

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. 8,941,331
Filing Date: May 17, 2013
Issue Date: January 27, 2015
Title: SOLID STATE LIGHTING PANELS WITH VARIABLE VOLTAGE
BOOST CURRENT SOURCES

Inter Partes Review No. IPR2023-01401

**PETITIONER'S OPPOSITION TO PATENT OWNER'S REVISED
CONTINGENT MOTION TO AMEND UNDER 37 C.F.R. § 42.121**

TABLE OF CONTENTS

I.	Introduction.....	1
II.	The Motion Enlarges the Scope of the Original Claims, Violates the Definiteness Requirements, and Impermissibly Introduces New Matter	2
A.	The Substitute Claims 31 and 34 Enlarge the Scope of the Original Claims.	2
B.	The Substitute Claims 26, 31, and 34 Violate the Definiteness Requirements.....	3
C.	The Substitute Claims Are not Supported by Early-filed Disclosure.	5
III.	The Proposed Substitute Claims 26-34 Are Not Patentable Over the Prior Art.	8
A.	Substitute Claim 26.1: “a lighting panel including at least a first lighting tile and a second lighting tile, each lighting tile comprising at least a first string of solid state lighting devices, and a second strings of solid state lighting devices; wherein each of said strings are respectively configured to emit at least a first light and a second light, respectively;”	8
B.	Substitute Claim 26.2: “wherein the brightness of the at least first light and second light is a function of the duty cycle of the string;”	9
C.	Substitute Claim 26.3: “wherein each of the first lighting tile and second lighting tile are arranged horizontally in the lighting panel;”	10
D.	Substitute Claim 26.4: “wherein each of the at least first, and second lighting tiles comprise a metal core printed circuit board (MCPCB) on which a plurality of patterned metal traces are formed and having thereon a polymer coating;”	11

E.	Substitute Claim 26.5: “at least first and second current supply circuits coupled to the at least first and second strings of solid state lighting devices, respectively, and configured to supply an on-state drive current to a respective one of the first and second strings of solid state lighting devices;”	12
F.	Substitute Claim 26.6: “wherein the at least first and second current supply circuits are coupled to the at least first and second strings of solid state lighting devices at least in part by one of the plurality of patterned metal traces formed on MCPCB;”	13
G.	Substitute Claim 26.7: “a pulse width modulation (PWM) controller that is coupled to the at least first current supply circuit and the second current supply circuit and that is configured to generate, for each of the at least first current supply circuit and the second current supply circuit, a first PWM control signal and a second PWM control signal that are supplied to the each of the at least first and second strings of solid state lighting devices.”	13
H.	Substitute Claim 27: “wherein the PWM control signals both have a period of approximately 5 ms or a frequency of approximately 200 Hz.”	14
I.	Substitute Claim 28: “wherein the PWM control signals both have a period greater than 0.5 ms or a frequency of less than 2000 Hz.”	15
J.	Substitute Claim 29: “wherein each of the solid state lighting devices comprises at least two or more light emitting diodes each covered by the same encapsulant.”	16
K.	Substitute Claim 30: “wherein an interconnect is mounted on each tile.”	19
L.	Substitute Claim 31: “The interconnect according to claim 30, comprising a low-profile configured so as to not interfere with the optical performance of the LEDs.”	20

M. Substitute Claim 32: “wherein each tile is coupled to a
flexible connector.” 21

N. Substitute Claim 33: “wherein the tiles are mounted to a
metal backplate that contains a through hole.” 22

O. Substitute Claim 34: “the metal backplate according to
claim 33, wherein the flexible connector travels via the
through hole to the interconnect mounted on the tile
substrate.” 25

IV. Conclusion 25

LIST OF EXHIBITS

EXHIBIT	DESCRIPTION
1001	U.S. Patent No. 8,941,331 (“the ’331 Patent”)
1002	Prosecution History of U.S. Patent No. 8,941,331
1003	Declaration of Rafael Betancourt
1004	Curriculum Vitae of Rafael Betancourt
1005	WO 2005/089293 to Lys (“Lys”)
1006	U.S. 2007/0046485 to Grootes (“Grootes”)
1007	CN 1588523 to Xu (“Xu”)
1008	Certified Translation of Xu
1009	U.S. 2005/0047134 A1 to Mueller (“Mueller”)
1010	U.S. 5,663,667 to Blum (“Blum”)
1011	Counterclaim filed by Patent Owner in <i>Hisense USA Corp. v. Brightplus Ventures LLC</i> , No. 1:22-cv-02774, Dkt. 9 (N.D. Ga. Sep. 16, 2022)
1012	Scheduling Order in <i>Hisense USA Corp. v. Brightplus Ventures LLC</i> , No. 1:22-cv-02774, Dkt. 35 (N.D. Ga.)
1013	Judicial Caseload Profile for the Northern District of Georgia
1014	Cover Pleading to Patent Owner’s Infringement Contentions in <i>Hisense USA Corp. v. Brightplus Ventures LLC</i> , No. 1:22-cv-02774 (N.D. Ga.)
1015	Cover Pleading to Patent Owner’s Supplemental Infringement Contentions in <i>Hisense USA Corp. v. Brightplus Ventures LLC</i> , No. 1:22-cv-02774 (N.D. Ga.) served June 21, 2023
1016	Supertex Inc., HV9910 – Universal High Brightness LED Driver
1017	Supertex Inc., Press Release Announcing HV9910 (May 17, 2004)
1018	US 2005/0227569 to Maeda (“Maeda”)
1019	US 2005/0133800 to Park (“Park”)
1020	US 2005/0140270 to Henson (“Henson”)
1022	Second Betancourt Declaration
1023	TW 502928U to Yu (“Yu”)
1024	Certified Translation of Yu

1025	CN 2726277Y to Zhong (“Zhong”)
1026	Certified Translation of Zhong
1027	Third Betancourt Declaration
1028	Narendran, PIER Lighting Research Program – Project 2.3 Low-profile LED Luminaires Final Report (“Narendran”)

I. Introduction

Patent Owner's substitute claims impermissibly enlarge the scope of the claims, introduce new matter, are indefinite, and are not patentable over the prior art.

