

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Hisense USA Corporation
Petitioner

v.
Brightplus Ventures LLC
Patent Owner

Patent No. 7,690,812
Filing Date: March 15, 2007
Issue Date: April 6, 2010
Title: APPARATUS AND METHODS FOR CONFORMABLE DIFFUSE
REFLECTORS FOR SOLID STATE LIGHTING DEVICES

Inter Partes Review No. IPR2023-01385

**Ex. 1020 – Declaration of P. Morgan Pattison, Ph.D. in Response to Patent
Owner’s Revised Contingent Motion to Amend**

Table of Contents

I.	Introduction.....	4
II.	Materials Considered	5
III.	Patent Owner’s Substitute Claims.	6
IV.	Substitute Claim 25 is Indefinite.	9
V.	Substitute Claims 29, 30, 32, and 33 are Not Enabled.....	10
VI.	The Prior Art Addressed in My Prior Declarations.....	12
A.	A support member comprising a first surface and a second surface (Substitute Claims 25).	13
B.	A substrate comprising a first surface and a second surface mounted on the first surface of the support member such that the [first] surface of the substrate is in direct contact with the first surface of the support member and the second surface of the substrate faces away from the first surface of the support member (Substitute Claim 25).	13
C.	A plurality of solid state lighting elements mounted on the second surface of the substrate (Claim 25).	14
D.	A reflector sheet on and in direct contact with the second surface of the substrate, the reflector sheet ... configured to conform to a shape of a plurality of protruding features on the solid state lighting tile (Claim 25).....	14
E.	Wherein the protruding features are separate from and not in contact with the solid state lighting elements (Claim 25).	18
F.	Wherein the reflector sheet comprises a plurality of circular apertures (Claim 25).....	19
G.	Wherein each of the plurality of apertures is configured to surround a corresponding one of the solid state lighting elements (Claim 25). ...	20
H.	Wherein the reflector sheet a thickness of less than 0.25mm (Claim 25).....	20
I.	Wherein the reflector sheet does not contact the solid state lighting elements (Claim 25)	20

J.	Wherein each of the solid state lighting elements includes a plurality of LED emitter chips configured to emit a single wavelength (Claim 26).....	21
K.	A mechanical fastening device configured to pass through the reflector sheet and the first surface of the support member and thereby attach the reflector sheet to the support member (Claim 31).....	22
L.	Wherein each of the solid state lighting elements comprises a dome shaped element disposed over the plurality of LED emitter chips (Claim 34).....	23
M.	Wherein the reflector sheets are flexible (Claim 37).	30
VII.	Additional Prior Art Shimizu Renders the Remaining New Elements of Substitute Claims 25–37 Obvious.	30
VIII.	Motivations to Combine	36
A.	It Would Have Been Obvious to Combine Kim and Sharp.....	36
B.	It Would Have Been Obvious to Combine Kim and Starry.....	40
C.	It Would Have Been Obvious to Combine Kim, Sharp, and Shimizu.....	42

I, P. Morgan Pattison, declare as follows:

I. Introduction

1. I am an independent consultant. I am over eighteen years of age, and I would otherwise be competent to testify as to the matters set forth herein if I am called upon to do so.

2. I have prepared this Declaration for consideration by the Patent Trial and Appeal Board in the *Inter Partes* Review of U.S. Patent No. 7,690,812 (“the ‘812 Patent”) and the Revised Contingent Motion to Amend (the “Motion”) Filed by Patent Owner in that *Inter Partes* Review Proceeding.

3. I provide this Declaration at the request of and have been retained by Kilpatrick Townsend & Stockton, LLP, which represents Hisense USA Corporation (“Hisense”) in connection with the above-captioned *Inter Partes* Review. I have been informed and understand that Hisense contends that substitute claims 25-37 submitted by the Patent Owner in the Motion are invalid.

4. I am being compensated at an hourly rate of \$550 per hour. My compensation is not dependent on the outcome of or any issue in relation to the above-captioned *Inter Partes* Review, and I have no interest in either party.

5. In forming my opinions, I relied on my knowledge, education, experience, and training in the field and on documents and information referenced in this Declaration.

6. My qualifications are summarized in Ex. 1003, which is my prior declaration in this proceeding and my CV, which was submitted as Ex. 1004. *See* Ex. 1003, ¶¶6-15. I am not a lawyer, however, my understanding of the legal issues, in particular with respect to obviousness are summarized in my prior declaration. *See* Ex. 1003, ¶¶16-23. My prior declaration also provides my opinion on the appropriate level of experience for a person to be a person of ordinary skill in the art. *See* Ex. 1003, ¶¶25-28. I also provided a prior declaration regarding Patent Owner’s original motion to amend, which was submitted as Ex. 1015.

II. Materials Considered

7. In addition to the materials identified in my prior declarations (*see* Ex. 1003, ¶30; Ex. 1015, ¶7) in forming my opinions, in addition to my knowledge and experience, I have considered the following documents and things that I have obtained, or that have been provided to me:

Exhibit	Description
1021	Japanese Patent Pub. No. 2004-139871 A to Shimizu et al. (“Shimizu”)
1022	Certified translation of Shimizu
1023	U.S. Pat. Pub. No. 2006/0221610 A1 to Chew et al. (Chew)
1024	U.S. Pat. Pub. No. 2002/0021085 A1 to Ng (“Ng”)
1025	U.S. Pat. Pub. No. 2006/0227545 A1 to Mok et al. (“Mok”)
1026	Taiwanese Patent Application No. 93218806, entitled DIRECT TYPE BACKLIGHT MODULE/ DIRECT TYPE BACKLIGHT MODULE to Chang (“Chang”)
1027	Certified Translation of Chang

8. In addition to the documents above, in forming the opinions expressed below, I have also considered my own knowledge and experience based upon my education, research and work in the fields of optics, LEDs, and display technology, as described above and in my *curriculum vitae* (Ex. 1004).

III. Patent Owner's Substitute Claims.

9. I am informed and understand that Patent Owner has proposed to substitute original claims 1-7, 10-12, 16-17, and 19¹ of the '812 Patent with the following substitute claims (the "Substitute Claims"):

25. (proposed substitute for Claim 1) A solid state lighting tile, comprising:
a support member comprising a first surface and a second surface;
a substrate comprising a first surface and a second surface mounted on the first surface of the support member such that the second surface of the substrate is in direct contact with the first surface of the support member and the second surface of the substrate faces away from the first surface of the support member;
a plurality of solid state lighting elements mounted on a the second surface of the substrate; and
a reflector sheet on and in direct contact with the second surface of the substrate, the reflector sheet configured to overlap in part with a second reflector sheet and configured to conform to a shape of a plurality of protruding features on the solid state lighting tile;-
wherein the protruding features are separate from and not in contact with the solid state lighting elements;

¹ The Motion does not list the original claims for which the new claims are be substituted. *See* Motion at 2. These claims are taken based on the parentheticals in Appendix A to the Motion. Proposed substitute claim 37 says it is the "proposed substitute for Claim 19." Motion, Appendix A, claim 37. However, the redlined language does not correspond to original claim 19.

wherein the reflector sheet comprises a plurality of circular apertures;
wherein each of the plurality of apertures is configured to surround a corresponding one of the solid state lighting elements;
wherein the reflector sheet a thickness of less than 0.25mm;
wherein the reflector sheet does not contact the solid state lighting elements;
and
wherein the reflector sheet comprises a plurality of perforation apertures, the perforation apertures being separate and distinct from the apertures configured to surround the solid state lighting elements.

26. (proposed substitute for claim 2) The solid state lighting tile of claim 125, wherein the reflector sheet comprises a diffuse reflector wherein each of the solid state lighting elements includes a plurality of LED emitter chips configured to emit a single wavelength.

27. (proposed substitute for claim 3) The solid state lighting tile of claim 125, wherein the reflector sheet comprises a polymer-based porous material the plurality of perforation apertures are disposed distally from the solid state lighting elements and protruding features.

28. (proposed substitute for claim 4) The solid state lighting tile of claim 125, wherein the reflector sheet comprises a thickness of less than approximately 1.0 millimeter the plurality of perforation apertures are circular in shape.

29. (proposed substitute for claim 5) The solid state lighting tile of claim 125, wherein the reflector sheet has a thickness of less than approximately 0.50 millimeters the plurality of perforation apertures are configured to reduce distortion of the reflector sheet.

30. (proposed substitute for claim 6) The tile of claim 125, wherein the reflector sheet has a thickness of less than approximately 0.25 millimeters the plurality of perforation apertures are configured to provide thermal expansion zones for the reflector sheet.

31 (proposed substitute for claim 7) The solid state lighting tile of claim 425, further comprising a mechanical fastening device configured to pass through the reflector sheet and the first surface of the support member and thereby attach the reflector sheet to the surface of the substrate the support member.

32. (proposed substitute for claim 16) ~~The method of claim 15, wherein positioning the reflector sheet comprises chemically bonding the reflector sheet to the surface of the substrate.~~ The solid state lighting tile of claim 25, wherein the plurality of perforation apertures are configured to reduce distortion of the reflector sheet due to thermal expansion.

33. (proposed substitute for claim 17) ~~The method of claim 15, wherein positioning the reflector sheet comprises mechanically attaching the reflector sheet to the surface of the substrate.~~ The solid state lighting tile of claim 25, wherein the plurality of perforation apertures are configured to ensure that the reflector sheet conforms to the shape of the support member.

