

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HISENSE USA CORPORATION,
Petitioner,

v.

LIGHT GUIDE INNOVATIONS LLC,
Patent Owner

Case: IPR2025-01538
U.S. Patent No. 8,267,537

**PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT NO. 8,267,537**

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LISTING OF CLAIMS

Claim 1. [1Pre] A backlight unit comprising:

[1A] a light emitting diode (LED) module comprising an LED;

[1B] a case supporting the LED module, and comprising a bending part that guides and fixes an end portion of the LED module; and

[1C] a fixing part fixing the LED module to the case.

Claim 2. The backlight unit as claimed in claim 1, wherein the LED module comprises a printed circuit board, the LED on the printed circuit board, and a mold part on the LED.

Claim 3. The backlight unit as claimed in claim 1, wherein the bending part has a length substantially identical to or shorter than a length of the LED module, and is located corresponding to a fixing position of the LED module.

Claim 4. The backlight unit as claimed in claim 1, wherein the bending part comprises at least one bent area formed corresponding to a fixing position of the LED module.

Claim 5. The backlight unit as claimed in claim 1, wherein the case is formed of a Steel Use Stainless (SUS) material.

Claim 6. The backlight unit as claimed in claim 1, comprising a reflective sheet on the LED module comprising an opening such that the LED is exposed.

Claim 7. The backlight unit as claimed in claim 6, wherein the reflective sheet reflects light emitted from the LED upward.

Claim 8. The backlight unit as claimed in claim 1, wherein the fixing part fixes the LED module to the case in another end area of the LED module in which the bending part is not formed.

Claim 9. The backlight unit as claimed in claim 1, wherein the bending part is integrated with the case.

Claim 10. The backlight unit as claimed in claim 1, wherein the bending part is formed with a member separated from the case.

Claim 11. The backlight unit as claimed in claim 1, wherein the LED module is formed as the plural number, and at least one LED module comprises a plurality of LEDs.

Claim 12. The backlight unit as claimed in claim 1, wherein the LED module is formed as the plural number, and each LED module comprises an LED.

Claim 13. [1Pre] A display device comprising:

[13A] a backlight unit comprising a light emitting diode (LED) module comprising an LED,

[13B] a case supporting the LED module, and comprising a bending part that guides and fixes an end portion of the LED module; and

[13C] a fixing part fixing the LED module to the case; and

[13D] a display part displaying an image.

Claim 14. The display device as claimed in claim 13, wherein the display part is a liquid crystal panel.

Claim 15. The display device as claimed in claim 13, wherein the LED module comprises a printed circuit board, the LED on the printed circuit board, and a mold part on the LED.

Claim 16. The display device as claimed in claim 13, wherein the bending part has a length identical to or shorter than a length of the LED module, and is located corresponding to a fixing position of the LED module.

Claim 17. The display device as claimed in claim 13, wherein the bending part has a length identical to or shorter than a length of the LED module, and is located corresponding to a fixing position of the LED module.

Claim 18. The display device as claimed in claim 13, comprising a reflective sheet on the LED module comprising an opening such that the LED is exposed.

Claim 19. The display device as claimed in claim 13, wherein the fixing part fixes the LED module to the case in another end area of the LED module in which the bending part is not formed.

Claim 20. The display device as claimed in claim 13, wherein the bending part is

formed integrally with or separately from the case.

PETITIONER’S EXHIBIT LIST

Exhibit No.	Description
1001	U.S. Patent No. 8,267,537 to Park (“’537 Patent”)
1002	Declaration of Mike Krames, PhD, NAE, FIEEE, FIES
1003	Certified Translation of Taiwan Patent No. TWI248538B to Liu and translation certification
1004	U.S. Patent Publication No. 2007/0247414 to Roberts (“Roberts”)
1005	File History Excerpts for U.S. Patent No. 8,267,537 to Park
1006	US Patent Publication No. 2006/0187660 to Liu (“Liu-660”)
1007	Taiwan Patent No. TWI248538B to Liu (“Liu”)
1008	US Patent Publication No. 2007/0065718 to Moon
1009	Taiwan Intellectual Property Office Bibliographic Data Sheet for Taiwan Patent No. TWI248538

I. GROUNDS FOR STANDING

Petitioner has standing to bring this challenge because neither it nor any privy or real party-in-interest was served with a Complaint more than one year before the filing of this Petition and it is not estopped from bringing this challenge.

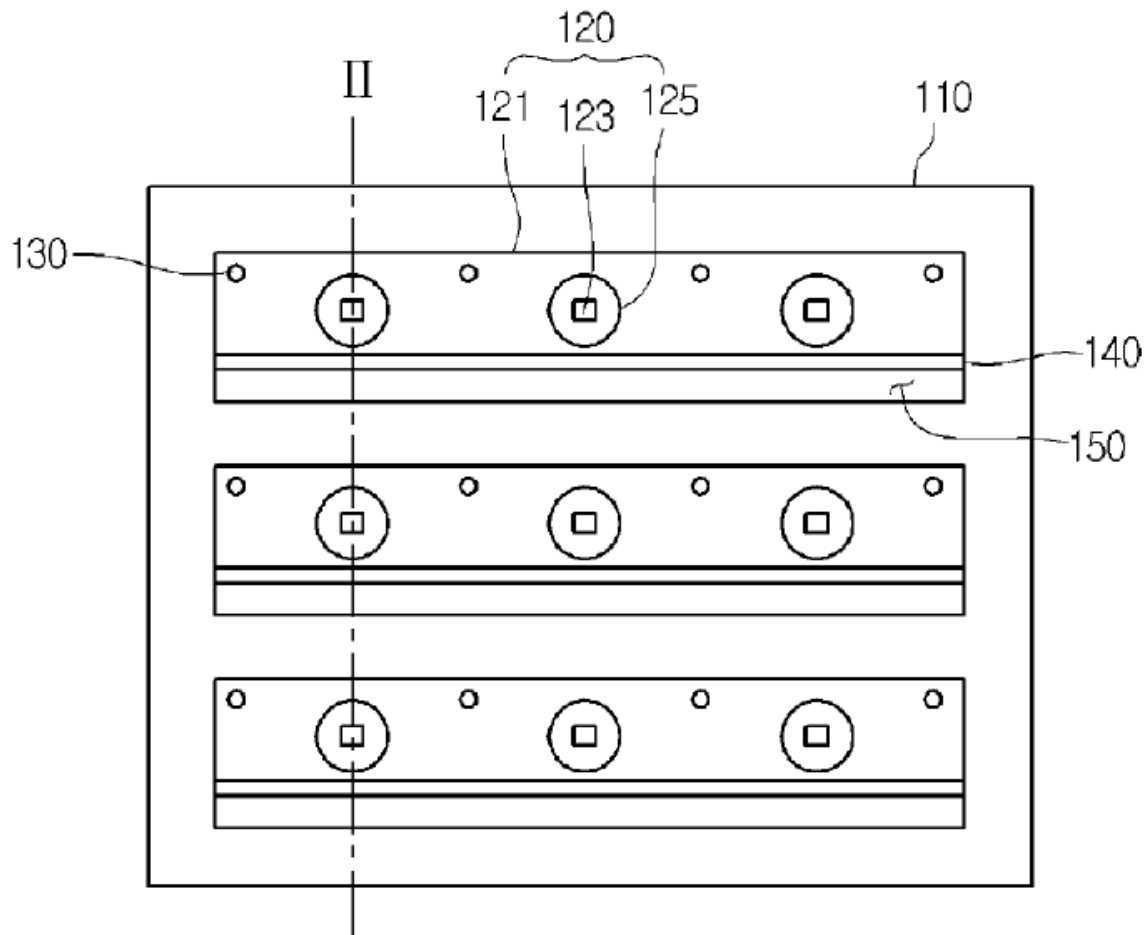
II. THE '537 PATENT

A. Overview of the Patent and Challenged Claims

The Abstract of the '537 Patent states that the patent describes a “backlight unit” having a light emitting diode (LED) module comprising an LED, a case supporting the LED module and comprising a bending part that guides and fixes an end portion of the LED module, and a fixing part fixing the LED module to the case.” EX1001, Abstract. The '537 Patent discloses that “in order to disassemble the case 10 and separate the LED modules 20 from the case 10, it is inconvenient in that many fixing parts 30 must be separated from the LED modules 20.” EX1001, 1:34-37. “Accordingly, a backlight unit, in which the LED module 20 can be easily separated from the case 10 and replaced with new ones, is required.” EX1001, 1:42-44.

The '537 Patent discloses “a backlight unit according to the embodiment comprises a case 110, an LED module 120, a fixing part 130, and a bending part 140.” EX1001, 2:33-45. Fig. 3 of the '537 Patent is reproduced below.

