

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. 1015 – Declaration of P. Morgan Pattison, Ph.D. in Response to Patent
Owner’s Contingent Motion to Amend**

Table of Contents

I.	Introduction.....	3
II.	Materials Considered	4
III.	Patent Owner’s Substitute Claims.	5
IV.	The Prior Art Addressed in My Prior Declaration Renders Every Element of Substitute Claims 25–28 Obvious.	6
	A. The reflector sheet comprises at least one aperture configured to be proximate to the at least one solid state lighting element, wherein the reflector sheet does not contact the at least one solid state lighting element. (Substitute Claims 25 and 27).	6
	B. The protruding feature is separate and positioned away from the at least one solid state lighting element. (Substitute Claims 25 and 27).13	
	C. The reflector sheet covers and maintains a substantially flat surface over the protruding feature, wherein, the flat surface is parallel to the surface of the substrate. (Substitute Claims 26 and 28).....	15
V.	Additional Prior Art Renders Every Element of Substitute Claims 25–28 Obvious.....	16
	A. Kim: U.S. Patent No. 7,481,553.....	17
	B. Sharp: U.S. Patent Publication No. 2007/0064171	19
	C. Liu: U.S. Patent Publication No. 2006/0187660.....	22
	D. Lee: U.S. Patent Publication No. 2003/0223249	26
VI.	Motivations to Combine	29
	A. It Would Have Been Obvious to Combine Chou and Tabito	29
	B. It Would Have Been Obvious to Combine Kim and Sharp.	29
	C. It Would Have Been Obvious to Combine Chou and Liu.	32
	D. It Would Have Been Obvious to Combine Lee and Sharp.	35

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 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 25-28 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.

II. Materials Considered

7. In addition to the materials identified in my prior declaration (*see* Ex. 1003, ¶30) 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
1013	U.S. Pub. No. 2006/0187660 (“Liu”)
1014	U.S. Patent No. 7,324,174 to Tabito (“Tabito 174”)
1016	U.S. Patent No. 7,481,553 to Kim <i>et al.</i> (“Kim”)
1017	U.S. Pub. No. 2007/0064171 (“Sharp”)
1018	U.S. Pub. 2003/0223249 to Lee <i>et al.</i> (“Lee”)

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, 12, 15, and 18 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 substrate;
a solid state lighting element mounted on a surface of the substrate; ~~and~~
a reflector sheet on the surface of the substrate, the reflector sheet configured to conform to a shape of a protruding feature on the tile-, wherein the reflector sheet comprises at least one aperture configured to be proximate to the at least one solid state lighting element, wherein the reflector sheet does not contact the at least one solid state lighting element; and
wherein the protruding feature is separate and positioned away from the at least one solid state lighting element.

26. (proposed substitute for Claim 12) The tile of claims 25, ~~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, wherein the reflector sheet covers and maintains a substantially flat surface over the protruding feature, wherein, the flat surface is parallel to the surface of the substrate.~~

27. (proposed substitute for Claim 15) A method of forming a solid state lighting device comprising:
providing a substrate of a solid state lighting tile;
mounting a solid state lighting element on a surface of the substrate; ~~and~~
positioning a reflector sheet on the surface of the substrate, the reflector sheet configured to conform to a shape of a protruding feature of the solid state lighting tile-, wherein the reflector sheet comprises at least one aperture configured to be positioned around the

at least one solid state lighting element, where the reflector sheet does not contact the at least one solid state lighting element; and wherein the protruding feature is separate and positioned away from the at least one solid state lighting element.

28. (proposed substitute for Claim 18) The method of claim 27, ~~wherein the reflector sheet comprises an aperture configured to be positioned over the solid state lighting element, wherein the reflector sheet does not contact the solid state lighting element.~~ wherein the reflector sheet covers and maintains a substantially flat surface over the protruding feature, wherein the flat surface is parallel to the surface of the substrate.

IV. The Prior Art Addressed in My Prior Declaration Renders Every Element of Substitute Claims 25–28 Obvious.

10. In my prior declaration I broke down the elements of claims 1–7, 10–12, 14–21, and 23 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. In the analysis below I address the new elements of Substitute Claims 25–28 and demonstrate that each of these elements was also known in the art before March 16, 2007, the priority date of the '812 Patent.

A. The reflector sheet comprises at least one aperture configured to be proximate to the at least one solid state lighting element, wherein the reflector sheet does not contact the at least one solid state lighting element. (Substitute Claims 25 and 27).

11. As discussed in my prior declaration, Chou (Ex. 1005) discloses or renders obvious each element of original claim 1, and it would be obvious to combine Chou with the knowledge of a POSITA. In effect, Patent Owner's proposed Substitute Claim 25 simply modifies claim 1 to include a limitation that

the reflector sheet does not contact the LED and a limitation that a protruding feature is separate from the LED. The first limitation of “the reflector sheet comprises at least one aperture configured to be proximate to the at least one solid state lighting element, wherein the reflector sheet does not contact the at least one solid state lighting element” is the same as original dependent claims 12 and 18. Claim 12 recites: “The tile of claim 1, 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.” ’812 Patent, Claim 12. Claim 18 recites: “The method of claim 15, wherein the reflector sheet comprises an aperture configured to be positioned over the solid state lighting element, wherein the reflector sheet does not contact the solid state lighting element.” ’812 Patent, Claim 18. Such a design for a reflector was well-known in the art before April 2006. Just as I previously discussed in my prior declaration that claims 12 and 18 are invalid because Chou renders them obvious either alone or in combination with the knowledge of a POSITA, this limitation in substitute claims 25 and 27 is obvious. Ex. 1003, ¶¶46–52. However, for completeness, I will briefly address this limitation here as well.

12. First, Chou Fig. 1A illustrates the reflector sheet 300 not in contact with the LED 200, as shown below.

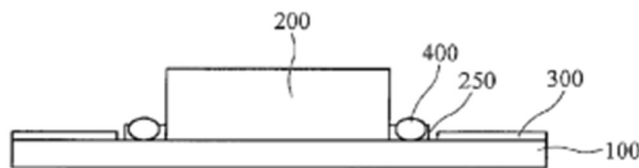


FIG. 1A (PRIOR ART)

Chou, Fig. 1A. Chou describes this arrangement as being well known in the art. Indeed, Chou labels it as prior art. Accordingly, a POSITA would know about this arrangement prior to the priority date of the '812 Patent and would understand how to implement it in Chou's assembly.

13. Additionally, as I previously discussed, "LED chips are typically packaged with a clear protective encapsulant. Thus, to the extent there is contact between the reflector sheet and the LED in the design shown in Chou, that contact is not with the semiconductor itself. Rather the reflector sheet would contact the encapsulant instead." Ex. 1003, ¶49.

