

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. 8,294,075
Filing Date: August 5, 2010
Issue Date: October 23, 2012
Title: SOLID-STATE LUMINAIRES FOR GENERAL ILLUMINATION

Inter Partes Review No. IPR2023-01410

**Ex. 1016 – Declaration of P. Morgan Pattison, Ph.D. in Response to Patent
Owner’s Contingent Motion to Amend**

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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. 8,294,075 (“the ‘075 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 34 and 35 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
1017	US 2006/0083023 to Ayabe <i>et al.</i> (“Ayabe”)
1018	US 2005/0274972 to Roth <i>et al.</i> (“Roth”)
1019	US 2007/0188425 to Saccomanno (“Saccomanno”)
1020	Taiwanese Patent Application No. 93218806, entitled DIRECT TYPE BACKLIGHT MODULE/ DIRECT TYPE BACKLIGHT MODULE to Chang
1021	Certified Translation of Exhibit 1020, Taiwanese Patent Application No. 93218806, entitled DIRECT TYPE BACKLIGHT MODULE/ DIRECT TYPE BACKLIGHT MODULE to Chang (“Chang”)
1022	US 2006/0186425A1 to Yano <i>et al.</i> (“Yano”)
1023	Transcript of July 12, 2024 Deposition of William Bohannon in Related Case No. IPR2023-01168
1024	Transcript of September 23, 2024 Deposition of William Bohannon

1025	US 6495861 to Hiroki (“Hiroki”)
1026	Korean Patent Application No. 2002/009578, entitled Electronic Display Board for indication equipment to Lee <i>et al.</i> (“Lee”)
1027	Certified Translation of Exhibit 1024, Korean Patent Application No. 2002/009578, entitled Electronic Display Board for indication equipment to Lee <i>et al.</i> (“Lee”)
1028	Japanese Patent Application No. 07199829, entitled Light emitting unit, display device, and illumination device to Hiratsuka (“Hiratsuka”)
1029	Certified Translation of Exhibit 1026, Japanese Patent Application No. 07199829, entitled Light emitting unit, display device, and illumination device to Heike (“Hiratsuka”)
1030	Certificate of Translation for Ex. 1026, Japanese Patent Application No. 07199829, entitled Light emitting unit, display device, and illumination device to Hiratsuka (“Hiratsuka”)
1031	Exhibit 8 to Deposition of William Bohannon in Related Case No. IPR2023-01168, 3M United States, Prism Films
1032	Exhibit 9 to Deposition of William Bohannon in Related Case No. IPR2023-01168, Vikuiti™ Brightness Enhancement Film (BEF) II
1033	Vikuiti™ Brightness Enhancement Film II (BEF II)
1034	Vikuiti™ Brightness Enhancement Film (BEF) III
1035	LUXEON® Power Light Sources

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 and 2 of the '075 Patent with the following substitute claims (the "Substitute Claims"):

34. (proposed substitute for Claim 1) A lighting panel, comprising:
at least one substrate having a first side parallel to a principal plane of the lighting panel;
a plurality of solid state lighting devices arranged on the first side of the at least one substrate and configured to emit light;
a reflector sheet on the first side of the at least one substrate, wherein the reflector is extended and angled with respect to the surface of the substrate;
a brightness enhancement film on the reflector sheet, wherein the reflector sheet is arranged between the at least one substrate and the brightness enhancement film and the brightness enhancement film is configured to preferentially emit light having a first orientation from the lighting panel and to preferentially reflect light having a second orientation, different from the first orientation, back into the lighting panel; and
a diffuser sheet between the reflector sheet and the brightness enhancement film, wherein the reflector sheet, the diffuser sheet and brightness enhancement film extend and are arranged parallel to the principal plane of the lighting panel.

35. (proposed substitute for Claim 2) The lighting panel of claim 34 ~~1,~~ wherein the reflector sheet is configured to reflect and disperse light incident thereon, wherein the reflector forms a reflective optical cavity around at least one solid state lighting device.

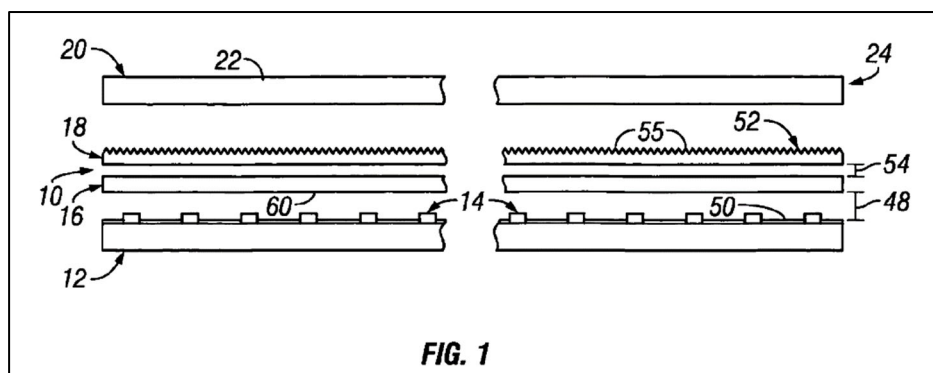
IV. The Prior Art Addressed in My Prior Declaration Renders Every Element of Substitute Claims 34 and 35 Obvious.

10. In my prior declaration I broke down the elements of claims 1-7 and 9-12 and demonstrated that each of the elements of those claims were known in the

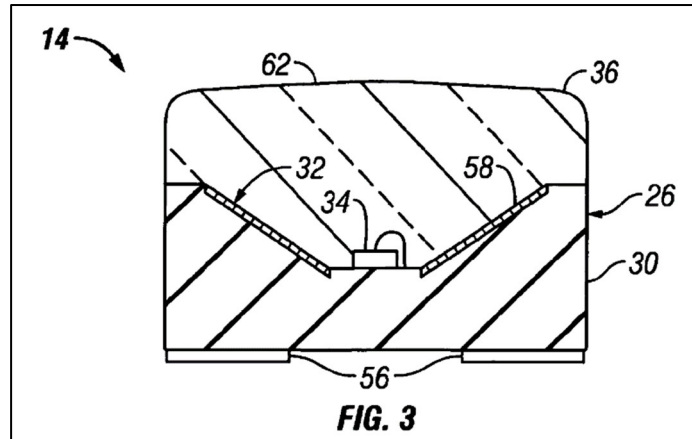
art before the April 21, 2006, priority date of the '075 Patent. *See* Ex. 1003, ¶¶39-108. In the analysis below I address the new elements of Substitute Claims 34 and 35 and demonstrate that each of these elements was also known in the art before the April 21, 2006, priority date of the '075 Patent.

A. A Reflector Sheet On the First Side of the At Least One Substrate, wherein the Reflector is Extended and Angled with Respect to the Surface of the Substrate. (Substitute Claim 34)

11. As discussed in my prior declaration, the combination of Mok (Ex. 1005), Holman (Ex. 1006), and Lamb (Ex. 1007) discloses or renders obvious each element of original claim 1, and it would be obvious to combine those three references. In effect Patent Owner's proposed Substitute Claim 34 is directed to modifying claim 1 to include a reflector cup recessed around one or more LEDs. Such a design for a reflector was well-known in the art before April 2006. For example, Mok discloses reflective surface 50 on base panel 12 and light emitting elements 14. This is described in Mok's paragraph [0021], which explains "A reflective surface 50 may be provided on the base panel 12 to "recycle" (i.e., reflect) light which may be reflected...." Mok, [0021]; [0020] ("The various light emitting elements 14 may be mounted to the base panel 12 in any of a wide variety of configurations."). This configuration is shown in Figure 1:



12. In addition to this disclosure, with regard to Figures 3 and 4, Mok describes that “the light emitting diode 26 may comprise a base portion or substrate 30 in which is formed a reflector cup 32. The light emitting diode junction 34 or die is then positioned within the reflector cup 32.” Mok, [0026]. Mok explains that “It is generally preferred that the reflector cup 32 be provided with a reflective coating 58 thereon to improve efficiency. By way of example, in one embodiment, the reflector cup 32 is initially plated with copper, then with a subsequent layer of gold or silver to maximize reflectivity.” Mok, [0028]. Thus, a person of ordinary skill in the art would understand that Mok’s reflector cup 32 discloses, or at a minimum, renders obvious, a reflector. The “reflector cup 32” is clearly shown in Mok’s Figure 3:

