

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. 9,605,835
Filing Date: February 2, 2015
Issue Date: March 28, 2017
Title: SOLID-STATE LUMINAIRES FOR GENERAL ILLUMINATION

Inter Partes Review No. IPR2023-01168

**PETITIONER'S OPPOSITION TO PATENT OWNER'S REVISED
MOTION TO AMEND**

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1004	Curriculum Vitae of Morgan Pattison, Ph.D.
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1006	WO 03/056876 to Holman <i>et al.</i> (“Holman”)
1007	US 2005/0135115 to Lamb <i>et al.</i> (“Lamb”)
1008	US 2005/0265029 to Epstein <i>et al.</i> (“Epstein”)
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1011	Counterclaim filed by PO in <i>Hisense USA Corp. v. Brightplus Ventures LLC</i> , No. 1:22-cv-02774, Dkt. 9 (N.D. Ga. Sep. 16, 2022)
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1028	Final Transcript of July 12, 2024 Deposition of William Bohannon
1029	US 2005/0231943A1 to Sloan <i>et al.</i> (“Sloan”)
1030	Korean Patent Application No. KR20050012372A, entitled “Luminescent diode package and method for manufacturing led package” to Park (“Park”)
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1032	Chinese Patent Application No. CN1693962A, entitled “LED backlight system of packing LED using three primary colors (RGB)” to Li <i>et al.</i> (“Li”)
1033	Certified Translation of Exhibit 1032, Chinese Patent Application No. CN1693962A, entitled “LED backlight system of packing LED using three primary colors (RGB)” to Li <i>et al.</i> (“Li”)
1034	US 2005/0047134A1 to Mueller <i>et al.</i> (“Mueller”)

EXHIBIT	DESCRIPTION
1035	US 2007/0046485A1 to Grootes <i>et al.</i> (“Grootes”)
1036	Declaration of P. Morgan Pattison, Ph.D. in Response to Patent Owner’s Revised Contingent Motion to Amend

I. Introduction

Patent Owner's (PO's) motion proposes substitute claims that lack written description support and cover well-known panel design that employ angled reflectors, packaged LEDs, and controllers for current supply based on pulse width modulation (PWM). This design is described in many prior art references, including the prior art of record in this proceeding. The revised claims are not patentable.

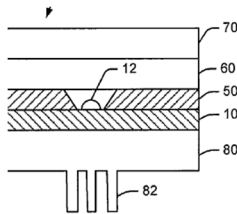
II. The Motion Fails to Comply with Section 316(d) Or Rule 42.121

A. The Substitute Claims Violate the Written Description Requirement

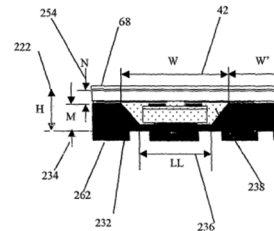
The substitute claims lack written description support. First, there is no support for a metal core printed circuit board (MCPCB) that is “mounted on a lighting tile” as recited in substitute claim 21. The only description related to the tile and the MCPCB in the patent specification is that “a **tile 10** may **include** a metal core PCB (MCPCB)”. Ex. 1001, 8:27-31. There is no disclosure, however, of a MCPCB that is *mounted on* the lighting tile.

Similarly, there is no support for “at least one **substrate comprising a [MCPCB]** having **traces** formed thereon **mounted on a lighting tile**” as recited in substitute claim 21. The only description of a substrate and a tile together is Fig. 2, which shows LED 12 on tile 10 with “carrier substrate 13,” but this carrier substrate is part of the packaged LEDs, not the substrate that comprises a MCPCB as recited in the substitute claims.

Furthermore, substitute claim 21 lacks written description support for a reflector that “extends to cover the lighting tile and includes a plurality of sidewalls outside of the packaged solid state lighting devices.” While the ’835 patent describes both a reflector and solid state lighting devices, there is no mention or depiction of a reflector having sidewalls **outside of** packaged solid state lighting devices. In fact, Figure 7 of the ’835 patent shows an arrangement of a reflector 50 with sidewalls around the LEDs 12 in a nearly identical configuration of the reflective sidewalls and LEDs in Holman, which PO claims *does not* meet this element of substitute claim 21. Revised MTA at 6-7.



Ex. 1001, Fig. 7.



Ex. 1008, Fig. 14.

Substitute claim 24 also lacks written description support for a generally planar diffuser “offset from the packaged solid state lighting devices.” In fact, there is no discussion whatsoever of the relation between the placement of the solid state lighting devices and the diffuser sheet in the ’835 patent.

III. Proposed Substitute Claims 21-29 Are Not Patentable in View of the Prior Art

A. The Prior Art Discloses “at least one substrate comprising a metal core printed circuit board having traces formed thereon mounted on a lighting tile” in Substitute Claim 21[a].

PO does not argue that Mok fails to disclose substitute claim 21[a], and indeed it cannot. Mok discloses a substrate having a base panel 12 that includes a printed circuit board (“PCB”). Ex. 1005, [0019] (“it will be convenient in most applications for the base panel 12 to comprise a printed circuit board”); Ex. 1036, ¶13-15. Mok goes on to explain that its PCB can be mounted to its base panel 12, which is the claimed tile of substitute claim 21. Ex. 1005, [0019] (describing connecting LED to PCB that is part of the base panel). *Id.* This disclosure is precisely the same as that found in the ’835 Patent, which states “[t]he tile 10 may include, for example, a printed circuit board (PCB)” on which LEDs may be mounted. Ex. 1001, 8:27-30. To the extent that PO argues that Mok does not explicitly state that its PCB has a metal core, as Dr. Pattison explains, the term PCB is commonly known and understood to refer to a class of PCB’s that would include metal core, FR4, Teflon, and other types of PCBs. Ex. 1036, ¶14. Moreover, MCPCBs were well known in the art and commonly used in the LED applications due to its advantages for heat dissipation. Ex. 1036, ¶14-15. For example, Sloan teaches that metal cores can be used to serve as heat sinks for heat generated by LEDs. Ex. 1029, [0039].