14. Further, Chou focuses on a specific aspect lighting: conforming a reflective sheet to a lighting element. In my opinion a person of ordinary skill in the art reviewing Chou would understand that there are protruding features elsewhere on the circuit board 500, and these protruding are separate and positioned away from the lighting element (e.g., an LED). It also would have been obvious to leave a space between the reflector and the LED or having an intervening material between the reflector and the LED so that the reflector and the

LED do not touch for several reasons.¹ For example, leaving space between the reflector and the LED allows for greater manufacturing tolerances because the LED does not have to fit perfectly within a hole or aperture in the reflector sheet. This is further confirmed by Chou's explanation that the reflector sheet can be made of a deformable material (Chou, col. 4:29-33), such a material would conform to the shape of protruding features separate and positioned away from the lighting element. Additionally, space between the reflector and LED allows for some thermal expansion, preventing the reflector sheet and LED pressing up against each other creating stresses that may damage the components in the lighting assembly. Finally, leaving space between the reflector and the LED or including an intervening material between the reflector and the LED helps prevent heat transfer that may damage the components from thermal expansion or overheating. Leaving such a space between the reflector and the LED would not result in a reflector sheet that is unmoored or "flapping around" as Patent Owner alleges. This is confirmed by Chou, which contemplated thicker solder and leads

¹ Leaving a space between the reflector and the LED can be accomplished through different means. For example, as discussed herein and in Chou, a space can be created by using thicker solder and leads that lift the reflector away from the LED. However, there are other ways to create a space between the LED and the reflector sheet. For example, because the height of an LED can vary in Chou, a POSITA would understand that creating a space between the reflector sheet and the LED could also be accomplished by using a lower profile LED with same thickness of solder and lead.

lifting the reflector away from the LED. Conversely, in FIG. 3, angle θ would not change if the thickness of either the solder or lead were reduced. As stated above, the reflector sheet can be made of a deformable material (which would not necessarily be loose or unrestrained) and there are protruding features elsewhere on the circuit board 500. Contrary to PO's assertion, a POSITA would understand that a reflector sheet that does not contact the LED would not be unmoored as it would be positionally restrained by the protrusion or restrained as a function of its material construction, or both.

15. Tabito (Ex. 1007) discloses a reflector sheet with an aperture proximate to the solid state lighting element, wherein the reflector sheet does not contact the at least one solid state lighting element. For example, Figure 2 illustrates a gap between the reflecting plate 26 and the LED 18. I have annotated Figure 2 below to show this.

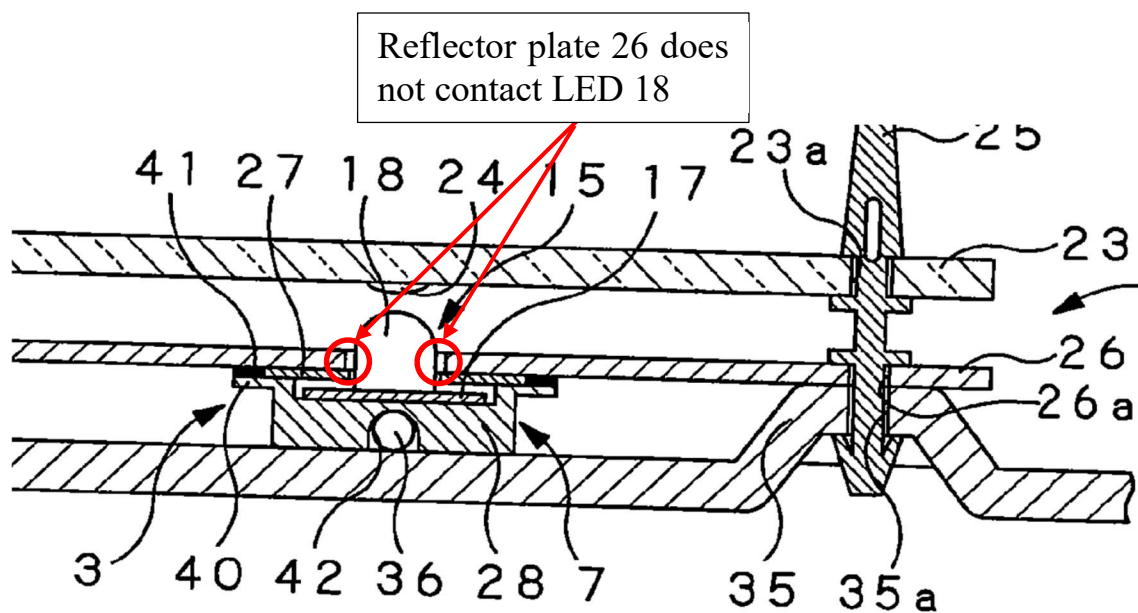


FIG. 2

Tabito, Fig. 2 (cropped and annotated).

16. Figure 2 confirms that there is a gap between the reflecting plate 26 and the LED 18 by not extending the hatch lines on the cross-section of the reflecting plate 26 all the way to the LED 18. Hatch lines are used in the art to show that a component in a drawing has been cut in the drawing to show the internal cross-section. Where there are no hatch lines, there is no material that has been cut to show the cross-section. The two horizontal lines on the top and bottom of the reflector plate that continue out from the reflector plate 26 and appear to touch the LED 18, are not illustrating that the reflector plate 26 is touching the LED 18. Instead, those two lines are referring to the edge of the reflector plate 26 as it continues around the back of the LED 18. Thus, figure 2 shows that the

reflector plate 26 has an aperture proximate to the LED 18 and does not contact the LED 18.

17. Tabito Figure 3, reproduced below, also shows the reflector sheet 26 not in contact with the LEDs 18. The apertures 32 in the reflector sheet 26 go around the LEDs 18 without touching them. Tabito describes this as “[e]ach opening of the unit guide opening section 32 has an opening width slightly larger than the outer diameter of the light emitting part 18a of the LED unit 18 and a length long enough to allow five LED units 15 to pass therethrough.” Tabito, [0069].

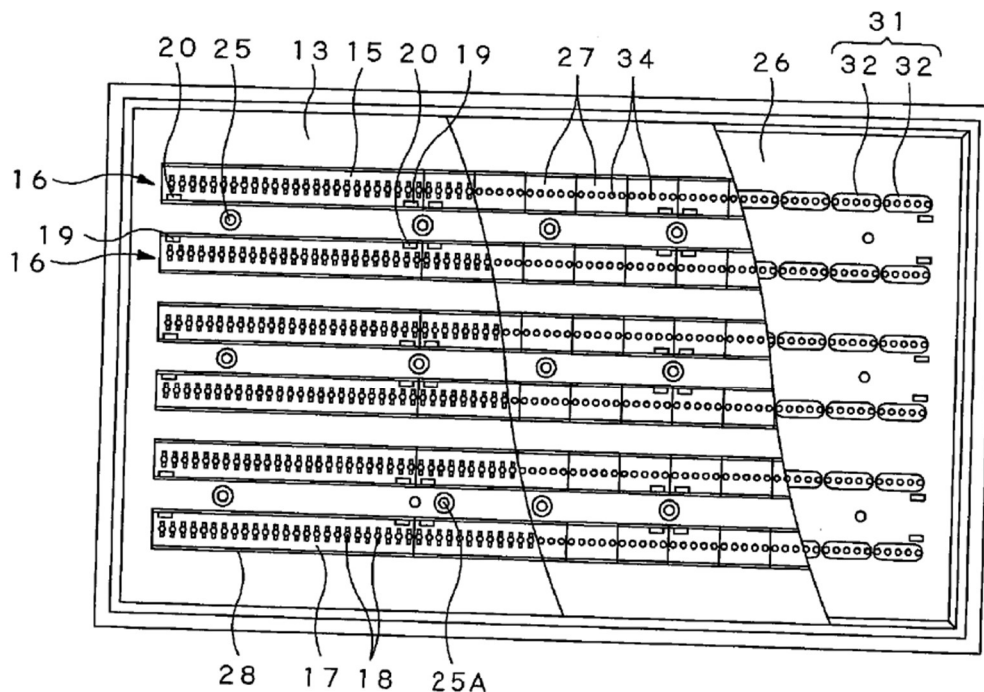
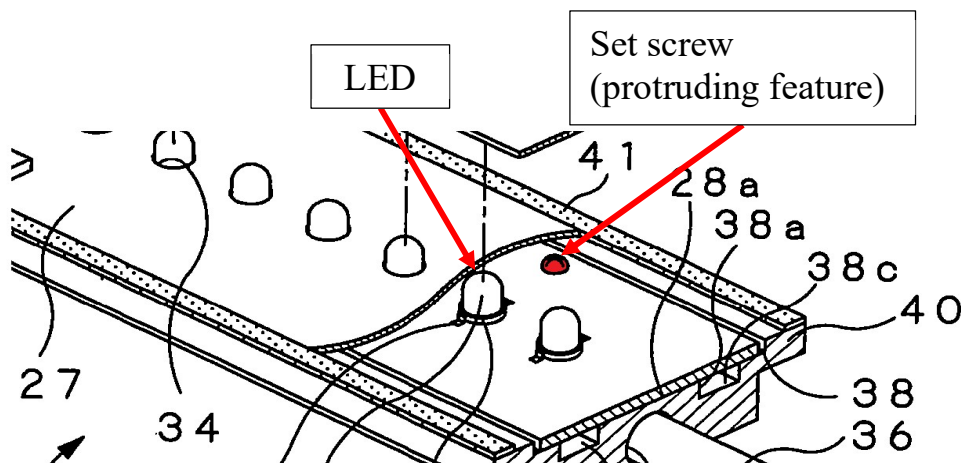