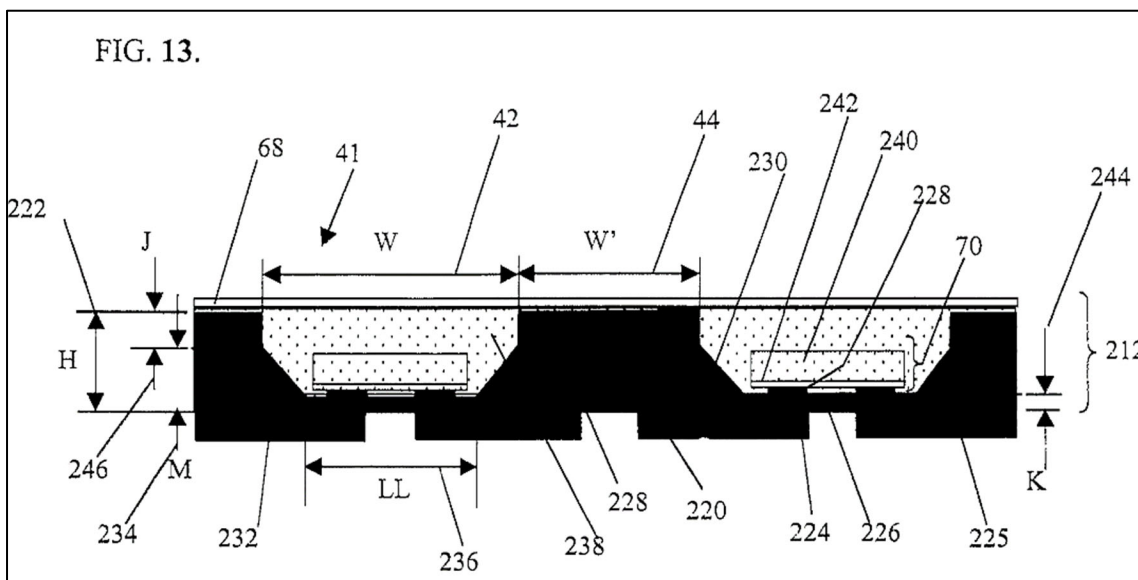


13. As is shown in Figure 1 above, Mok discloses reflective surfaces 50 and 58 that are both extended and angled with respect to the substrate. In my opinion, a person of ordinary skill in the art would review Mok, including the paragraphs noted above and Figure 3, and understand that Mok discloses an LED positioned within a reflector cup. As Mok further explains that the reflector cup 32 is formed in a base portion or substrate (Mok, [0026]), a person of ordinary skill in the art would recognize that Mok discloses a reflector on the first side of a substrate, wherein the reflector is extended and angled with respect to the surface of the substrate. To the extent Patent Owner contends that reflective surface 50 and reflective coating 58 are different components, one of skill in the art would understand that both components are disclosed in Mok as being made of the same material (e.g. metal) and/or a reflective coating. *See* Mok, [0021], [0028]. Further Mok states that the reflective surface 50 may be made of a “sheet-like material. *Id.* A person of skill in the art would know that sheet like materials are easy to bend

and reform. Thus, it would be simple to modify the sheet-like reflective surface to cover the walls of the reflector cup 32. Further, manufacturing efficiencies would be created by manufacturing the reflective surface 50 and reflector cup 32 from one single process. Thus, a person of ordinary skill in the art would be motivated to make this modification for more efficient, cost-effective manufacturing. A person of ordinary skill in the art would be motivated to include the reflector cup 32 of Mok into the embodiments of Mok, Holman, and Lamb discussed in my original declaration in order to maximize the efficiency and uniformity of light output provided by increasing the surface area of the reflector.

14. Similarly, a person of ordinary skill in the art would review Holman (Ex. 1006) and recognize that it discloses a reflecting layer on a base layer that has angled sidewalls and is extended. In particular, Holman describes with respect to Figure 13, “[t]he individual LEDs 70 are mounted flip-chip (electrodes below the light emission) on composite, electrically-insulating, reflective base layers 220 and 225....” Ex. 1006, p. 38. Holman also expressly discloses “sloped sidewalls 230,” which include reflecting capability to “increase the amount of LED light coupled to the light cavity’s output aperture....” Ex. 1006, pp. 38-39. As Holman explains, “[t]he sloped sidewall can be a diffusely reflecting material identical to the base layer material 220 or deposited as an external coating. The sloped sidewall 230 can also be made specularly reflecting. In either case, light emitted by the LED

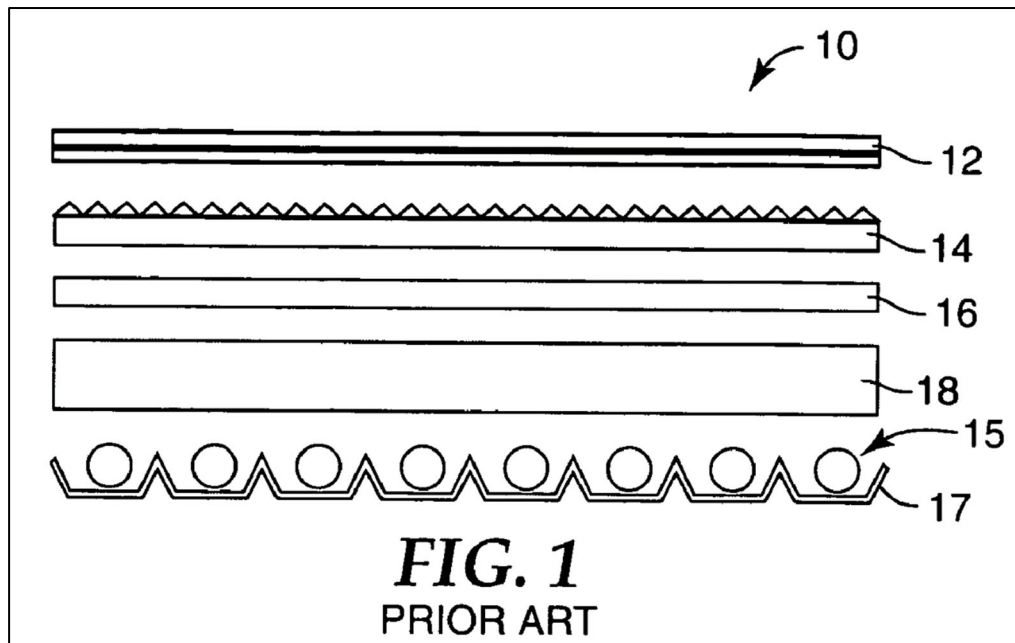
towards the side of the cavity is reflected generally upwards, towards the cavity aperture, 24.” The described structure is shown in Holman’s Figure 13:



15. A person of ordinary skill in the art reviewing the disclosure above would recognize that Holman’s sloped sidewalls include reflective material. Similarly, a person of ordinary skill in the art would recognize that these sloped sidewalls side a substrate, because Holman describes “[t]he individual LEDs 70 are mounted flip-chip (electrodes below the light emission) on composite, electrically-insulating, reflective base layers 220 and 225 of thickness H, 222, that include appropriate conductive circuits 224 and conductive vias 226 between those circuits and the LED contacts 228.” Holman, p. 38. A person of ordinary skill in the art would recognize that the reflector must be mounted to some structure, and, at a minimum would recognize that the circuit on which the reflector is positioned could be a substrate as recited by the claim.

16. Thus, a person of ordinary skill in the art reviewing Holman would recognize that Holman discloses or renders obvious a reflecting layer on a base layer that has angled sidewalls and is extended. A person of ordinary skill in the art would be motivated to include the sloped sidewalls include reflective material of Holman into the embodiments of Mok, Holman, and Lamb (Ground I) or Epstein, Holman, and Lamb (Ground II) discussed in my original declaration in order to maximize the efficiency and uniformity of light output provided by increasing the surface area of the reflector.