34. (proposed substitute for claim 10) ~~The solid state lighting tile of claim 426, further comprising a chemical bonding component configured to attach the reflector sheet to the surface of the substrate. wherein each of the solid state lighting elements comprises a dome shaped element disposed over the plurality of LED emitter chips.~~

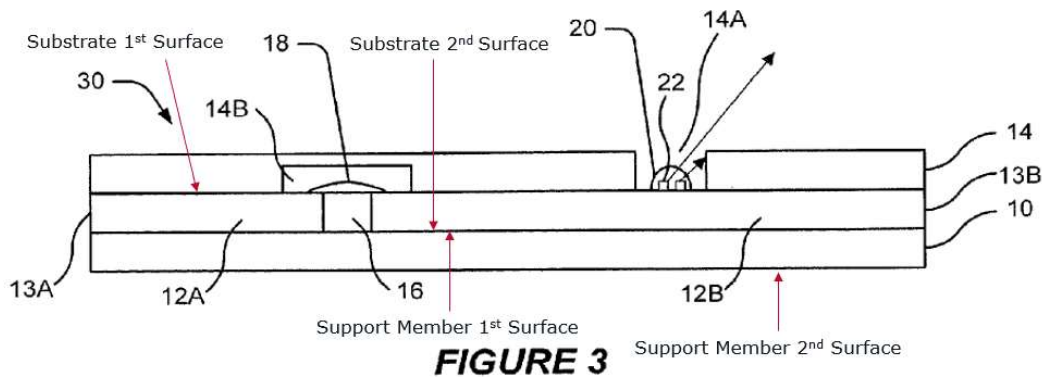
35. (proposed substitute for claim 11) ~~The solid state lighting tile of claim 4025, wherein the chemical bonding component comprises glue and/or a pressure sensitive adhesive compound~~ the solid state lighting tile comprises a third reflector sheet mounted on and in direct contact with the second surface of the substrate.

36. (proposed substitute for claim 12) ~~The solid state lighting tile of claim 435, wherein the reflector sheet comprises an aperture configured to be positioned proximate to the solid state lighting element, wherein the reflector sheet does not contact the solid state lighting element~~ the third reflector sheet overlaps in part with the second reflector sheet.

37. (proposed substitute for Claim 19) ~~The luminaire of claim 18, wherein the reflector comprises a coating on the substrate that is configured to reflect and scatter light incident thereon. The solid state lighting tile of claim 18-35, wherein the reflector sheets are flexible.~~

IV. Substitute Claim 25 is Indefinite.

10. Substitute Claim 25 recites that “the second surface of the substrate is in direct contact with the first surface of the support member and the second surface of the substrate faces away from the first surface of the support member.” This language is contradictory, as a surface cannot be both in contact with something and also face away from it. As illustrated below, if the second surface of the substrate is in direct contact with the first surface of the support member, then it cannot also face away from the first surface of the support member.



'812 Patent, Fig. 3 (annotated). Rather, the first surface of the substrate would face away from the first surface of the support member. In my opinion, this language renders Substitute Claim 25 unworkable as written.

V. Substitute Claims 29, 30, 32, and 33 are Not Enabled.

11. A subset of the Substitute Claims contain language about perforation apertures being “configured to” perform certain functions:

- a. “reduce distortion of the reflector sheet” (claim 29);
- b. “provide thermal expansion zones for the reflector sheet” (claim 30);
- c. “reduce distortion of the reflector sheet due to thermal expansion” (claim 32); and
- d. “ensure that the reflector sheet conforms to the shape of the support member” (claim 33).

12. These perforation apertures are shown in Figure 6 of the '812 Patent, and the specification provides the following regarding the perforation apertures:

“Brief reference is now made to FIG. 6, which is a top view of a reflector sheet according to some embodiments of the invention. The reflector sheet 60 includes multiple apertures 62 for receiving emitters on one or more solid state lighting bars. The reflector sheet 60 also can include multiple perforation apertures 64 that may be configured in patterns arranged in one or more dimensions across the reflector sheet 60. The perforation apertures 64 can serve to provide designated expansion zones in the event that the solid state lighting bars experience thermal expansion and/or contraction. In this manner, expansion and/or contraction can be isolated to the designated expansion zones in order to reduce buckling, warping,

and/or distortion that might undesirably affect uniformity.” ’812 Patent, 7:25-38.

There is no other disclosure in the specification regarding the perforation apertures.

13. To the extent Patent Owner is contending that the claims cover a specific arrangement of the perforation apertures, there is no teaching or explanation in the specification regarding how the apertures are actually configured or arranged to perform the claimed functions. The only disclosure regarding any arrangement of the perforation apertures is that they “may be configured in patterns arranged in one or more dimensions across the reflector sheet 60” (’812 Patent, 7:29-32) and the configuration shown in Figure 6.

14. The specification also does not teach a POSA how to use the perforation apertures to ensure that the reflective sheet conforms to the shape of the support member, as required by Substitute Claim 33. The support member is underneath the substrate, and the reflective sheet is above the substrate. In situations where the substrate and the support member are not the same shape, there is nothing in the specification or the claims that guides a POSA as to how to configure the perforation apertures so the reflective sheet conforms to the support member rather than the substrate (and anything on the surface of the substrate). The specification states that the perforation apertures can serve as “designated expansion zones” (’812 Patent, 7:32-38), but this merely states a purpose and does not explain how designated expansion zones would ensure that the reflective sheet

conforms to the support member rather than the substrate. Therefore, it is my opinion that the '812 Patent fails to disclose or teach how to specifically arrange or configure the perforation apertures to perform the claimed functions.

15. To the extent Patent Owner argues that no specific arrangement is required, then the claimed functions are inherent in the inclusion of perforation apertures. As explained further below with respect to Sharp and Shimizu, it was known in the art that having apertures in the reflective sheet allows for thermal expansion.

VI. The Prior Art Addressed in My Prior Declarations.

16. In my prior declarations I broke down the elements of claims 1–7, 10–12, 14–21, and 23 and the new elements of original Substitute Claims 25–28 and demonstrated that each of the elements of those claims were known in the art before March 16, 2007, the priority date of the '812 Patent. *See* Ex. 1003, ¶¶38–77; Ex. 1015, ¶¶11–43. In the analysis below, I address the new elements of new Substitute Claims 25–37 and demonstrate that the newly added elements were also known in the art before the priority date of the '812 Patent. To the extent that any previously identified prior art does not disclose a newly added element, other prior art demonstrates that the concepts that these claims attempt to cover was well-known in the art before March 16, 2007. *See* Section VII.

A. A support member comprising a first surface and a second surface (Substitute Claims 25).

17. As discussed in my second declaration, Kim (Ex. 1016) describes its invention as “[a] backlight assembly includes a plurality of light emitting diode units, each of the plurality of light emitting diode units including at least one light emitting diode and a printed circuit board mounting the at least one light emitting diode, and a reflective sheet on the printed circuit board, the reflective sheet having at least one hole corresponding to the at least one light emitting diode.” Kim, Abstract.

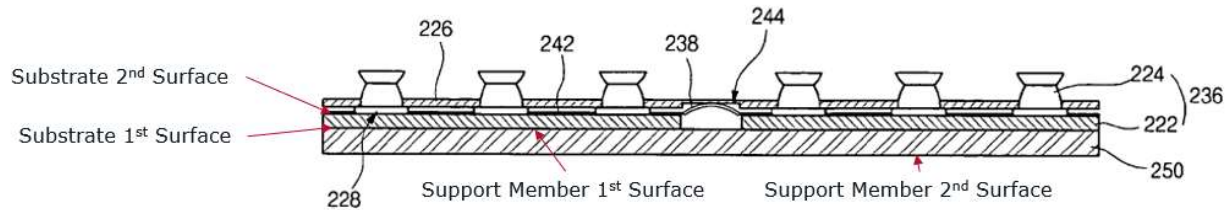
18. Kim further describes a bottom frame 150/250/350, and the PCB 122/222/322 is mounted on the bottom frame 150/250/350. *See, e.g.*, Kim, 3:2-3, 4:5-9, 4:23-25, 5:21-27, Fig. 2 (element 150), Fig. 3 (element 250), Fig. 4A & 4B (element 350). The bottom frame 150/250/350 has first and second surfaces (*i.e.*, top and bottom surfaces, respectively) and corresponds to the claimed support member.

B. A substrate comprising a first surface and a second surface mounted on the first surface of the support member such that the [first] surface of the substrate is in direct contact with the first surface of the support member and the second surface of the substrate faces away from the first surface of the support member (Substitute Claim 25).

19. As discussed above, Kim discloses a support member with a first and second surface. As shown below, the bottom (first surface) of the PCB 222 is

mounted on and in direct contact with the top (first surface) of the bottom frame 250.

FIG. 3



Kim, Fig. 3 (annotated). As shown above, the top (second surface) of the PCB 222 faces away from the top (first surface) of the bottom frame 250.

C. A plurality of solid state lighting elements mounted on the second surface of the substrate (Claim 25).

20. As discussed in my second declaration, Kim shows a plurality of LEDs 224 mounted on the PCB 222. Ex. 1015, ¶24. This is shown in Figure 3 of Kim. An LED is a solid state light source. These LEDs are mounted on top (the second surface) of the PCB 222.

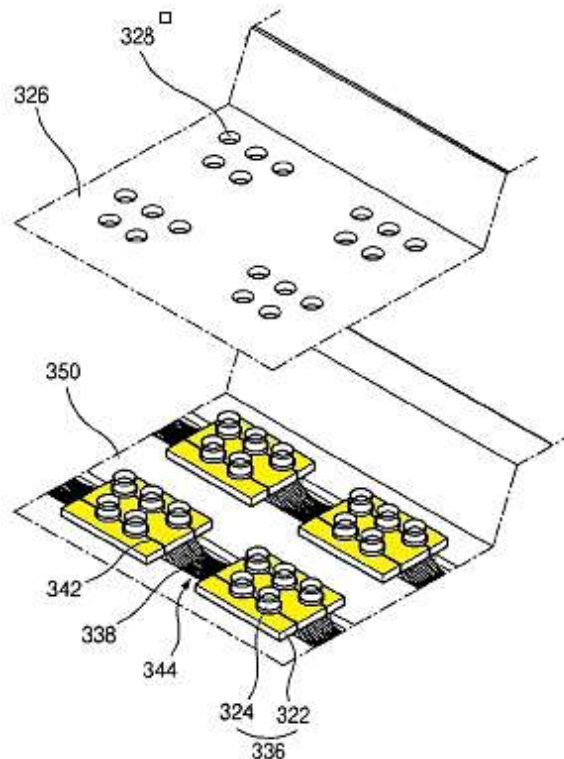
D. A reflector sheet on and in direct contact with the second surface of the substrate, the reflector sheet ... configured to conform to a shape of a plurality of protruding features on the solid state lighting tile (Claim 25).

