organic layer comprising sidewall angles between 30-60° to expose multiple various underlying layers. *See, e.g.*, EX1008, 0010, 0055-0065, 0072, 0106, 0119, Figs. 3, 9, 11, 12, 21A; EX1003, ¶¶74-75. Kim explains that creating openings with such angles allows for the smooth creation of later layers formed on top of the organic layer. EX1008, 0062, 0074, 0085. In this way, the organic insulating layer may remain sufficiently thick while simultaneously allowing for better contacts through the openings. *Id.*

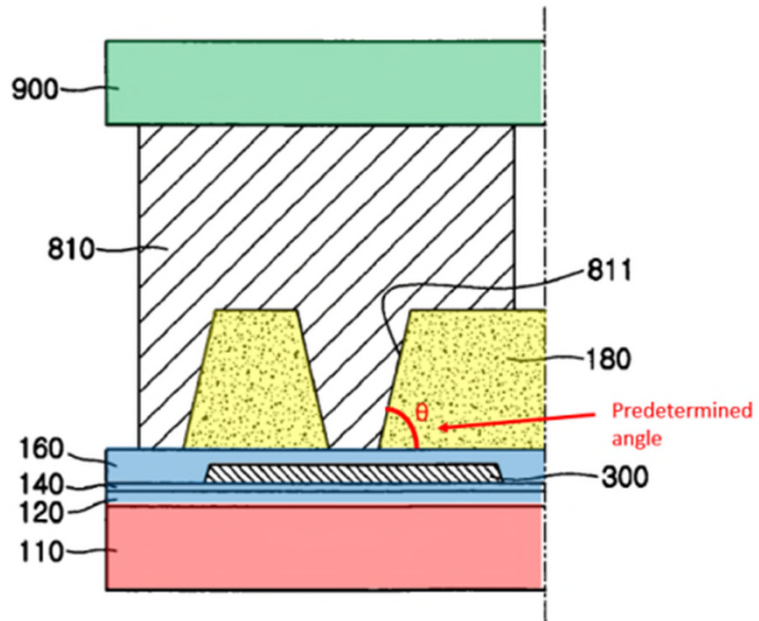
Pet. at 11; *see also id.* 46-48 (Ground 4)

PO objects to the use of Kim as relevant prior art based solely on the basis that “[n]othing in Kim concerns sealing or adhesion.” POR at 14-15. This fact alone does not render the reference irrelevant. (*See II.B*). Specifically, Kim teaches techniques for creating openings in an organic layer having sidewalls with a predetermined angle. Thus, the reference is relevant for the limited uses identified in the Petition.

Ex 1008; Reply at 3-4; *see also id.* at 17-18.

Ground 5 – Kwak and Yamazaki

FIG. 2D



Ex. 1005; Pet. at 21-29 (Ground 1), 29-42 (Ground 2);
Reply at 1, 14-15 (Ground 1), 15-16 (Ground 2)

FIG. 2A

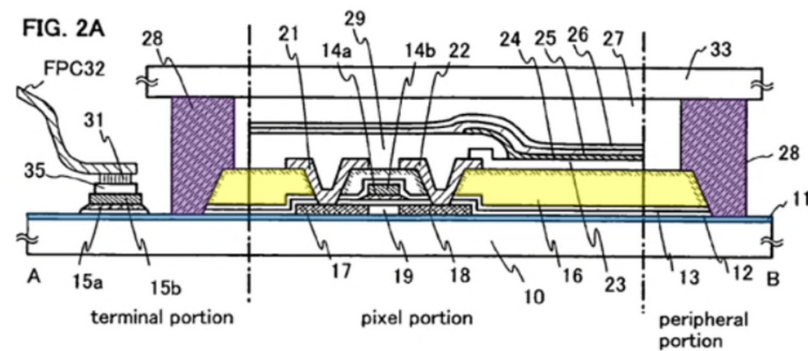
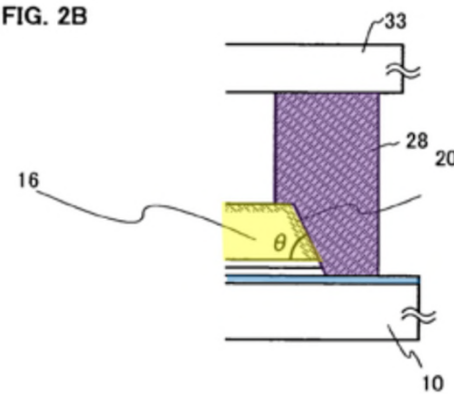


FIG. 2B



Ex. 1009; Pet. at 11-14, 49-52 (Ground 5); Reply at 3-4, 17-18.