Epstein also discloses substitute claim 21[a], describing a tile 304 with a number of layers (including, for example, substrate 308/408 and guiding layer 310/410) wherein the substrate 408 may be formed from a “metal” and may include “metallic traces” to carry current to and from the LED. Ex. 1008, [0046], [0051]. These metallic traces in the metal substrate would be understood to a POSITA as including a MCPCB. Ex. 1036, 16-17. As Dr. Pattison explains, MCPCBs make excellent substrates and were commonly used because they allow for creating electrical connections amongst and between arrays of LEDs and also serve as heat sinks to manage heat created by the LEDs. Ex. 1036, 14-17; *see also*, Ex. 1029, [0039].

Park also discloses this element and describes a “light emitting diode package” (i.e., a lighting tile), that includes a “wiring part on which the light emitting diodes are mounted” and “the wiring part is a metal core PCB.” Ex. 1031 at Abstract. This wiring portion is thus a substrate which comprises a MCPCB. Ex. 1036, ¶18.

Similarly, Li discloses LEDs soldered to MCPCBs. Ex. 1033, 8. Li’s aluminum-based PCB is a MCPCB and is also evidence of the common and ubiquitous use of MCPCBs as substrates. Ex. 1036, ¶18.

B. The Prior Art Discloses a “plurality of strings of packaged solid state lighting devices” in Substitute Claim 21[b].

Substitute claim 21[b] is also disclosed by both prior art in the original grounds, as well as other prior art. Mok, for example, provides that LEDs can be

arranged in two dimensional arrays across its tile and substrate. Ex. 1005, [0019]. As a POSITA would recognize, Mok's disclosure of a two-dimensional array "over both the length 38 and width 40 of the base panel 12" as also disclosing a plurality of strings. Ex. 1036, ¶20-22. In fact, arranging the LEDs in multiple strings is a common practice in the art. *Id.* This arrangement can be seen across the art, including, for example, in Grootes where the LEDs are "***strings of LEDs.***" Ex. 1035, [0010] (emphasis added); Ex. 1036, 20-21.

To the extent PO argues that the prior art does not disclose "***packaged*** solid state lighting devices," PO is wrong. For example, Holman describes LEDs that may be "manufactured in two types of packages." Ex. 1006, 25. And packaged LEDs were common at the time as numerous companies offered LED packages that could be used in displays. Ex. 1036, ¶23-25. Similarly, Epstein explicitly states that its "LEDs may be packaged LEDs." Ex. 1008, [0044]. Park also discloses a "plurality of high-power light emitting diodes in a package form." Ex. 1031, 5. Li too describes "LCD backlight system using three-primary-color (RGB) unit-packaged LEDs." Ex. 1033, Abstract. Thus, each of Holman, Epstein, Park, and Li discloses packaged LEDs. And as set forth above, arranging these LEDs in strings was a common, well-known arrangement for LEDs. *See* Ex. 1035, [0010]; Ex. 1036, ¶20-25.

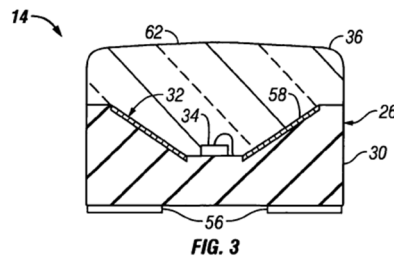
C. The Prior Art Discloses “wherein the plurality of strings of packaged solid state lighting devices is mounted on the lighting tile” in Substitute Claim 21[c].

Claim 21[c] also describes common elements met both by the references in the original petition and other prior art. First, Mok describes solid state lighting devices (light emitting elements 14) that are mounted on a lighting tile comprising a PCB (base panel 12). Ex. 1005, [0019]. Next, Epstein discloses a display panel 302 that “comprises a number of tiles 304” with a number of layers, such as the substrate 308/408. Ex. 1008, [0039]. Epstein’s light emitting elements 306, which “may be packaged LEDs” are mounted on the substrate 408, which is part of the lighting tile 304. Ex. 1008, [0039], [0044], [0046]; Ex. 1036, ¶28.

In Park, there are a “plurality of high-power [LEDs] mounted in a package form” that are “on the wiring part,” which is the lighting tile on which MCPCB are mounted. Ex. 1031, 1; Ex. 1036, ¶29. Further, Li discloses that “A plurality of tri-color packaged LEDs are soldered to an aluminum-based PCB 12 using a patch mounting process.” Ex. 1033, 8. Finally, in Grootes, “the LEDs are first mounted and electrically connected on a printed circuit board (PCB).” Ex. 1035, [0011]. Thus, all of Mok, Epstein, Park, and Li disclose LEDs mounted on a lighting tile. Ex. 1036, ¶26-30.

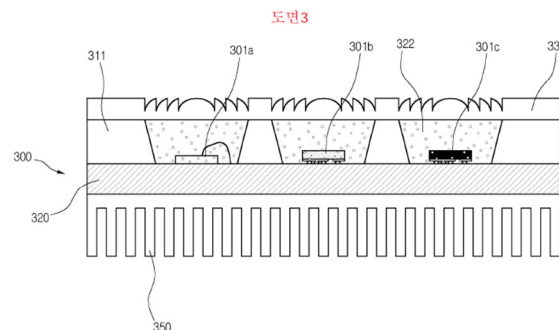
D. The Prior Art Discloses “wherein a lens is mounted over each one of the packaged solid state lighting devices” in Substitute Claim 21[d].