21. As discussed in my second declaration, Kim shows the reflective sheet 226 conforming to the shape of the line 238, which is a protruding feature.

Ex. 1015, ¶25-28. The reflector sheet is on and in direct contact with the top (second surface) of the PCB 222.

22. A POSA would have recognized that the reflective sheet 26/126/226/326 is in direct contact with the second surface of the PCB 22/122/222/322, despite a “thin film line 342,” because the majority of the PCB 322 would have been in direct contact with the reflective sheet when the reflective sheet is deposited on the PCB 322, in the area highlighted in yellow below:

FIG. 4A



Kim, Fig. 4A (annotated). This is particularly so where a thin, flexible reflector is used.

23. While it appears in Figure 4B that there may possibly be an air gap between the reflective sheet 326 and the PCB 322 due to the specific base shape of the LED 244/324 illustrated in FIG. 4A/4B, this is described as “an exemplary embodiment,” and a POSA would have understood that such a gap would have not existed in other embodiments for LED 244 with a different base shape, particularly where a thin, flexible reflector is used. This gap also would not exist where a space is left between the hole and the LED (such as when Kim is combined with Sharp), as the reflective sheet 326 would not contact the base of the LED 244/344 as shown in FIG. 3. It also would have been an obvious design choice to have direct contact between the reflector sheet and the substrate to improve thermal coupling between the reflector sheet and the underlying substrate. This is a very common design. For example, US 2006/0227545 to Mok *et al.* (“Mok”) illustrates this obvious design choice:

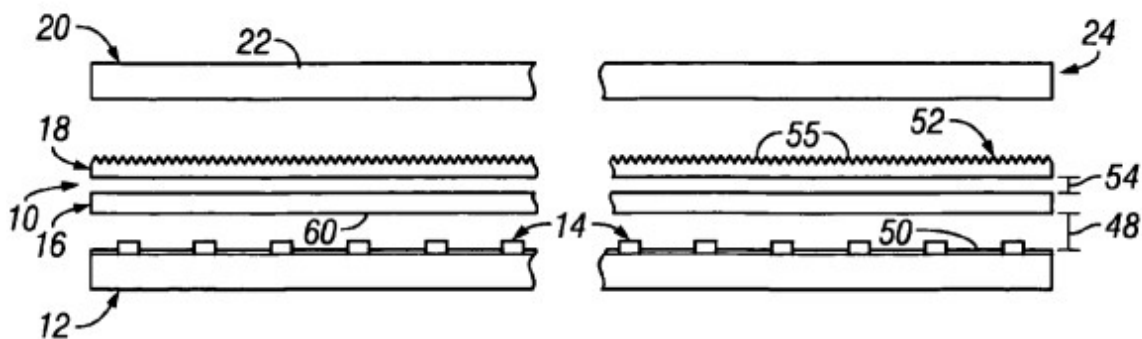
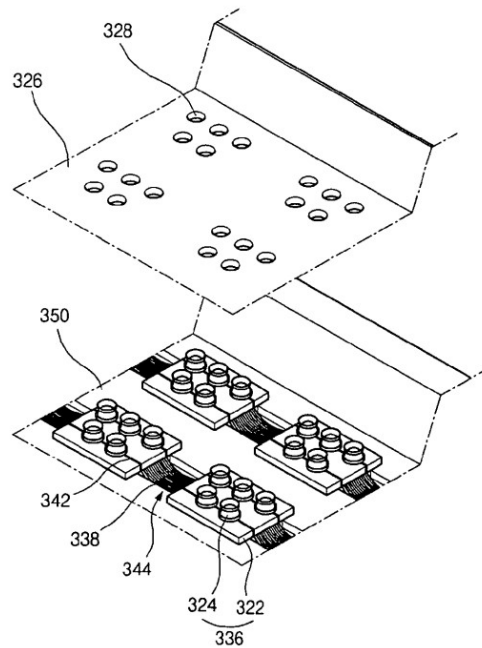


FIG. 1

Mok, Fig. 1 (showing reflector surface 50 in direct contact with the base panel 12).

FIG. 4A



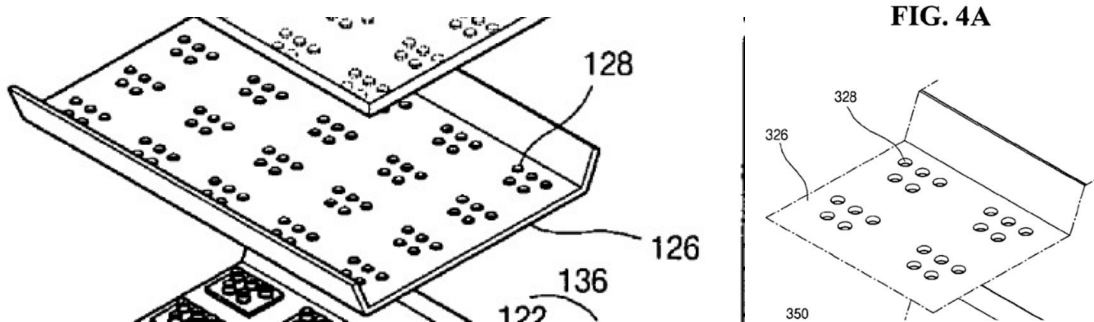
Kim, Fig. 4A.

E. Wherein the protruding features are separate from and not in contact with the solid state lighting elements (Claim 25).

25. Kim shows in Figure 3 (reproduced above) that the line 238 (protruding feature) is separate from and not in contact with the LEDs 224. As shown in Figure 4A of Kim (reproduced above), there are multiple lines 338, which are separate from and not in contact with the LEDs 324. As stated above and in my previous declaration, line 238/338 is a protruding feature on the tile, and LED 224/324 is a solid state lighting element. Ex. 1015, ¶24-25.

F. Wherein the reflector sheet comprises a plurality of circular apertures (Claim 25).

26. As discussed in my second declaration, Kim's reflector sheet contains a plurality of holes (apertures) that the LEDs fit through. Ex. 1015, ¶29. As can be seen in Figures 2 and 4A of Kim, the plurality of apertures (holes 128/328) are circular in shape:



Kim, Fig. 2 (cropped), Fig. 4 (cropped).

27. To accommodate circular or near-circular LEDs, such as those shown in Kim, the reflector sheet would have circular apertures for passing the LEDs through the reflector sheet. Even if circular or near-circular LEDs were not used, circular apertures are easier to manufacture as opposed to tracing a specific shape during the manufacturing process. Circular apertures may also provide a more predictable and even thermal expansion unlike shapes with corners, which would reduce the possibility of deformation.

G. Wherein each of the plurality of apertures is configured to surround a corresponding one of the solid state lighting elements (Claim 25).

28. As discussed in my second declaration, Kim's reflector sheet contains a plurality of holes (apertures) that the LEDs fit through. Ex. 1015, ¶29. As seen in Kim Figs. 2, 3, and 4A, each of the plurality of holes 128/228/328 (apertures) in the reflective sheet 226 is configured to surround an LED 124 (solid state lighting element). *See* Kim, 2:5-8 ("The reflective sheet 126 is formed with a plurality of holes 128 corresponding to the respective LEDs 124. The LEDs 24 pass through the holes 28, thereby being exposed from the reflective sheet 26.").

H. Wherein the reflector sheet a thickness of less than 0.25mm (Claim 25)

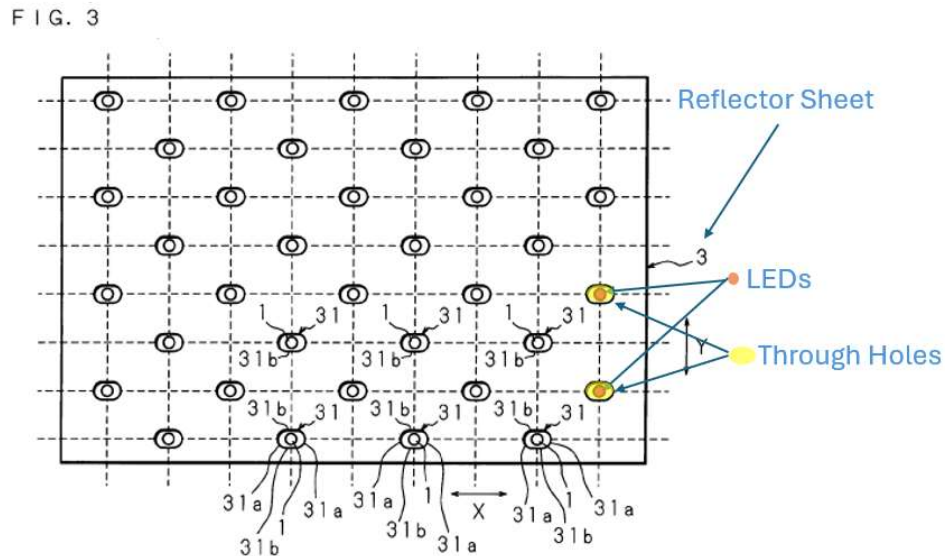
29. As discussed in my first declaration, Starry (Ex. 1006) discloses a reflector sheet that has thickness of less than 0.25 mm. *See* Ex. 1003, ¶55; Starry, [0006] ("For certain markets it is critical that the backlight reflector is relatively thin, i.e., less than 250 µm and often less than 150 µm, to minimize the thickness of the completed display."); [0075] ("Nonwoven sheets having a thickness of about 250 µm and greater still exhibit useful and improved properties, such as flexibility, low cost, and high photopic reflectance").

I. Wherein the reflector sheet does not contact the solid state lighting elements (Claim 25)

30. As discussed in my second declaration, Sharp (Ex. 1017) describes through-holes 31 in a reflector sheet 3 for passing LEDs 1 through, where a gap is

left between the LEDs and the reflector sheet to prevent the reflector sheet from contacting the LEDs when it thermally expands. Ex. 1015, ¶30-32.

31. The gaps between the through-holes 31 and the LEDs 1 are illustrated in Figure 3:



Sharp, Fig. 3 (annotated).