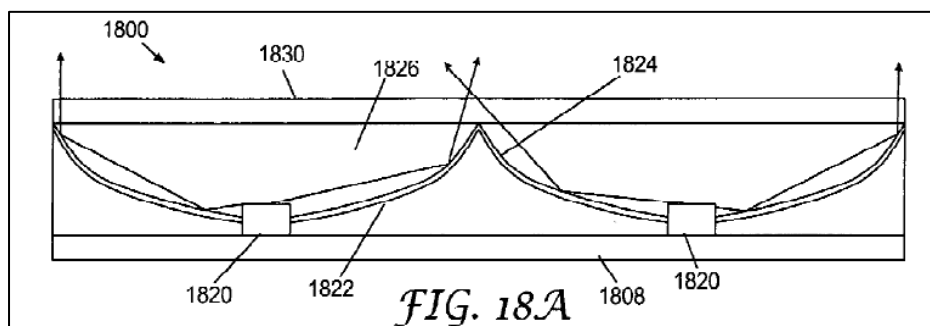
17. Further still, Lamb (Ex. 1007) also discloses shaping a reflector that is both angled and extended. For example, with respect to Figure 1, Lamb describes “a shaped reflector 17 located behind the array of light bulbs 15 for directing more light toward a viewer.” Lamb, [0034]. This configuration, including the shaped reflector 17 is shown in Figure 1:



18. As is shown above, Lamb expressly discloses “a shaped reflector 17 ... for directing more light toward a viewer.” Lamb, [0034]. A person of ordinary skill in the art reviewing this disclosure would recognize that Lamb thus discloses a reflector that is extended and angled with respect to the surface of the substrate on which it is positioned. To the extent that no substrate is pictured in Figure 1, the inclusion of a substrate would be obvious to a person of ordinary skill in the art in light of Lamb’s disclosure of a substrate in other embodiments, such as the lightguide 140 that light sources 185a and 185b are placed on in Figure 2 of Lamb. See Lamb Figure 2, [0037]. Further, a person of skill in the art would recognize that Lamb is not limited to any particular type of lighting, as Lamb is explicit that “Light sources suitable for use with embodiments of the present disclosure include any source that emits light, such as ... a light emitting diode (LED), including

organic LEDs (OLEDs), an array of LEDs, any other suitable light source(s), or any appropriate number or combination thereof.” Lamb, [0039].

19. Epstein (Ex. 1008) similarly discloses with respect to Figure 18A “LEDs 1820 are disposed on a substrate 1808.” Epstein, [0106]. Epstein further describes that “[t]he sheet 1822 is provided with a reflecting surface 1824 that reflects the light emitted by the diodes 1820. The reflecting surface 1824 is curved so as to direct the light in a desired direction. For example, the reflecting surface may be paraboloidal, elliptical or have some other shape.” Epstein, [0107]. This embodiment is shown in Figure 18A:



20. As is shown above, Epstein expressly discloses a “curved” “reflecting surface 1824.” The curved reflecting surface is mounted to a substrate 1808. Further, the reflector “may be paraboloidal, elliptical or have some other shape.” A person of ordinary skill in the art reviewing this disclosure would recognize that Epstein thus discloses a reflector that is extended and angled with respect to the surface of the substrate on which it is positioned. A person of ordinary skill in the art would be motivated to include the “curved” “reflecting surface 1824” into the

embodiments of Epstein, Holman, and Lamb discussed in my original declaration in order to maximize the efficiency and uniformity of light output provided by increasing the surface area of the reflector.

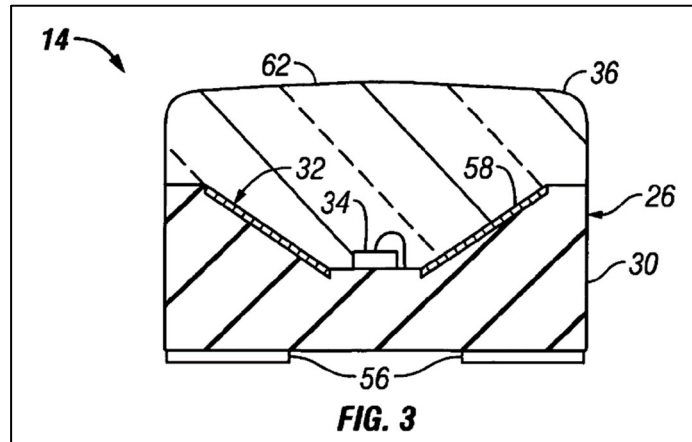
21. Thus, in my opinion, a person of ordinary skill in the art would recognize that any of Mok, Holman, Lamb, or Epstein discloses a reflector that is extended and angled with respect to the surface of the substrate on which it is positioned.

B. A Lighting Panel Wherein the Reflector Forms a Reflective Optical Cavity Around At Least One Solid State Lighting Device. (Substitute Claim 35)

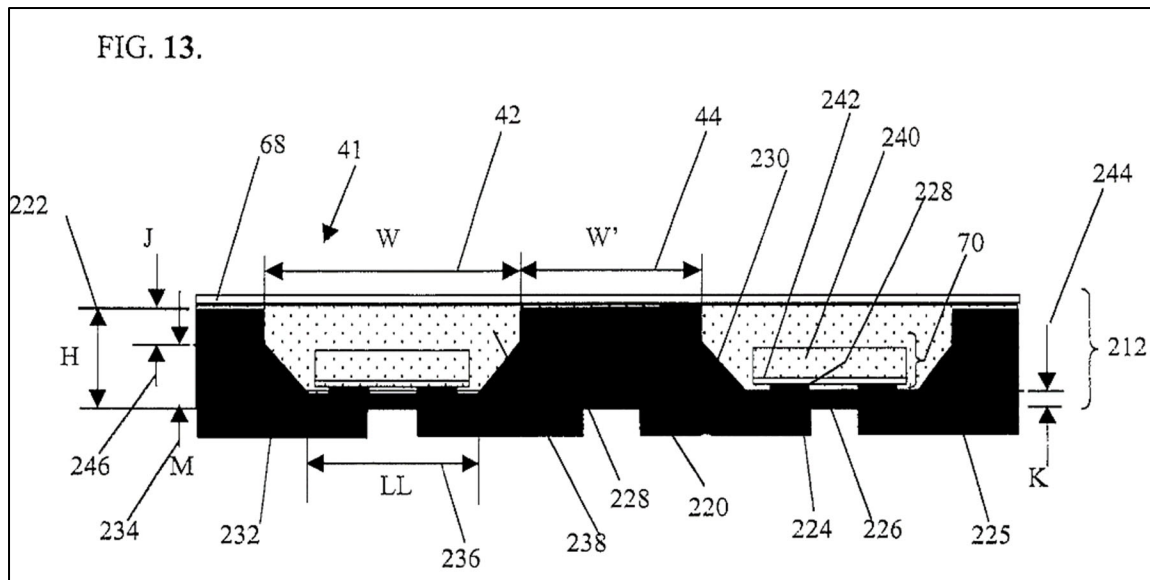
22. Each of the embodiments discussed in Section IV.A above shows a lighting panel wherein the reflector forms a reflective optical cavity around at least one solid state lighting device as is required by substitute claim 35.

23. For example, with respect to Mok, its Figure 3, “[i]t is generally preferred that the reflector cup 32 be provided with a reflective coating 58 thereon to improve efficiency. By way of example, in one embodiment, the reflector cup 32 is initially plated with copper, then with a subsequent layer of gold or silver to maximize reflectivity.” Mok, [0028]. A person of ordinary skill in the art reviewing the reflector cup shown in Mok, Figure 3 would understand that the reflector cup forms a reflective optical cavity around at least one solid state

lighting device, which is the diode junction 34 shown in Figure 3. *See* Mok, [0016].



24. Holman also describes, with respect to its Figure 13, an embodiment in which the LED is positioned in a cavity with “sloped sidewalls 230,” which include reflecting capability to “increase the amount of LED light coupled to the light cavity’s output aperture....” Ex. 1006, pp. 38-39. A person of ordinary skill in the art reviewing the embodiment shown in Holman, Figure 13 would understand that the sloped sidewalls 230 form a reflective optical cavity around at least one solid state lighting device.