Substitute claim 21[d] was known in the art. For example, Mok discloses a lens 36 mounted over each packaged LED. Ex. 1005, [0029]; *see also* FIG. 3.



Holman also discloses that its packaged LEDs have a lens. Ex. 1006, 25. A POSITA would understand that the lens of Holman may be mounted over each of its packaged LEDs. Ex. 1036, ¶33.

Next, Park discloses that its lens portion 330 is “coupled with” the reflection cup portion 311 in its packaged LED. Ex. 1031, 7. As shown in Figure 3, Park’s lens portion 330 is mounted over each LED (301a, 301b, 301c):



Id., Fig. 3. Finally, Li discloses that each of its packaged LEDs have a lens mounted to it. Ex. 1033, 10. The lens above the LED light source in Li is a lens mounted over the solid state lighting devices. Ex. 1036, ¶35.

E. The Prior Art Discloses “a controller configured to control the plurality of strings of packaged solid state lighting devices” in Substitute Claim 21[e].

Using a controller to control LED strings was well known and commonly used as of the '835 Patent's priority date. This is demonstrated, for example, by Mueller, which describes and shows a central controller 202 and several lighting unit controllers (LUCs) 208A-D. Ex. 1034, [0189]. The LUCs 208 and central controller 202 are configured to control the lighting units 101.

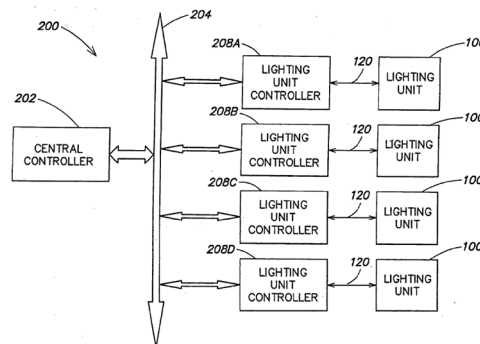


FIG. 2

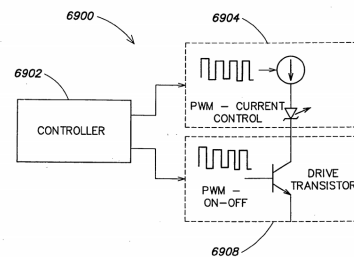
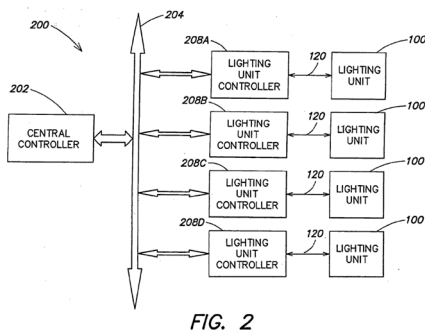
Id., Fig. 2.

Similarly, Grootes describes “an external PWM or amplitude modulation controller” through which “[e]ach current source 40-42 is controllable to control the brightness of its associated LEDs to achieve the desired white point” where the LEDs are arranged in “strings.” Ex. 1035, [0010], [0017], [0041]. Thus, the PWM or

amplitude modulation controller of Grootes controls the “strings of LEDs.” *Id.*, [0010]; Ex. 1036, ¶38.

F. The Prior Art Discloses “wherein the controller is operable to deliver a control signal to a plurality of current supply circuits that are operable to control the pulse width of the current supplied to each one of the plurality of strings of packaged solid state lighting devices using information transmitted to the controller over a communication link” in Substitute Claim 21[f].

Substitute Claim 21[f] is also aimed at elements well known in the art. Mueller, for example, describes controllers (202 and 208) that send control signals based on information sent over communication facility 120, which is a communication link. Ex. 1034, Fig. 2, [0272], [0280]. Mueller goes on to disclose that its control signals may be “pulse width modulated signals (PWM).” Ex. 1034, [0156], Fig. 2, Fig. 69; Ex. 1036, ¶39-41. Mueller’s control signals control the pulse width of the current. As shown in FIG. 2, the PWM signals from central controller 202 go to communication facility/coupling device 204, which connects to a plurality of circuits, including “serial connections of LEDs.” *Id.*, [0160], [0156], [0276], Fig. 2; Ex. 1036, ¶39-41.



Mueller further describes that its processor may generate PWM signals, and that these signals “may control other dedicated circuitry ..., which in turn controls the light sources so as to vary their respective intensities.” *Id.* at [0156].

Similarly, Grootes describes a “PWM controller” which is connected to “PWM control line in FIG. 4, that receives a control signal.” Ex. 1035, [0035]-[0037], [0041]-[0044]; Ex. 1036, ¶¶39, 42-44. The PWM controller delivers control signals based on information that is sent to it from a “programmed microprocessor, a memory, or other controller,” via a communication link. *Id.* As shown in Figure 4, there are a plurality of PWM control lines delivering control signals to a plurality of current supply circuits (e.g., circuits 40, 41, 42) that are operable to control respectively the pulse width of the current supplied to each LED string. *Id.*, Fig. 4, [0035]-[0037], [0048]-[0049]; Ex. 1036, ¶¶42-44.