FIG. 3

Tabito, Fig. 3.

B. The protruding feature is separate and positioned away from the at least one solid state lighting element. (Substitute Claims 25 and 27).

18. Tabito discloses the second new limitation in substitute claims 25 and 27: “wherein the protruding feature is separate and positioned away from the at least one solid state lighting element.” Figure 4 of Tabito shows a set screw underneath the reflector plate 26. The set screw is a protruding feature that is clearly separate and positioned away from the LEDs 18. I have cropped and annotated figure 4 below to better show the set screw in red, which is separate and positioned away from the LEDs 18.



Tabito, Fig. 4 (cropped and annotated).

19. Tabito figure 5 is similar to figure 4 but illustrates the assembly from a side view as opposed to the isometric view in figure 4. From my review of Tabito, figure 5 is not shown in the publication, but it is described: “LED unit 18 is stored in the hermetically sealed light guide section 14” which is separate from the

set screw 39. Tabito, [0100] and [0103]. I understand from counsel that a clerical error may have caused figure 5 from being omitted from the publication of Tabito. However, figure 5 was included in the issued version of Tabito, which is U.S. Patent No. 7,324,174 (Ex. 1014). Below is an annotated version of figure 5 also showing the set screw 39 in red, which is separate and positioned away from the LEDs 18 and which conforms to a shape of a protruding feature (e.g., the set screw 39).

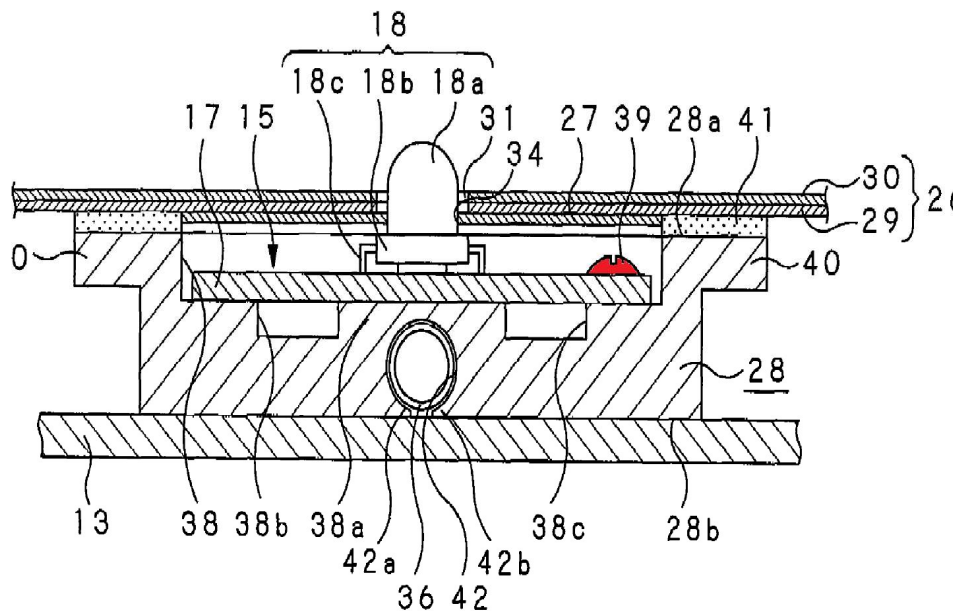


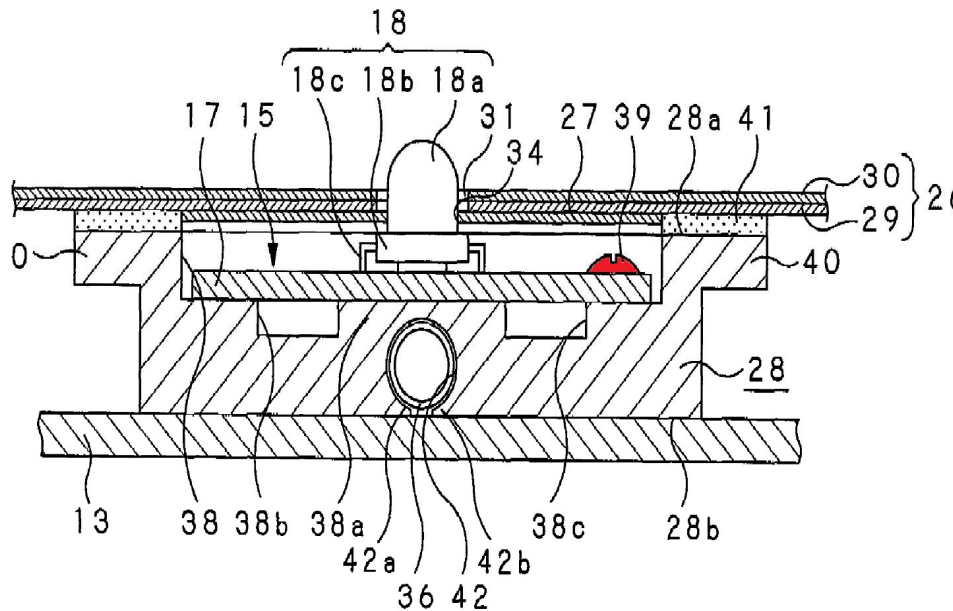
FIG. 5

Ex. 1014, at Fig. 5 (annotated). As can be seen in figure 5, Tabito's reflector sheet 26 is provided in a way that it does not extend down into the area containing Tabito's set screw 39 or interfere with the set screw 39.

C. The reflector sheet covers and maintains a substantially flat surface over the protruding feature, wherein, the flat surface is parallel to the surface of the substrate. (Substitute Claims 26 and 28).