[Fig. 3]



EX1001, Fig. 3. The '537 Patent describes that "[t]he case 110 supports the LED module 120, and is formed with a bending part 140 for guiding and fixing an end portion of the LED module 120." EX1001, 2:49-51.

B. Prosecution History

The '537 Patent was filed as US Application No. 12/521,490 on June 26, 2009. EX1001, cover (86). The '537 patent issued after only two actions in which the examiner applied references that were not prior art. File History Excerpts for

U.S. Patent No. 8,267,537 to Park (“EX1005-FH”), 241, 256, 281-290, 306.

Specifically, on July 18, 2011, the Office issued its first Non-Final Office Action and rejected all pending claims 1-20 based on anticipation and obviousness rejections based on US 2008/0304259 to Teng and US 2007/0211205 to Shibata. Patent Owner overcame the rejections by removing the asserted prior art by claiming priority to its December 21, 2007 international application date. EX1005-FH, 306. The Office then issued a second Non-Final Office Action and rejected all pending claims 1-20 based on anticipation and obviousness rejections based on US 2007/0230206 to Hsiao. EX1005-FH, 281-290. Patent Owner overcame the rejections by removing the asserted prior art by claiming priority to the December 29, 2006 filing date of its Korean priority application. EX1005-FH, 256. The Office then issued a Notice of Allowance on the basis that independent claims 1 and 13 provide a “combination of limitations [that] is not found, taught, or suggested in the prior art.” EX1005-FH, 241. Accordingly, the ’537 Patent never received any substantive examination during prosecution.

III. EFFECTIVE FILING DATE

The ’537 Patent claims priority to PCT/KR2007/006719, filed December 21, 2007. EX1001, cover (22). PCT/KR2007/006719 claims priority to Korean Patent Application No. 10-2006-0138965, filed December 29, 2006. EX1001, cover (30).

The prior art references relied upon in this Petition pre-date the earliest priority date on the face of the '537 patent; thus, Petitioner does not challenge Patent Owner's priority claim here but reserves the right to contest it.

IV. IDENTIFICATION OF THE CHALLENGE

Petitioner challenges the following claims on the following grounds:

Ground	Claims	Challenge
1	1, 3, 4, 5, 8-9, 11-14, 16-17, 19, and 20	Obviousness over Liu and the knowledge of a POSITA
2	2, 6, 7, 15 and 18	Obviousness over Liu in view of Roberts and the knowledge of a POSITA
3	10	Obviousness over Liu in view of Liu-660 and the knowledge of a POSITA

V. CLAIM CONSTRUCTION

Petitioner submits that no formal claim constructions are necessary because “claim terms need only be construed to the extent necessary to resolve the controversy.” *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011). Petitioner reserves the right to respond to any constructions offered by Patent Owner or adopted by the Board.

VI. THE PERSON OF ORDINARY SKILL IN THE ART (“POSITA”)

Based on the '537 patent, the prior art and other documentation cited herein,

and on the testimony of Michael Krames, Ph.D. (Petitioner's expert), a POSITA as of December 29, 2006 would have had 2 or 3 years of experience in LED-based lighting device design and fabrication as well as at least a bachelor's degree in a relevant field (e.g., mechanical engineering), or alternatively would have an equivalent combination of advanced education and practical experience, such as an advanced degree that is based on work involving LED-based lighting device design and fabrication. Declaration of Mike Krames ("EX1002-Krames"), ¶48. A POSITA would have been knowledgeable regarding backlighting devices that use LED and fluorescent/phosphor-based conversion materials. EX1002-Krames, ¶49.

VII. PRIOR ART

Each reference relied upon in the grounds is analogous prior art. EX1002-Krames, ¶53.

A. Liu

Taiwan Patent No. TWI248538 to Liu ("Liu") was filed on July 13, 2004, published as TW200602716A on January 16, 2006, and issued on February 1, 2006. EX1007 (original Taiwanese version of the patent); EX1009, 1, 2[45].¹ Exhibit 1003 ("EX1003-Liu") provides a certified translation, including the translation certificate,

¹ EX1009 provides the Taiwan Intellectual Property Office ("TIPO") Bibliographic Data Sheet for Taiwan Patent No. TWI248538.

of TWI248538 to Liu (EX1007). Liu is at least pre-AIA §102(a) prior art. Liu discloses “a light source assembly structure of a backlight module,” and “the structure includes at least one light source assembly and one backboard,” wherein the “light source assembly includes at least one light-emitting device and one board, “[t]he backboard has at least one protrusion part,” and “[t]he board is detachably installed on the backboard and is tightly held by the backboard and the protrusion part.” EX1003-Liu, 3. Fig. 5 of Liu is reproduced below.

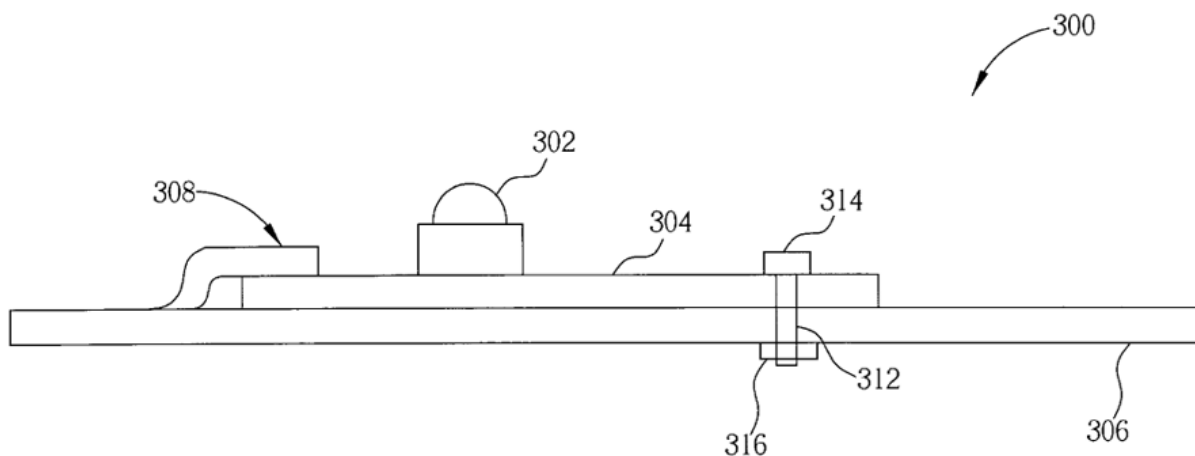


FIG. 5

EX1003-Liu, Fig. 5. “As shown in FIG. 5, the LED light source assembly structure 300 of the present invention comprises an LED light source 302, a board 304 supporting the LED light source 302, and a backboard 306.” EX1003-Liu, 13. “The LED light source 302 is welded to the surface of the board 304.” EX1003-Liu, 13. Liu further discloses an improved device where “[t]he backboard has at least one

protrusion part ... [w]herein the board is detachably installed on the backboard and the board is tightly held by the backboard and the protrusion part.” EX1003-Liu, 8.

B. Roberts

U.S. Patent Publication No. 2007/0247414 to Roberts (“Roberts”) is the publication of U.S. Application No. 11/408,648 filed on April 21, 2006. EX1004-Roberts, cover (22). Roberts is at least pre-AIA §102(e) prior art. Roberts discloses a “lighting panel according to some embodiments of the invention includes at least one tile, or an LED module having one or more LEDs mounted thereon” (EX1004-Roberts, ¶13). Roberts explains the benefits of using printed circuit boards for electrical connections for the LEDs and reflective materials to improve LCD backlight units. EX1004-Roberts, ¶¶60-62, 77-79. Roberts discloses a “solid state lighting tile 10 [that] may include thereon a number of solid state lighting elements 12 arranged in a regular and/or irregular one- or two-dimensional array. The tile 10 may include, for example, a printed circuit board (PCB) on which one or more circuit elements, such as discrete light emitting components, may be mounted,” as illustrated in Fig. 1 reproduced below. EX1004-Roberts, ¶60.