J. Wherein each of the solid state lighting elements includes a plurality of LED emitter chips configured to emit a single wavelength (Claim 26).

32. As discussed above and in my second declaration, an LED is a solid state light source. Ex. 1015, ¶24. LEDs can be configured to emit a range of wavelengths. LEDs configured to emit red light have a wavelength generally in the range of 600-700 nm. LEDs configured to emit green light have a wavelength generally in the range of 500-570 nm. LEDs configured to emit blue light have a wavelength generally in the range of 450-490 nm. These LED chips generate a

single wavelength, and can be combined to create other colors. For example, red, blue, and green LED chips can be combined to give the appearance of white light. Kim discloses the use of LED chips emitting red, green, and blue colors. *See Kim*, 4:51-52, 4:61-62. A POSA would understand that these LED chips emit a single wavelength.

K. A mechanical fastening device configured to pass through the reflector sheet and the first surface of the support member and thereby attach the reflector sheet to the support member (Claim 31).

33. Sharp secures the light emitting diode substrate 2 and reflection sheet 3 to the housing 5 by way lamp clips or the like. *See Sharp*, [0047]-[0049]. When mechanical fasteners such as lamp clips or screws are used, Sharps describes inserting the lamp clips or screws into holes in the reflector sheet 3 similar to those used for passing the LEDs and using the lamp clips or screws to sandwich the substrate 2 between the reflection sheet 3 and the housing 5. Sharp [0048] (“In the case where the light emitting diode substrates 2 are fixed with lamp clips or the like, similar holes are also formed in the reflection sheet 3 placed between the light emitting diode substrates 2 and a liquid crystal panel (panel module), and the light emitting diode substrates 2 *are positioned and fixed by the fastening function of the lamp clips in a state in which the light emitting diode substrates 2 are sandwiched between the reflection sheet 3 and the housing 5.*”) (emphasis added). Sharp further discloses that “in order to prevent dust that may be

generated by the fastening operation of the lamp clips or screws, the size of the holes formed in the light emitting diode substrates 2 is made larger than *the sizes of the holes formed similarly in the housing 5 or the reflection sheet 3.*” Sharp, [0049] (emphasis added). This indicates that holes are made in the reflection sheet 3, the light emitting diode substrate 2, and the housing 5 for securing the components in place with mechanical fastening devices. Thus, Sharp discloses using lamp clips, screws, and the like (mechanical fastening devices) that are figured to pass through holes in reflection sheet 3, light emitting diode substrate 2, and the housing 5 and attach the reflection sheet 3 and light emitting diode substrate 2 to the housing 5.

L. Wherein each of the solid state lighting elements comprises a dome shaped element disposed over the plurality of LED emitter chips (Claim 34)

34. The ’812 Patent does not discuss the shape of the solid state emitter 20 (i.e., the element disposed over the LED emitter chips 22). *See generally* ’812 Patent, 4:52-58, 5:16-21, 5:24-29, 5:53-56, 6:30-33, 7:27-29. The only disclosures in the ’812 Patent regarding the shape of the element disposed over the LED emitter chips are the figures.

35. As an initial matter, Patent Owner’s statements regarding what is “dome shaped” appear to be contradictory. On page 6 of the Motion, Patent

Owner states that support for this element is found in figures 3, 4, 5A, and 5B.

Those figures are provided below:

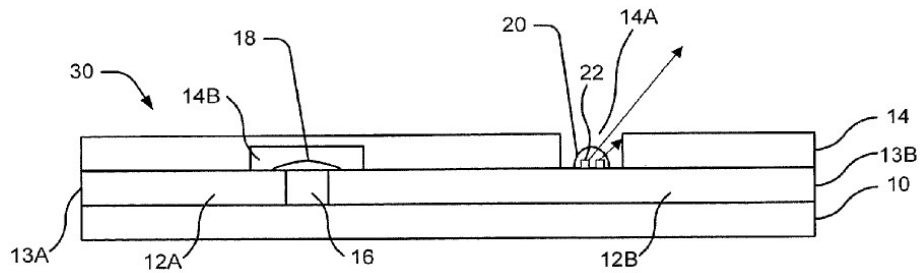


FIGURE 3

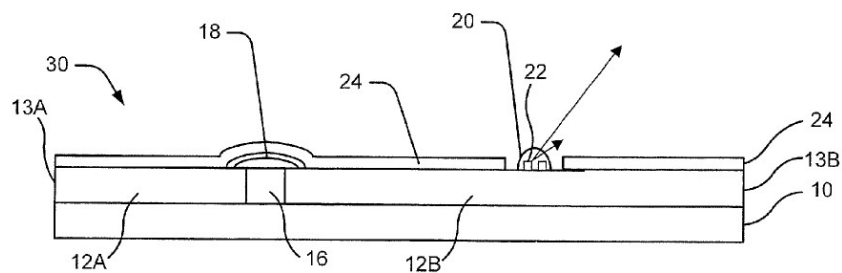


FIGURE 4

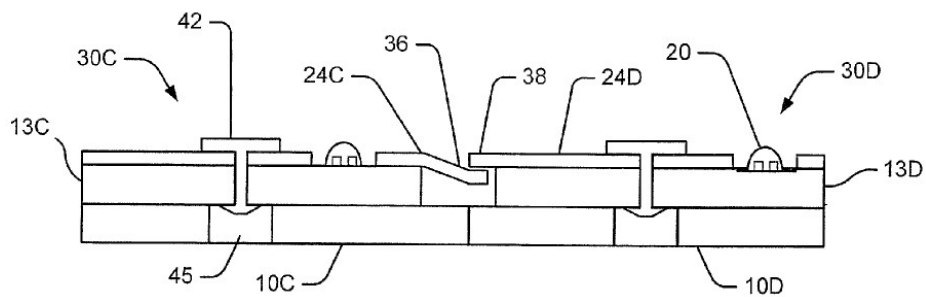


FIGURE 5A

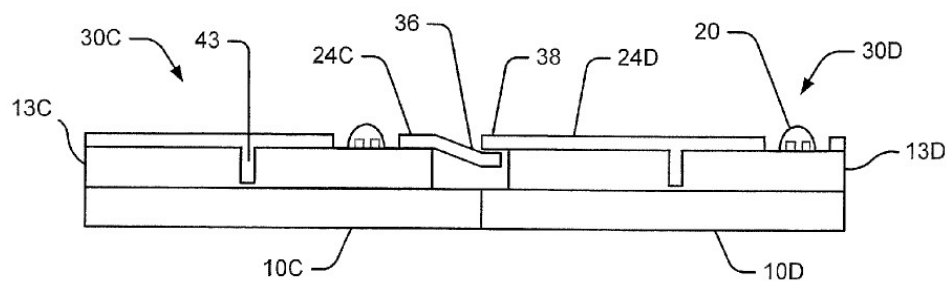
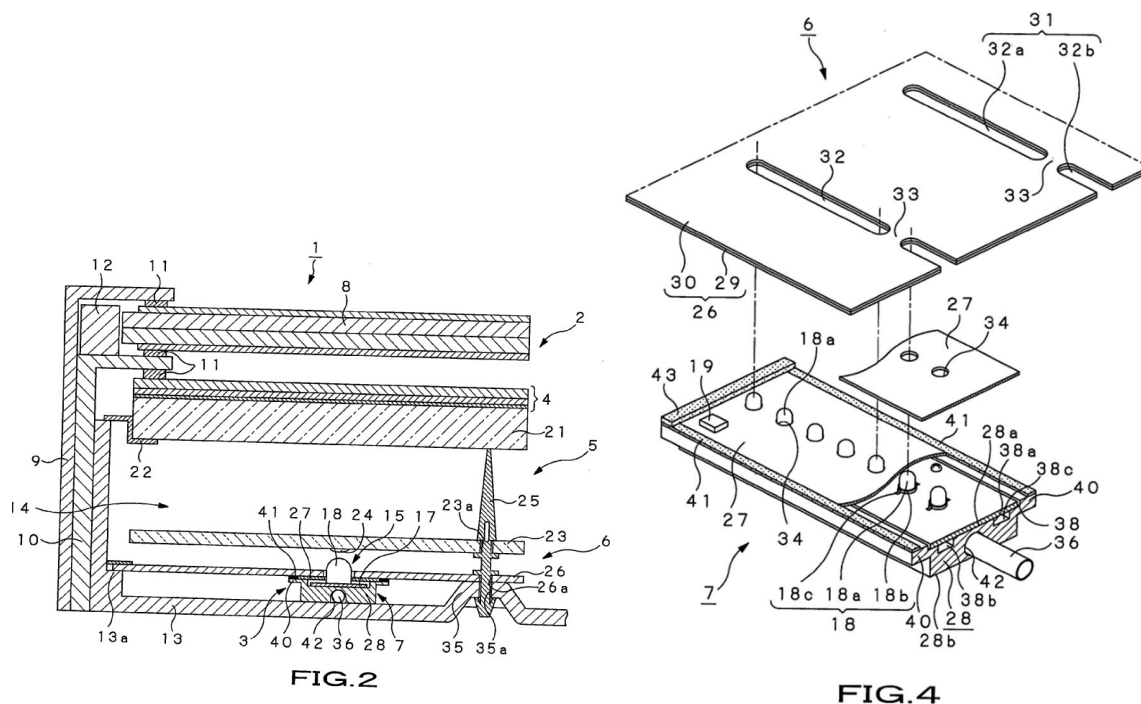


FIGURE 5B

Figures 3-5B show cross-sections with the emitter 20 having a rounded shape.