Patent Owner's proposed substitute claims simply amend certain of the challenged claims to introduce eight groupings of new elements: (1) a first lighting tile and a second lighting tile, "arranged horizontally in the lighting panel" and each comprising at least a first string and a second string of solid state lighting devices; (2) the brightness of the first light and the second light is "a function of the duty cycle of the string;" (3) a metal core printed circuit board (MCPCB) on which a plurality of patterned metal traces are formed and having thereon a polymer coating, wherein the first and second current supply circuits are coupled to the first and second strings "at least in part by" the patterned metal traces; (4) the PWM control signals have a period of approximately 5 ms (or alternatively a *range* greater than 0.5 ms) or a frequency of approximately 200 Hz (or alternatively a *range* of less than 2000 Hz); (5) each solid state lighting device comprises at least two or more light emitting diodes "each covered by the same encapsulant;" (6) an interconnect mounted on each tile and having "a low-profile" configured so as to not interfere with the optical performance of the LEDs;" (7) each tile is coupled to a flexible connector; and (8) the tiles are mounted to a metal backplate that contains a through hole, via which the flexible connector travels to the interconnect.

All of these elements, however, were known in the prior art years before the effective filing date of the '331 Patent. Moreover, as explained by Petitioner's expert, Mr. Betancourt, it would have been obvious to a POSITA to modify the lighting system in Lys, for example, in view of the prior art and the knowledge of a POSITA to achieve improved thermal management, higher efficiency, and better alignment and attachment, which renders the proposed substitute claims obvious.

II. The Motion Enlarges the Scope of the Original Claims, Violates the Definiteness Requirements, and Impermissibly Introduces New Matter

A. The Substitute Claims 31 and 34 Enlarge the Scope of the Original Claims.

Substitute claim 31 recites “[t]he *interconnect* according to claim 30.” The subject matter of claim 30, however, is “[t]he *lighting system*.” Thus, dependent claim 31 does not claim the same subject matter of the claim from which it depends, or the subject matter of any original claim of the '331 patent. Substitute claim 31 impermissibly enlarges the claim scope because it is infringed by an interconnect apart from a lighting system as recited in all original claims of the '331 patent.

Similarly, substitute claim 34 recites “[t]he **metal backplate** according to claim 33.” The subject matter of claim 33, however, is “[t]he lighting system.” Thus, substitute claim 34 impermissibly enlarges the claim scope because it is infringed by a metal backplate as described by substitute claim 34 apart from a lighting system as recited in all original claims of the '331 patent.

B. The Substitute Claims 26, 31, and 34 Violate the Definiteness Requirements.

Substitute claims 26, 31, and 34 are indefinite for numerous antecedent basis errors. The following claim elements lack proper antecedent basis: “the brightness” (claim 26), “the duty cycle” (claim 26), “the optical performance” (claim 31), and “the tile substrate” (claim 34). In addition, claim 31 recites “the LEDs.” And although dependent claim 29 recites “at least two or more light emitting diodes,” dependent claim 31 does *not depend from* claim 29. Rather dependent claim 31 depends from claim 26 (claim 30 serving as the intervening claim) and there is no antecedent basis for claim 31’s “the LEDs.”

Substitute claims 31 and 34 are also invalid. For example, substitute claim 31 recites “[t]he *interconnect* according to claim 30.” The subject matter of claim 30, however, is “[t]he *lighting system*.” Accordingly, dependent claim 31 does not recite the same subject matter of the claim from which it depends. Instead, claim 30 is directed to a “lighting system” whereas claim 31 is directed to an “interconnect”. This improper claiming means that dependent claim 31 does not claim the lighting system and its attendant limitations found in claim 30 or independent claim 26.¹ The same applies to dependent claim 34. Substitute claim

¹ To the extent Patent Owner argues that it intended to claim “*a lighting system* according to claim 30, wherein the interconnect comprises a low-profile ...” courts

34 recites “[t]he **metal backplate** according to claim 33.” The subject matter of claim 33, however, is “[t]he lighting system.” Thus, dependent claim 34 does not recite the same subject matter of the claim from which it depends.

Finally, substitute claim 31 recites “comprising a low-profile configured so as to” However, it is unclear what the adjective “low-profile” is modifying as the claim language does not recite an object, noun, or component. In addition, “low-profile” is a relative term without clear definition in the ’331 Patent. Neither the originally filed disclosure (the provisional application) nor the applications claiming priority to it provides some standard for measuring the degrees intended. *Ex parte Oetiker*, 23 U.S.P.Q.2d 1641, 1645 (B.P.A.I. 1992) (“the phrases ‘relatively shallow,’ ‘of the order of,’ ‘the order of about 5mm,’ and ‘substantial portion’ were held to be indefinite because the specification lacked some standard for measuring the degrees intended.”). Accordingly, substitute claim 31 also fails to meet the statutory and/or regulatory requirements for amended claims in an IPR.

are not in the business of rewriting claims to preserve validity. *Chef America, Inc. v. Lamb-Weston, Inc.*, 358 F.3d 1371, 1373 (Fed. Cir. 2004) (“Courts are not permitted to redraft claims. . . .; The court cannot rewrite the patent.”).