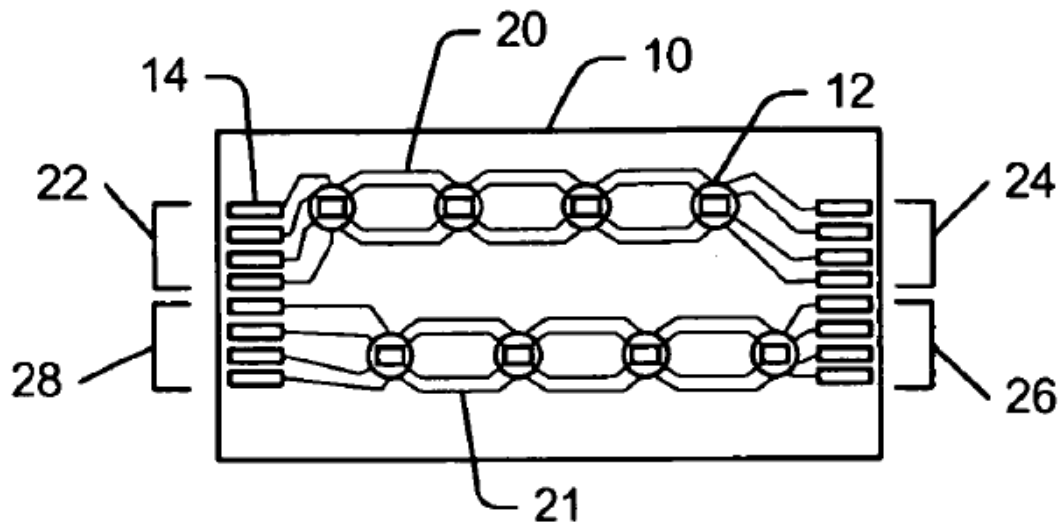


FIGURE 1

EX1004-Roberts, Fig. 1. Roberts discloses that “a tile 10 may include a metal core PCB (MCPCB) including a metal core having thereon a polymer coating on which patterned metal traces (not shown) may be formed.” EX1004-Roberts, ¶60. Roberts also discloses that “[i]n order to provide and/or improve light recycling in the lighting panel 40, a reflector sheet 50 may be provided on the same side of the tile 10 as the lighting elements 12.” EX1004-Roberts, ¶77. Roberts discloses that “in addition to reflecting incident light, the reflector sheet 50 may help disperse the incident light so that it is reflected in a random direction (i.e. a Lambertian reflector), which may improve the uniformity of the lighting panel 40.” EX1004-Roberts, ¶79.

C. Liu-660

US Patent Publication No. 2006/0187660 to Liu (“Liu-660”) was published on August 24, 2006 and filed on July 15, 2005. EX1006-Liu-660, cover (43), (22).

Liu-660 is at least pre-AIA §§102(a) and (e) prior art.

Liu-660 and Liu share the same solo inventor, Pang-Hsuan Liu, and Liu-660 provides a related disclosure regarding a backlight module for an LED display. EX1006-Liu-660, Abstract. Specifically, Liu-660 discloses a “device for fastening the lighting units in a backlight module,” and a “rigid board [that] partially laps over the adjacent lighting unit or units.” EX1006-Liu-660, Abstract.

Liu-660 discloses and illustrates a “backlight module 2 [] composed of a backboard 21 and a plurality of lighting units 22 arranged in equal space and in parallel to one another on the backboard 21” and “[e]ach lighting unit 22 comprises a plurality of lighting elements 221 and a metal board 222 carrying the lighting elements 221.” EX1006-Liu-660, ¶17.



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on the backboard 21.” EX1006-Liu-660, ¶19.

VIII. DETAILED DISCUSSION

A. Ground 1: Claims 1, 3-5, 8, 9, 11, 12, 13, 14, 16, 17, 19, and 20 are obvious over Liu in view of the knowledge of a POSITA

1. Claim 1

a. [1Pre]: A backlight unit comprising

Assuming the preamble is limiting, Liu renders obvious the claimed “*backlight unit.*”² EX1002-Krames, ¶63. Liu discloses “a light source assembly structure of a **backlight module.**” EX1003-Liu, 3; EX1002-Krames, ¶63. Liu discloses that “[a]mong the various key components of LCDs, the **backlight module** used to supply light has a significant impact on the overall luminous efficacy of the LCD,” and “[w]hen the **backlight module** itself has excellent luminous efficacy, it can not only improve the brightness of the LCD, but also provide flexibility in the design and manufacturing of other components in the LCD.” EX1003-Liu, 5.

Thus, Liu in view of the knowledge of a POSITA renders obvious limitation [1Pre]. EX1002-Krames, ¶¶63-4.

² Italicized text appearing in quotes herein is used to identify claim language, unless otherwise noted.

b. [1A]: a **light emitting diode (LED) module** comprising an **LED**³

Liu in view of the knowledge of a POSITA renders obvious the claimed “a **light emitting diode (LED) module** comprising an **LED**.” EX1002-Krames, ¶¶65-68.

Liu discloses “an LED light source assembly structure 300 in a backlight module according to a third embodiment of the present invention,” in Fig. 5 reproduced below. EX1003-Liu, 13.

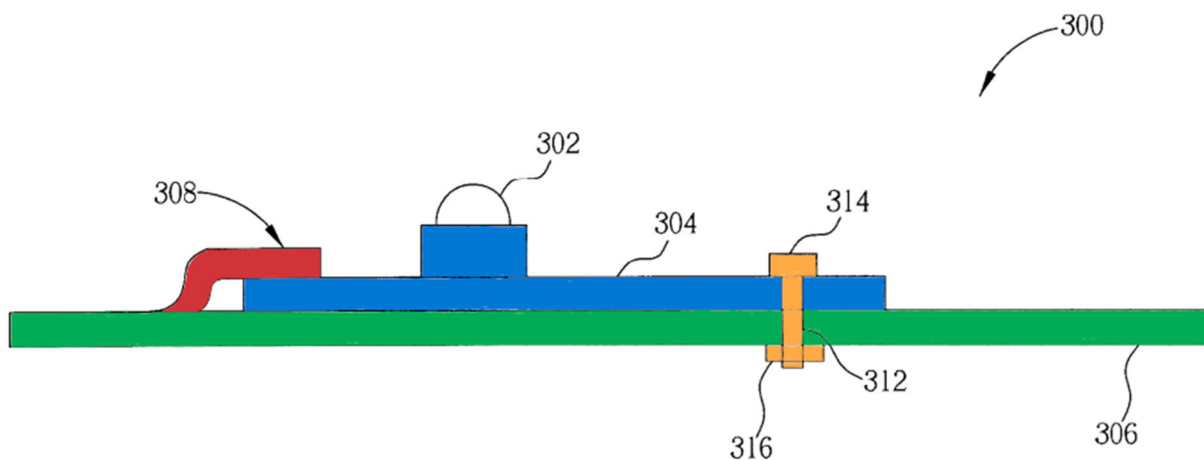


FIG. 5

EX1003-Liu, Fig. 5.⁴ “As shown in FIG. 5 above, the LED light source assembly

³ All colorized text emphases herein are annotations added by Petitioner, unless otherwise noted.

⁴ All colorization appearing in the figures herein are annotations added by Petitioner, unless otherwise noted.

structure 300 of the present invention comprises **an LED light source 302**, a **board 304** supporting **the LED light source 302**.” EX1003-Liu, 13.

Thus, Liu in view of the knowledge of a POSITA renders obvious limitation [1A]. EX1002-Krames, ¶¶64-68.

c. [1B] a **case** supporting the **LED module**, and comprising a **bending part** that guides and fixes an end portion of the **LED module**

Liu in view of the knowledge of a POSITA renders obvious “a **case** supporting the **LED module**, and comprising a **bending part** that guides and fixes an end portion of the **LED module**.” EX1002-Krames, ¶¶69-74.

Liu states that a problem with prior art is that “it requires the use of bolts 18 and nuts 22 for assembly, which is too complicated during assembly and results in an increase in various labor and material costs,” and “[p]articularly in some large backlight modules, where dozens or hundreds of LED light sources are installed, the number of bolts and nuts used must be considerable, further highlighting this problem.” EX1003-Liu, 7.⁵ Accordingly, Liu discloses an improved device where

⁵ The ’537 Patent address a similar problem to the problem identified in Liu. More particularly, the ’537 Patent states that “it is inconvenient in that many fixing parts 30 must be separated from the LED modules 20” to service the unit. EX1001, 1:35-36. Thus, the ’537 Patent proposes that “a backlight unit, in which the LED module 20 can be easily separated from the case 10 and replaced with new ones, is

“[t]he **backboard** has at least one **protrusion part** ... [w]herein the **board** is detachably installed on the **backboard** and the board is tightly held by the backboard and the protrusion part.” EX1003-Liu, 8.

Liu discloses that “[s]ince the material of the backboard itself is elastic, the board can be detachably installed on the backboard. At the same time, **at least one** corner **or at least one side** of the board is tightly held by the backboard and the at least one protrusion part. By utilizing the clamping force applied to the board by the backboard and the protrusion part, the board can not only be tightly held onto the backboard, but the contact surface between the board and the backboard will also be intact and good.” EX1003-Liu, 8. Liu further teaches the claimed “*bending part that guides and fixes*” as Liu discloses embodiments that “concurrently use the stamped protrusion part and the backboard to **tightly hold the sides and corners of the board** to achieve the same purpose, and the number of boards installed on the backboard and the number of LED light sources installed on the board can be adjusted according to actual conditions without any special restrictions.” EX1003-Liu, 13.

This is further illustrated in Liu’s Fig. 5 below:

required.” EX1001, 1:42-44.