Ground 6-8: Zhang Grounds

Zhang Grounds

Petitioner Does Not Rely on AAPA to Fill Any Gap in the Teachings of Zhang

expert believes it, this is not allowed. The Director's July 31, 2025 Memorandum states "[a]s a practical matter, enforcement of Rule 104(b)(4) means that applicant admitted prior art (AAPA), expert testimony, common sense, and other evidence that is not 'prior art consisting of patents or printed publications' (collectively, 'general knowledge') may not be used to supply a missing claim limitation."² This is precisely what Petitioner is attempting to do with Zhang, which does not disclose or suggest using an organic layer in its improved design—rather, it relies on expert testimony that a POSITA would use the teachings of Zhang in a device that had an organic layer despite Zhang's teaching that devices using an organic layers had "insufficient bonding strength." Ex. 1006, p. 6.

Sur-Reply at 16-17

The Zhang Grounds

Zhang Figures Discloses Two Types of Conventional LCD Panels

Petitioner's Reply still has no coherent obviousness theory. Reply at 20. The Petitioner's Reply appears to argue that Zhang's conventional reflective LCDs of 1A, 1B, 2A, and 2B are the starting point, and that these conventional reflective LCD's would be modified based on improvements discussed with respect to Zhang Figures 3A–E. Reply at 20 (“the teachings of Zhang, when implemented in a conventional reflective LCD, render the '801 patent claims obvious.”)

Sur-Reply at 17.

Figure 1A, which is a schematic diagram of a conventional LCD Panel.

...

Figure 1B is a cross-sectional view of the liquid crystal display panel in Figure 1A.

...

Figure 2A, which is a side view of a conventional reflective liquid crystal display panel.

...

Figure 2B is a side view of another conventional reflective liquid crystal display panel.

Ex. 1006 at 4-6; Reply at 2-3, 18-22

substrate 210 and the TFT substrate 220. The difference between the reflective liquid crystal display panel 200A and the general liquid crystal display panel 100 is that the reflective liquid crystal display panel 200A has an additional photoresist layer 225A on the TFT substrate 220, which covers the protective layer 224.

Ex. 1006 at 5; Reply at 2-3, 18-22

The Zhang Grounds

Zhang Teaches Improving Both Types of Conventional LCD Panels

Otherwise, Petitioner is wrong that Zhang did not teach away from the conventional example. The part of Petitioner's Reply that addresses Zhang does not

Sur-Reply at 4.

However, the bonding strength of the assembled liquid crystal display panels 100, 200A, and 200B is insufficient. During reliability tests or drop tests, the panels are prone to developing cracks at the contact interface between the TFT substrate and the CF substrate due to impact or vibrational forces. This results in damage to the display panel, significantly affecting the quality of the display panel.

(3) Summary of the Invention

In view of this, the purpose of the present invention is to provide a display panel frame adhesive structure with greater bonding strength. By increasing the contact area of the frame adhesive, more frame adhesive can penetrate into grooves or openings, thereby increasing the bonding strength between the TFT substrate and the CF substrate. This allows the structure to withstand greater external impact or vibration forces, avoiding the generation of damaging cracks between the CF substrate and the TFT substrate, thus affecting the display quality of the panel.

Ex. 1005 at 6-7; Reply as 2-3, 18-22.

The Zhang Grounds

Zhang Does Not Limit the Second Covering Layer

Petitioner's Reply argues, "a POSITA would have understood the teachings of Zhang to apply to both types of LCD panels regardless of whether the figures explicitly depict the photoresist layer when describing the teachings." Reply at 19. This is wrong because Zhang explicitly states otherwise, and it would be error to ignore the explicit teaching of Zhang. Ex. 1006, p. 9 ("... the protective layer 324 is composed of silicon dioxide (SiO₂) or silicon nitride (Si₃N₄). . . . the second covering layer 380a refers to the protective layer 324.").

Sur Reply at 16; see also *id.* at 5.

the first covering layer 370a." See, e.g., EX1006, 8. Zhang does not limit the second covering layer to any specific layer or combination of layers. See EX1006, 8-9, cl. 1. "In Figure 3B, both the first covering layer 370a and the second covering layer 380a on the TFT substrate 320 are single-layer structures." EX1006, 9.