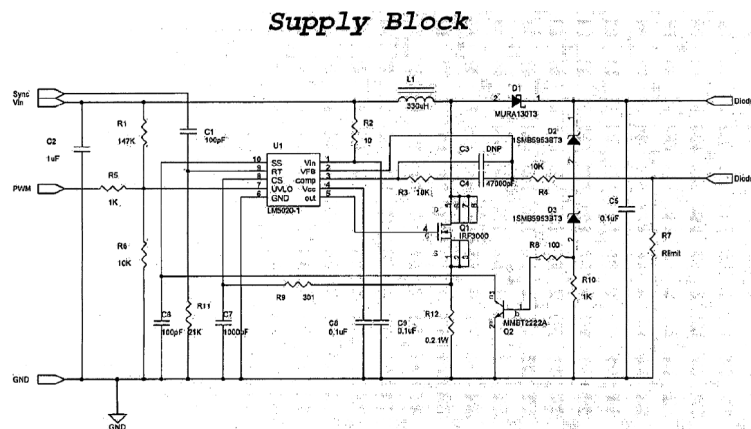
C. The Substitute Claims Are not Supported by Early-filed Disclosure

“[T]he Board requires that a motion to amend set forth written description support in the originally filed disclosure of the subject patent for each proposed substitute claim, and also set forth support in an earlier filed disclosure for each claim for which benefit of the filing date of the earlier filed disclosure is sought. See 37 C.F.R. §§ 42.121(b)(1), 42.121(b)(2).” Patent Owner has failed to carry its burden with respect to 37 C.F.R. § 42.121(b)(2).

Patent Owner claims that its amendments have support in multiple disclosures all the way back to the provisional application (i.e., “earlier-filed disclosure”). Paper 19 at 11. However, Patent Owner failed to carry its burden for multiple reasons.

First, the motion must set forth written description support for each proposed substitute claim *as a whole*, and not just the features added by the amendment. *See Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 15 at 6 (PTAB Feb. 25, 2019) at 8. Here, Patent Owner simply ignores its burden and did not identify written description support for any *existing* features, alone or together with the amended features, as required by the rules. Paper 17 at 6; Paper 19 at 4-10. For example, Patent Owner never set forth written description support, in the earlier filed disclosure, for the element in substitute claim 26 that recites a PWM controller configured to generate “... *a first PWM control signal* and *a second PWM control signal* that are supplied to the each of the at least first and second

strings.” To the extent Patent Owner attempts to rely on Figure 9 of the ’331 Patent for support, no such figure appears in the “earlier-filed disclosure” (e.g., provisional application). See 37 C.F.R. § 42.121(b)(2). Moreover, to the extent Patent Owner attempts to belatedly explain that the circuit diagram entitled “Supply Block” on page 10 of the earlier filed disclosure corresponds to Figure 9 of the ’331 patent, such a comparison would be incorrect. The Supply Block diagram from the earlier-filed disclosure does not identify two transistors and/or two PWM control signals. As the earlier-filed disclosure lacks any such disclosure, the substitute claim 26 Patent Owner has failed to carry its burden in establishing that it has complied with the applicable regulatory requirements and its motion should be rejected.



Ex. 2011 at 10

Second, Patent Owner has failed to demonstrate written description support under 35 U.S.C. § 112 for its proposed amendments reciting new features. For example, Patent Owner has failed to demonstrate written description support for a

metal core printed circuit board (MCPCB) on which a plurality of patterned metal traces are formed and having thereon a “polymer coating.” Although the earlier-filed disclosure mentions MCPCB as one of many implementations of a substrate, the earlier-filed disclosure is *devoid* of any reference to “a *polymer* coating.” Ex. 2011 at 15 (stating that “[t]hese substrates are typically fashioned into circuits from combinations of *dielectric* and conductive materials.”) A POSITA would know a dielectric material is not necessarily a polymer, although a polymer is one of many types of dielectric materials. Ex. 1027 at ¶20.

Third, Patent Owner has failed to demonstrate written description support under 35 U.S.C. § 112 for its proposed amendments reciting that “the PWM control signals both have a period greater than 0.5 ms and a frequency of less than 2000 Hz.” The earlier filed disclosure simply mentions a *single* data point. Ex. 2011 at 7 (describing that the overall PWM period *is 5 ms* and inferring that the PWM frequency *is 200 Hz*). In sharp contrast, the claimed scope of substitute claim 28 includes a period range (*i.e.*, greater than 0.5 ms, meaning above 0.5 ms to infinity) and a corresponding frequency range (*i.e.*, less than 2000 Hz, meaning between 0 and 2000 Hz). A *single data point*, however, cannot provide adequate written description support for a *broad range* even if the disclosed single data point is within the claimed range. *Ariad Pharmaceuticals, Inc. v. Eli Lilly and Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc) (“Merely disclosing a *single* embodiment or *data*

point within a broader claimed range is generally insufficient to meet this requirement.").

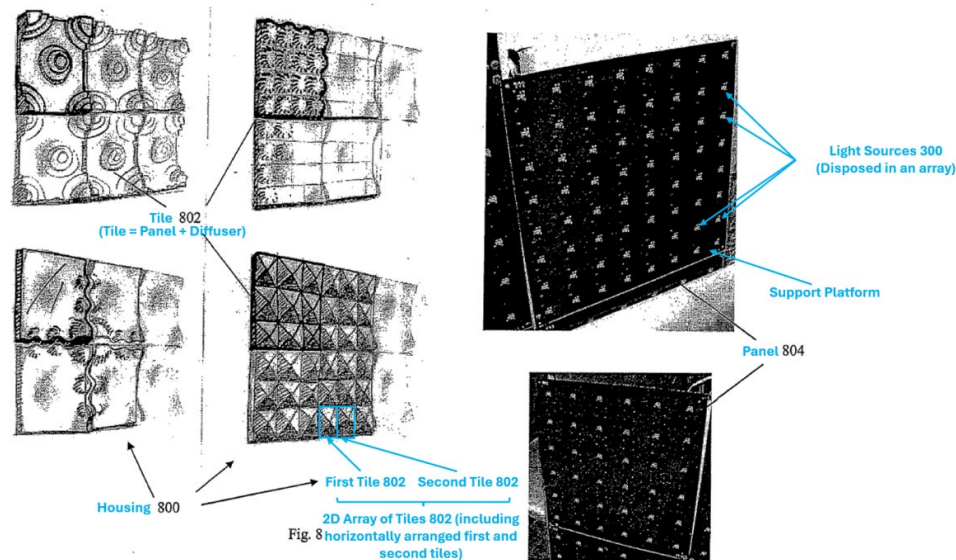
Because Patent Owner's rMTA fails to provide written description support for the above identified claim elements in its earlier-filed disclosure (*i.e.*, the provisional, to which Patent Owner claims priority), Patent Owner's motion should be denied for failing to comply with the Board's regulations attendant to motions to amend.