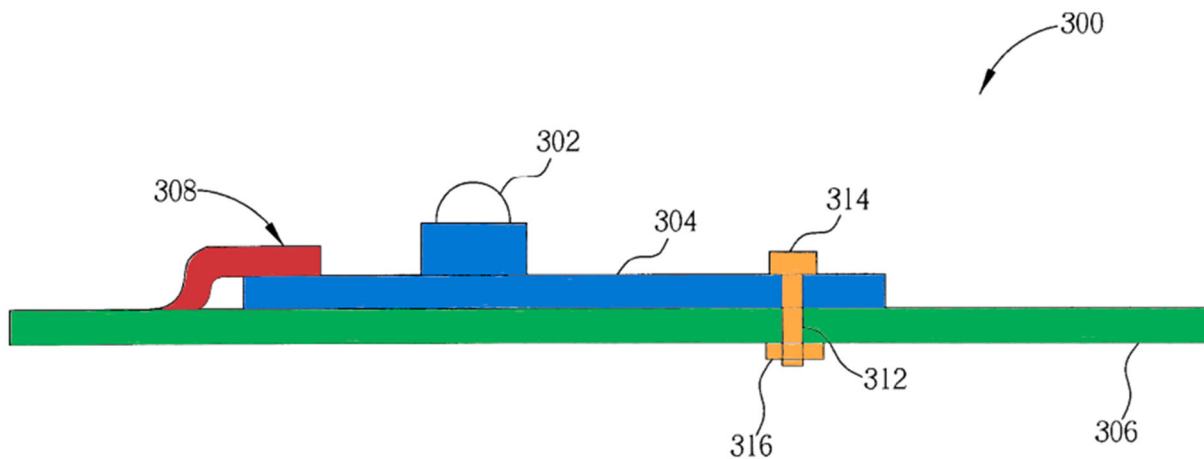


FIG. 5

EX1003-Liu, Fig. 5. As shown above in Fig. 5, Liu discloses that the at least one protrusion part is a “**stamped protrusion part 308**” and that there is a “clamping force” applied “by the **backboard 306** and the **stamped protrusion part 308**.” EX1003-Liu, 13-14. Liu further discloses that in some embodiments, “the **backboard** and the **first protrusion part** are integrally formed.” EX1003-Liu, 21. Liu also discloses “the material of the **backboard 106** can be stainless steel.” EX1003-Liu, 9. Accordingly, a POSITA would have understood that the “**first protrusion part**” in Liu is elastic, as it is formed from the same elastic material as the **backboard**. EX1002-Krames, ¶72. Similar to Liu, the ’537 patent discloses that its “**bending part 140** may be formed by bending an area corresponding to an opening 150 of the **case 110**.” EX1001, 2:55-57. It would have been obvious to a POSITA that Liu’s integrally formed “**first protrusion part**” would exhibit the elastic properties of the

backboard. EX1002-Krames, ¶¶72.

A POSITA would have understood based on Liu’s disclosure of “the clamping force applied to the board by the backboard and the protrusion part,” that the “elastic” “protrusion part” can bend such that **“the board is detachably installed on the backboard.”** EX1003-Liu, 6; EX1002-Krames, ¶73. In *KSR Int’l Co. v. Teleflex, Inc.*, the Supreme Court held the obviousness analysis should consider the “background knowledge possessed by a person having ordinary skill in the art.” 550 U.S. 398 (2007).⁶ A POSITA would have understood, based on Liu’s disclosure, that a “protrusion part” (claimed “*bending part*”) would guide and fix the board (claimed “*LED module*”) in order to achieve Liu’s teaching that “the board is detachably installed on the backboard and the board is tightly held by the backboard and the protrusion part.” EX1002-Krames, ¶73; EX1003-Liu, 8. Liu further teaches that “the contact surface between the board 304 and the backboard 306 will be **intact**

⁶ In *Koninklijke Philips N.V. v. Google LLC*, the Federal Circuit determined that “under 35 U.S.C. § 103, the obviousness inquiry turns not only on the prior art, but whether the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious . . . to a person having ordinary skill in the art to which the claimed invention pertains.” 948 F.3d 1330, 1337 (Fed. Cir. 2020) (affirming PTAB’s determination of unpatentability based upon cited prior reference in view of knowledge of POSITA).

and good due to the clamping force applied to the board 304 by the backboard 306 and the stamped protrusion part 308.” EX1003-Liu, 13-14. A POSITA would have understood, based on Liu’s disclosure, that in order for the “stamped protrusion part 308” (claimed “*bending part*”) to provide the “intact and good” “contact surface,” it would guide and fix the “board 304” (claimed “*LED module*”) to the backboard 306 (claimed “*case*”). EX1002-Krames, ¶¶73; EX1003-Liu, 13-14.

Thus, Liu in view of the knowledge of a POSITA renders obvious limitation [1B]. EX1002-Krames, ¶¶69-74.

d. [1C] a **fixing part** fixing the **LED module** to the **case**

Liu in view of the knowledge of a POSITA renders obvious “a **fixing part** fixing the **LED module** to the **case**.” EX1002-Krames, ¶¶75-79.

Liu discloses:

In addition to at least one stamped protrusion part 308, the backboard 306 also has at least one **bolt hole 312**. Therefore, the **board 304** is not only tightly held by the **backboard 306** and the stamped protrusion part 308, but is also fastened onto the backboard 306 by the **bolt 314** and the **nut 316**. In this case, the contact surface between the board 304 and the backboard 306 will be intact and good due to the clamping force applied to the board 304 by the backboard 306 and the stamped protrusion part 308 and the force when the **bolt 314** is locked to the **nut 316**.

EX1003-Liu, 13-14. As shown in Fig. 5, reproduced below, **bolt 314** and **nut 316** (claimed “*fixing part*”) can be fastened through the **bolt hole 312** to help in fixing the **board 304** (claimed “*LED module*”) to the **backboard 306** (claimed “*case*”). *Id.*

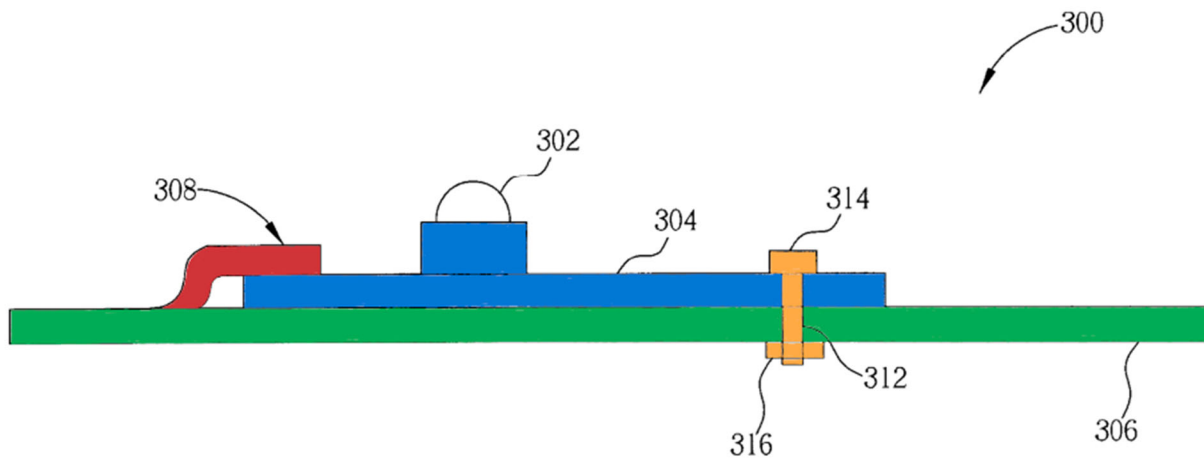


FIG. 5

EX1003-Liu, Fig. 5.

Thus, Liu in view of the knowledge of a POSITA renders obvious limitation [1C]. EX1002-Krames, ¶¶75-79. Furthermore, in view of the above, Liu in view of the knowledge of a POSITA renders obvious all limitations, [1Pre]-[1C], of claim 1.

EX1002-Krames, ¶¶63-79.

2. **Claim 3. The backlight unit as claimed in claim 1, wherein the bending part has a length substantially identical to or shorter than a length of the LED module, and is located corresponding to a fixing position of the LED module.**

Liu in view of the knowledge of a POSITA renders obvious the claimed “*the bending part has a length substantially identical to or shorter than a length of the*

LED module, and is located corresponding to a fixing position of the LED module.”

EX1002-Krames, ¶¶80-85. As shown below in Fig. 5, Liu discloses a stamped protrusion part 308 (claimed “*bending part*”), but, given the side perspective of Fig. 5, its length in comparison to the length of the board 304 (claimed “*LED module*”) is not illustrated.