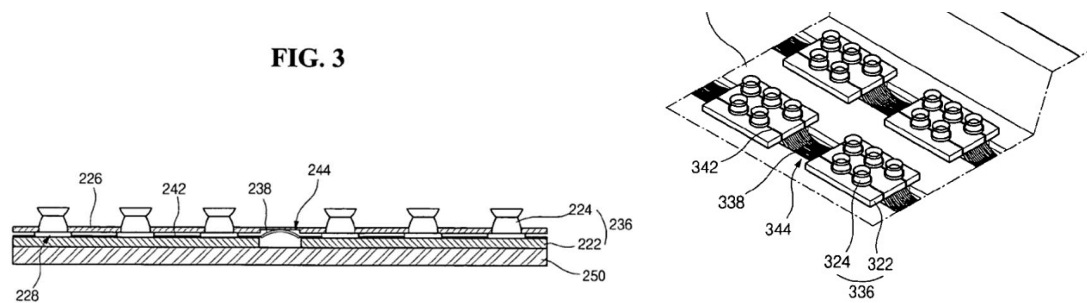
However, Patent Owner states with respect to Tabito (Ex. 1007) that “Tabito does not disclose... a dome shaped element disposed over those LED emitter chips.”

Motion, 14. Figures 2 and 4 of Tabito shows a dome shaped element 18 disposed of the over the LED chips:



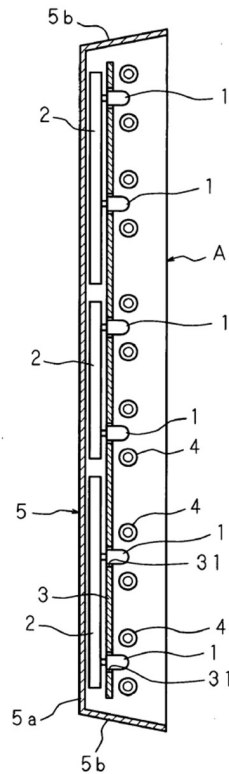
Tabito, Fig. 2, Fig. 4. The LED emitters in Tabito are similar to those shown in figures 3, 4, 5A, and 5B of the '812 Patent. Therefore, Patent Owner’s statements on what is and is not “dome-shaped” appear to be inconsistent. My understanding of the phrase “dome shaped element” is that it refers to a lens or other covering element where the upper portion opposite the LED chip is rounded in shape.

36. Patent Owner also states that “Neither Kim nor Sharp disclose a plurality of LED emitter chips or a dome shaped element disposed over the plurality of LED emitter chips. Kim and Sharp are generally silent as to the structure of their light emitting elements.” Motion, 9-10. However, Figures 3 and 4 of Kim show a dome-shaped elements (LEDs 24/124/224/324), which “may emit light using LED chips.”



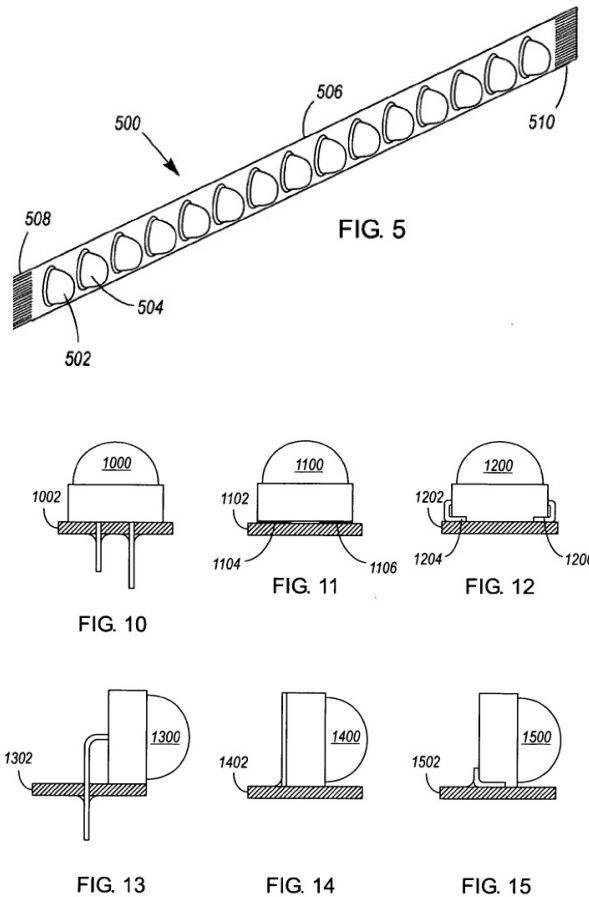
Kim, Fig. 3, Fig. 4 (cropped). Similarly, Figure 1 of Sharp (Ex. 1017), reproduced below, illustrates the backlight device assembly with LEDs 1, reflection sheet 3, and through-holes 31. Sharp, Fig. 1.

FIG. 1



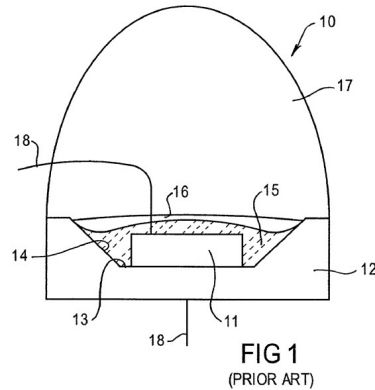
Sharp, Fig. 1. As seen in Sharp, a dome-shaped element is used to cover the LED chips. *See Sharp*, [0050] (“[E]ach of the light emitting diode 1 is substantially cylindrical with a spherical end.”). Both Kim and Sharp disclose LEDs with dome-shaped elements/lenses that cover the LED chips.

37. In addition to Kim, Sharp, and Tabito, there are numerous disclosures of LED emitters having a dome-shaped element/lens covering the LED chips. For example, U.S. Pat. Pub. No. 2006/0221610 A1 (Ex. 1023) discloses dome-shaped element/lens covering the LED chips:



Ex. 1023, Figs. 10-15; *id.*, [0011] (“FIG. 5 illustrates an array of LEDs forming one of the light sources shown in FIGS. 1-3”), [0014] (“FIGS. 10-15 illustrate various LED mounting configurations”), [0028] (“In one embodiment, the light sources 138, 140, 142 may take the form of arrays 500 of light-emitting diodes (LEDs). See FIG. 5. The individual LEDs (e.g., 502, 504) of an array 500 may be of the same or different colors.”), [0029] (“In one useful combination of LEDs, differently colored LEDs may emit dominant light wavelengths between 450 and 490 nanometers (nm) (bluish light), between 510 and 550 nm (greenish light), and between 610 and 650 nm (reddish light).”). Similarly, U.S. Pat. Pub. No.

2002/0021085 A1 (Ex. 1024) (published February 21, 2002) describes the prior art LEDs and shows them in figure 1:



Ex. 1024, Fig. 1; *id.*, [0002] (“Light emitting diodes (LEDs) are very well known in solid state illuminating devices, commonly used for illuminators, display components and indication devices.”), [0020] (“FIG. 1 illustrates a prior art light emitting device having a phosphor/epoxy layer located over a light emitting die”). It describes the dome-shaped lens 17 as “a conventional clear epoxy lens 17.” *Id.*, [0026]. Indeed, LEDs generally had dome-shaped emitters as of 2007. Dome-shaped emitters offered several advantages, such as providing uniform light distribution and reducing the hotspots. The dome shape allows for the efficient light extraction and redirection of light from the LED chips across a wider area. This accords with Kim’s goal of improving “improving brightness, color uniformity and preventing color spots.” Kim, 6:21-35

M. Wherein the reflector sheets are flexible (Claim 37).

38. Starry discloses that reflector sheets having a thickness of less than 0.25 mm would be flexible. *See* Ex. 1003, ¶55; Starry, [0075] (“Nonwoven sheets having a thickness of about 250 µm and greater still exhibit useful and improved properties, such as flexibility, low cost, and high photopic reflectance”).

VII. Additional Prior Art Shimizu Renders the Remaining New Elements of Substitute Claims 25–37 Obvious.

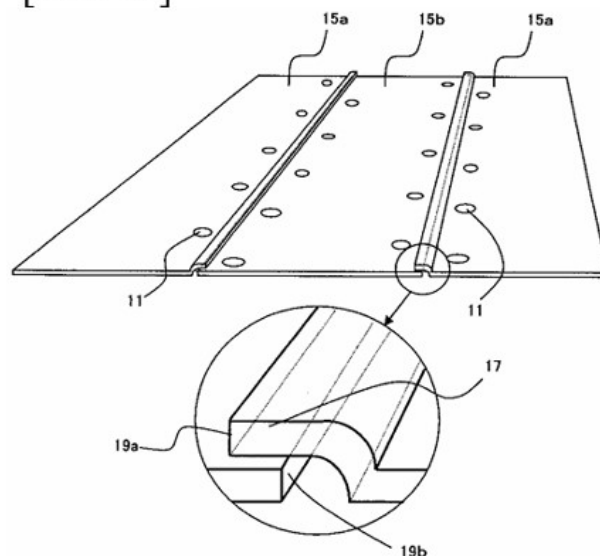
39. Substitute Claims 25–37 cover the well-known concepts in the area of lighting panel design using two or more overlapping reflector sheets having a plurality of perforation apertures configured to reduce distortion of the reflector sheets by allowing for thermal expansion. The Substitute Claims also cover the well-known concept of using mechanical fastening devices to secure the reflector sheets in place. The prior art discussed below demonstrates that the concepts that these claims attempt to cover was well-known in the art before March 16, 2007, the priority date of the ’812 Patent.

40. I am informed and understand that Shimizu (Japanese Pat. Pub. No. 2004-139871 A) is prior art to the ’812 Patent. I understand that Exhibit 1022 is a certified translation of Shimizu. Shimizu is entitled “LIGHTING DEVICE, BACKLIGHT DEVICE, AND LIQUID CRYSTAL DISPLAY DEVICE.” Shimizu describes the problem it addresses as “In a lighting device equipped with a light source and a reflective plate that reflects light emitted from the light source,

warping or bending of the reflective plate may occur when the lighting device reaches a high temperature due to continuous operation of the light source or the like, and thus, provided is a lighting device that prevents such.” Shimizu, Abstract. Shimizu solves this problem “[b]y dividing the reflective plate, configuring from a plurality of reflective plate constituents, and disposing reflective plate constituents adjacent to each other at a predetermined width, a lighting device can be provided in which no warping or bending of the reflective plate occurs even when the reflective plate constituents expand due to a temperature increase.” Shimizu, Resolution Means.