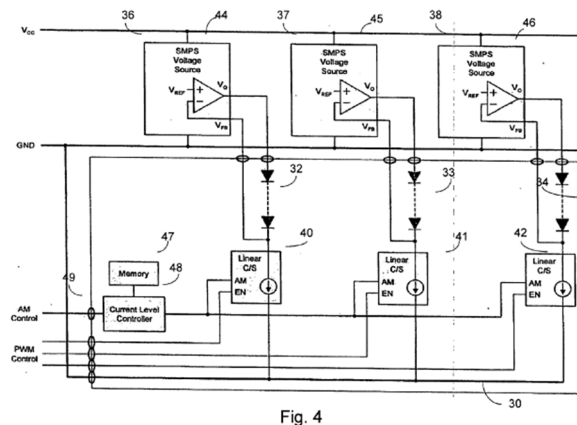
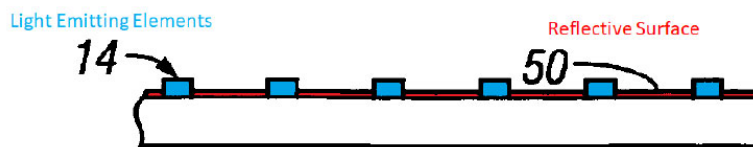


Fig. 4

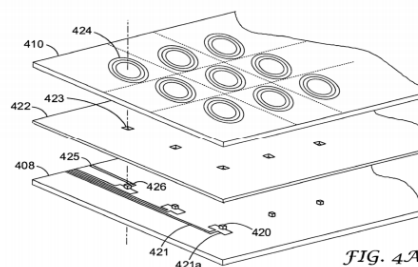
G. The Prior Art Discloses “a reflector mounted to the lighting tile and on the first side of the at least one substrate, the reflector being outside of the packaged solid state lighting devices” in Substitute Claim 21[g].

The prior art from the Petition and a number of other references all disclose claim 21[g]. For example, Mok states that “[t]he reflective surface 50 may comprise a separate component (e.g., a sheet-like material) that is affixed to the base panel 12.” Ex. 1005, [0021]. As shown by Figure 1 of Mok, the sheet-like reflective surface 50 is mounted to the base panel 12, and is separate from, or outside of, the light emitting elements 14. *See* Ex. 1036, ¶45.

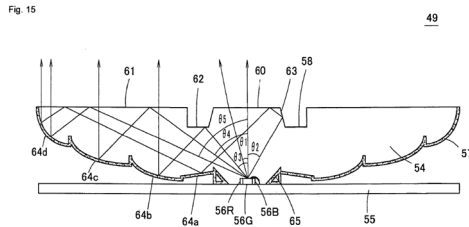


Ex. 1005, Fig. 1 (annotated).

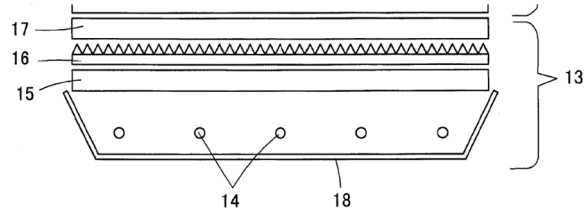
Epstein discloses an intermediate layer 422/522/622 which “may be reflective for light at the wavelength emitted by the LED 420.” Ex. 1008, [0048]. The intermediate layer 422 is thus a reflector mounted on the substrate 408. Ex. 1036, ¶46. As shown in FIG. 4A, intermediate layer 422 is outside LEDs 420. *Id.*, Fig. 4A.



Ayabe also describes and shows a reflector outside of the LEDs. *See, e.g.*, Ex. 1017, [0091]-[0092], Fig. 15 (LEDs 56 and annular reflecting areas 64), Fig. 1 (light sources 14 and reflective film 18).

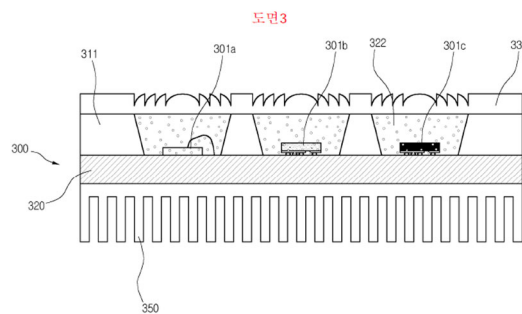


Id., Fig. 15



Id., Fig. 1

Park also describes “mounting a reflection cup part on the wiring part on which the light emitting diodes are mounted to reflect light” and states that “a reflection coating treatment by Ag may be performed on a surface of an inner area of the reflection cup part in which the light emitting diode is mounted.” Ex. 1031, 5. The reflective cup (311) is thus mounted on the wiring part (320) (the lighting tile), and outside of the LED packages (301). Ex. 1036, ¶48; *see also* Ex. 1031, Fig. 3:



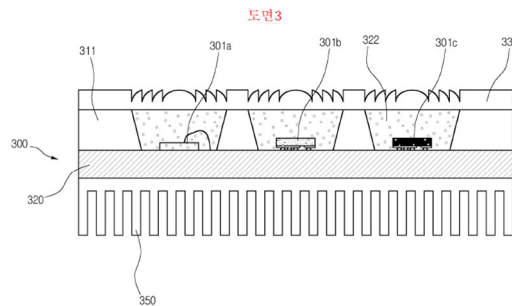
Finally, in Li “a plurality of several RGB unit-packaged LEDs are soldered onto an aluminum-based PCB 12.” Ex. 1033, 8. As shown in FIG. 5 of Li, a reflector

2 is mounted on the PCB 12 and is outside of the encapsulated LEDs. *Id.*, 8, Fig. 5; Ex. 1036, ¶49.

H. The Prior Art Discloses “wherein the reflector extends to cover the lighting tile and includes a plurality of sidewalls outside of the packaged solid state lighting devices that are angled with respect to the principal plane of the lighting panel” in Substitute Claim 21[h].