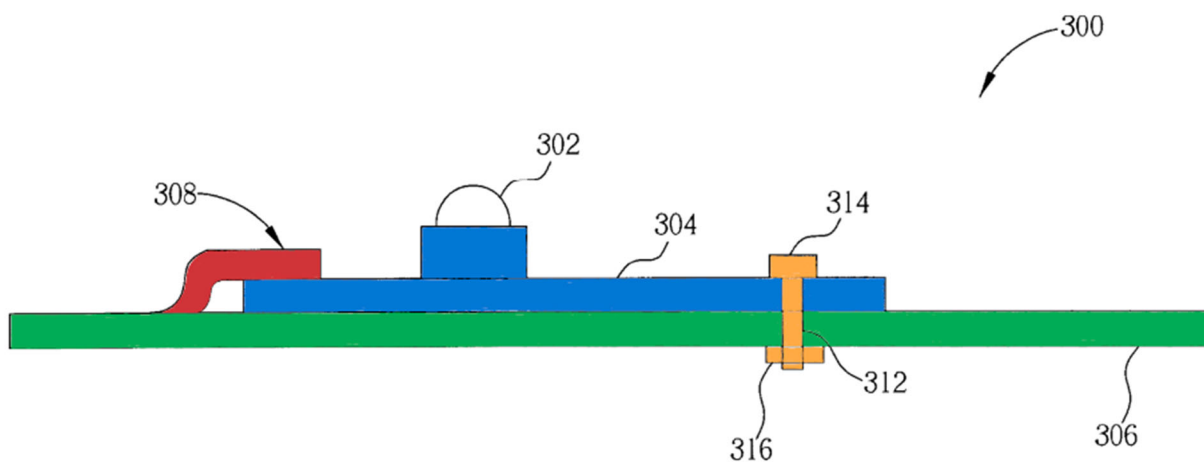


FIG. 5

EX1003-Liu, Fig. 5. However, Fig. 3 of the Liu, reproduced below, shows another embodiment in which the “backboard has at least one stamped protrusion part 108” and, as shown in Fig. 3, the “stamped protrusion part 108” (claimed “*bending part*”) has a length that is shorter than the board 104 (claimed “*LED module*”). EX1003-Liu, Fig. 3.

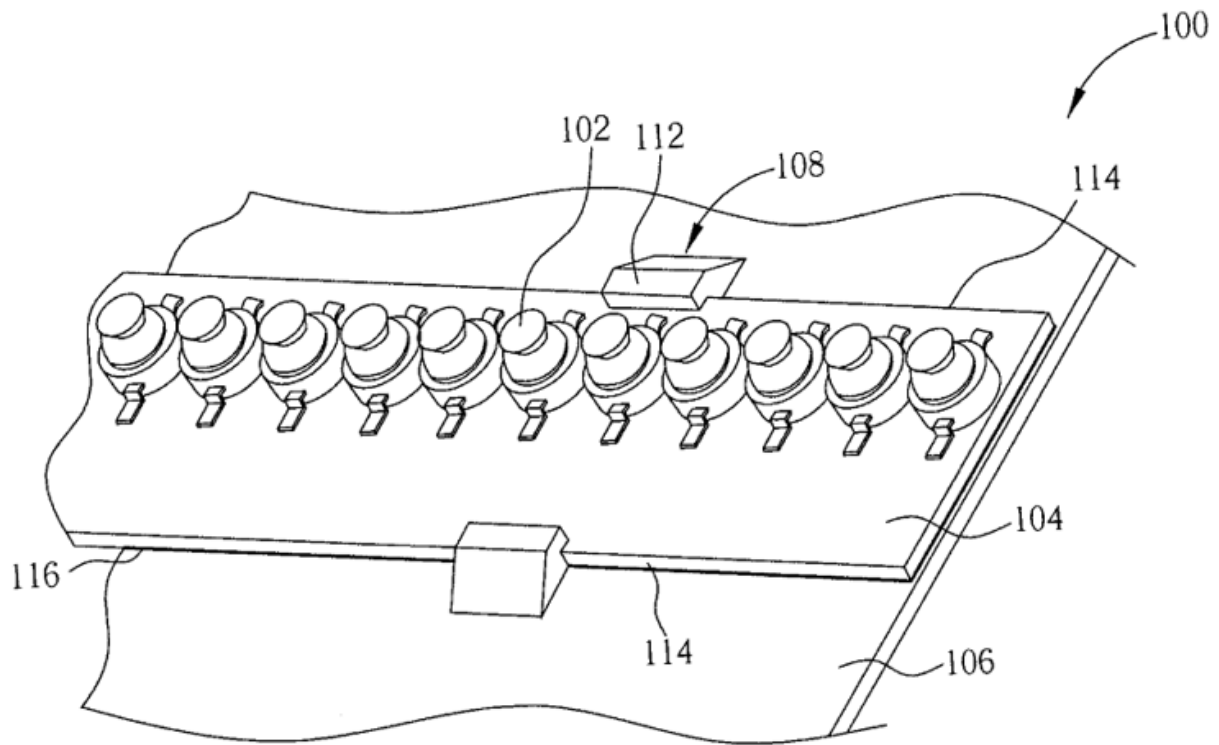


FIG. 3

Liu further discloses “at least one corner or at least one side of the board is tightly held by the backboard and the at least one protrusion part.” EX1003-Liu, 8. Accordingly, it would have been obvious to a POSITA in view of Liu’s disclosures for Liu’s “stamped protrusion part 308” (claimed “*bending part*”) to be arranged on at least one corner of the board, and thus have a length shorter length than “board 304” (claimed “*LED module*”). EX1002-Krames, ¶83.

Liu also discloses that “the board 304 is . . . tightly held by the backboard 306 and the stamped protrusion part 308.” EX1003-Liu, 13. Thus, as shown above in

Fig. 5, Liu teaches that the stamped protrusion part 308 (claimed “*bending part*”) is located “*corresponding to a fixing position*” of the board 304 (claimed “*LED module*”).

Thus, Liu in view of the knowledge of a POSITA renders obvious claim 3.
EX1002-Krames, ¶80-85.

3. Claim 4. The backlight unit as claimed in claim 1, wherein the bending part comprises at least one bent area formed corresponding to a fixing position of the LED module.

Liu in view of the knowledge of a POSITA renders obvious the claimed “*the bending part comprises at least one bent area formed corresponding to a fixing position of the LED module.*” EX1002-Krames, ¶86-88. As shown below in Fig. 5, Liu discloses a stamped protrusion part 308 (claimed “*bending part*”) that comprises “*at least one bent area,*” as indicated in the annotations to Fig. 5 included below.

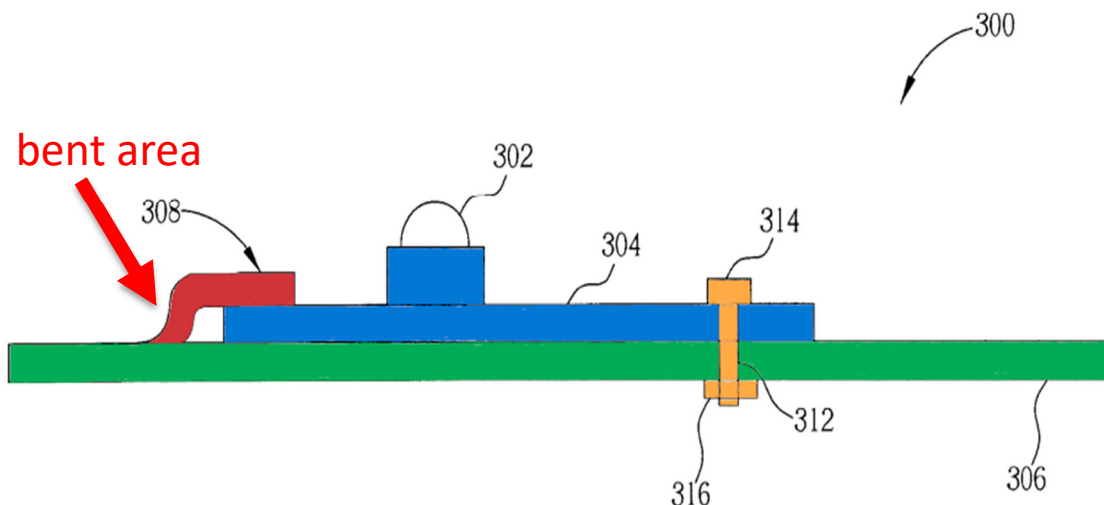


FIG. 5

EX1003-Liu, Fig. 5. Fig. 5 shows that the “stamped protrusion part 308” (claimed “*bending part*”) comprises a bent area. Additionally, Liu discloses that “the board is detachably installed on the backboard and the board is tightly held by the backboard and the protrusion part.” EX1003-Liu, 8. Accordingly, Liu teaches that the stamped protrusion part 308 (claimed “*bending part*”) is located “*corresponding to a fixing position*” of the board 304 (claimed “*LED module*”). EX1002-Krames, ¶87.