III. The Proposed Substitute Claims 26-34 Are Not Patentable Over the Prior Art.

- A. Substitute Claim 26.1: “a lighting panel including at least a first lighting tile and a second lighting tile, each lighting tile comprising at least a first string of solid state lighting devices, and a second strings of solid state lighting devices; wherein each of said strings are respectively configured to emit at least a first light and a second light, respectively;”**

Lys discloses “a tile light housing”/“housing 800” that includes at least two “tiles or panels” (*e.g.*, the rectangular tiles 802) that are configured into a ***two-dimensional array*** (*e.g.*, the two-dimensional array as denoted in annotated Figure 8). Lys also discloses that each tile 802 comprises lighting units 102 including light sources 300 disposed in an array, which includes at least ***first and second strings*** of solid state lighting devices (*e.g.*, one row or one column of the lighting units 102/light sources 300 in the array as denoted in annotated Figure 8). *See* Ex. 1005 at 49:7-19; *See* Paper 16 at 9-10. As shown in the annotated Figure 8 of Lys, the two-

dimensional array *includes the first lighting tile and the second lighting tile*. Ex. 1027 at ¶14.



Ex. 1005, Fig. 8 (annotated).

Lys also discloses “each of said strings are respectively configured to emit at least a first light and a second light, respectively.” See, Paper 1 at 20-21; see also, Paper 7 at 12-13.

B. Substitute Claim 26.2: “wherein the brightness of the at least first light and second light is a function of the duty cycle of the string;”

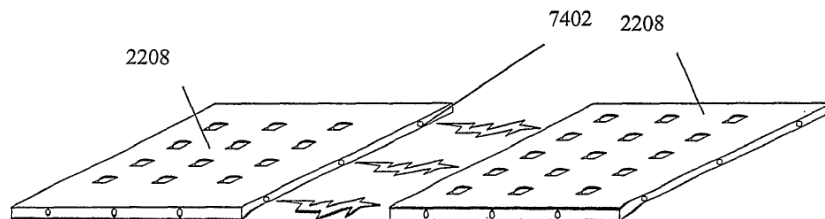
Lys discloses “varying the respective *intensities* of the light sources ... using a *duty cycle* in a pulse width modulation technique.” Ex. 1005, 35:16-24. Lys further describes that a switch 3900 used for turning on the current to a light source 300 can turn on or off in *rapid pulses*, such as in PWM of the current to the LEDs, which results in *changes in the apparent intensity* of the LED, “based on the percentage

of the duty cycle of the pulse width modulation technique.” *Id.* at 74:7-15. Lys further explains that the *apparent intensity* of the LEDs reflects the portion of *the duty cycle of a PWM signal* during which the LED is on as compared to the portion during which it is off. Ex. 1005, 81:21-24. As Petitioner’s expert, Mr. Betancourt, explains, a POSITA would understand that the intensity (*i.e.*, the brightness) of the light is a function of the duty cycle in view of Lys’s disclosure. Ex. 1027 at ¶¶16-18.

C. Substitute Claim 26.3: “wherein each of the first lighting tile and second lighting tile are arranged horizontally in the lighting panel;”

As articulated *supra* and shown in the annotated Figure 8 of Lys, the two-dimensional array certainly includes the first lighting tile and the second lighting tile, and the first lighting tile and the second lighting tile are “arranged horizontally” in the lighting panel. Ex. 1027 at ¶14.

Moreover, as shown in Figure 74, Lys discloses that two boards 204 holding the array 2208 are horizontally “placed side by side with [each] other” in the overall lighting panel. Ex. 1005, 145:18-20; Figure 74.



Ex. 1005, Fig. 74.

D. Substitute Claim 26.4: “wherein each of the at least first, and second lighting tiles comprise a metal core printed circuit board (MCPCB) on which a plurality of patterned metal traces are formed and having thereon a polymer coating;”

Lys teaches “The board 204 may be a metal core board for accepting heat from the light sources 300 and trapping the heat away from the light sources 300.” Ex. 1005, 56:18-21. Lys expressly states that the **metal core board** may be a **printed circuit board (PCB)**. *Id.* at 5:19-20. Lys also discloses that the board 204 may be a PCB. Ex. 1005, 56:21; 144:11. Thus, Lys teaches the lighting tiles that each comprises a MCPCB. A POSITA would understand that the MCPCB is characterized by patterned metal traces on the MCPCB and a polymer coating on the patterned metal traces. Ex. 1027 at ¶¶20-23.

Additionally, Henson discloses an interconnect circuit layer “utilized to provide thermal management for and electric connection.” Ex. 1020 at ¶46. Henson states that the interconnect circuit layer comprises *a multilayer structure*, which can comprise a metal mounting substate 112, made of copper or other thermally conductive material, *an electrically insulative dielectric layer* 114, and *a patterned conductive layer* 113, where the LED dies are operatively connected to bond pads of the conductive layer 113. *Id.* Moreover, Henson describes that the electrically insulative dielectric layer 114 may comprise of a variety of suitable materials, including *polyimide, polyester, polyethyleneterephthalate (PET), polycarbonate, polysulfone*, or FR4 epoxy composite. *Id.* at ¶59.