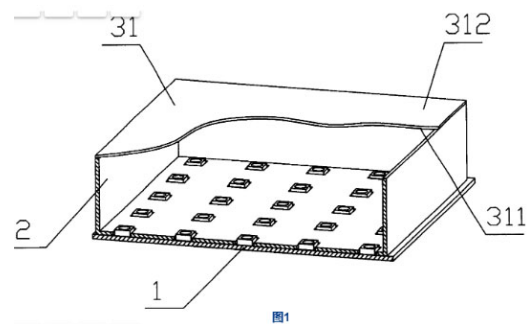
Claim 21[h] is disclosed by the prior art. For example, Epstein shows that the intermediate layer 422/522/622, a reflector, extends to cover the lighting tile of the PCB. *See, e.g.*, Ex. 1008, [0048], Fig. 4A. Epstein further states that “the aperture in the intermediate layer 522 may be sized larger than the LED 520.” Ex. 1008, [0062]. Because the aperture in the intermediate layer 522/622, which is a reflector, may be larger than the substrate 508, a POSITA would understand that the intermediate layer would have sidewalls that form the aperture. Further, because these are sidewalls within an aperture they necessarily would be angled, rather than in parallel with, the principal plane of the lightning panel to form the aperture and create the space to accommodate the LED. Ex. 1036, ¶50-51. Also, Holman describes a “sloped sidewall [which] 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.” Ex. 1006, 37. The reflective sloped sidewalls 230 are sidewalls of a reflector which are angled with respect to the principal plane of the lighting tile. Ex. 1036, ¶52.

Park also describes and shows a reflector cup 311 with angled sidewalls that cover the wiring board 320 and are outside of the packaged LEDs 301a. Ex. 1031, 6, Fig. 3. The angled sidewalls of the reflector cup 311 are angled with respect to the wiring board 320 that the LEDs 301a are mounted on, and thus the principal plane of the lighting panel. *Id*; Ex. 1036, ¶55.



Ex. 1031, Fig. 3.

Li describes and shows, for example in Figure 5, a reflector 2 that is shaped as a box and extends to cover the PCB that the LEDs are mounted on. Ex. 1033, 8. The reflector box has sidewalls which are outside of the LED light sources and are angled with respect to the PCB the LEDs are mounted on and thus the principal plane of the lighting panel. *Id*; Ex. 1036, ¶57.



Finally, Lamb, Ayabe, and Saccomano all disclose angled sidewalls with respect to the principal plane of the lighting panel. And although the Board provided guidance on angled and extended reflectors in its PG relative to this prior art, PO's

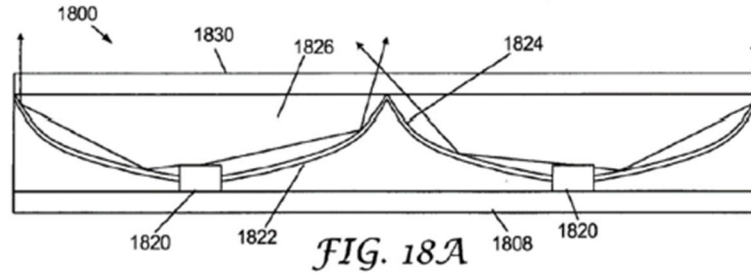
amendments removed the limitation requiring angled and extended reflectors relative to a substrate surface. With this limitation gone, this prior art is directly relevant to PO's newly revised claims. Thus, Lamb (*see, e.g.*, Ex. 1007, at Fig. 1; [0304]-[0035]), Ayabe (*see, e.g.*, Ex. 1017, [0091]-[0092], Fig. 1 and 15), and Saccomano (*see, e.g.*, Ex. 1019, [0038]-[0039], Fig. 5) all disclose this limitation.

I. The Prior Art Discloses “wherein the generally planar diffuser contacts the reflector” in Substitute Claim 21[i].

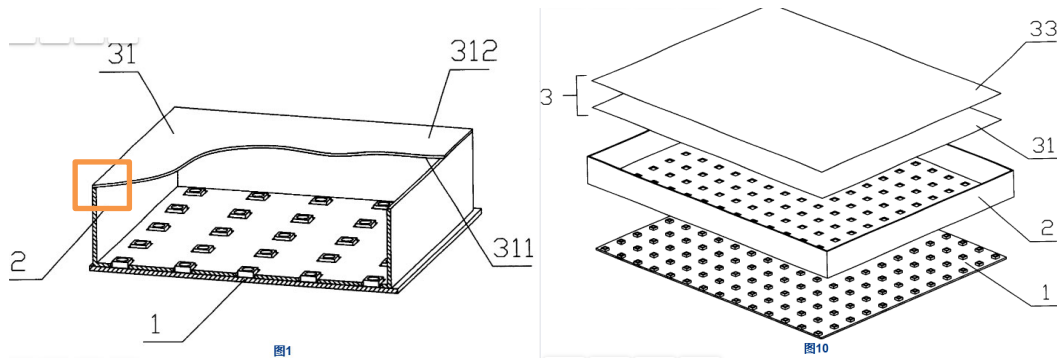
Substitute claim 21[i] is disclosed in the art. For example, as recognized by the Board's Preliminary Guidance, at least Holman and Epstein each disclose this limitation. Paper 21 at 25 (Holman), 31 (Epstein). Mok discloses a generally planar diffuser 16 that may be a distance 48 from base panel 12 and reflective surface 50 that may be 50 mm “or less.” Ex. 1005 at [0023]. Thus, as zero is less than 50 mm, the distance may be zero. Further, as noted above, this is expressly disclosed by Holman. Ex. 1006, pp. 39-41; Paper 21 at 25. A person of ordinary skill in the art would have been motivated to apply Holman's design to Mok as Mok also teaches the benefit of having light conditioning layers, such as brightness enhancers and a diffuser in contact with each other. *Id.* at [0025]; Ex. 1022 at ¶23-24.