25. Lamb also describes “a shaped reflector 17 located behind the array of light bulbs 15 for directing more light toward a viewer.” Lamb, [0034]. And as discussed above, Lamb discloses that any type of light source, including an LED, may be used. Lamb, [0039]. Again, person of ordinary skill in the art reviewing this description and the embodiment shown in Lamb Figure 1 would understand that the “shaped reflector 17” forms a reflective optical cavity around at least one lighting device, which could be a solid state lighting device, e.g., an LED.

26. Further, Epstein describes a “reflecting surface **1824** is curved so as to direct the light in a desired direction. For example, the reflecting surface may be paraboloidal, elliptical or have some other shape.” Epstein, [0107]. Again, person of ordinary skill in the art reviewing this description and the embodiment shown in Epstein Figure 18A would understand that the curved reflecting surface 1824 a

reflective optical cavity around a solid state lighting device, e.g., LED 1820 shown in Figure 18A.

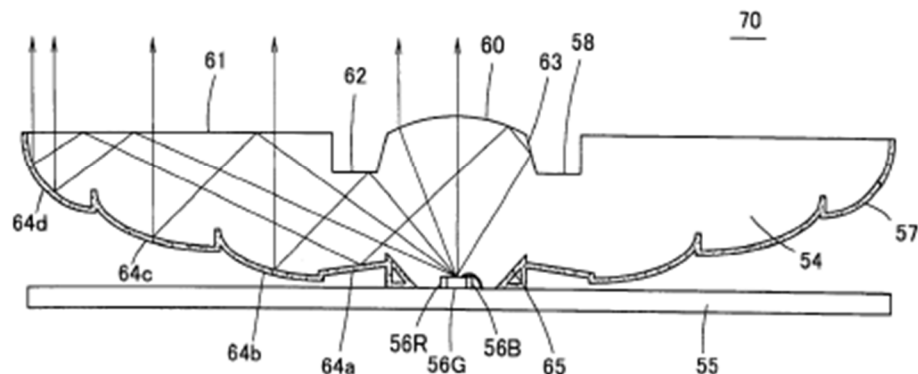
V. Other Prior Art Renders Every Element of Substitute Claims 34 and 35 Obvious.

27. Substitute Claims 34 and 35 cover the well-known concept of a reflecting cup, 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 the April 21, 2006, priority date of the '075 Patent.

A. Ayabe Renders Substitute Claims 34 and 35 Obvious

28. I am informed and understand that Ayabe is prior art to the '075 Patent. Ayabe is entitled “light emitting source and a lighting emitting source array,” and describes with respect to its Figure 32, “a sectional view illustrating the structure of light emitting sources” which is shown below:

Fig. 32



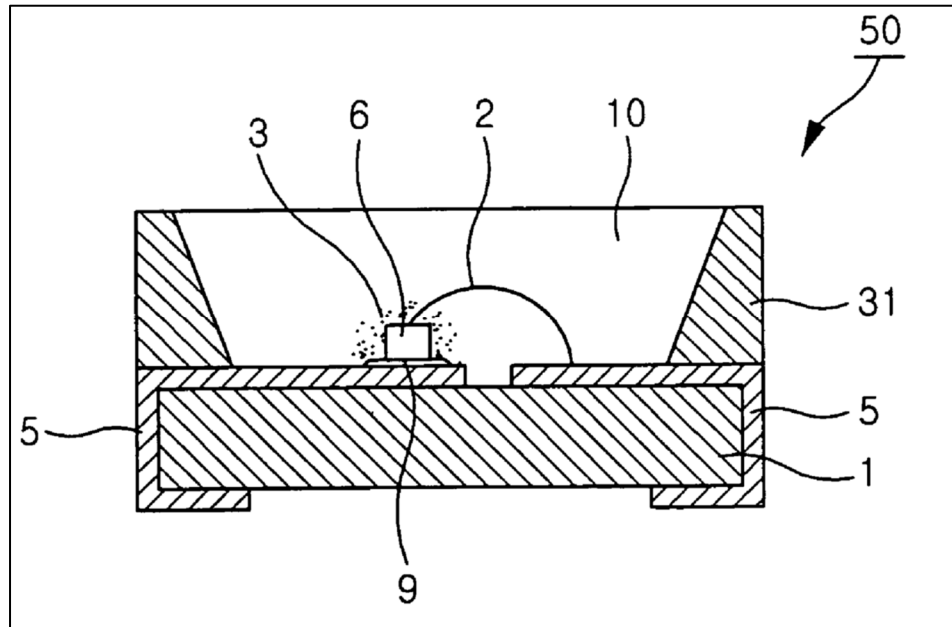
29. Ayabe describes that the design in Figure 32 uses “light emitting devices 56R, 56G, and 56B such as three LED chips” which are installed on the surface of “wiring board 55.” Ayabe, [0091]. Ayabe further discloses a “light diffusing film 51” and, as shown in Figure 32, a “reflecting member 57” that forms a cup-shaped area around the LEDs. *See* Ayabe, [0089], [0091].

30. A person of ordinary skill in the art reviewing the disclosure of Ayabe, and in particular Figure 32 above, would understand that Ayabe discloses or renders obvious the additional limitations of a reflector sheet on the first side of the at least one substrate, wherein the reflector is extended and angled with respect to the surface of the substrate (Substitute Claim 34) and a lighting panel wherein the reflector forms a reflective optical cavity around at least one solid state lighting device. (Substitute Claim 35). As is shown by Figure 32 of Ayabe, the reflector (reflecting member 57) forms a cup-shaped area around the LEDs, 56R, 56G, and 56B. Thus, this reflecting member is extended and angled with respect to the mounting surface of the LEDs. Further, the reflector forms an optical cavity around at least one LED, which is a solid state lighting device.

B. Roth Renders the New Elements of Substitute Claims 34 and 35 Obvious

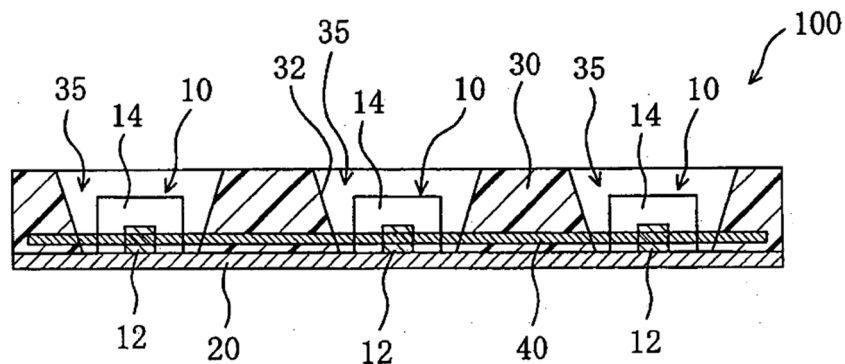
31. I am informed and understand that Roth is prior art to the '075 Patent. Roth is entitled “light emitting device.” Roth describes an angled reflector 31 on substrate 1 creating an optical cavity. As described by Roth, its “device may have

reflector 31 which may reflect the light from the light emitting diode 6 to the desired direction.” Roth, [0028]. This is shown in Roth, Figure 2 below:



32. A person of ordinary skill in the art reviewing the disclosure of Roth, and in particular Figure 2 above, would understand that Roth discloses or renders obvious the additional limitations of “a reflector on the first side of a substrate, wherein the reflector is extended and angled with respect to the surface of the substrate (Substitute Claim 21) and a lighting panel wherein the reflector forms a reflective optical cavity around at least one solid state lighting device. (Substitute Claims 23 and 25). As is shown by Figure 2 of Roth, the reflector 31 forms a cup shape around the LED 6. Thus, this reflector 31 is extended and angled with respect to the mounting surface of the LEDs. Further, the reflector 31 forms an optical cavity around at least one LED, which is a solid state lighting device. Roth