Thus, Liu in view of the knowledge of a POSITA renders obvious claim 4. EX1002-Krames, ¶86-88.

4. Claim 5. The backlight unit as claimed in claim 1, wherein the case is formed of a Steel Use Stainless (SUS) material.

Liu in view of the knowledge of a POSITA renders obvious the claimed “*wherein the case is formed of a Steel Use Stainless (SUS) material.*” EX1002-Krames, ¶¶89-90. Liu discloses “the material of the backboard 106 can be **stainless steel**, aluminum, aluminum alloy, or galvanized steel plate.” EX1003-Liu, 9. A POSITA would have understood that the claimed “*Steel Use Stainless (SUS) material*” is a type of stainless steel. EX1002-Krames, ¶89. It was well known to those of skill in the art in 2006 that Steel Use Stainless (SUS) material is a type of stainless steel. EX1002-Krames, ¶89. As Dr. Krames testified, this is exemplified by the disclosure in US Patent Publication No. 2007/0065718 to Moon, filed March 24,

2006, which discloses that “case cover 400 is **made of a SUS (Steel Use Stainless) material, a kind of stainless steel material** according to Japan Industrial Standards.” EX1002-Krames, ¶89 (citing EX1008-Moon, ¶35). Dr. Krames testified that, as disclosed in Moon, it was well known to a POSITA in 2006 that SUS was a type of stainless steel. EX1002-Krames, ¶89. As Liu discloses the use of stainless steel for the backboard 106 (claimed “case”), it teaches the use of the claimed “*Steel Use Stainless (SUS) material*.” EX1002-Krames, ¶89.

Thus, Liu in view of the knowledge of a POSITA renders obvious claim 5. EX1002-Krames, ¶¶89-90.

5. Claim 8. The backlight unit as claimed in claim 1, wherein the fixing part fixes the LED module to the case in another end area of the LED module in which the bending part is not formed.

Liu in view of the knowledge of a POSITA renders obvious the claimed “*wherein the fixing part fixes the LED module to the case in another end area of the LED module in which the bending part is not formed*.” EX1002-Krames, ¶¶91-93. As shown in Fig. 5, reproduced below, bolt 314 and nut 316 (claimed “*fixing part*”) can be fastened to help in fixing the board 304 (claimed “*LED module*”) to the backboard 306 (claimed “*case*”). The bolt 314 and nut 316 are fastened to an end of board 304 that is opposite to the end of the board 304 (claimed “*another end area of the LED module*”) that is clamped by the stamped protrusion part 308 (claimed

“bending part”).

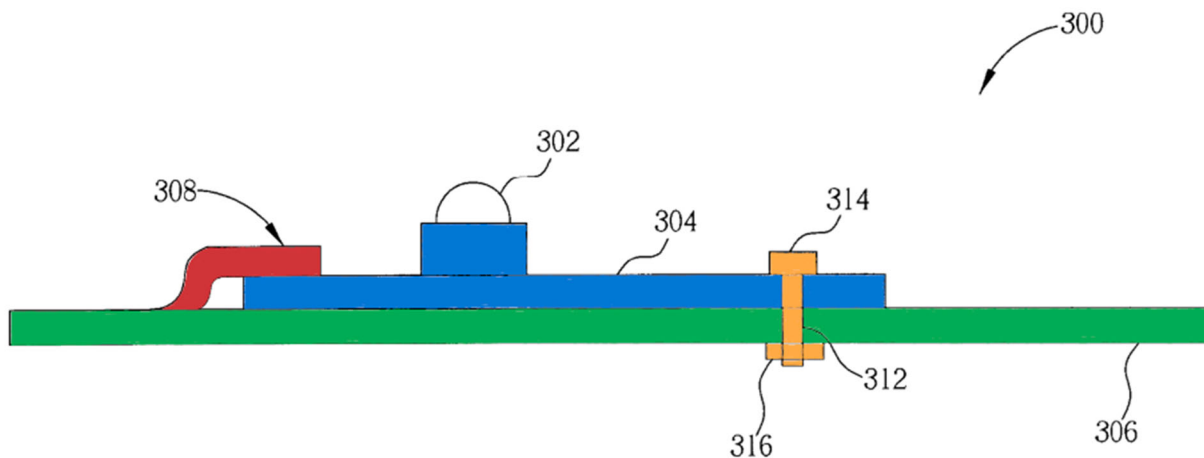


FIG. 5

EX1003-Liu, Fig. 5.

Thus, Liu in view of the knowledge of a POSITA renders obvious claim 8.

EX1002-Krames, ¶¶91-93.

6. Claim 9. The backlight unit as claimed in claim 1, wherein the bending part is integrated with the case.

Liu in view of the knowledge of a POSITA renders obvious the claimed “wherein the bending part is integrated with the case.” EX1002-Krames, ¶94. Liu discloses that “backboard 106 [claimed “case”] has at least one stamped protrusion part 108” (claimed “bending part”). EX1003-Liu, 9. Liu further discloses that in some embodiments, “the backboard and the first protrusion part are integrally formed.” EX1003-Liu, 21. Accordingly, a POSITA would have understood that the bending part is integrated with the case. EX1002-Krames, ¶94.

Thus, Liu in view of the knowledge of a POSITA renders obvious claim 9.
EX1002-Krames, ¶¶94-95.

7. Claim 11. The backlight unit as claimed in claim 1, wherein the LED module is formed as the plural number, and at least one LED module comprises a plurality of LEDs.

Liu in view of the knowledge of a POSITA renders obvious the claimed “*wherein the LED module is formed as the plural number, and at least one LED module comprises a plurality of LEDs.*” EX1002-Krames, ¶¶96-99. Liu discloses that “[a]s shown in FIG. 4, the LED light source assembly 200 of the present invention comprises at least one LED light source 202.” EX1003-Liu, 11. In the embodiment shown in Fig. 4, reproduced below, the board 204 comprises 11 LEDs:

Liu in view of the knowledge of a POSITA renders obvious the claimed “wherein the LED module is formed as the plural number, and each LED module comprises a plurality of LEDs.” EX1002-Krames, ¶100-103. Liu discloses, “[a]s shown in FIG. 5, the LED light source assembly structure 300 of the present invention comprises an LED light source 302.” EX1003-Liu, 13. Fig. 5 is reproduced below:

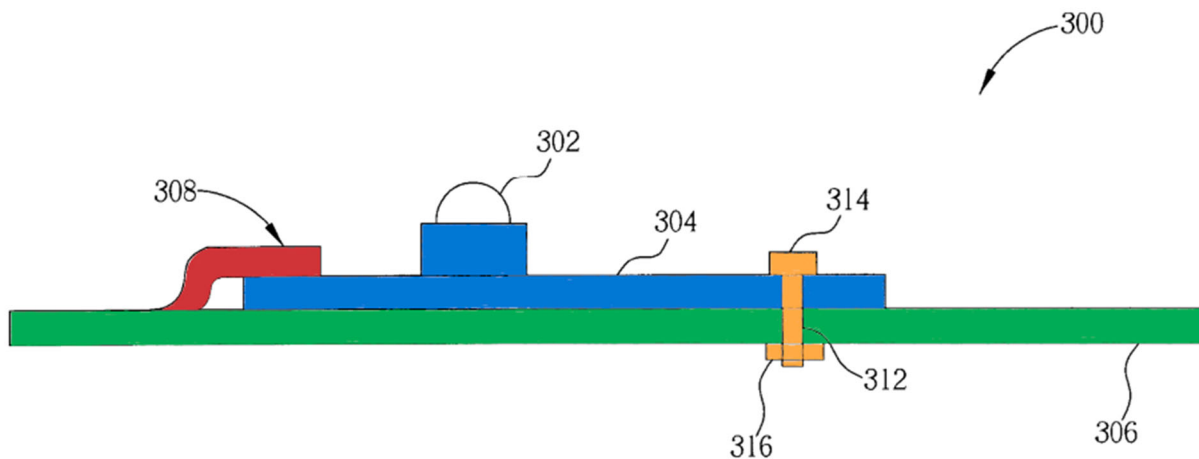


FIG. 5

EX1003-Liu, Fig. 5. Accordingly, a POSITA would have understood from Liu’s teachings that the LED light source assembly structure 300 embodiment shown in Fig. 5 would have been configured with an LED light source 302. EX1002-Krames, ¶102. Liu further discloses that “the number of boards [claimed “LED modules”] installed on the backboard and the number of LED light sources installed on the board can be adjusted according to actual conditions without any special

restrictions.” EX1003-Liu, 13. Thus, Liu teaches its “board” (claimed “*LED module*”) can be “*formed as the plural number.*” *Id.*; EX1002-Krames, ¶102.