A POSITA would understand that Henson's interconnect circuit layer is a type of MCPCB, on which the patterned conductive layer 113 (including "a plurality of patterned metal traces") is formed and that dielectric (*e.g.*, polymer) layer 114 should be applied over the patterned metal traces to provide insulation, protect the copper from corrosion, and prevent shorting between the traces. Ex. 1027 at ¶¶24-25.

Henson discloses an interconnect circuit layer "utilized to provide thermal management for and electric connection to the LED dies." Ex. 1020 at ¶46. Lys, in the same endeavor of lighting systems, discloses that the board 204 may be a metal core board for accepting heat from the light sources 300 and trapping the heat away from the light sources 300. Ex. 1005, 56:18-19. A POSITA would be motivated to combine the Lys-Grootes combination with Henson by incorporating the detailed structures of the interconnect circuit layer that comprises a metal mounting substrate, a patterned conductive layer, and an electrically insulative dielectric layer because the modification could further improve the *thermal management capabilities* of the MCPCB disclosed in Lys, in light of the express desire in Lys. Ex. 1027 at ¶¶60-61.

E. Substitute Claim 26.5: "at least first and second current supply circuits coupled to the at least first and second strings of solid state lighting devices, respectively, and configured to supply an on-state drive current to a respective one of the first and second strings of solid state lighting devices;"

The Lys-Grootes combination discloses these elements. Paper 1 at 21-24; see also, Paper 7 at 13-16.

F. Substitute Claim 26.6: “wherein the at least first and second current supply circuits are coupled to the at least first and second strings of solid state lighting devices at least in part by one of the plurality of patterned metal traces formed on MCPCB;”

As explained *supra*, the Lys-Grootes combination discloses that the first and second current supply circuits coupled to the first and second strings of solid state lighting devices. Paper 1 at 21-24. Also as articulated *supra*, Henson discloses an interconnect circuit layer which comprises *a multilayer structure*. Ex. 1020 at ¶46. The multilayer structure itself comprises a metal mounting substate 112, an electrically insulative dielectric layer 114, and *a patterned conductive layer* 113, where *the LED dies are operatively connected to bond pads of the conductive layer* 113. *Id.* Henson discloses that the “driving current/voltage is then supplied to the different *LED die* channels.” Ex. 1020 at ¶74.

As discussed above, it would have obvious to combine Lys-Grootes with Henson. In the combination, a POSITA would understand that for the first and second current supply circuits to supply driving current to the LEDs (“the at least first and second strings of solid state lighting devices”), the first and second current supply circuits are coupled to the LEDs at least in part through the LED dies which are connected to the patterned conductive layer 113 (“a plurality of patterned metal traces” formed on the MCPCB). Ex. 1027 at ¶26.

G. Substitute Claim 26.7: “a pulse width modulation (PWM) controller that is coupled to the at least first current supply circuit and the second current supply circuit and that is configured to

generate, for each of the at least first current supply circuit and the second current supply circuit, a first PWM control signal and a second PWM control signal that are supplied to the each of the at least first and second strings of solid state lighting devices.”

Petitioner has already shown that the Lys-Grootes combination discloses these elements. Paper 1 at 25-28; *see also* Paper 7 at 19-21.

Notably, Patent Owner now admits that “Lys describes the use of two PWM signals” and that “Lys supplies two separate PWM signals, both with different functions, one to adjust brightness via on-off control and a second to adjust the current supplied to the LEDs to adjust LED wavelength.” Paper 18 at 4 and 6.

H. Substitute Claim 27: “wherein the PWM control signals both have a period of approximately 5 ms or a frequency of approximately 200 Hz.”

Yu discloses a *traditional general-purpose* PWM controller 4 at a low speed of a frequency range of between 90 Hz and **200 Hz**. Ex. 1024 at p. 9. Therefore, Yu discloses that the frequency of the PWM control signals is approximately 200 Hz and the corresponding period is 5 ms (i.e., 1/200 s) because the period is the inverse of the frequency. Ex. 1027 at ¶29.

A POSITA would also understand and/or find it obvious that the “traditional general-purpose PWM controller 4 at a low speed of 90-200 Hz” disclosed in Yu can be used for the PWM controller discussed in Lys, which generates “a first PWM control signal and a second PWM control signal” because it is traditional and general-purpose. Ex. 1027 at ¶30.

A POSITA would be motivated to combine the Lys-Grootes-Henson combination with Yu by adding the “*traditional general-purpose* PWM controller 4 at a low speed of 90-200 Hz” disclosed in Yu because such a PWM controller 4 is *traditional and general-purpose* and should be in the toolbox of a POSITA. Ex. 1027 at ¶64. Thus, the combination renders obvious “the PWM control signals *both* have a period of approximately 5 ms or a frequency of approximately 200 Hz.”

I. Substitute Claim 28: “wherein the PWM control signals both have a period greater than 0.5 ms or a frequency of less than 2000 Hz.”

Yu discloses a frequency range of the PWM control signals, which is between *90 Hz* and *200 Hz*. Ex. 1024 at p. 9. To the extent that substitute claim 28 does not introduce new matter, Yu discloses the ranges recited therein.