20. Chou discloses the limitation “the reflector sheet covers and maintains a substantially flat surface over the protruding feature, wherein, the flat surface is parallel to the surface of the substrate” from substitute claims 26 and 28. Chou teaches that “The reflector sheet 700 is disposed on the circuit board 500 and the reflector sheet 700 adjacent to the hole 750 forms an angle θ between about 0 degree to about 90 degree with the circuit board 500. The angle θ will change with the height of the spotlight source (LED 600), the length of lead 650 of the spot light source (LED 600), and the amount of the solder 800.” Chou, 3:42–48. If the reflector sheet 700 formed an angle at or about 0 degrees with the circuit board 500, then it would be substantially flat and parallel to the substrate.

21. Tabito also discloses this limitation in substitute claims 26 and 28. As shown below in Figures 4 and 5, the reflector plate 26 is covering the set screw 39. Also, it maintains a substantially flat surface over the set screw 39. Moreover, it is parallel to the surface of the substrate.



Ex. 1014, at Fig. 5 (annotated).

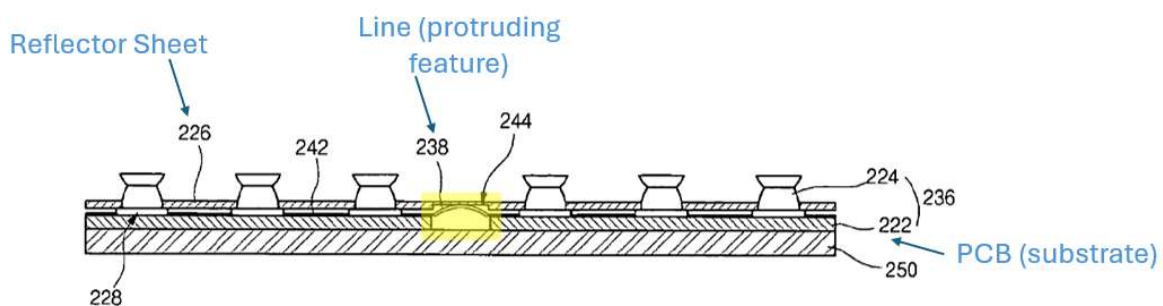
V. Additional Prior Art Renders Every Element of Substitute Claims 25–28 Obvious.

22. Substitute Claims 25–28 cover the well-known concept of a lighting panel design that has a reflector sheet that does not contact the solid state light element and is separate from a protruding feature that the reflector sheet covers, which as discussed above was shown in the prior art addressed in my prior declaration. However, other prior art demonstrates that each of 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.

A. Kim: U.S. Patent No. 7,481,553

23. I am informed and understand that Kim (U.S. Patent No. 7,481,553) is prior art to the '812 Patent. Kim is entitled “backlight assembly and liquid crystal display module using the same.” Kim 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.

24. Figure 3 of Kim, which I have reproduced below, “is a schematic cross-sectional view illustrating a connection structure of an LED unit 236 according to an exemplary embodiment of the present invention. As shown in FIG. 3, the LED unit 236 includes a PCB 222 and a plurality of LEDs 224 mounted on the PCB 222 in a row. The LED unit 236 is spaced apart from an adjacent LED unit 236 on the bottom frame 250.” Kim, 5:21–27. An LED is a solid state light source. Additionally, a PCB, also known as a printed chip board, is a substrate.



25. Figure 3, as annotated above shows the reflective sheet 226 conforming to the shape of the line 238. The line 238 is clearly a protruding feature. Kim describes figure 3 as illustrating that “a portion of the reflective sheet 226 corresponding to a space between the adjacent LED units 236 has a concave portion 244 to prevent the reflective sheet 226 from contacting the line 238. That is, the reflective sheet 226 includes the concave portion 244 so that a projected portion of the line 238 is not pressed by the reflective sheet 226.” Kim, 5:36–41.

26. I understand that the parties have disputed the meaning of the phrase “configured to conform to a shape of a protruding feature” in the ’812 Patent. Under both of the presented constructions, Kim still renders the ’812 Patent obvious.

27. I understand that PO’s construction requires the reflective sheet to provide cover and relief for the protruding feature. Under this construction, reflective sheet 226 provides cover and relief for a shape of the line 238. This is seen in figure 3 where the reflective sheet 226 has the concave portion 224 in order to provide cover and relief so it does not contact the line 238 but still maintains the reflective qualities over the line 238.

28. I understand that petitioner’s construction requires the reflective sheet to overlay (e.g., by deformation) the protruding feature and have the same shape, outline, or contour of the protruding feature. Under this construction, reflective

sheet 226 overlays the line 238 and has the same shape, outline, or contour of the line 238. This is seen in figure 3 where the reflective sheet 226 has the concave portion 224 in order to overlay the line 238. Because concave means to be rounded inward, this confirms that the reflective sheet 226 at the concave portion 224 has the same shape, outline, or contour of the line 238.

29. Kim's reflective sheet contains holes that the LEDs fit through. For example, Kim states that the "reflective sheet 126 is formed with a plurality of holes 128 corresponding to the respective LEDs 124. Each LED 124 passes through the corresponding hole 128, thereby being exposed from the reflective sheet 126." Kim, 4:34–38. Kim explains that the purpose of this is for ease of repairing and replacing individual LEDs in the assembly and to improve productivity and reduce production costs. Kim, 2:46–53.

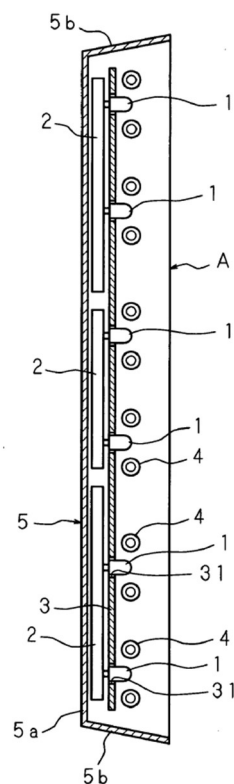
B. Sharp: U.S. Patent Publication No. 2007/0064171

30. I am informed and understand that Sharp (U.S. Pat. Pub. No. 2007/0064171) is prior art to the '812 Patent. Sharp is entitled "backlight device and display device comprising backlight device." Sharp describes its invention as "a light emitting diode substrate, which has a light emitting diode and is placed on the back side of a panel module having an image display surface on the front side, and 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.” Sharp, Abstract.

31. Figure 1 of Sharp, reproduced below, illustrates the backlight device assembly with LEDs 1, reflection sheet 3, and through-holes 31. Sharp, Fig. 1.