Thus, Liu in view of the knowledge of a POSITA renders obvious claim 12. EX1002-Krames, ¶100-103.

9. Claim 13

a. [13Pre]: A display device comprising

Assuming the preamble is limiting, Liu in view of the knowledge of a POSITA renders obvious the claimed “*display device.*” EX1002-Krames, ¶¶104-105. Liu discloses that “[t]he present invention discloses a light source assembly structure, especially a light emitting diode (LED) light source assembly structure used in a liquid crystal display (LCD) backlight module.” EX1003-Liu, 5. Liu discloses that “[a]mong the various key components of LCDs, the backlight module used to supply light has a significant impact on the overall luminous efficacy of the LCD,” and “[w]hen the backlight module itself has excellent luminous efficacy, it can not only improve the brightness of the LCD, but also provide flexibility in the design and manufacturing of other components in the LCD.” EX1003-Liu, 5.

Thus, Liu in view of the knowledge of a POSITA renders obvious limitation [13Pre]. EX1002-Krames, ¶¶104-105.

b. [13A]: a backlight unit comprising a light emitting diode (LED) module comprising an LED

Liu in view of the knowledge of a POSITA renders obvious the claimed “*a*

backlight unit comprising a light emitting diode (LED) module comprising an LED.”

EX1002-Krames, ¶¶106-109.

Liu discloses “an LED light source assembly structure 300 in a backlight module according to a third embodiment of the present invention,” in Fig. 5 reproduced below. EX1003-Liu, 13.

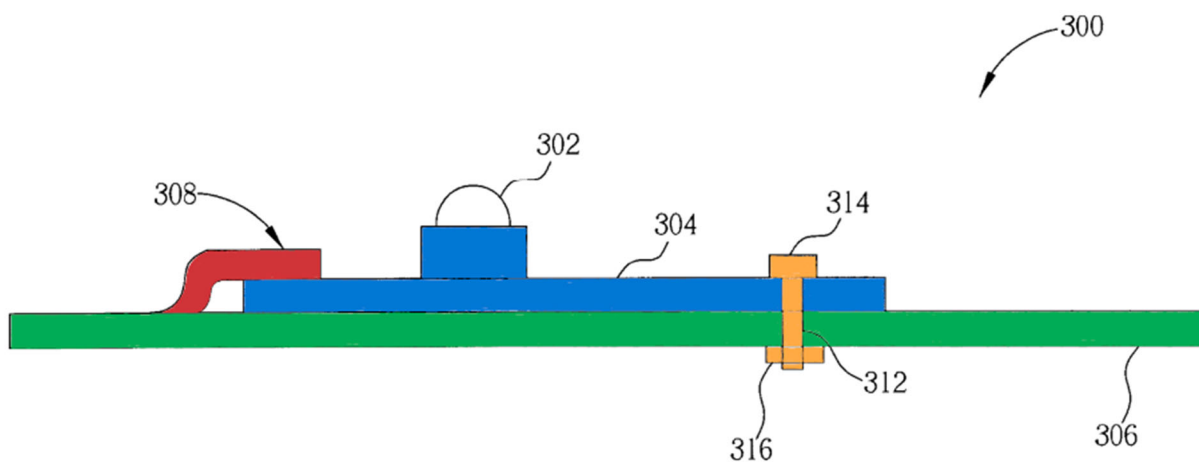


FIG. 5

EX1003-Liu, Fig. 5. “As shown in FIG. 5, the LED light source assembly structure 300 of the present invention comprises **an LED light source 302**, a **board 304** supporting **the LED light source 302**.” EX1003-Liu, 13. EX1002-Krames, ¶108.

Thus, Liu in view of the knowledge of a POSITA renders obvious limitation [13A]. EX1002-Krames, ¶¶106-109.

- c. [13B] a **case** supporting the **LED module**, and comprising a **bending part** that guides and fixes an end portion of the **LED module**

Liu in view of the knowledge of a POSITA renders obvious the claimed “a *case supporting the LED module, and comprising a bending part that guides and fixes an end portion of the LED module.*” EX1002-Krames, ¶¶110-117.

Liu discloses that a problem with prior art is that “it requires the use of bolts 18 and nuts 22 for assembly, which is too complicated during assembly and results in an increase in various labor and material costs,” and “[p]articularly in some large backlight modules, where dozens or hundreds of LED light sources are installed, the number of bolts and nuts used must be considerable, further highlighting this problem.” EX1003-Liu, 7. Accordingly, Liu discloses an improved device where “[t]he backboard has at least one protrusion part ... [w]herein the board is detachably installed on the backboard and the board is tightly held by the backboard and the protrusion part.” EX1003-Liu, 8.

Liu discloses that “[s]ince the material of the backboard itself is elastic, the board can be detachably installed on the backboard. At the same time, **at least one corner or at least one side** of the board is tightly held by the backboard and the at least one protrusion part. By utilizing the clamping force applied to the board by the backboard and the protrusion part, the board can not only be tightly held onto the backboard, but the contact surface between the board and the backboard will also be intact and good.” EX1003-Liu, 8. Liu further teaches the claimed “*bending part that guides and fixes*” as Liu discloses embodiments that “concurrently use the stamped

protrusion part and the backboard to **tightly hold the sides and corners of the board** to achieve the same purpose, and the number of boards installed on the backboard and the number of LED light sources installed on the board can be adjusted according to actual conditions without any special restrictions.” EX1003-Liu, 13.

This is further illustrated in Liu’s Fig. 5 below:

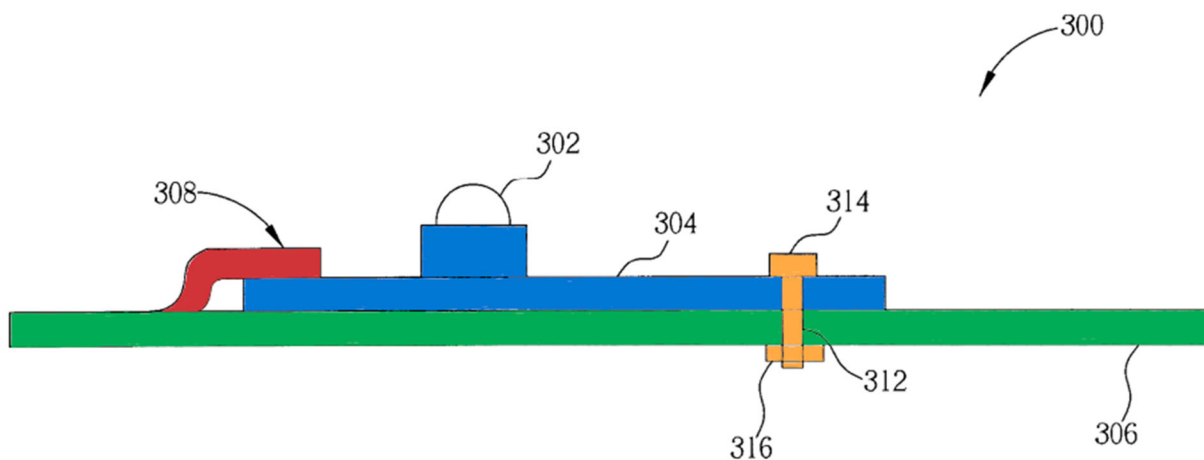


FIG. 5

EX1003-Liu, Fig. 5. In Fig. 5, Liu discloses that the at least one protrusion part is a “**stamped protrusion part 308**” and that there is a “clamping force” applied “by the **backboard 306** and the **stamped protrusion part 308**.” EX1003-Liu, 13-14. Liu further discloses that in some embodiments, “the backboard and the first protrusion part are integrally formed.” EX1003-Liu, 21. Liu also discloses “the material of the

backboard 106 can be stainless steel.” EX1003-Liu, 9. Accordingly, a POSITA would have understood that the “first protrusion part” in Liu is elastic, as it is formed from the same elastic material as the backboard. EX1002-Krames, ¶114. Similar to Liu, the ’537 patent discloses that “case 110 may be formed of a Steel Use Stainless (SUS) material,” and “bending part 140 may be integrated with the case 110 in the manufacturing process of the case 110.” EX1001, 2:57-60. It would have been obvious to a POSITA that Liu’s integrally formed “**first protrusion part**” would exhibit the elastic properties of the **backboard**. EX1002-Krames, ¶114.