As agreed by the Board, Epstein also describes and shows, for example in Figure 18A, a diffuser 1830 which is generally planar and in direct contact with the reflective sheet 1822. Ex. 1008, [0107], [0109], Fig. 18A; Ex. 1022 at ¶31-32; Paper

21 at 31 (“Petitioner appears to have shown a reasonable likelihood that Epstein teaches or suggests a ‘diffuser sheet [that] contacts the reflector’”).



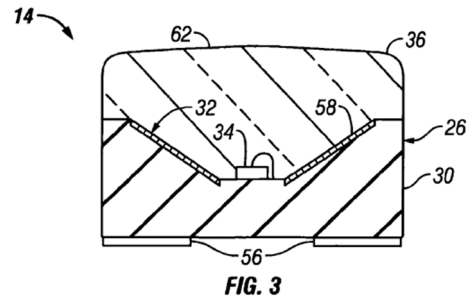
Li discloses a “scattering layer 31” that functions as a diffuser. Ex. 1033, 8; Ex. 1036, ¶61. As shown in Li’s Figures 1 and 18, the scattering layer 31 is generally planar and contacts the reflector box 2.



Id., Fig. 1, 18.

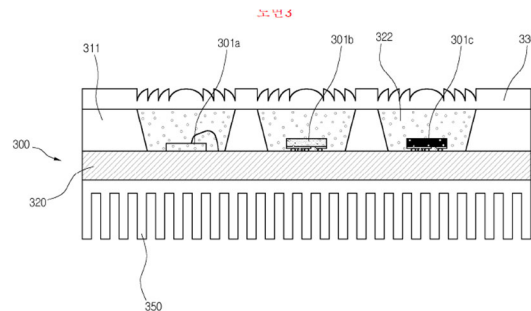
J. The Prior Art Discloses “wherein the lens surrounds each of the packaged solid state lighting devices” in Substitute Claim 22.

Substitute claim 22 is disclosed by a number of references, such as Mok, which discloses a “lens 36” that is “formed over the diode junction 34 and reflector cup 32 in the manner best seen in FIG. 3.” Ex. 1005, [0029]. As shown in Figure 3, the lens 36 of Mok surrounds each LED in diode junction 34.



Id., Fig. 3.

Park also describes and shows lens portion 330 surrounding packaged LEDs 301a. Ex. 1031, Fig. 3:



Finally, Li discloses its lens positioned above its packaged LED devices. Ex. 1033, 10. As Dr. Pattison explains, a POSITA would understand Li’s disclosure to describe a lens that surrounds Li’s LED packages. Ex. 1036, ¶64.

K. The Prior Art Discloses “wherein the generally planar diffuser contacts the sidewalls of the reflector with no intervening elements” in Substitute Claim 23.

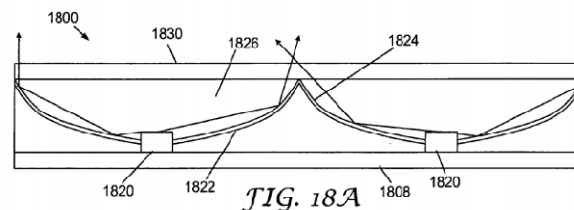
Substitute claim 23 is disclosed by the prior art. Epstein discloses a planar diffuser (guiding layer 610) in direct contact with the reflector sheet (intermediate

layer 622). *See* Ex. 1008, Fig. 11, [0074]-[0075]. Thus, the generally planar diffuser (guiding layer 610) of Epstein contacts the sidewalls that form the reflector (intermediate layer 622) with no intervening elements. Ex. 1036, ¶65.

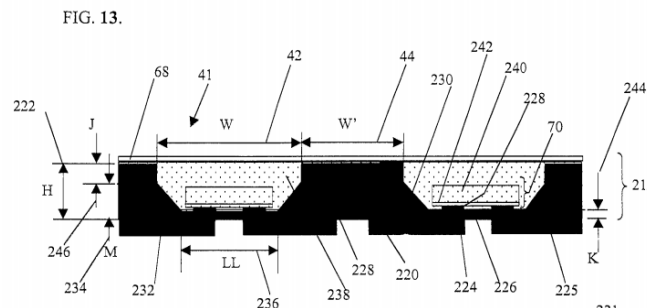
Holman describes and shows a diffuser 68 in direct contact with sloped sidewall 230, which may be a reflector. *See* Figs. 14-15. This generally planar diffuser contacts the reflector with no intervening elements. Ex. 1036, ¶66.

L. The Prior Art Discloses “wherein the generally planar diffuser is offset from the packaged solid state lighting devices” in Substitute Claim 24.

Substitute claim 24 is disclosed by a number of prior art references, such as Epstein. As shown in Figure 18A, Epstein discloses LEDs 1820 which are offset from the diffuser 1830. Ex. 1008, [0109], Fig. 18A.



Next, as shown in Figures 13-15, Holman discloses a diffuser 68 that is offset from LEDs 70. *See* Ex. 1006, Fig. 13:



M. The Prior Art Discloses “wherein the controller transmits control signals to a plurality of current supply circuits” in Substitute Claim 25.