41. Figure 10 of Shimizu, reproduced below, shows an embodiment that uses multiple reflective plates with overlapping edges to prevent warping or bending of the reflective plate.

[FIG. 10]



In this embodiment, “close portions of adjacent edges 19a and 19b of the reflective plate constituent 15a and the adjacent reflective plate constituent 15b are disposed in an overlapping manner.” Shimizu, [0048]. As seen in Figure 10, the first and third reflective plate constituents 15a have edges overlapping the second reflective plate constituent 15b. Shimizu explains that “[w]hen the temperature increases, such as by continuously operating the light source 4, the reflective plate constituents 15a and 15b both expand and grow larger” and that “the adjacent edges 19a and 19b expand to increase the area of the overlapping portion 17 without touching each other. Therefore, stress based on the contact between adjacent edges does not occur, and it is possible to prevent the occurrence of warping and bending.” Shimizu, [0049]-[0050].²

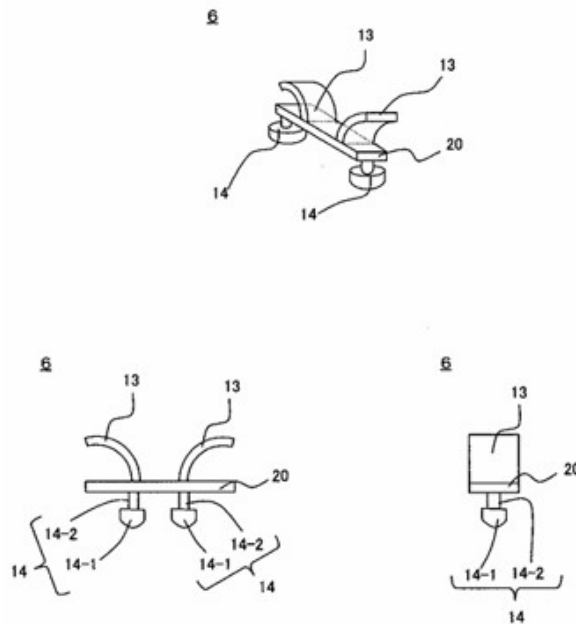
42. The reflector sheets of Shimizu contain circular holes 11 for securing the reflective plate constituent 5 in place. Shimizu, [0033], [0040] (describing hole 11 as “a circular hole”). The holes 11 correspond to holes 16 in the housing 2 for insertion of a locking device 6, which secures adjacent reflective plate constituents

² Shimizu also discloses an embodiment that uses a gap between the reflective plates to allow for thermal expansion rather than using overlapping edges. *See generally* Shimizu, [0020]-[0045]. Shimizu indicates that the discussion with respect to the gap embodiment applies equally to the embodiment using overlapping edges. Shimizu, [0051] (“Note that it goes without saying that modifications similar to those described in embodiment 1 can also be made to embodiment 2.”).

5 . Shimizu, [0027]-[0028]. Shimizu discloses that the holes are configured to have “a gap corresponding to the amount of expansion when the reflective plate constituent 5 thermally expands.” Shimizu, [0034].

43. Shimizu’s locking device 6 passes through the holes 11 and 16 in the reflective plate constituent 5 and housing 2 and attaches the reflective plate constituent 5 to the housing 2. *See* Shimizu, [0013], [0021], [0027], [0030]-[0035], [0051], Figs. 4-6, 10-13. Figure 4 of Shimizu illustrates the components of the locking device 6.

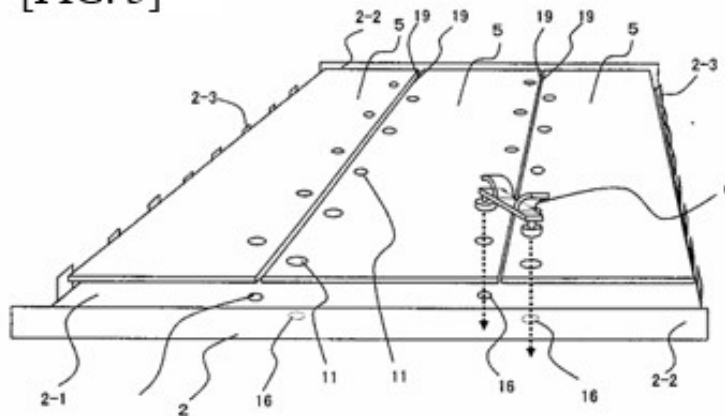
[FIG. 4]



Shimizu, Fig. 4. The locking device 6 includes “a locking part 14 for locking the locking device 6 to the housing 2.” Shimizu, [0030]. “[T]he locking part 14 of the

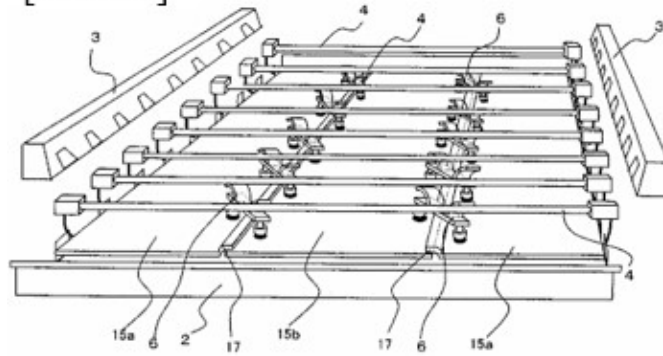
locking device 6 is inserted through the hole 11 and the hole 16 as illustrated by the arrow in FIG. 5.” Shimizu, [0033].

[FIG. 5]

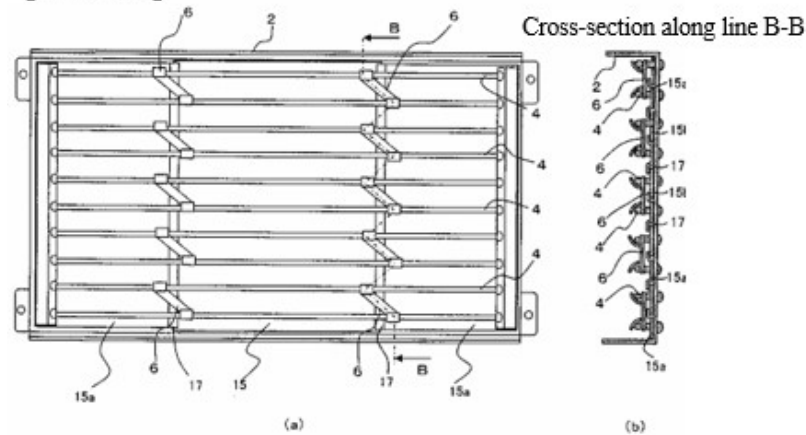


As described in Shimizu, “the locking device 6 is disposed straddling both adjacent edges 19 of adjacent reflective plate constituents 5,” which makes it “possible to lock a plurality of reflective plate constituents using a single locking device, thereby reducing the number of locking devices 6.” Shimizu, [0033]. This is shown with respect to the overlapping embodiment in Figures 11 and, 12:

[FIG. 11]



[FIG. 12]



Shimizu Fig. 11, Fig. 12. As discussed above, Shimizu describes leaving a gap between the hole 11 in the reflective plate constituent 5 and the locking device 6 so to prevent distortion (i.e., warping or bending) of the reflective constituent 5 due to thermal expansion. Shimizu [0034] (“Furthermore, as a result of disposing as described above, the reflective plate constituent 5 can be locked into the housing 2 by sandwiching it between the base 20 and the flat plate 2-1, a gap corresponding to the amount of expansion when the reflective plate constituent 5 thermally

expands is simultaneously created between the neck part 14-2 and the hole 11, and furthermore, each reflective plate constituent 5 is disposed having a gap between itself and an adjacent reflective plate constituent 5 similar to the amount of expansion when the reflective plate constituent expands.”).

44. The overlapping edges and designated thermal expansion zones in the form of gaps between the holes 11 and the locking device 6 prevent distortion of the reflective plate constituent due to warping or bending. Shimizu [0011] (“[W]hen the temperature of the reflective plate increases due to the operation of the light source or the like, opposing edges (hereinafter referred to as adjacent edges) of adjacent reflective plate constituents do not come into contact when the reflective plate constituents expand. Therefore, no stress due to thermal expansion is applied to either adjacent reflective plate constituent, thus preventing the occurrence of bending or warping of the reflective plate.”), [0034]. This ensures that the reflective plate remains flat, which is the same shape as the housing 2 in Shimizu.

VIII. Motivations to Combine

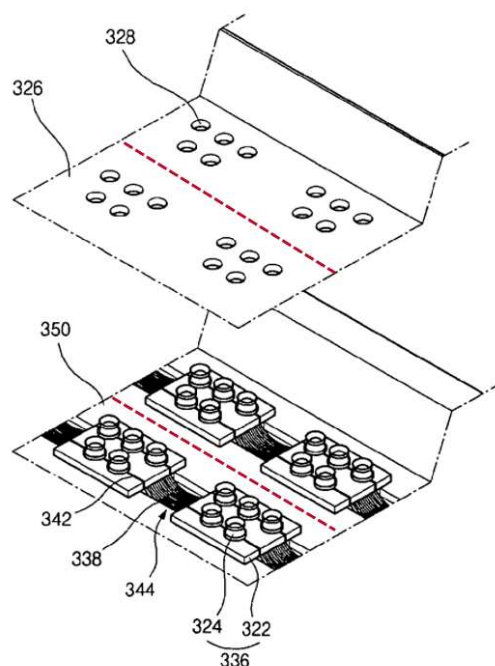
A. It Would Have Been Obvious to Combine Kim and Sharp.

45. As discussed in my second declaration, it would have been obvious to combine Kim and Sharp. Ex. 1015, § VI.B.

46. Additionally, a POSA would have been motivated to use the mechanical fastening devices of Sharp with Kim's system. Kim discloses components and arrangements for its backlight assembly 20 but is silent as to how the components are secured within the backlight assembly 20. Two methods of securing components in a backlight assembly are physical means (e.g., mechanical fasteners) and chemical means (e.g., adhesives). Sharp discloses physical means for securing its components. *See* Section VI.K. It would have been obvious to a POSA to use physical means (lamp clips, screws, and the like) as disclosed Sharp in the backlighting assembly of Kim in order to secure the components in place. Doing so would provide an advantage over chemical/adhesive means, where there may be a risk of delamination or detachment of the reflector sheet or other components in the backlighting assembly due to high heat from continuous operation of the LEDs and/or thermal cycling of the display which could lead to expansion-contraction cycles which could increase the risk of delamination of the reflector.