9; POR at 11 (citing the same). The use of inorganic material would not be an improvement at least because those materials were already being used in the conventional prior art panels. Zhang does not teach away from or counsel against

Reply at 2; Pet. at 8, 56.

(TFT-LCD) panel, the thin-film transistor (TFT) substrate usually has multiple covering layers. From bottom to top, these layers typically include a scan line metal layer, a dielectric layer composed of a material such as silicon nitride (SiN_x), a data line metal layer, and a protective layer used to protect the transistor components. In addition, for reflective and semi-transmissive/semi-reflective TFT-LCD panels, apart from the aforementioned covering layers, there may sometimes be an additional layer of photoresist layer (PL) above the protective layer.

EX 1006 at 4; Pet. at 8.

The Zhang Grounds

Zhang Improves on Conventional Prior Art Devices

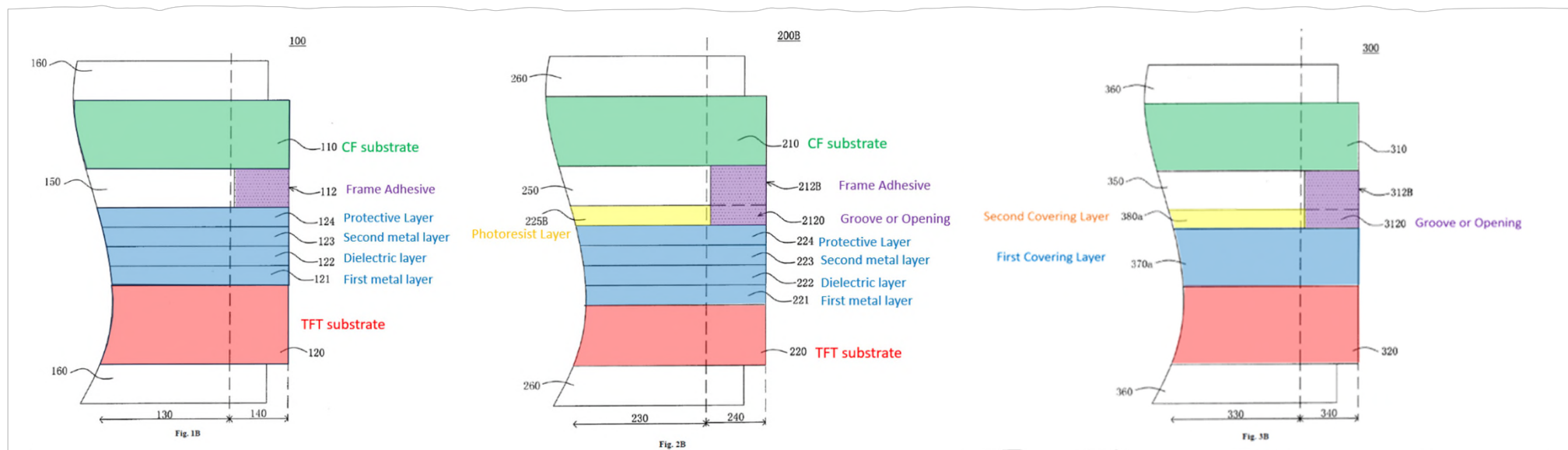
As explained in Section II(C) above, the Petition and the Reply both ignore the part of Zhang that criticizes and disparages the conventional examples, which are distinct from the improved embodiments. Thus, it is improper for a Petitioner to cross-cite to these distinct examples/embodiments like they are a single embodiment. *Abiomed, Inc. v. Maquet Cardiovascular, LLC*, IPR2017-01204, -01205, Paper 8 at 8–12 (holding “Petitioner has failed to establish sufficiently that the features of those different embodiments are interchangeable or provide sufficient rationale to combine the teachings of those different embodiments”).

Sur Reply at 15.