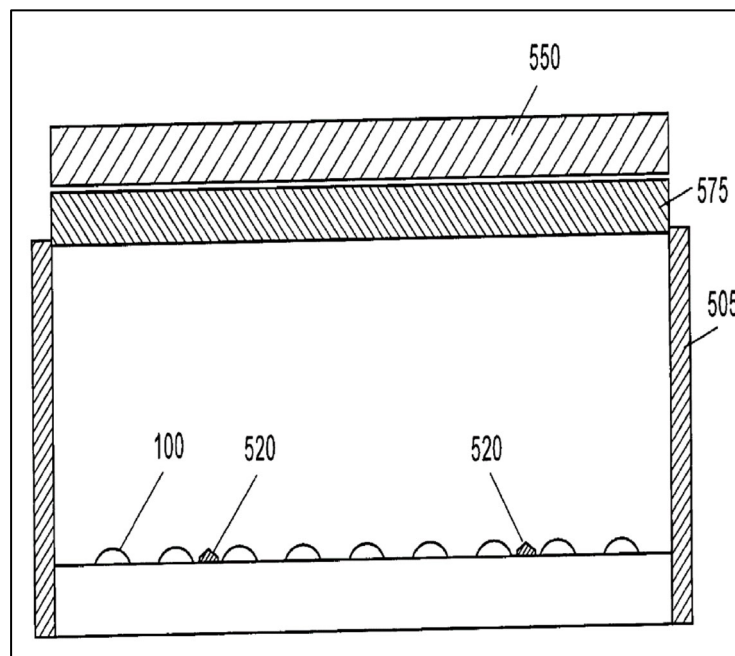
further makes clear that it can be used in a backlight application. *See, e.g.,* Roth, [0121] (“In such a wavelength conversion light emitting device is capable of applying on mobile phone, note book and electronic devices Such as home appliance, Stereo, telecommunication products, but also for custom display's key pad and back light application.”). To the extent it is not expressly described in Roth, a person of ordinary skill in the art would recognize that in a back light application the reflector design of Roth would be used in an array configuration. Such a prior art array configuration is shown in Figure 3 of Yano, which Yano describes as an “LED lamp 100 include[ing] a substrate 20, LED elements 10 that are arranged two-dimensionally on the substrate 20, and a reflector 30 with reflective surfaces 32 for reflecting the emissions of the LED elements 10.” Yano, [0057].



Yano, Fig. 3.

C. Saccomanno Renders Substitute Claims 34 and 35 Obvious

33. I am informed and understand that Saccomanno is prior art to the '075 Patent. Saccomanno is entitled “systems and methods for controlling light sources.” Figures 4 and 5 of Saccomanno, and their accompanying description, disclose a lighting panel in which a reflector 505 is extended and angled at a 90-degree angle. This is shown below in Figure 5:



34. A person of ordinary skill in the art reviewing the disclosure of Saccomanno, and in particular Figure 5 above, would understand that Saccomanno discloses or renders obvious the additional limitations of a reflector sheet on the first side of the at least one substrate, wherein the reflector is extended and angled with respect to the surface of the substrate (Substitute Claim 34) and a lighting panel wherein the reflector forms a reflective optical cavity around at least one

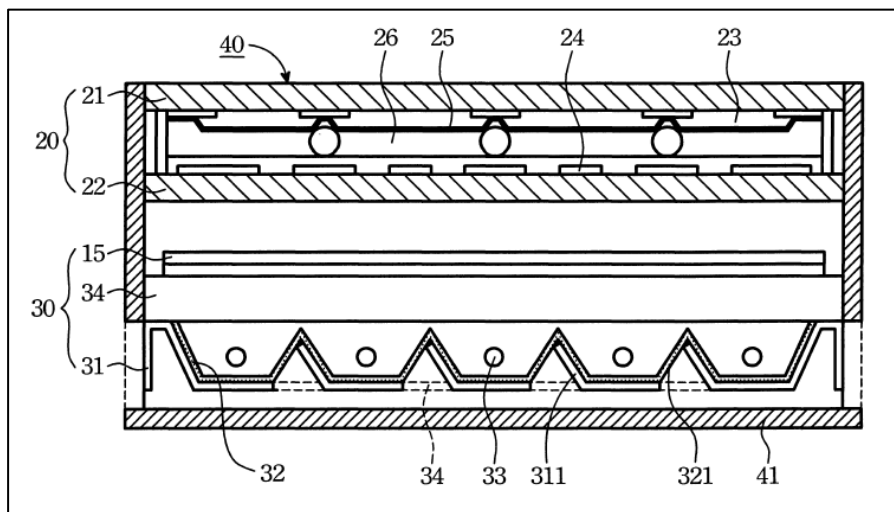
solid state lighting device. (Substitute Claim 35). As is shown by Figure 5 of Saccomanno, the reflector 505 forms an enclosure around the light sources 100, which may be LEDs (*see* Saccomanno, [0038]). This reflector 505 is both extended and angled with respect to the mounting surface of the LEDs. In particular, the angle between the substrate and the reflector 505 is 90 degrees and the reflector 505 extends upward, as is shown. Further, the reflector 18 forms an optical cavity around at least one LED, which is a solid state lighting device.

35. Saccomanno further states that Figures 4 and 5 show “[a]lternate exemplary approaches,” and that the goal of the claimed invention is to receive “excess light [that] may be light emitted from the light sources at angles that do not reach the element being illuminated.” Saccomanno, [0023], [0038]. A person of skill in the art would have recognized that, to capture excess light at angles that do not reach the element being illuminated, the angle of reflector 505 with respect to the substrate could be altered to capture light emitted from the light sources at angles that do not reach the element being illuminated to create a more efficient system.

D. Chang Renders Substitute Claims 34 and 35 Obvious

36. I am informed and understand that Chang is prior art to the '075 Patent. Chang is entitled “direct type backlight module/direct type backlight module.” Figures 1 through 6 of Chang, and their accompanying description,

disclose a lighting panel in which a reflector 32, on base plate 31, is extended and angled and forms optical cavities around light emitting components 33, which may be LEDs. This is best shown below in Figure 6:

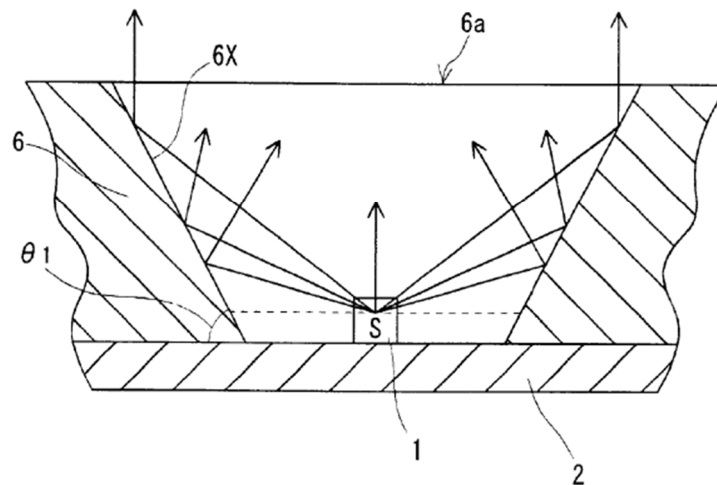


37. A person of ordinary skill in the art reviewing the disclosure of Chang, and in particular Figure 6 above, would understand that Chang discloses or renders obvious the additional limitations of a reflector sheet on the first side of the at least one substrate, wherein the reflector is extended and angled with respect to the surface of the substrate (Substitute Claim 34) and a lighting panel wherein the reflector forms a reflective optical cavity around at least one solid state lighting device. (Substitute Claim 35). As is shown by Figure 6 of Chang, the reflector 32 forms an enclosure around the light emitting component 33, which may be LEDs (*see* Chang, p. 9). Chang's reflector 32 is both extended and angled with respect to the mounting surface of the LEDs. Further, the reflector 32 forms an optical cavity around at least one light emitting component, which is a solid state lighting device.