FIG. 1



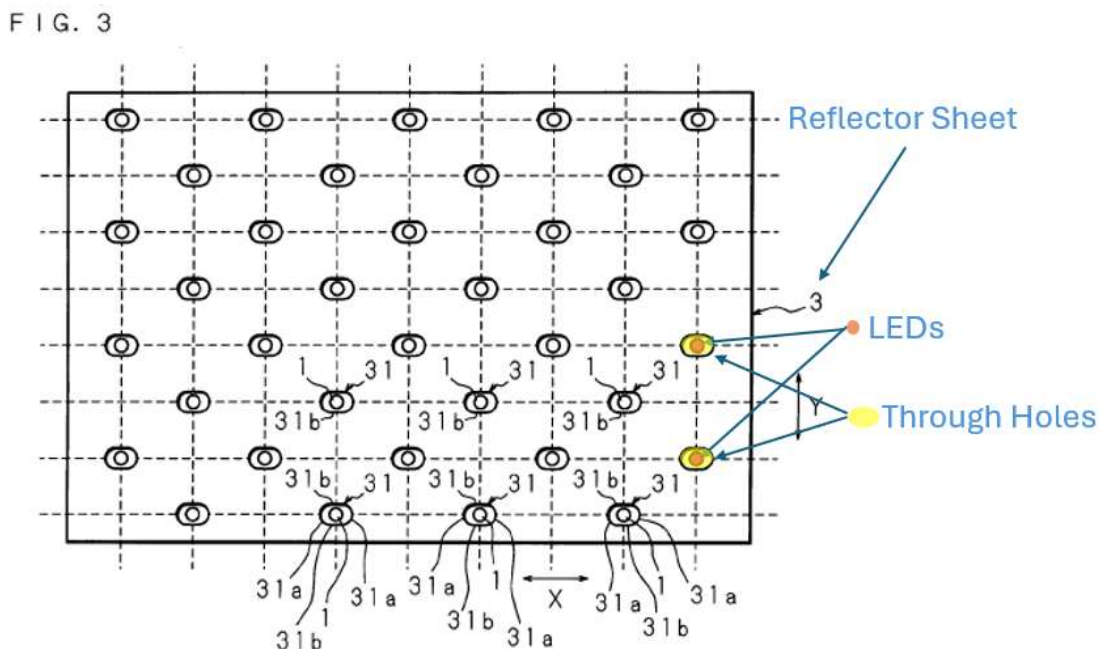
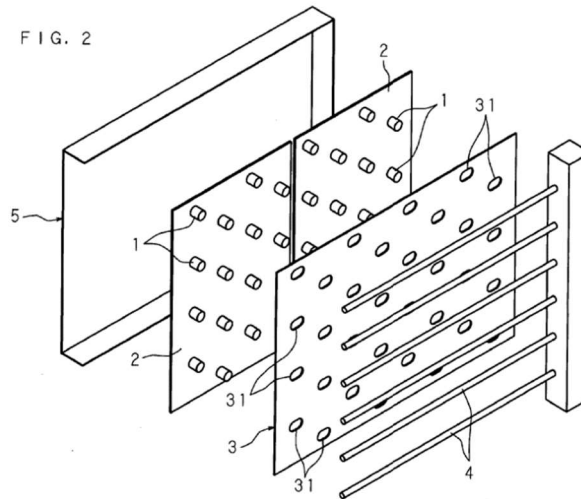
32. Sharp seeks to solve several problems caused by a reflection sheet contacting the LED through “a backlight device and display device constructed to have a gap between the through-hole of the reflection sheet and the circumferential surface of the inserted light emitting diode.” Sharp, [0009]. One of those problems is brightness unevenness and color unevenness. Sharp, [0007]. Additionally, by including a gap, the device is “capable of reflecting light emitted from the light

emitting diode by the reflection sheet without being influenced by the mount position of the light emitting diode substrate even when there is an irregularity in the positional relationship between the light emitting diode and the through-hole due to the mount position of the light emitting diode substrate.” Sharp, [0011].

Also, when the components of the device heat up, the gap prevents the reflection sheet from being creased if it were to push up against the LED. Sharp, [0033].

33. There are many other advantages to having a gap between the reflection sheet and the LED beyond just those specifically highlighted in Sharp. For example, having a gap allows the holes that the LEDs fit through to be larger 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. Additionally, if an LED is replaced it does not need to be perfectly installed in precisely the same position, so variation is allowed.

34. Figures 2 and 3 of Sharp, reproduced below, clearly show the through-holes 31 having gaps between the reflection sheet 3 and LEDs 1.



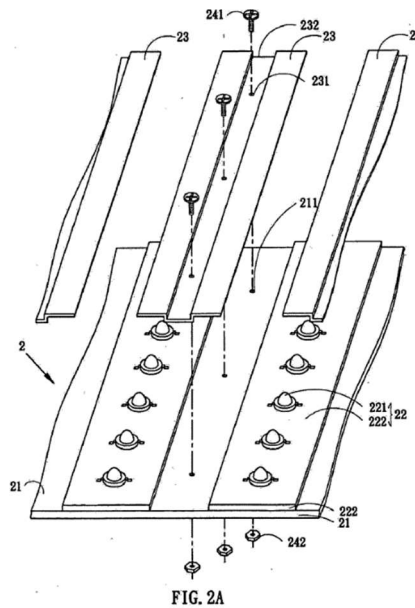
Sharp, Figs. 2 and 3 (annotated).

C. Liu: U.S. Patent Publication No. 2006/0187660

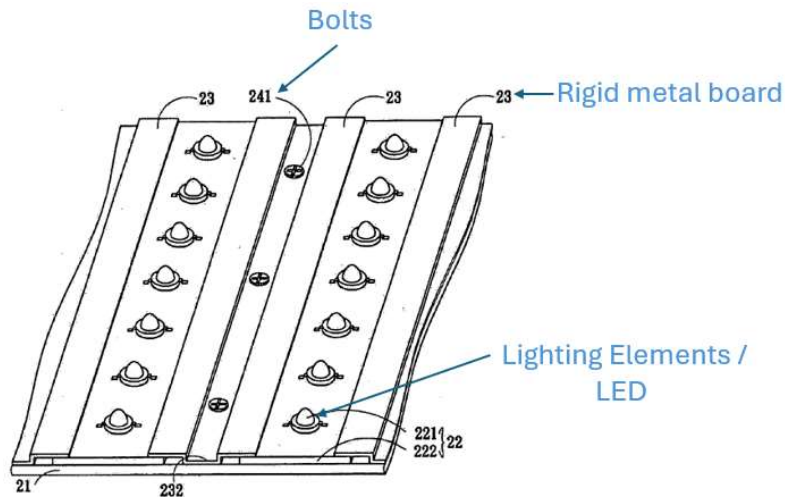
35. I am informed and understand that Liu (U.S. Pat. Pub. No. 2006/0187660) is prior art to the '812 Patent. Liu is entitled "backlight module having device for fastening lighting units." Liu describes "a backlight module 2 is composed of a backboard 21 and a plurality of lighting units 22 arranged in equal

space and in parallel to one another on the backboard 21. Each lighting unit 22 comprises a plurality of lighting elements 221 and a metal board 222 carrying the lighting elements 221. The lighting element 221 can be a conventional lighting device such as a light emitting diode (LED) soldered on the metal board 222.” Liu, [0017]; [0022] (noting that it in Fig. 2E, “side-emitting lighting elements 223 are used as the light source.”).

36. Figure 2A of Liu, reproduced below, shows an exploded view of part of Liu’s backlight module. As Liu explains, “[t]he rigid metal board 23 ... has a raised portion along its center to face towards the backboard 21.” Liu, [0018]. The rigid metal board 23 and bolts 241 are protruding features.



37. Figure 2B of Liu, reproduced below with annotations, shows an assembled version of figure 2A, again illustrating that the rigid metal board 23 and bolts 241 are separate and positioned away from the lighting units 22.