47. Sharp's mechanical fasteners (lamp clips, screws, or the like) could be used in different ways in Kim's backlighting lighting assembly 120 in order to secure the components. For example, there could be the holes for insertion of the lamp clips or screws in the space between the PCBs 222/322, such as along the dashed line below:

FIG. 4A



Kim, Fig. 4A (annotated). The lamps clips, screws, or the like, would pass through the reflective sheet 326 and the bottom frame 350 to secure the reflective sheet 326 to the bottom frame 350. The PCB 322 and LEDs 336 would be secured by being sandwiched between the reflective sheet 326 and the bottom frame 350. *See Sharp, [0048]* (“the light emitting diode substrates 2 are positioned and fixed by the fastening function of the lamp clips in a state in which the light emitting diode substrates 2 are sandwiched between the reflection sheet 3 and the housing 5”). Another option would be to place the holes for insertion of the lamp clips or screws on the PCBs 222/322 themselves in addition to the holes in the reflective sheet 326 and the bottom frame 350. The lamp clips, screws, or the like would pass through

the PCB 322, the reflective sheet 326, and the bottom frame 150 in order to secure both the PCB 322 and reflective sheet 326 to the bottom frame 150. This method would not rely on mechanical pressure (i.e., sandwiching) to secure the PCB 322. Both methods are equally viable design choices. The first method would require requiring less precision during manufacturing but relies on sandwiching to secure the PCB. The latter method would require more precision during manufacturing in order to avoid damaging any components on the PCB, but does not rely on sandwiching to secure the PCB.

48. Although I use the term “pass through” above, mechanical fasteners such as screws may not necessarily pass all the way through to the backside of the bottom frame 350. For example, such screws may pass through the top surface of the bottom frame 350 (where the light emitting diode substrates 2 and the bottom frame 350 contact) and penetrate partially through the bottom frame 350. Whether the mechanical fasteners pass partially or all the way through the bottom frame would depend on factors such as the thickness of the bottom frame 350 and where there is anything on the backside of the bottom frame. These variations in fastening the optical and structural components of panel displays are all obvious design choices that were available to and used by one of skill in the art in the field at the relevant time.

B. It Would Have Been Obvious to Combine Kim and Starry.

49. As discussed above and in my prior declarations, Kim and Starry both disclose optical elements for backlit LCD assemblies. For example, Kim discloses “[a] backlight assembly includes a plurality of light emitting diode units, each of the plurality of light emitting diode units including at least one light emitting diode and a printed circuit board mounting the at least one light emitting diode, and a reflective sheet on the printed circuit board, the reflective sheet having at least one hole corresponding to the at least one light emitting diode.” Kim, Abstract. Starry discloses a reflector sheet of a preferable thickness between 0.25 and 0.15 mm. Starry, [0006] (“For certain markets it is critical that the backlight reflector is relatively thin, i.e., less than 250 μm and often less than 150 μm , to minimize the thickness of the completed display.”), [0007] (“The reflective material used in LCD backlights has a significant effect on the brightness, uniformity, color and stability of the backlight unit and, ultimately, the LCD module.”).

50. In my opinion, a POSA would have been motivated to apply the thickness of Starry’s reflector to Kim’s system. Although Kim does not specifically disclose the thickness of the reflector, Starry does. Starry provides an express motivation to combine, explaining that “[p]ortable computer LCDs are a substantial and demanding market requiring high levels of diffuse reflection of

visible light from very thin materials. For certain markets it is critical that the backlight reflector is relatively thin, i.e., less than 250 μm and often less than 150 μm , to minimize the thickness of the completed display.” Starry, [0006]. An LCD display, which is an example given by Starry, is exactly the type of display device described in Kim. *See* Kim, 1:12-15 (“The present invention relates to a backlight assembly, and more particularly, to a backlight assembly including at least one light emitting diode (LED) as a light source and a liquid crystal display (LCD) module using the backlight assembly.”). A POSA would have been motivated to use Starry’s thinner materials to minimize the thickness of the backlight assembly and thereby minimize the thickness of the overall LCD display

51. It would have been obvious to apply Starry’s teachings regarding a thin backlight reflector “less than 250 μm and often less than 150 μm , to minimize the thickness of the completed display.” Starry, [0006]. Such a reflector sheet would “exhibit useful and improved properties, such as flexibility, low cost, and high photopic reflectance, that make them desirable for use in place of competitive materials in applications requiring diffuse reflection of visible light.” Starry, [0075]. Accordingly, it would be obvious to combine Kim and Starry in order to “improve[] productivity and reduce[] production costs” as Kim seeks to accomplish. Kim, 2:50–53. This would yield predictable results with a reasonable expectation of success. The thin thickness of the reflector for panel displays is an

obvious design choice that was available to and used by one of skill in the art in the field at the relevant time.

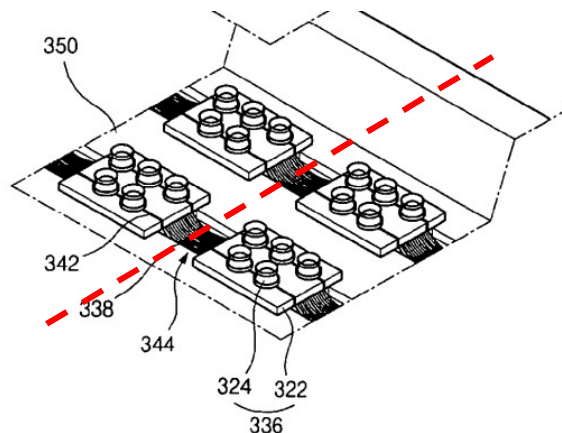
C. It Would Have Been Obvious to Combine Kim, Sharp, and Shimizu

52. In my opinion, a POSA would have been motivated to combine Kim, Sharp, and Shimizu, would have understood how to do so, and would have had the skillset to do so. All three disclose reflectors and LEDs in a backlight assembly. *See* Kim, 1:13–14 (“[A] backlight assembly including at least one light emitting diode (LED) as a light source and a liquid crystal display (LCD) module using the backlight assembly.”); Sharp, Abstract (“a reflection sheet for reflecting light emitted by the light emitting diode to the panel module, the reflection sheet is placed on the front side of the light emitting diode substrate, and the reflection sheet is provided with a through-hole into which the light emitting diode is inserted.”); Shimizu, [0024] (“Furthermore, the light source 4 includes a plurality of fluorescent tubes disposed at equal distances apart and facing the flat plate 2-1, and emits light by applying a predetermined electric power. Note that, in the present embodiment, a fluorescent tube is described, but this is merely one example, and the fluorescent tube may also be another light-emitting element such as an LED (light-emitting diode). Note that, in the present Specification, light source refers to all light-emitting elements, including fluorescent tubes and LEDs.”).

53. Shimizu recognizes a problem that “warping or bending of the reflective plate may occur when the lighting device reaches a high temperature due to continuous operation of the light source,” and “uneven brightness occurs on the display screen of the liquid crystal display device, leading to a decrease in image quality.” Shimizu, Abstract, [0007]. The focus of Shimizu is configuring the reflector to “obtain a backlight device that does not undergo warping or bending of the reflective plate and provides uniform emission without uneven brightness even when the temperature increases.” Shimizu, [0078]; *see also id.*, [0077], [0079]. Shimizu achieves this by using multiple reflectors with either a gap between the reflectors or by overlapping the edges of adjacent reflectors. *See supra* Section VII. Doing so prevents contact and stress between adjacent edges during thermal expansion and prevents the reflector from creasing as it thermally expands. This accords with Kim’s goal of improving “improving brightness, color uniformity and preventing color spots.” Kim, 6:21-35.

54. Although Kim does not specify the exact size of the backlight unit, as the size of the LCD device increases in size, a larger LED module is required as the backlight module. *See* Kim, 1:40-43 (recognizing “the great demand for the LCD device having a large display screen”). These in turn requires a greater number of LEDs and larger reflectors, which increases the thermal management (and thermal expansion) issues. For larger or wider LCD screens, it would be

advantageous to use multiple smaller reflectors over a single large reflector. *See, e.g.,* Shimizu, [0003] (“In response to this, patent document 1 discloses art that aims to prevent warping and bending of the reflective plate, in which a large reflective plate is formed by combining a plurality of reflective plate constituents, thereby reducing the size of a single reflective plate constituent, in order to solve the problem of warping and deflection caused by strength problems when the reflective plate is enlarged”). This allows for better thermal expansion. For example, the use of multiple reflectors in Kim would allow thermal expansion along the dashed line below.