E. Hiroki Renders Substitute Claims 34 and 35 Obvious

38. I am informed and understand that Hiroki is prior art to the '075 Patent. Hiroki is entitled "Light-emitting semiconductor chip." Figures 1 through 14 of Hiroki, and their accompanying description, disclose a chip-type semiconductor light-emitting device lighting panel in which a reflector 6 with a slant surface 6Z is extended and angled from a substrate 2 and forms optical cavities around LED elements 1. This is best shown below in Figure 4:

FIG. 4

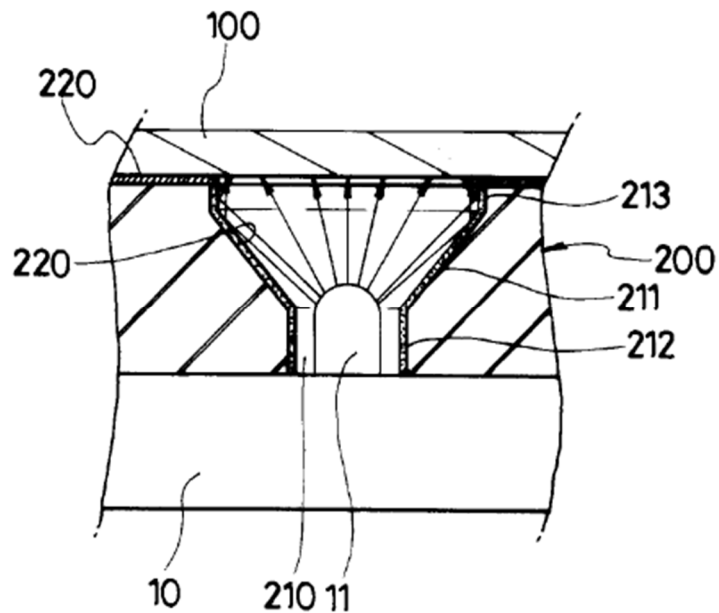


39. A person of ordinary skill in the art reviewing the disclosure of Hiroki, and in particular Figure 4 above, would understand that Hiroki discloses or renders obvious the additional limitations of a reflector sheet on the first side of the at least one substrate, wherein the reflector is extended and angled with respect to the surface of the substrate (Substitute Claim 34) and a lighting panel wherein the reflector forms a reflective optical cavity around at least one solid state lighting

device. (Substitute Claim 35). As is shown by Figure 4 of Hiroki, the reflector 6 forms an enclosure around the LED 1. Lee's reflector 6 is both extended and angled with respect to the substrate 2 on which the LEDs are mounted. Further, the reflector 6 forms an optical cavity around at least one LED 1, which is a solid state lighting device.

F. Lee Renders Substitute Claims 34 and 35 Obvious

40. I am informed and understand that Lee is prior art to the '075 Patent. Lee is entitled "Electronic Display Board for indication equipment." Figures 1-4 of Lee, and their accompanying description, disclose LED lamps 11 that are installed on LED substrate 10 through an insertion hole 210 that has an inclined surface 211 with a reflective coating 230 that is angled and extended with respect to the LED substrate 10 to form an optical cavity around the LED lamps 11. This is best shown below in Figure 3:



41. A person of ordinary skill in the art reviewing the disclosure of Lee, and in particular Figure 3 above, would understand that Lee discloses or renders obvious the additional limitations of a reflector sheet on the first side of the at least one substrate, wherein the reflector is extended and angled with respect to the surface of the substrate (Substitute Claim 34) and a lighting panel wherein the reflector forms a reflective optical cavity around at least one solid state lighting device. (Substitute Claim 35). As shown by Figure 3 of Lee, the inclined surface 211 with a reflective coating 230 forms an enclosure around the LED lamp 11. Lee's inclined surface 211 with a reflective coating 230 is also extended and angled from the substrate 10 that the LED lamps 11 are mounted on. Further, the

G. Hiratsuka Renders Substitute Claims 34 and 35 Obvious

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discloses or renders obvious the additional limitations of a reflector sheet on the first side of the at least one substrate, wherein the reflector is extended and angled with respect to the surface of the substrate (Substitute Claim 34) and a lighting panel wherein the reflector forms a reflective optical cavity around at least one solid state lighting device. (Substitute Claim 35). As shown by Figure 4 of Hiratsuka, the inclined reflecting surface 7 forms an enclosure around the LED chip 3. The inclined reflecting surface 7 in Hiratsuka is extended and angled from the substrate 1 that the LED chip 3 are mounted on. Further, the inclined reflecting surface 7 forms an optical cavity around at least one LED chip 3, which is a solid state lighting device.

VI. Motivations to Combine.

A. It Would Have Been Obvious to Incorporate the Teachings of Ayabe, Roth, Saccomanno, Chang, Hiroki, Lee, or Hiratsuka with the Prior Art of Ground I.

44. For similar reasons expressed in my original declaration for combining the prior art of Ground I (Mok, Holman, and Lamb), it would have been obvious to combine any of Ayabe, Roth, Saccomanno, Chang, Hiroki, Lee, or Hiratsuka with the prior art of Ground I.

45. For example, Ayabe, Roth, Saccomanno, Chang, Hiroki, Lee, and Hiratsuka all relate to the same field of endeavor as Mok, Holman, and Lamb, i.e., LED based lighting devices to provide backlighting for display elements.

Additionally, each of Ayabe, Roth, Saccomanno, Chang, Hiroki, Lee, and Hiratsuka discuss and are directed to overcoming common issues in lighting panel designs, such as lighting efficiencies, light uniformity, light diffusion, on axis-brightness, reducing “hot-spots”, and other common lighting panel design considerations. Moreover, each of Ayabe, Roth, Saccomanno, Chang, Hiroki, Lee, and Hiratsuka employ similar structures and components, including LEDs, substrates, reflector sheets or reflective substrates, diffusers, and brightness enhancement films.

46. Ayabe, for example, discusses the importance of light mixing chamber (“equalizing chamber 24”) for light uniformity and color mixing. Ayabe, [0007]. And Ayabe’s teachings regarding the use of this conventional lighting panel design, in conjunction with Ayabe’s teaching regarding improvements in the configuration of reflective optical cavities with angled and extended sidewalls, would have combined with the prior art disclosures of Ground I to achieve better lighting efficiency, light distribution, and light output – all of which are common goals and aims across all of the cited prior art.

47. Similarly, Roth describes the common use of LED lights in lighting panel designs and the need to improve light quality. Roth, [0003-0006]. Moreover, Roth describes the use of a reflector forming an optical cavity with angled and extended sidewalls to improve light mixing and increase the amount of light

emitted by the LED in the desired direction. Roth, [0007], [0028]. Thus, it would have been obvious to use Roth's angled reflector cup designs to improve light output in the lighting panel designs disclosed by the prior art in Ground I.

48. Saccomanno relates to optical sensing and controlling of light sources in conventional light panel designs. And as explained in conjunction with Figures 4 and 5 of Saccomanno, the use of conventional reflective surfaces and the recycling nature of the BEF can be optimized by the use of optical sensors to detect excess light being reflected by these reflective surfaces in conventional mixing chamber light panel designs. Saccomanno, [0038-0040], [0045]. Thus, one of skill in the art would understand that Saccomanno's teachings of extended and angled reflector which form optical cavities around the LEDs, in conjunction with its teachings regarding the management of recycled light reflected from light management films, including diffusers and BEFs, could be used in combination with the designs taught by the prior art in Ground I.

49. Chang is directed to improving panel design to reduce heat and increase brightness. And Chang specifically discusses the use of angled reflectors to "enhance the reflection effect" in an effort to increase brightness. Chang also teaches the use of diffusers and optical films to increase light uniformity and brightness. Finally, Chang discloses the relative position of these components and shows the reflector in contact with the diffuser, which in turn is in contact with the

optical film or BEF. Thus, it would have been obvious to use Chang's angled reflector surface and stacked sheet design to improve light output, brightness, and efficiency in the lighting panel designs disclosed by the prior art in Ground I.

50. Hiroki aims to create a lighting device "capable of improving radiation center brightness" and "reducing change or variation in center brightness even if there is positional deviation of the LED element relative to the substrate." Hiroki, 2:39-46. To achieve these goals, Hiroki discloses that "[b]y forming the slant surface 6X in the reflector 6, the output light of the LED element 1 is reflected upon the slant surface 6X and radiated toward the front of the chip-type semiconductor light-emitting device 20. Due to this, light emission efficiency is improved in the chip-type semiconductor light-emitting device." Hiroki, 1:54-59. A person of ordinary skill in the art would be motivated to use a similar slanted reflective surface efficiency in the lighting panel designs disclosed by the prior art in Ground I to achieve the more efficient light emission Hiroki describes.