Zhang teaches improvements on conventional LCD panels, not “teaching away” from their use. POR at 9-10. Zhang teaches an improvement to the sealant region in both conventional LCD panels and conventional reflective LCD panels. EX1006 at 4. Figures 1A and 1B depict conventional LCD panels and Figures 2A and 2B depict conventional reflective LCD panels. These are not “embodiments” of the invention as PO contends, but rather examples of what existed in the prior art at the time. See POR at 62 (referring to these figures as “distinct embodiments”); see also *id.* (referring to a “separate ‘conventional’ embodiment”). Zhang found a way to improve the bonding strength of **both** types of LCD panels. See EX1006 at 6 (identifying issues in both conventional LCD panels “100” and conventional reflective LCD panels “200A and 200B”). PO is simply wrong that

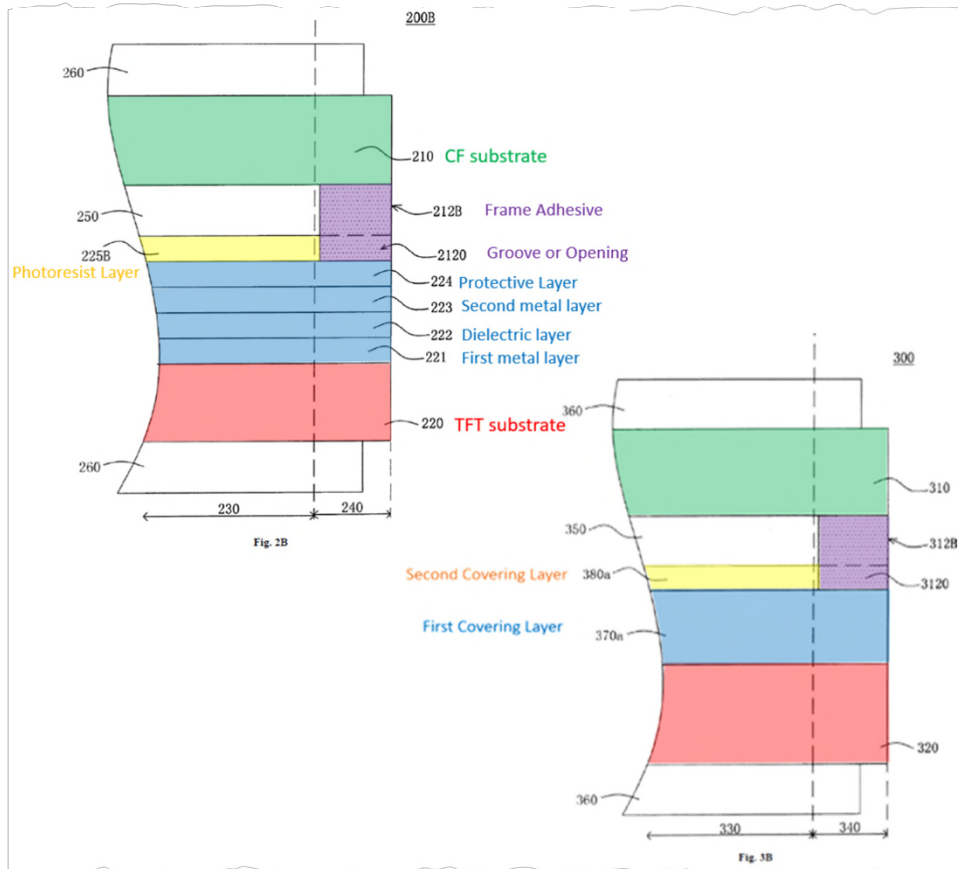
Reply at 2

Ground 6 - Zhang



EX. 1006; Pet. at 5-9, 52-78 (Ground 6); Reply at 2-3, 18-22 (Ground 6)

Ground 7 – Zhang and Vaganov



EX. 1006; Pet. at 5-9, 52-78 (Ground 6); Reply at 2-3, 18-22 (Ground 6)