38. Figure 2E of Liu, reproduced below, shows the full backlight module, which includes a reflective board 27 that covers and maintains a substantially flat surface over the rigid metal board 23 and bolts 241. Also, the reflective board 27 is parallel to the surface of the backboard 21. As I stated above, the rigid metal board 23 and bolts 241 are protruding features. Additionally, the backboard 21 is a substrate.

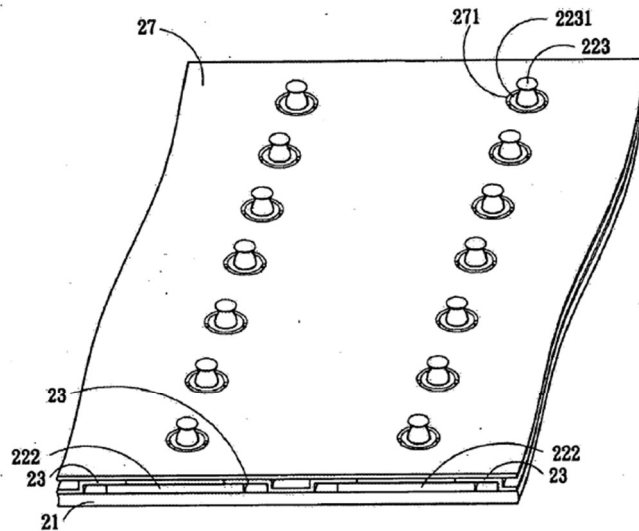
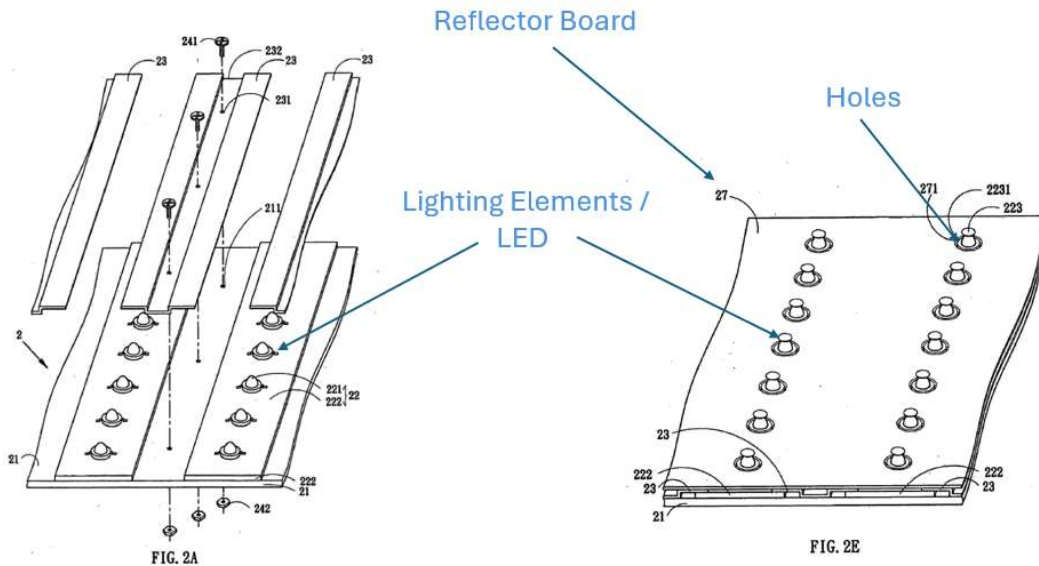
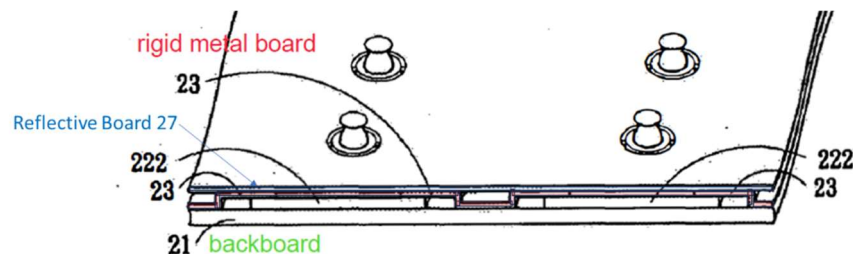


FIG. 2E

39. Figure 2E also shows that “reflective board 27 has holes 271 with dimension larger than that of the side emitting lighting elements 223, such that the side-emitting lighting elements 223 could protrude from the holes 271.” Liu, [0022]. In other words, the holes 271 create apertures in the reflective board 27. This is further demonstrated by the annotations shown below:



As illustrated above and in the annotated figure 2E below, Liu shows that the reflective board 27 is configured to conform to the shape of the protruding features (e.g., rigid metal board 23 and bolts 241).



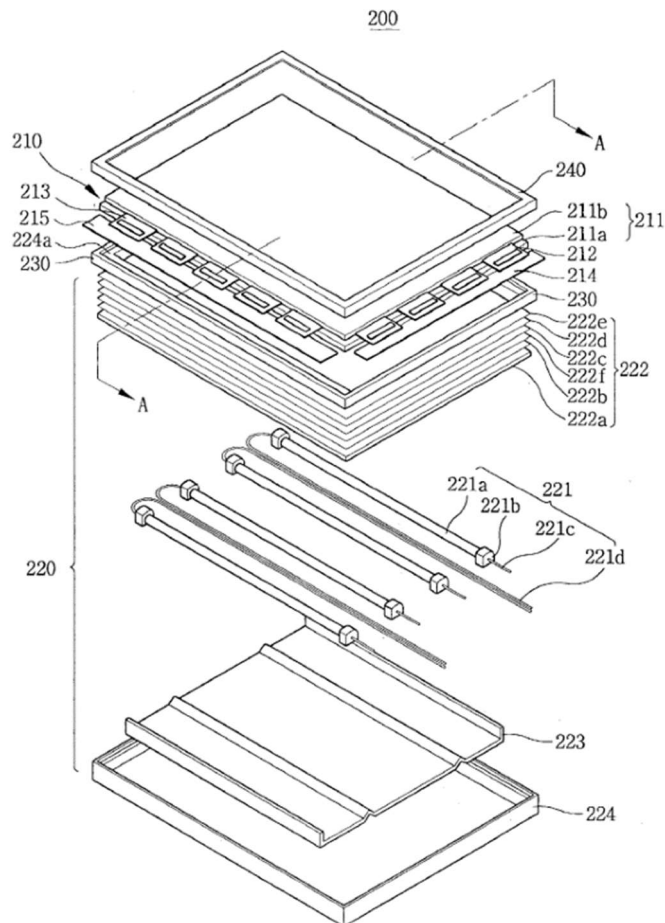
As can be seen in the figures above, Liu's reflector board 27 does not extend down or interfere with the protrusions.

D. Lee: U.S. Patent Publication No. 2003/0223249

40. I am informed and understand that Lee (U.S. Pat. Pub. No. 2006/0187660) is prior art to the '812 Patent. Lee is entitled "liquid crystal display device having a noise shielding member." As evidenced from Lee's title, Lee

describes a backlight assembly for a liquid crystal display device. Lee, [0015]. An LCD device may contain an LED backlight, which is a solid state lighting element.

41. Figures 1 and 2 illustrate Lee's backlight assembly. Figure 1 is an exploded view, and figure 2 is an assembled view. Both figures 1 and 2 are reproduced below.