First, Yu discloses a frequency range between 90 Hz and 200 Hz, which is a frequency of less than 2000 Hz, and thus Yu discloses this element of the claim. As a POSITA knows, period is the inverse of frequency, and thus Yu inherently discloses the period range between 5 ms and 11.11 ms. Ex. 1027 at ¶31. As a matter of fact, the frequency range between 90 Hz and 200 Hz is less than 2000 Hz, whereas the period range between 5 ms and 11.11 ms is greater than 0.5 ms. *Id.*

Second, Yu’s disclosure of multiple frequency (and periods) ranges between 90 and 200 Hz is significantly greater than the provisional’s disclosure of a single data point (e.g. 200 Hz). *See* Ex. 2011 at 7. Thus, to the extent that PO has support

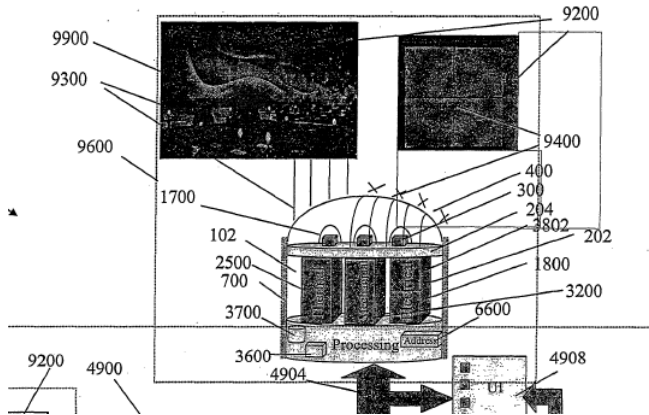
for a range of less than 2000 Hz, Yu's range certainly discloses this claim element.

The combination renders this claim element obvious.

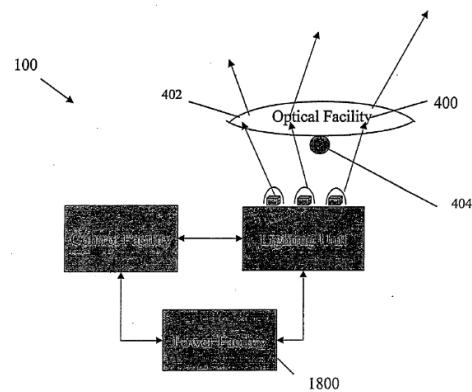
J. Substitute Claim 29: “wherein each of the solid state lighting devices comprises at least two or more light emitting diodes each covered by the same encapsulant.”

Lys discloses that “lighting unit ... including one or more light sources 300” “such as light emitting diode, or LED.” Ex. 1005 at 49, 7-8; 30:11-12. Lys's FIGs. 1, 2 and 4 explicitly shows that the lighting unit 102 includes three light sources/LEDs 300. FIG. 2 (excerpt reproduced below) shows that the lighting unit 102 including three light sources/LEDs 300 covered by the same “secondary optical facility 400, which may diffuse, spread, focus, filter, diffract, reflect, guide or otherwise affect light coming from a light source 300.” Ex. 1005 at 30:30-31:1. Also, each of the three light sources/LEDs 300 is covered by the same “primary optical facility 1700, such as a lens, mirror, or other optical facility for shaping beams of light that exit the light source, such as photons exiting the semiconductor in an LED package.” Ex. 1005 at 30:26-28.

Further, as shown in Figure 4 (below), an optical facility 400 is configured to optically process the radiation generated by the light sources 300, such as to change the spatial distribution and/or the propagation direction. Ex. 1005 at 40:29-31.

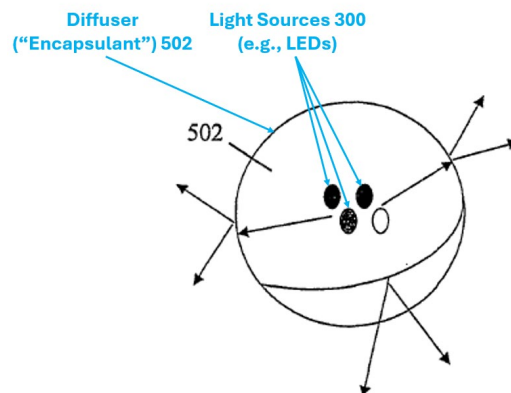


Ex. 1005, FIG. 2.

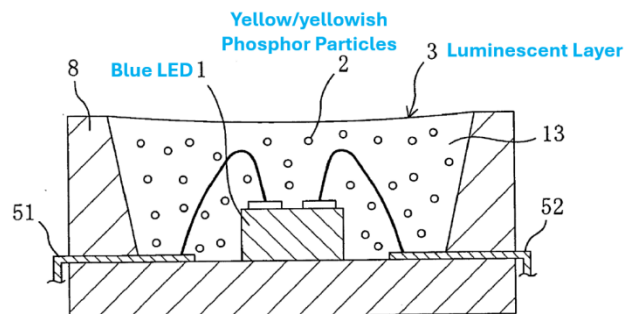


Ex. 1005, FIG. 4.

Lys further explains that the optical facility 400 may be a diffuser 502, which may absorb and scatter light from the source. Ex. 1005 at 41:8-10. The diffuser 502 can take many different shapes, including *spheres*, shown in Figure 5 and may be made of materials such as plastics, *polymers*, hydrocarbons, coated materials, etc. *Id.* at 41:10-21.



Ex 1005, FIG. 5 (excerpt and annotated). Moreover, as shown in the remaining depictions of FIG. 5 of Lys, Lys shows multiple light emitting diodes (LEDs 300) covered by the same encapsulant (diffuser 502). Ex. 1027 at ¶38. To the extent Patent Owner argues that the diffuser 502 in Lys is not an encapsulant, Maeda discloses the recited “encapsulant” that covers a blue LED. As shown in the embodiment illustrated in Figure 3, a chip-type LED includes a blue LED 1 placed in the recess of the casing 8 and a luminescent layer 3 formed in the casing 8, and the luminescent layer 3 is made of a mixture of yellow/yellowish phosphor particles 2 and a base material (e.g., *resin*) 13. Ex. 1018, ¶178, 180, 181.

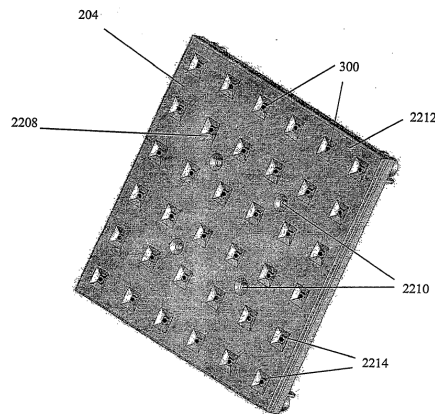


Ex. 1018, Fig. 3 (annotated).