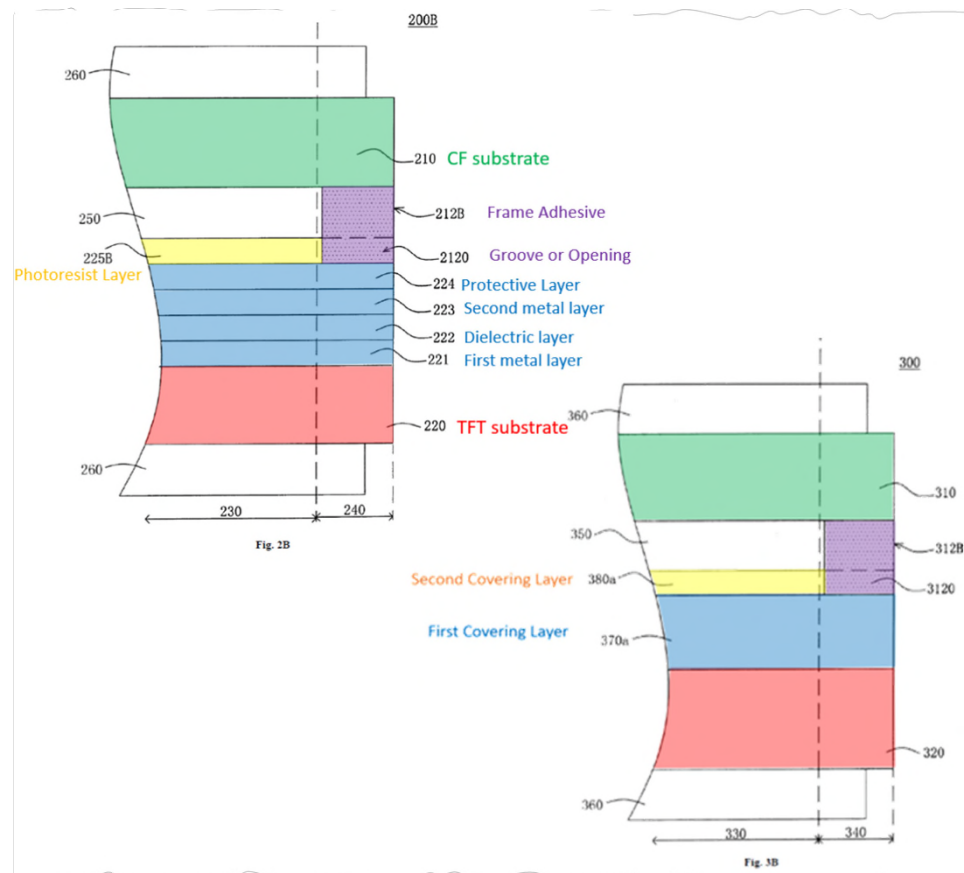
Vaganov describes techniques that were well-known in the art for creating a variety of predetermined angles, including 90° , $54^\circ 44''$, 45° , and $35^\circ 16''$. *See id.*, 10:23-12:42, 12:46-52, Figs. 36-55. The reference also teaches that the dimensions and angles of any given opening are determined by the processes used and by design considerations. *Id.*, 5:14-22, 10:23-51, 12:46-53. Vaganov explains that no

Petition at 10-11; *see also id.* at 78-81 (Ground 7)

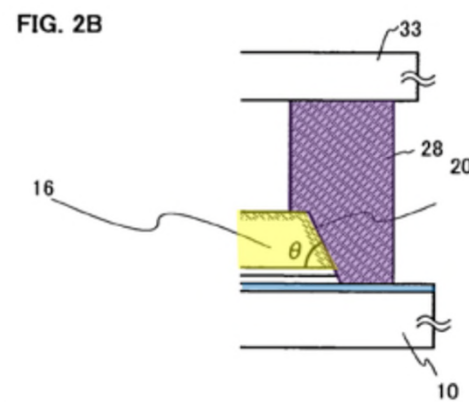
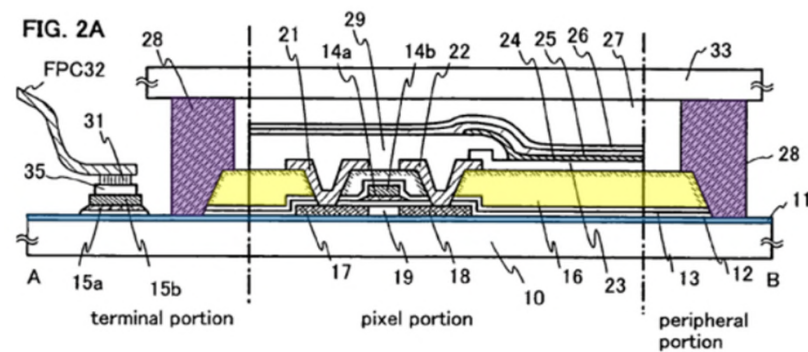
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Ex. 1007; Reply at 3; *see also id.* at 23-24 (Ground 7)

Ground 8 – Zhang and Yamazaki



EX. 1006; Pet. at 5-9, 52-78 (Ground 6); Reply at 2-3, 18-22 (Ground 6)



EX 1009; Pet. at 11-14, 82-85 (Ground 8); Reply at 3-4, 24 (Ground 8).