Lee, Fig. 1.

relief for second power line 221d. This is seen in figure 2 where the reflecting plate 223 goes over and covers the second power line 221d. I understand that petitioner's construction requires the reflective plate to overlay (e.g., by deformation) the protruding feature and have the same shape, outline, or contour of the protruding feature. Under this construction, reflecting plate 223 overlays the second power line 221d and has the same shape, outline, or contour of the second power line 221d, just as shown in figure 2. Additionally, it would have been obvious that Lee's specification could include the reflecting plate 223 having a substantially flat surface parallel to the bottom chassis 224 because one of Lee's goals is to "prevent the second power line 221d from affecting an image display." Lee, [0049]. Even if this modifies Lee, in view of the reflecting plate 223 shown in figure 2 not being perfectly flat, this still would have been obvious to do.

VI. Motivations to Combine

A. It Would Have Been Obvious to Combine Chou and Tabito

44. As discussed in my original declaration, it would have been obvious that to combine Chou and Tabito. Ex. 1003, § X.

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

45. In my opinion, a person of ordinary skill in the art would have been motivated to combine Kim and Sharp, would have understood how to do so, and would have had the skillset to do so. Both Kim and Sharp disclose backlight assemblies that include reflectors and LEDs. 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. Sharp discloses “a light emitting diode substrate, which has a light emitting diode and is placed on the back side of a panel module having an image display surface on the front side, and 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.” Sharp, Abstract.

46. Although Kim does not specifically disclose the reflector’s spatial relationship to the LEDs, Sharp does. For example, Sharp states that the “backlight device and display device [are] constructed to have a gap between the through-hole of the reflection sheet and the circumferential surface of the inserted light emitting diode.” Sharp, [0009]. This gap is illustrated in figure 3 of Sharp. Figure 3 of Sharp shows the reflection sheet laid on top of the substrate and the LEDs inserted into the through-holes in the reflection sheet. Kim figure 2 shows a similar assembly. Figure 2 of Kim and Figure 3 of Sharp are reproduced below to show this similarity. Kim is on the left and Sharp is on the right.

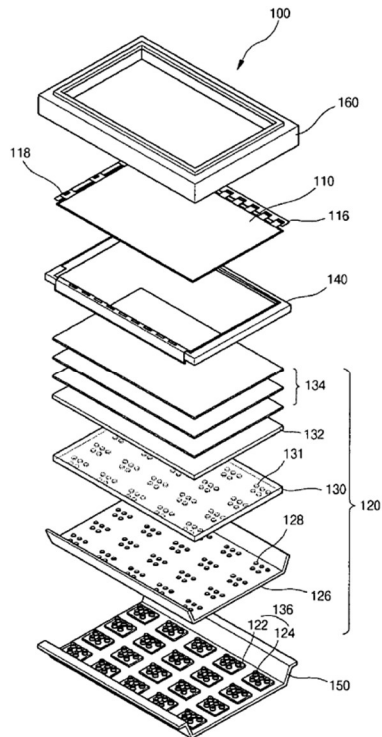
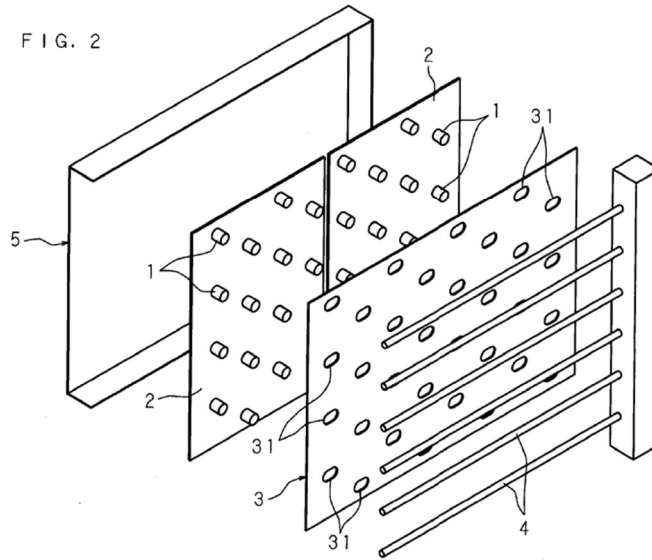


FIG. 2



Kim, Fig. 3; Sharp, Fig. 2.

47. It would have been obvious to apply the gap disclosed in Sharp to the reflector disclosed in Kim. As Sharp explains, a gap can be preferred because it is “capable of preventing the circumferential surface of the through-hole of the reflection sheet from coming into contact with the circumferential surface of the light emitting diode even when the reflection sheet thermally expands somewhat.” Sharp, [0009]. Additionally, it reduces brightness unevenness and color unevenness. Sharp, [0016]. Moreover, as I discussed above, there are many other advantages to having a gap between the reflection sheet and the LED beyond just those specifically highlighted in Sharp. For example, having a gap allows the holes that the LEDs fit through to be larger 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. Additionally, if an LED is replaced it does not need to be perfectly installed in precisely the same position, so variation is allowed. Accordingly, it would be obvious to combine Kim and Sharp in order to “improve[] productivity and reduce[] production costs” as Kim seeks to accomplish. Kim 2:50–53.

C. It Would Have Been Obvious to Combine Chou and Liu.

48. In my opinion, a person of ordinary skill in the art would have been motivated to combine Chou and Liu, would have understood how to do so, and would have had the skillset to do so. Both Chou and Liu disclose LED backlight assemblies for a display. For example, Chou discloses “a light source assembly, and in particular relates to a light source assembly using light emitting diodes (LEDs) as the light source.” Chou, 1:6–8. Liu discloses “a backlight module 2 is composed of a backboard 21 and a plurality of lighting units 22 arranged in equal space and in parallel to one another on the backboard 21. Each lighting unit 22 comprises a plurality of lighting elements 221 and a metal board 222 carrying the lighting elements 221. The lighting element 221 can be a conventional lighting device Such as a light emitting diode (LED) soldered on the metal board 222.” Liu, [0017].

49. Chou describes a reflective sheet; however, it does not explicitly disclose an aperture for a protruding feature that is separate and positioned away from the solid state lighting element. Additionally, I understand that Patent Owner argues that Chou does not disclose a reflective sheet that does not contact the solid state lighting element. As I discussed in my original declaration, I disagree with Patent Owner—Chou does disclose a reflective sheet that does not contact the solid state lighting element and even if it does not, it would have been obvious to modify Chou such that the reflective sheet does not contact the solid state lighting element. That being said, Liu discloses both an aperture for a protruding feature that is separate and positioned away from the solid state lighting element, as well as a reflective sheet that does not contact the solid state lighting element.

50. It would have been obvious to apply Liu's assembly containing holes in the reflector that are larger than the LEDs to Chou. One reason is that it would increase the efficiency of manufacture, by making it easier to apply the reflector to the lighting unit. Another reason is that the metal boards and fasteners disclosed in Liu would provide additional support for attaching lighting units together in Chou. Figure 2A of Liu illustrates this technique for fastening lighting units together.