A POSITA would readily modify the sphere diffuser 502 disclosed in Lys to be the luminescent layer 3 disclosed in Maeda because Lys suggests LEDs including “some type of encasement and/or optical element” and the luminescent layer 3 discussed in Maeda serves the same purpose and utilizes the same material (i.e., polymer). Ex. 1027 at ¶40.

K. Substitute Claim 30: “wherein an interconnect is mounted on each tile.”

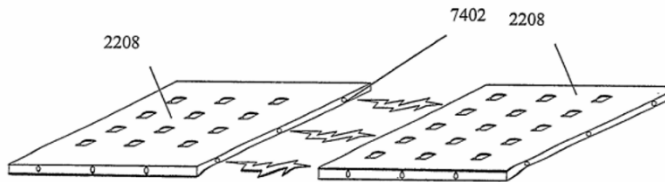
Lys describes that the board 204 has multiple pre-fabricated screw holes 2210 that make it very convenient to attach the board 204 to a wall or other mounting area to “facilitate rapid installation.” Ex. 1005, 68:28-30; Figure 22b.



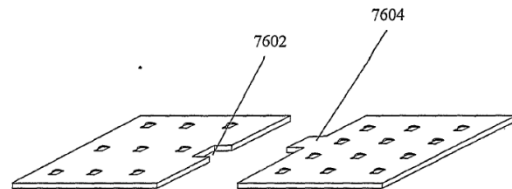
Ex. 1005, FIG. 22b.

Figure 74 shows that two boards 204, each of which holds the array 2208 of light sources 300, are fitted with magnetic facilities 7402 along their sides for fastening one to another. Ex. 1005 at 145:18-20. The magnetic facilities 7402 provide a magnetic connection as well as a power and/or data interface between these two boards 204. Ex. 1005 at 145:20-21. The boards may be fitted with other fastening facilities to connect the boards to another, such as ball/socket combinations, adhesives, tapes, interlocking shapes, tabs, etc. Ex. 1005 at 145:21-24.

Similarly, Figure 76 shows another embodiment of interlocking boards 204 using the tab 7604 designed to fit into the space 7602 to form a physical connection, thereby allowing for a data and/or power connection. Ex. 1005, 146:12-14.



Ex. 1005, FIG. 74.



Ex. 1005, FIG. 76.

A POSITA would appreciate that the pre-fabricated screw holes 2210 (shown in Figure 22b), the magnetic facilities 7402 (shown in Figure 74), and the tab 7604 (shown in Figure 76) fall within the claimed “interconnect” mounted on each tile (i.e., board 204) because they are used for interconnection between, for example, two boards 204. Ex. 1027 at ¶45.

L. Substitute Claim 31: “The interconnect according to claim 30, comprising a low-profile configured so as to not interfere with the optical performance of the LEDs.”

To the extent this claim is interpretable (see *supra* §II.A, B), the “interconnect” examples disclosed by Lys such as screw **holes** 2210 (shown in FIG. 22b), **magnetic facilities** 7402 (shown in FIG. 74), and tabs (shown in FIG. 76) are low-profile as each do not include any protruding feature that extends beyond the dimension of tiles or boards 204 that would interfere with the optical performance of the LEDs. Ex. 1027 at ¶45.

Additionally, Lys describes that variable optics can provide discrete or continuous adjustment of beam spread or angle of the light emitted from a fixture, and properties can include adjusting the profile for surfaces that vary in distance from the fixture. Ex. 1005 at 42:2-7. Thus, Lys expressly emphasizes the need to maximize optical performance, including brightness. Ex. 1027 at ¶46.

A POSITA therefore is motivated to adopt the design choice that employs a low-profile interconnect “configured so as to not interfere with the optical performance of the LEDs.” *Mitigating optical interference* is one of the requirements for designing LEDs. If an interconnect had a large profile so that optical interference with the LEDs increases, a POSITA would be motivated to adopt a low-profile interconnect to mitigate the optical interference in light of the express teachings in Lys explained above. Ex. 1027 at ¶47.

M. Substitute Claim 32: “wherein each tile is coupled to a flexible connector.”

Lys describes a lighting system that includes “a flexible connection between the circuit boards,” which may include interlocking tab, a power/data connection, a data cable, a wire, or other connection type. Ex. 1005 at 15:17-21. Lys also discloses embodiments that are flexible and a POSITA would understand that in such embodiments flexible connectors would be used. For example, Lys discloses embodiments wherein a housing 800 “may take the form of a flexible band 1102, tape or ribbon to allow the user to conform the housing to particular shapes or

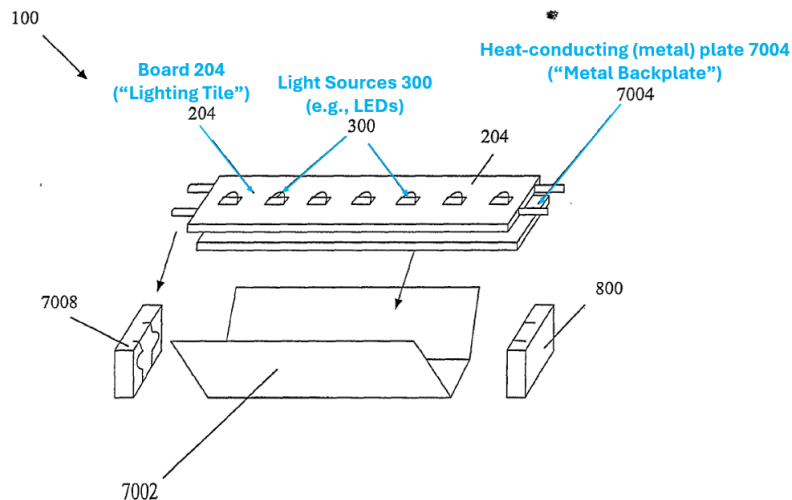
cavities.” Ex. 1005 at 54:12-18. Such embodiments would employ a flexible connector to accommodate the flexible housing. Ex. 1027 at ¶49.