51. Lee is directed to "provide an electronic display board which can prevent a viewer from feeling eye strain by collecting light of LED lamps without modifying a configuration of a related-art electronic display board, and can transmit luminous light." Lee, [0021]. This is done through "a coating layer [that] may be formed on an inner surface of the insertion hole of the light collection panel to allow the light of the LED lamp to be reflected and collected." Further,

“[t]he insertion hole 210 is formed in such a shape that it becomes gradually narrower toward a lower side, and has an inclined surface 211,” which helps with Lee’s goal of improved light collection and illumination. Lee, [0035]. It would have been obvious to a person of ordinary skill in the art to use Lee’s inclined reflective surface, which forms a cavity around the LED lamps, to improve light collection and output for easier viewing in the lighting panel designs disclosed by the prior art in Ground I.

52. Hiratsuka states that its “objective is to efficiently emit light incident from an LED chip onto a reflective surface from the opening of the housing in order to increase the brightness and luminance... By using a configuration that has reduced the losses that may occur during the repeated reflection of the light that is emitted from the LED chip on the peripheral wall surface of the light-radiating hole, it will be possible to increase the luminance or amount of light that is emitted from the light-radiating hole or light-radiating unit.” Hiratsuka, Abstract. As described in Hiratsuka’s specification, these goals are achieved by placing “LED chips 3 and 3 “in the central axis of each light-radiating hole 6 and 6 ... such that, when LED chip 3 is illuminated, that radiated light will be efficiently irradiated outside of housing 5 via reflective surface 7” which is to be at an incline that “forms a truncated conical shape.” Hiratsuka, [0005]. A POSITA would be motivated to use an incline reflective surface forming an optical cavity around the

LED, such as the system described in Hiratsuka design to improve illumination, brightness, and efficiency in the lighting panel designs disclosed by the prior art in Ground 1.

53. A person of ordinary skill in the art reviewing the teachings of Ayabe, Roth, Saccomanno, Chang, Hiroki, Lee, and Hiratsuka would recognize that incorporating the elements discussed above of any one of Ayabe, Roth, Saccomanno, Chang, Hiroki, Lee, and Hiratsuka into the combination of Mok, Holman, and Lamb would improve efficiency as well as the quality and uniformity of light output by the backlight system. Thus, a person of ordinary skill in the art would be motivated to make this modification to improve the quality of light output. Accordingly, it would have been obvious to one of skill in the art to employ the teachings of Ayabe, Roth, Saccomanno, Chang, Hiroki, Lee, and Hiratsuka with each of the prior art in Ground I.

B. It Would Have Been Obvious to Incorporate the Teachings of Ayabe, Roth, or Saccomanno with the Prior Art of Ground II.

54. For similar reasons expressed in my original declaration for combining the prior art of Ground II, it would have been obvious to combine any of Ayabe, Roth, Saccomanno, Chang, Hiroki, Lee, or Hiratsuka with the prior art of Ground II (Epstein, Holman, and Lamb).

55. As discussed above, Ayabe, Roth, Saccomanno, Chang, Hiroki, Lee, and Hiratsuka all relate to the same field of endeavor as Epstein, Holman, and

Lamb, i.e., LED based lighting devices to provide backlighting for display elements and are directed to common issues across the art of lighting panel design including light uniformity and diffusion, increasing on axis-brightness, reducing “hot-spots” and other deleterious lighting effects, and reducing panel thickness.

56. Moreover, each of Ayabe, Roth, Saccomanno, Chang, Hiroki, Lee, and Hiratsuka employ similar structures and components, including LEDs, substrates, reflector sheets or reflective substrates, diffusers, and brightness enhancement films.

57. Similarly, it would have been obvious to one of skill in the art to employ the teachings of Ayabe, Roth, Saccomanno, Chang, Hiroki, Lee, and Hiratsuka with each of the prior art in Ground II. The reasoning and analysis I provide above applies to the prior art in Ground II as well and is incorporated herein in this section. Each of Epstein, Lamb, and Holman relate to the same field of endeavor, utilize similar light panel designs and light panel constructions, and have similar goals of increasing light output, maximizing efficiency, and improving light uniformity. A person of ordinary skill in the art reviewing the teachings of Ayabe, Roth, Saccomanno, Chang, Hiroki, Lee, and Hiratsuka would recognize that incorporating the elements discussed above of any one of Ayabe, Roth, Saccomanno, Chang, Hiroki, Lee, and Hiratsuka into the combination of Epstein, Holman, and Lamb would improve efficiency as well as the quality and

uniformity of light output by the backlight system. Thus, a person of ordinary skill in the art would be motivated to make this modification to improve the quality of light output.

VII. Additional Views

58. I previously provided a discussion relating to Mok, Epstein, Holman, and Lamb, and their relevance to the original claims. I have been asked to expand on my previous discussion. In doing so, I have not relied on any new embodiment or combination but simply wish to provide additional detail in response to Patent Owner's and their expert's arguments.

59. First, as to Mok, I understand that PO argues Mok fails to disclose a brightness enhancing film on a reflector, because Mok discloses that there may be an air gap between these elements. I disagree. Rather, as used in the '075 patent, a person of skill in the art would understand "on" means there may be some intervening elements, such as air gaps. This is because a person of skill in the art would understand that the '075 patent uses the term "directly on" when it describes a configuration with no intervening elements such as air gaps.

60. I understand Mr. Bohannon contests that 3M's BEFs sold under the Vikuiti tradename are not the claimed brightness enhancement films because "in his experience" 3M's BEF do not recycle light. Ex. 2006, ¶48-49. Mr. Bohannon is wrong.

61.First, I note that Mr. Bohannon does not cite to any evidence or provide any other explanation other than citing his “experience”. *Id.* However, I also note that Mr. Bohannon testified that he does not know much about 3M’s BEFs and that he does not really know how 3M’s BEFs work. ’835 Bohannon Dep., 84:9-10¹; ’075 Bohannon Dep., 49:9-50:4.

62.Second, I note that the prior art, including Holman and Lamb, confirms that 3M’s BEFs were known to recycle light. In fact, Holman goes so far as to say that recycling light is a “hallmark” feature of 3M’s BEFs. Holman at 125.

63.Third, 3M product brochures provide further evidence that 3M’s BEFs recycle light. For example, I note that Exhibits 8 and 9 to Bohannon’s testimony in the ’835 proceedings show light rays being internally reflected by 3M’s BEF and such characteristics are described by 3M as “recycling.” *See* Ex. 1031, Ex. 1032. Additional brochures from 3M also confirm this understanding and show the exact type of light ray reflection that is described by the ’075 patent. *See, e.g.,* Ex. 1033, 1034. These brochures simply confirm and reinforce what Lamb and Holman already disclose and describe and what one of skill in the art would already know – 3M’s BEFs were well-known to recycle light and that such light recycling was a hallmark feature of their optical characteristics.

¹ “I reviewed Mr. Bohannon’s deposition testimony in the ’075 proceeding and understand that he stands by his testimony in the ’835 proceeding and that nothing since his ’835 testimony changes his opinions as it relates to the ’075 proceeding, and specifically as it relates to the prior art. ’075 Bohannon Deposition at 8:1-15.

64. These brochures and exhibits also confirm what Lamb and Holman explicitly describe relative to the well-known properties of 3M's BEFs – they refract light of one orientation towards a viewer, and reflect light outside that angle back into the system to be recycled. Finally, I have reviewed Mr. Bohannon's testimony on this point and although his testimony appears to me to be mostly argumentative and conclusory, eventually even he admits that 3M's BEFs reflect some light back into the system. '835 Bohannon Dep., 115:20-117:3.

65. Next, I understand that Mr. Bohannon argues that Mok's printed circuit board does not draw away heat from the LEDs and thus is not a heat sink. I disagree. A person of skill in the art would know that a metal core printed circuit board would improve heat dissipation, and thus function as a heat sink. This is especially true in comparison to base layers made of other materials, like plastic, as those materials allow for far less heat dissipation, which the metal base of a printed circuit board would encourage great heat dissipation.