Kim, Fig. 4A (cropped and annotated). The dashed line is an example of where the reflector sheets would overlap using the reflectors disclosed in Shimizu in the backlight assembly of Kim. As Shimizu explains, “the adjacent edges 19a and 19b [of the reflector sheet] expand to increase the area of the overlapping portion 17 without touching each other. Therefore, stress based on the contact between

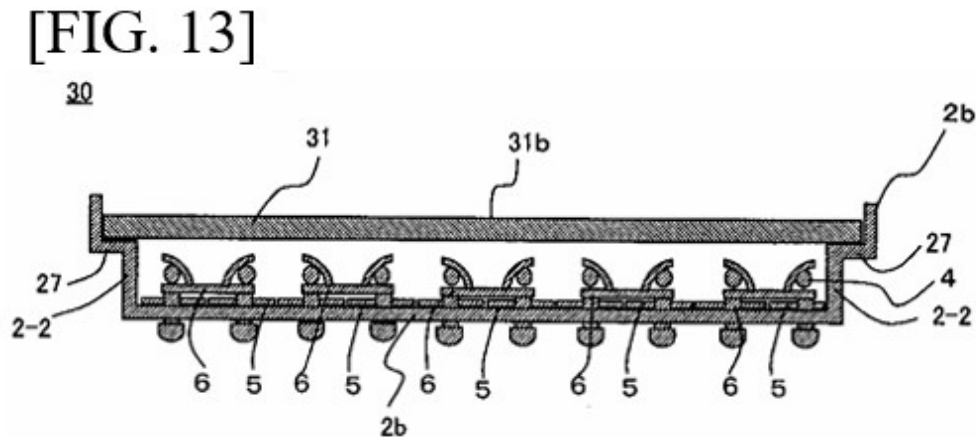
adjacent edges does not occur, and it is possible to prevent the occurrence of warping and bending.” Shimizu, [0050]. Using a single reflector sheet, expansion along dashed line above may result in a crease due to warping or bending of the reflector sheet. The cost of a large size reflector is also significantly higher than multiple smaller reflector sheets. Reducing the production cost by using multiple smaller reflectors aligns with Kim’s of “reduced production costs.” Kim, 2:50-53. Using multiple smaller reflectors would also allow for easier and more efficient correction of manufacturing defects. For example, an imperfection or defect in a larger reflector sheet may require replacing the entire reflector sheet. However, using multiple smaller reflectors would only require replacing the single reflector sheet containing the defect. *Cf.* Kim, 2:30-39 (“If only a few of the LEDs 24 are defective, it is difficult to selectively replace the defective LEDs 24, and the whole row of PCBs 22 with the defective LEDs 24 has to be replaced with a new one. As a result, many non-defective LEDs 24 on the PCBs 22 are wasted, thereby lowering productivity and increasing the product costs.”). This results in better modality and scalability, aligning with Kim’s goals of “improv[ing] productivity” and “reduc[ing] production costs.” Kim, 2:50-53.

55. Regarding the different embodiments in Shimizu, a POSA would prefer the embodiment with overlapping edges over the embodiment with gaps between the reflectors. First, the overlapping edges would result in increased

reflectance since there would not be spaces between the reflectors without the reflective material. Second, there is not the risk of adjacent edges contacting each other if the thermal expansion was greater than the space of the gap left between the reflectors in the gap embodiment of Shimizu. Thus, the overlapping edge embodiment of Shimizu would provide better reflectance and require less precise manufacturing tolerances. By not requiring manufacturing tolerances to be as precise, the manufacturing process can be substantially more efficient and less expensive. Accordingly, it would be obvious to combine the multiple overlapping reflectors of Shimizu with Kim in order to “improve[] productivity and reduce[] production costs” as Kim seeks to accomplish. Kim 2:50–53. This variation in the reflector component of panel displays is an obvious design choice that was available to and used by one of skill in the art in the field at the relevant time.

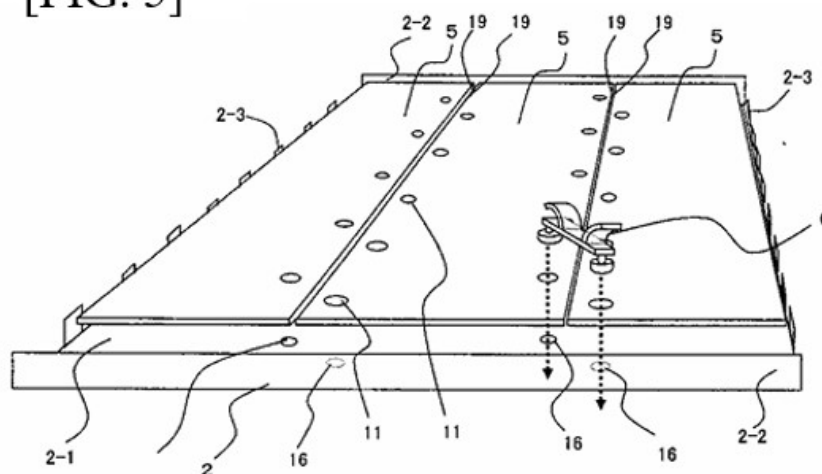
56. It also would have been obvious to apply Shimizu’s teachings regarding mechanical fasteners to hold the reflectors in place. As explained above in Section VIII.A, Kim is silent regarding how the components in the backlight assembly 120 are held in place. It would have been obvious to a POSA to use mechanical fasteners to secure the components in Kim’s backlight assembly for the same reasons stated above with respect to Sharp, and the discussion of the positioning for the fasteners discussed above applies equally to Shimizu.

Shimizu discloses a locking device that provides means for securing the reflector. Shimizu's fastening device 6 penetrates through to the back of the housing 2 and "holds the light source 4 and the reflective plate constituent 5 in the housing 2." See Ex. 1022, [0021]. This can be seen, for example, in Fig. 13 of Shimizu:



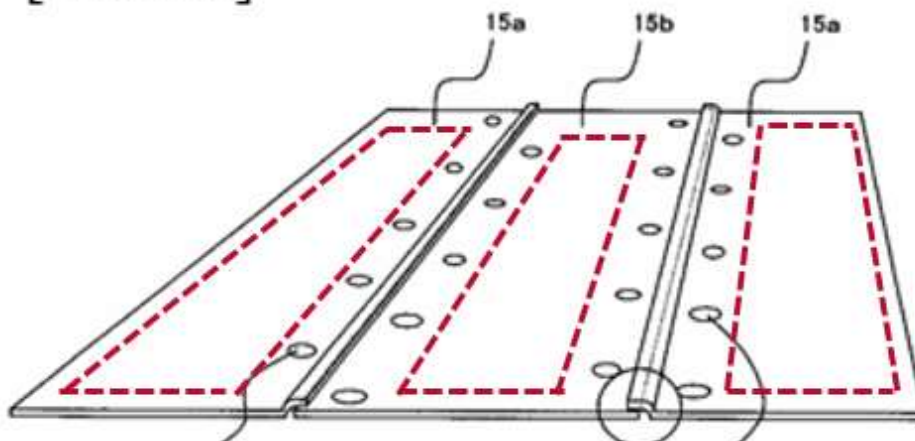
Shimizu explains with respect to figure 5 that "the locking device 6 is disposed straddling both adjacent edges 19 of adjacent reflective plate constituents 5," and that it is possible to lock a plurality of reflective plate constituents using a single locking device, thereby reducing the number of locking devices 6." Shimizu, [0033].

[FIG. 5]

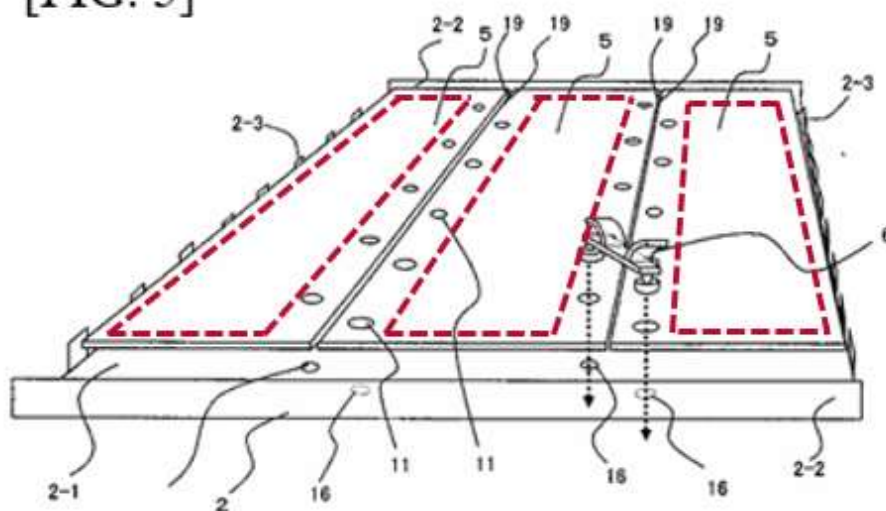


Shimizu, Fig. 5. An additional benefit of using the specific locking device 6 of Shimizu is that the supporting part 13 of the locking devices 6 could also be utilized to provide support for the other components in Kim (such as the transparent window 130 and diffusion plate 132) so that they do not contact the LEDs. The circular holes 11 for securing the reflective plate constituent 5 would be separate and distinct from the holes 128/228/328 in Kim that are arranged to accommodate the LEDs since the holes 11 are used for securing one or more reflective plate constituents 5. The holes in Kim for accommodating the LEDs would be within the regions outlined in red:

[FIG. 10]



[FIG. 5]



Shimizu, Figs. 10 & 5 (cropped and annotated). Because the holes 11 and 16 are aligned and used for securing one or more reflective plate constituents 5 via the locking device 6, these holes would also be separate and away from any lines 238/338 interconnecting the LEDs. The locking device 6 would pass through the reflective sheet 26/126/22/326, the PCB 122, 222, 322, and the bottom frame 150/250/350 of Kim to secure the reflective sheet 26/126/22/326 in place. This

variation in fastening the optical and structural components of panel displays is an obvious design choice that was available to and used by one of skill in the art in the field at the relevant time.

57. The advantages of Shimizu's multiple reflector sheet arrangement and locking devices align with Kim's goals. For example, Kim seeks to "improve[] productivity and reduce[] production costs." Ex. 1016, 2:50–53. Shimizu explains that the number of locking devices can be reduced and that the overlapping sheets accommodate thermal expansion. These advantages translate to improved manufacturing efficiency and a reduction in production costs because the manufacturing tolerances can be greater, requiring less precision during manufacturing. Kim is ready for improvement and combining the known solutions disclosed in Sharp, Starry, and Shimizu in a similar system described by Kim would yield predictable results with a reasonable expectation of success. These variations in the optical and structural components of panel displays are all obvious design choices that were available to and used by one of skill in the art in the field at the relevant time. Accordingly, it would be obvious to combine Kim, Sharp, Starry, and Shimizu.

I hereby declare that statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true.

Should further information become available to me as this matter proceeds, I may revise my opinions accordingly as necessary. I declare under penalty of perjury that the foregoing Declaration is true and correct.

December 9, 2024

Date



Dr. F. Morgan Pattison