Thus, Lys explicitly discloses a flexible connector and its other teachings of other flexible embodiments would also incentivize a POSITA to adopt a flexible connector. Accordingly, Lys discloses or renders obvious “wherein each tile is coupled to a flexible connector.” Ex. 1027 at ¶51.

N. Substitute Claim 33: “wherein the tiles are mounted to a metal backplate that contains a through hole.”

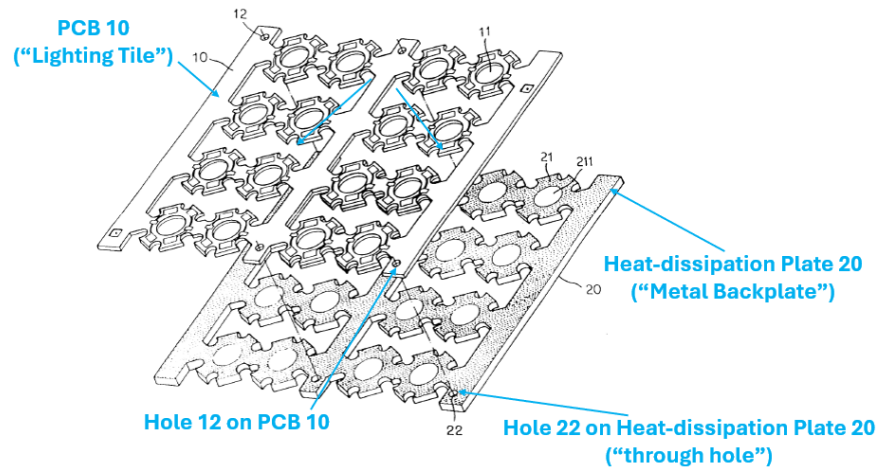
Lys discloses a metal plate that conducts heat away from board 204.² Ex. 1005, 57:21-21; FIG. 14c. Lys also discloses that board 204 is “positioned on top of a heat-conducting plate 7004, such as a metal plate, that acts as a thermal facility for conducting heat away from the light sources 300.” Ex. 1005, 144:10-18; FIG. 70.

² Board 204 is a tile, which is the same as tile 802. *See*, FIGS. 22a-d, FIG. 8, and FIG. 70 and accompanying disclosures, including Lys at 65 (“Mechanical interfaces 3200 configured as **boards 204** on which light sources 300 are disposed can take many shapes, including shapes that allow ***the boards 204 to be used as elements, such as tiles***, to make up larger structures.”); *see also* Lys at 66 (“boards 204 formed into tiles can be assembled into a tessellation. Since edges or faces of the boards 204 or tiles will be in contact with one another...”).



Ex. 1005, Fig. 70. Thus, Lys discloses that “wherein the tiles (boards 204) are mounted to a metal backplate (the heat-conducting (metal) plate 7004).”

To the extent one would argue that Lys fails to disclose a “through hole” contained by the metal backplate, Zhong discloses this element. Zhong generally relates to a heat dissipation circuit board structure capable of solving the heat dissipation problem of electronic components plugged on a general PCB. Ex. 1026 at p. 1. As shown in Figure 2, the heat dissipation circuit board includes one PCB 10 and one heat dissipation plate 20 bonded in an overlapping manner. Ex. 1026 at p. 5. Mutually corresponding holes 12 and 22 are punched on the PCB 10 and the heat dissipation plate 20, respectively. Ex. 1026 at p. 4.



Ex. 1026, Fig. 2 (annotated).

A POSITA would understand that the heat-dissipation plate 20 is equivalent to the claimed “metal backplate,” whereas the hole 22 is equivalent to the claimed “through hole.” A POSITA would be further motivated to modify the heat-conducting metal plate 7004 in Lys to incorporate the through hole 22 discussed in Zhong. Ex. 1027 at ¶57. Such a modification would provide precise alignment between the lighting tile and the metal backplate and facilitate the attachment therebetween (by using the corresponding through holes for attachment or coupling). *Id.* Such a dual-use (e.g., both alignment and attachment) through hole system is a common design choice that a POSITA could appreciate. *Id.* In fact, alignment is secured by attachment, whereas attachment is enabled by alignment. *Id.*

O. Substitute Claim 34: “the metal backplate according to claim 33, wherein the flexible connector travels via the through hole to the interconnect mounted on the tile substrate.”

To the extent this claim is interpretable (see *supra* §II.A, B), the prior art discloses this element. As articulated *supra*, a POSITA would have been motivated to combine Lys with Zhong, and Lys discloses or renders obvious “wherein each tile is coupled to a flexible connector” and “an interconnect ... mounted on each tile” and Zhong discloses “a metal backplate that contains a through hole,” a POSITA would find it obvious to make use of the connector, the through hole, and the interconnect to let the flexible connector of Lys travel via the through hole of Zhong to the interconnect of Lys to connect the board/tiles. Ex. 1027 at ¶58. Since the through hole exists on the metal backplate after combining Lys and Zhong, it would be a natural design choice to use the through hole on the metal backplate for attachment, one of the two functions (i.e., attachment and alignment). *Id.* Furthermore, flexible connectors such “power/data connection, a data cable, a wire,...” would also be part of the flexible connector that travels via the through hole to the interconnect. Ex. 1005 at 15:17-21. Moreover, the fact that the connector is flexible further enables traveling it “via the through hole.” *Id.* In contrast, a rigid connector may not smoothly travel via the through hole. *Id.*

IV. Conclusion

Patent Owner’s substitute claims are unpatentable.

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
CONTINGENT MOTION TO AMEND has been served via email on the
following:

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

Dated: December 9, 2024

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