66. It was well known in the art that printed circuit boards in LED applications typically used metal cores such as aluminum, specifically because they have enhanced thermal management properties. See, e.g., <https://www.mainpcb.com/pcb-substrates/>. And it was well known to use such printed circuit boards, especially those using metal, as heat sinks. Id. I note that the publication referenced in this paragraph is consistent with the knowledge one of

skill in the art would have had as of the earliest priority date of the '075 patent. As seen from commercially available literature at the time of the purported invention, MCPCBs were understood to be used as heat sinks, or alternatively, it was common to use additional heat sinks with PCMB's in LED applications. See Ex. 1035. ("The MCPCB acts as an electrical interconnect, as well as a thermal heat sink interface. While we recommend using an additional heat sink, these products can be operated at 25°C without one.").

67. Further, the heatsink panel described and shown in Figure 7 of the '075 Patent, is similar in size, shape, and placement within the layered structure as the metallic layer of the printed circuit board of Mok. The heatsink panel of the '075 Patent is also disclosed as being made of a metallic material, such as aluminum, similar to the printed circuit board's metal layer. Indeed, Mr. Bohannon confirmed in his deposition that the '075 Patent discloses a layer 80 made of metal that moves heat in a direction opposite of light. '075 Bohannon Dep., 56:11-58:11, 60:5-61:11. This further demonstrates, and a person of skill in the art would know, that the heatsink panel of the '075 Patent and printed circuit board of Mok have the same function, dissipating heat.

68. Mr. Bohannon also argues that a person of skill in the art would not be motivated to combine Mok's printed circuit board with Holman's heat sinking layer. Again, I disagree.

69. Holman describes and shows in Figure 14 a base layer that has thermal heat sinking vias 250 and heat sink tabs 264 to pull heat away from the light emitting units and into the base layer, such that the base layer is a heat sink panel. Holman, Fig. 14, 39-40. A person of skill in the art would realize that Holman's base layer functions in the same way as the heat sink described and shown in Figure 7 of the '075 patent, which is similarly described as pulling heat away from the light emitting units.

70. A person of skill in the art would recognize that the base layer in Holman could be placed on the bottom of the printed circuit board described in Mok for even greater and more efficient heat extraction. Such a modification would be simple to a person of ordinary skill in the art, because it would merely require affixing a panel (the base layer of Holman) to the bottom surface of Mok's printed circuit board. The resulting panel, which would have greater heat management properties, would be a predictable result to a person of skill in the art.

71. Alternatively, a person of skill in the art would recognize that a metallic layer could be added to the base layer described in Holman as another way to improve heat extraction. This is because metallic materials are well known to be efficient at extracting heat. And again, this would be a simple modification to a person of skill in the art, leading to a predictable and desirable result of better heat dissipation.

72. I am informed that Patent Owner also argues that Mok does not disclose a diffuser sheet is in direct contact with a reflector sheet. I disagree. To the extent Patent Owner's argument is based on the height of the light emitting units shown in Figure 1 of Mok, a POSITA would understand that the embodiment shown in that figure is exemplary, as stated in Mok. It is not the only possible configuration of the invention. Indeed, a person of skill in the art would understand that there are multiple possible configurations of the light emitting elements shown in Mok.

73. For example, Mok notes that "one embodiment of a light emitting panel 10 may comprise a base panel 12 suitable for receiving the various light emitting elements 14 in the manner described herein" and "[t]he base panel 12 provides a convenient mounting location for the various light emitting elements 14, allowing them to be arranged in a two dimensional array or pattern over both the length 38 and width 40 of the base panel 12." Ex. 1005, [0019]-[0020]. Additionally, "[t]he light emitting elements 14 may be selected to provide any of a wide range of spectral outputs that may be desired for the particular light emitting panel 10." *Id.*, [0033]. Thus, a POSITA would understand Mok as teach different LEDs and different configurations of LEDs on the base panel 12 based on the needs of the particular light emitting panel.

74. Thus, rather than extending from the base panel past the distance of the reflective surface in Mok, the light emitting elements and reflective surface could be the same height.

75. When the light emitting elements and reflective surface extend the same distance from the base panel, the reflective surface could contact the diffuser in Mok. This would lead to less empty space in the device, which is desirable because it would create a thinner, more efficient display assembly. Further, when the reflective surface is the same height as the light emitting elements, the reflector can capture greater amounts of light from the light emitting elements, as the reflector can capture light from more angles. This would lead to brighter, more luminous lighting. Finally, lowering the LED height allows emitted light from lighting elements to experience light mixing between the reflective surface and the diffuser.

76. Thus, a person of skill in the art would be motivated to utilize an embodiment of Mok where the light emitting elements are the same height as the reflective surface, such that the diffuser is in direct contact with the reflective surface.

77. Alternatively, to both create a thinner display but also allow more space for light mixing to occur, the light emitting elements could extend lower from the base panel than the reflective surface. This would result in a thinner, less bulky system, because the light emitting elements would not require as much space,

while still allowing open space between the light emitting units and diffuser for light mixing. In this arrangement, the reflector and diffuser would still be in direct contact.

78. Both the arrangement of Mok where the light emitting elements extend the same distance from the base panel as the reflective surface and the arrangement of Mok where the light emitting elements extend lower from the base panel than the reflective surface would be obvious to a person of skill in the art, and would be dependent on what light emitting elements are used in the device. This is because there are many different types of light emitting units, which all have different dimensions, including different height. Indeed, as Holman teaches, “[p]referable choices for cavity dimensions... as well as for the reflective properties (diffuse or specular) given to its interior walls 230 and the optical properties given to its immersing media 238 *depend on the size 236 of the LED and the specific system application within which the LED light source array is to be used.*” Holman, 39-40. (emphasis added).

79. Thus, a person of skill in the art would understand light emitting elements with different dimensions may have different lighting characteristics, and a person of skill in the art would consider these different lighting characteristics, weighing this along with the fact that thinner light emitting units would allow for a thinner display unit, in selecting LEDs based on the needs of a specific application.

80.I understand that Patent Owner, but not Mr. Bohannon, argues that Epstein does not disclose a diffuser sheet in direct contact with a reflector sheet, because Figure 11 of Epstein shows that there may be reflecting material on the guiding layer, and molding the guiding layer around the reflecting material of Epstein would have negative effects, or no benefit. I disagree.

81.First, Epstein only includes the reflecting material between the guiding layer and the BEF in one potential configuration of the invention. Epstein states “the light extraction features 624 may comprise areas that include diffractive structures or diffusely reflecting material 636 provided.” Epstein, [0069]. Epstein further states that “[t]he extraction feature does not have to be situated on the upper surface of the guiding layer 610, but may be provided on the lower surface of the guiding layer 610 and/or on the intermediate layer 622.” *Id.*, [0068]. Thus, Epstein discloses configurations of its invention where the light extraction features, of which the reflecting material is one possible option, may be on the lower surface of the guiding later, and thus not between the guiding layer and the BEF. Epstein, [0080]-[0082].

82.Epstein also states that “the light extraction features comprise indentations 648 that penetrate the upper surface 611 of the guiding layer.” Epstein, [0070]. Thus, Epstein also discloses a configuration where the light

extraction features do not extend out from the guiding layer, but instead are indented into the guiding layer.

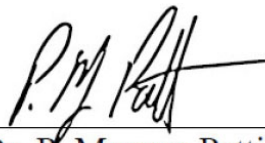
83.Epstein also discloses that “the light extraction features may be placed or adapted to extract less light at a position close to the LED itself, to increase the amount of light extraction from the positions of the light extracting element further away from the LED” and “obtain a more uniform intensity profile in the light emitted from the light emitting element.” Epstein, [0088]; Fig. 16A-D. In this configuration, the light extraction features would be on the lower surface of the guiding layer, as would be necessary to be closer to the LEDs.

84.In all of these configurations, the light extraction features, which include reflecting material, would not extend from the upper surface of the guiding layer. Thus, the reflecting material would not be between the guiding layer and BEF, and the guiding layer and BEF would thus be in direct contact.

85.Further, as I previously explained in my earlier declaration, Epstein seeks to create a thinner display assembly. A person of skill in the art would recognize that if the reflecting material were molded to the guiding layer of Epstein such that the brightness enhancement film is in contact with the reflector, less space would be needed for the components. This would help to create a thinner, less bulky display device as sought by Epstein. Thus, Patent Owner is incorrect that there would be no benefit by this configuration of Epstein.

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 30, 2024
Date



Dr. F. Morgan Pattison