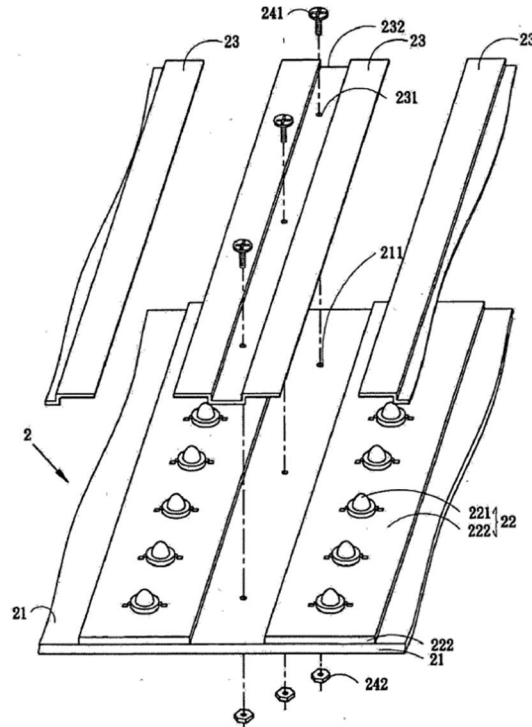
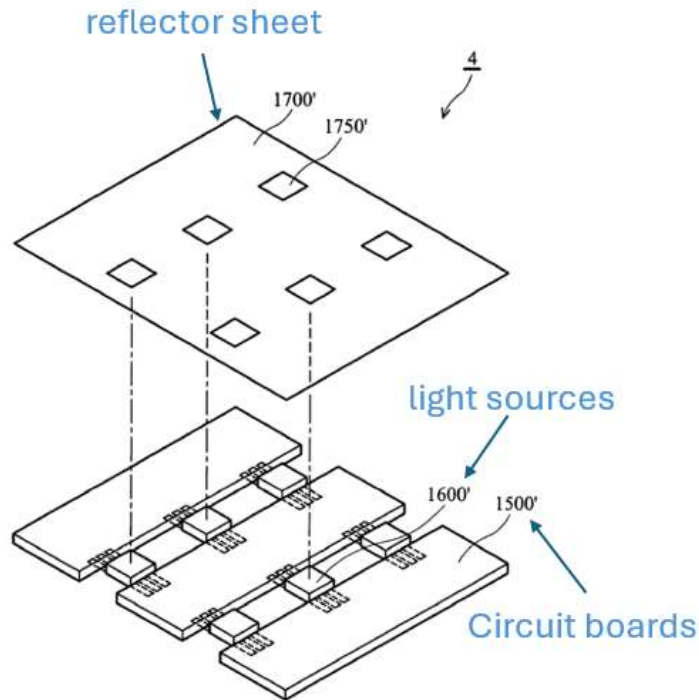


FIG. 2A

Liu, Fig. 2A. Chou on the other hand merely relies on the solder between the lighting units to hold the assembly together. This is shown in figure 9 of Chou, which is reproduced below, with annotations. Accordingly, it would be obvious to improve the support between the lighting units of Chou by applying the metal rails and fastening technique of Liu.



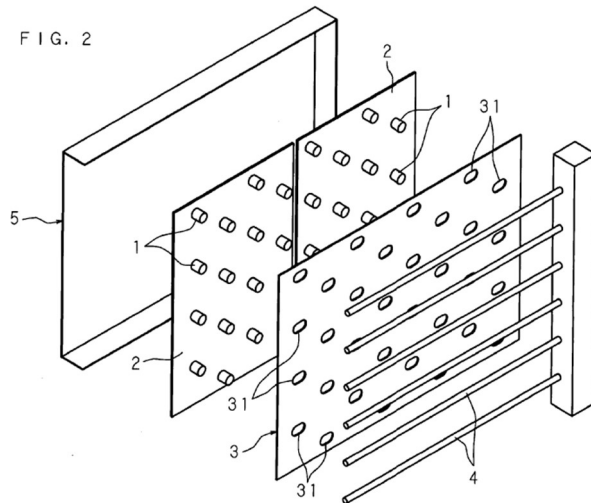
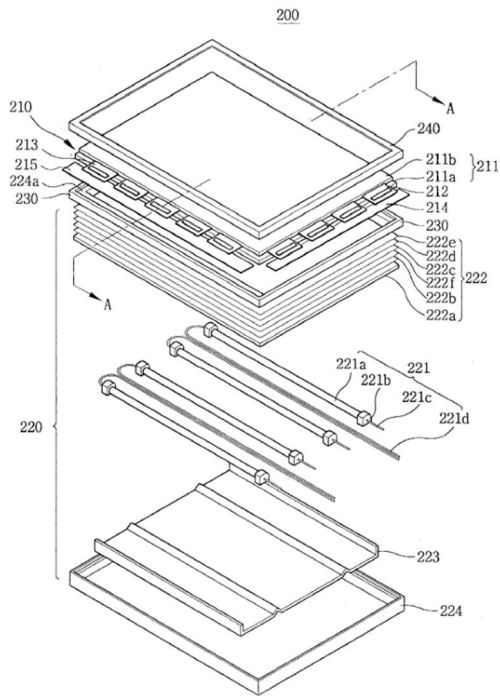
Chou, Fig. 9 (annotated). Chou also discloses that its reflector may “form[] an angle θ between about 0 degree to about 90 degree with the circuit board 500.” Ex. 1005, 3:42–45. A person of ordinary skill in the art would understand that at an angle at or about 0 degrees the light reflected by the reflector would be normal to the emission surface.

D. It Would Have Been Obvious to Combine Lee and Sharp.

51. In my opinion, a person of ordinary skill in the art would have been motivated to combine Lee and Sharp, would have understood how to do so, and would have had the skillset to do so. Both Lee and Sharp disclose backlight assemblies that include reflectors and LEDs. For example, Lee discloses “a backlight assembly, a liquid crystal display panel and a liquid crystal display

having the same.” Lee [0015]. Sharp discloses “a light emitting diode substrate, which has a light emitting diode and is placed on the back side of a panel module having an image display surface on the front side, and 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.” Sharp, Abstract.

52. Although Lee does not specifically disclose the reflector’s spatial relationship to the LEDs, Sharp does. For example, Sharp states that the “backlight device and display device [are] constructed to have a gap between the through-hole of the reflection sheet and the circumferential surface of the inserted light emitting diode.” Sharp, [0009]. This gap is illustrated in figure 3 of Sharp. Figure 3 of Sharp shows the reflection sheet laid on top of the substrate and the LEDs inserted into the through-holes in the reflection sheet. Lee figure 1 shows a similar assembly. Figure 1 of Lee and Figure 3 of Sharp are reproduced below to show this similarity. Lee is on the left and Sharp is on the right.



Lee, Fig. 1; Sharp, Fig. 2.

53. It would have been obvious to apply the gap disclosed in Sharp to the reflector disclosed in Lee. As Sharp explains, a gap can be preferred because it is “capable of preventing the circumferential surface of the through-hole of the reflection sheet from coming into contact with the circumferential surface of the light emitting diode even when the reflection sheet thermally expands somewhat.” Sharp, [0009]. Additionally, it reduces brightness unevenness and color unevenness. Sharp, [0016]. Moreover, as I discussed above, there are many other advantages to having a gap between the reflection sheet and the LED beyond just those specifically highlighted in Sharp. For example, having a gap allows the holes that the LEDs fit through to be larger 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. Additionally, if an LED is replaced it does not need to be perfectly installed in precisely the same position, so variation is allowed. Accordingly, it would be obvious to combine Kim and Sharp in order to improve the display quality of the LCD device. Lee, [0025].

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.

September 17, 2024

Date



Dr. F. Morgan Pattison