Substitute claim 25 is disclosed in the prior art. For example, Mueller discloses with respect to Figure 69 a control system using PWM controller to control multiple strings of LED using multiple signals. *See* Ex. 1034, [0315] (“one possible embodiment for creating the two control signals from a controller, such as a microprocessor to control one or more LEDs in a string.”); Fig. 69:

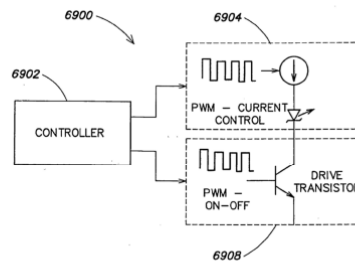


FIG. 69

Grootes discloses a PWM controller connected to PWM control lines. Ex. 1035, [0049], Fig. 4. These PWM control lines, shown in FIG. 2, are a plurality of current supply circuits connecting to LEDs, which are each connected to their own current source. *Id.*, Fig. 4, [0035]-[0037], [0048]-[0049]; Ex. 1036, Ex. 1036, ¶¶71-72.

N. The Prior Art Discloses “wherein at least one of the current supply circuits transmit pulse width modulated signals to one or more of the plurality of strings of packaged solid state lighting devices” in Substitute Claim 26.

Mueller further describes controlling the lighting units with PWM signals via its current supply circuits. Ex. 1034, [0156], Fig. 69. Additionally, Grootes provides that “[e]ach current source 40-42 is controllable to control the brightness of its

associated LEDs” and that the brightness is controlled by PWM control signals. Ex. 1035, [0041], [0047]-[0049]; Ex. 1036, ¶73-74.

O. The Prior Art Discloses “wherein the current supply circuits are operable to individually control the current to each of the strings of packaged solid state lighting devices” in Substitute Claim 27.

Substitute claim 27 is disclosed by Grootes, which states that the cathode of each string is “connected to its own current source 40, 41, 42.” Ex. 1035, [0035]-[0037]. Each current source is operable to individually control the current of each LED string. *Id.*, [0041].

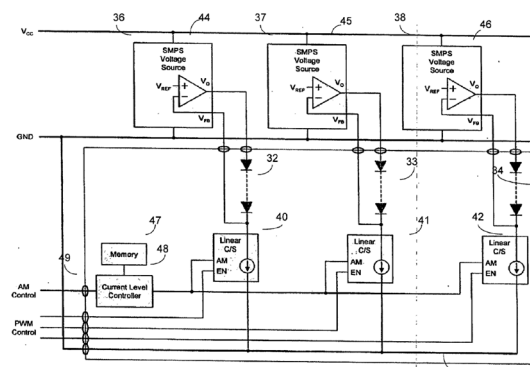


Fig. 4

Further, Mueller describes that its processor 102 may generate “at least one control signal for each light source so as to independently control the intensity of light generated by each light source,” and provides as examples of these control signals, current control signals. Ex. 1034, at [0156]

P. The Prior Art Discloses “wherein the pulse width modulation of the current delivered to each of the strings of packaged solid state lighting

devices is based on one or more of: user input, ambient light information or other input” in Substitute Claim 28.

Grootes also discloses substitute claim 28, stating that the PWM controller “allow[s] the user to adjust the brightness and white point to meet the particular specifications of the user” and “[t]he PWM signals are then set by the user to achieve the desired white point.” Ex. 1035, [0017], [0043]. The user setting a PWM signal is user input, and the PWM signals control the PWM of the current delivered to each packaged LED string. *Id.*, [0035]-[0037], [0048]-[0049]. Mueller similarly discloses controlling a PWM circuit based on signals received from a sensor, including a sensor configured to detect ambient light information. Ex. 1034, [0291].

Q. The Prior Art Discloses “wherein the reflector is substantially planar to the surface of the lighting tile where the reflector is on the at least one substrate” in Substitute Claim 29.

Mok FIG. 1 discloses reflector sheet 50 that is planar to surface of base panel 12, the lighting tile, and is on the substrate having the base panel 12. *See* Ex. 1005, Fig. 1 (inset).

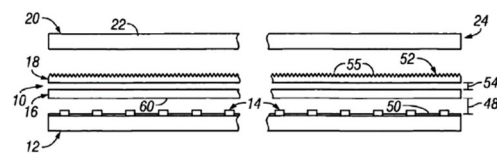


FIG. 1

Epstein also discloses and shows a reflector (intermediate layer 622) that is on a substrate 608. Ex. 1008, [0067], Fig. 11. As shown in FIG. 11 (inset) of Epstein, the reflector is planar to the surface of the lighting tile. *Id.*

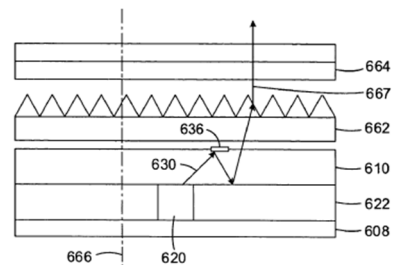


FIG. 11

IV. One of Skill in The Art Would Have Been Motivated to Combine the Prior Art Features of the Prior Art with Either Ground I or Ground II.

	Ground 1	Ground 2
Claim 21[a]	+ Park and/or Li	+ Park and/or Li
Claim 21[b]	+ Park, Li, and/or Grootes	+ Park, Li, and/or Grootes
Claim 21[c]	+ Park and/or Li	+ Park and/or Li
Claim 21[d]	+ Park and/or Li	+ Park and/or Li
Claim 21[e]	+ Mueller and/or Grootes	+ Mueller and/or Grootes
Claim 21[f]	+ Mueller and/or Grootes	+ Mueller and/or Grootes
Claim 21[g]	+ Ayabe, Park, and/or Li	+ Ayabe, Park, and/or Li
Claim 21[h]	+ Saccomanno, Ayabe, Park, and/or Li	+ Saccomanno, Ayabe, Park, and/or Li
Claim 21[i]	+ Li	+ Li
Claim 22	+ Park and/or Li	+ Park and/or Li
Claim 23	Ground 1	Ground 2
Claim 24	Ground 1	Ground 2
Claim 25	+ Mueller and/or Grootes	+ Mueller and/or Grootes
Claim 26	+ Mueller and/or Grootes	+ Mueller and/or Grootes
Claim 27	+ Mueller and/or Grootes	+ Mueller and/or Grootes
Claim 28	+ Mueller and/or Grootes	+ Mueller and/or Grootes
Claim 29	Ground 1	Ground 2

To the extent Patent Owner argues that the features disclosed by the existing art or new art would not be combined with the prior art combinations detailed in the current grounds, Patent Owner is wrong. The new features of the amended claims are found explicitly in the art already of record. For both Grounds 1 and 2, as articulated in the Petition, such features would have been combined or used with the existing disclosures, which was also confirmed by the Board. Petition, 11-15, 35-37; Paper 7. For Saccomanno and Ayabe, a POSITA would be motivated to combine

these references with the art in Grounds 1 and 2 for the same reasons set forth in Petitioner's opposition, which the Board adopted. Paper 18 at 22-24; Paper 21 at 17.

As to new art, such disclosures are readily combinable with the existing grounds. Park, Li, Grootes, and Mueller, the Ground 1 references, and the Ground 2 references all utilize similar components and are all aimed at creating brighter, more efficient lighting systems. Ex. 1036, ¶¶79-89. Thus, a POSITA would have a reasonable expectation of success in combining the disclosures of Park, Li, Grootes, or Mueller with the Ground 1 or Ground 2 references. *Id.* Further, a POSITA would be motivated to combine the LED packages mounted on wiring portion, lens portion, and reflective cup of Park, with the lighting systems described in the Ground 1 or Ground 2 references to create brighter, more uniform lighting. *Id.*, ¶¶79-84, 89-93, 96-97, 99. Park explicitly states that it aims to create a system that has “good luminance,” “a long lifespan,” “thermal stability,” “operation at a low voltage.” Ex. 1031, 2. This is done, for example, through “the heat dissipation effect of the wiring part 320” and “reflection cup part 311 [that] serves to enhance light efficiency.” *Id.*, 6. Thus, a POSITA would realize that by combining elements of Park with Ground 1 or Ground 2, these desirable effects could be realized. Ex. 1036, ¶¶79-93, 96-99.

Similarly, a POSITA would be motivated to combine the lighting systems described in the Ground 1 or 2 references with Li's lens, reflector box, and scattering layer, as these components would give greater, more efficient reflection of light and

create a brighter lighting system. Ex. 1036, ¶¶79-85, 89-93, 96-99. Indeed, Li explicitly states that “those skilled in the art can make many modifications and variations without departing from the spirit and scope of the present disclosure,” which is intended to “achieve high brightness” and “simplif[y] subsequent optical design.” Ex. 1033, 5-6, 10. A POSITA would also be motivated to combine Li’s packaged LEDs mounted on an aluminum-based PCB with the Ground 1 or Ground 2 references, as this aluminum-based PCB would help provide greater heat dissipation, which is a goal Li as well as the Ground 1 and Ground 2 references. *See, e.g.* Ex. 1005, [0004]; Ex. 1008, [0054]; Ex. 1033, 6; Ex. 1036, ¶¶79-85, 89-90.

A POSITA would be motivated to combine the LED strings and LUCs delivering control signals to control PWM in Grootes with the lighting systems described in the Ground 1 or 2 references to create a more efficient, uniform lighting system, which is a common goal of Grootes and the Ground 1 and 2 references. *See, e.g.,* Ex. 1005, [0006], [0028], Ex. 1008, [0121]; Ex. 1035, [0010]; Ex. 1036, ¶¶79-82, 86-89, 94-95, 101-103. Indeed, Grootes explicitly states that its LED strings and control system helps “minimize energy dissipation by the current source” and create “uniform light output characteristics,” which would be highly desirable to a POSITA. Ex. 1035, Abstract, [0010]; Ex. 1036, ¶¶79-82, 86-89, 94-95, 101-103.

A POSITA also would be motivated to combine the LED strings that are connected to current sources and mounted on a PCB, PWM controller, and control

signals in Mueller with the lighting systems described in the Ground 1 or Ground 2 references for brighter, more efficient lighting. *See, e.g.*, Ex. 1005, [0006], [0028], Ex. 1008, [0121]; Ex. 1034, [0157]; Ex. 1036, ¶¶79-82, 86-89, 94-95, 101-103. The LED strings and control system in Mueller “improve[s] the quality of lighting in environments,” allowing “optimal efficacy” and “maximum brightness.” Ex. 1034, [0040], [0157]. Thus, a POSITA would seek to obtain these benefits by combining Mueller with Ground 1 or Ground 2. Ex. 1036, ¶¶79-82, 86-89, 94-95, 101-103.

V. Conclusion

Patent Owner’s substitute claims are invalid.

Respectfully submitted,

By: /s/ Matias Ferrario
Matias Ferrario
Registration No. 51,082

CERTIFICATE OF SERVICE

The undersigned hereby certifies that on the date below a copy of this
PETITIONER'S OPPOSITION TO PATENT OWNER'S REVISED
MOTION TO AMEND has been served via email on the following:

hni@nilawfirm.com
twang@nilawfirm.com
nmassand@nilawfirm.com

Dated: October 15, 2024

By: /s/ *Matias Ferrario*
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