A POSITA would have understood based on Liu’s disclosure of “the clamping force applied to the board by the **backboard** and the **protrusion part**,” that the “elastic” “**protrusion part**” can bend such that “the **board** is detachably installed on the **backboard**.” EX1003-Liu, 8; EX1002-Krames, ¶115. In *KSR Int’l Co. v. Teleflex, Inc.*, the Supreme Court held the obviousness analysis should consider the “background knowledge possessed by a person having ordinary skill in the art.” 550 U.S. 398 (2007). A POSITA would have understood, based on Liu’s disclosure, that a “**protrusion part**” would guide and fix the **board** (claimed “*LED module*”) in order to achieve Liu’s disclosure that “the **board** is detachably installed on the **backboard** and the **board** is tightly held by the **backboard** and the **protrusion part**.” EX1003-Liu, 8. This is further illustrated in Liu’s Fig. 5 below:

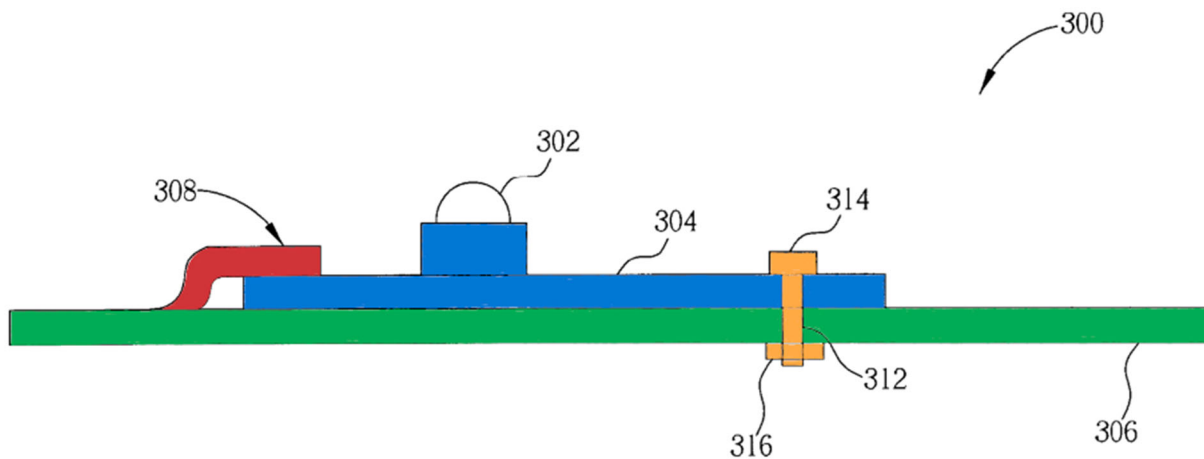


FIG. 5

EX1003-Liu, Fig. 5. In the embodiment shown above in Fig. 5, Liu discloses that the at least one **protrusion part** is a “at least one **stamped protrusion part 308**” and that there is a “clamping force applied between the **board 304** by the **backboard 306** and the **stamped protrusion part 308**.” EX1003-Liu, 13-14.

Thus, Liu in view of the knowledge of a POSITA renders obvious limitation [13B]. EX1002-Krames, ¶¶110-117.

d. [13C] a **fixing part** fixing the **LED module** to the **case**

Liu in view of the knowledge of a POSITA renders obvious “a **fixing part** fixing the **LED module** to the **case**.” EX1002-Krames, ¶¶118-120.

Liu discloses:

In addition to at least one **stamped protrusion part 308**, the **backboard 306** also has at least one **bolt hole 312**. Therefore, the **board 304** is not only tightly held by the

backboard 306 and the **stamped protrusion part 308**, but is also fastened onto the **backboard 306** by the **bolt 314** and the **nut 316**. In this case, the contact surface between the **board 304** and the **backboard 306** will be intact and good due to the clamping force applied to the **board 304** by the **backboard 306** and the **stamped protrusion part 308** and the force when the **bolt 314** is locked to the **nut 316**.

EX1003-Liu, 13-14. As shown in Fig. 5, reproduced below, **bolt 314** and **nut 316** can be fastened through the **bolt hole 312** (claimed “*fixing part*”) to help in fixing the **board 304** (claimed “*LED module*”) to the **backboard 306** (claimed “*case*”).

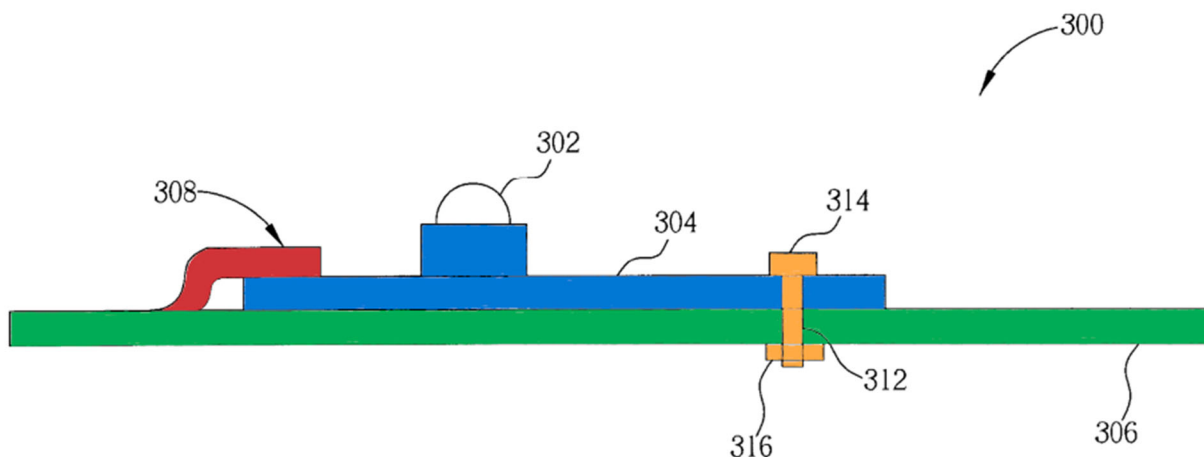


FIG. 5

EX1003-Liu, Fig. 5; EX1002-Krames, ¶119.

Thus, Liu in view of the knowledge of a POSITA renders obvious limitation

[13C]. EX1002-Krames, ¶¶118-120.

e. **[13D] a display part displaying an image**

Liu in view of the knowledge of a POSITA renders obvious “*a display part displaying an image.*” EX1002-Krames, ¶¶121-125. In Fig. 8, reproduced below, Liu illustrates an “an operational view of the LED light source assembly structure in the backlight module of the present invention when applied to an LCD 400.” EX1003-Liu, 15.

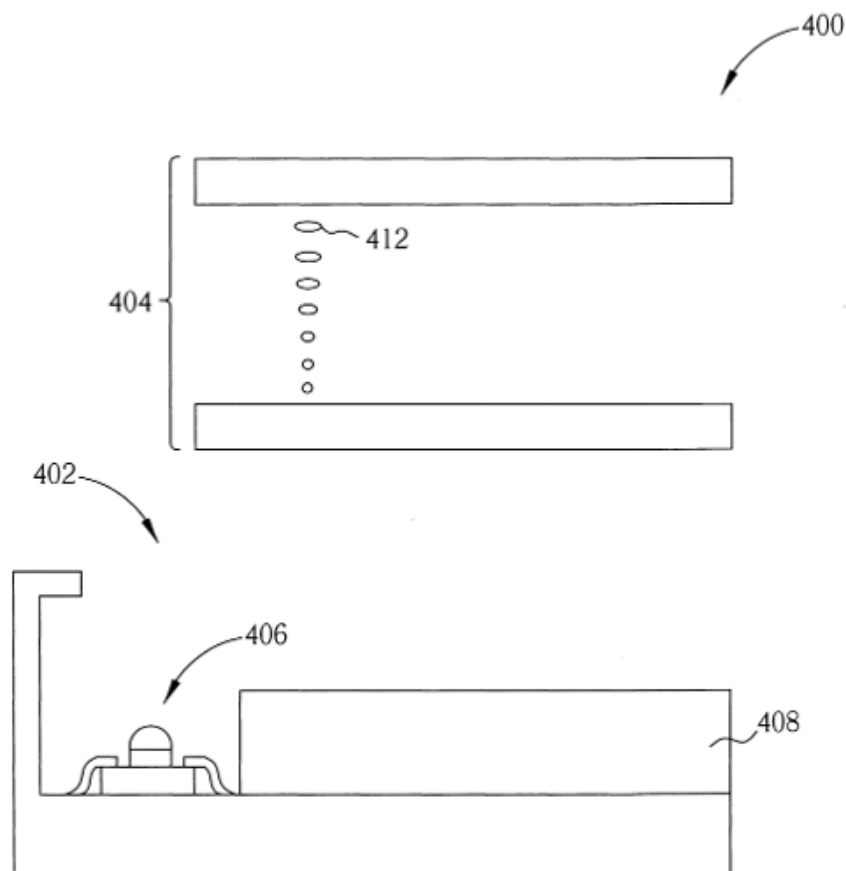


FIG. 8

EX1003-Liu, Fig. 8. Liu discloses:

As shown in FIG. 8, **the LCD 400 comprises a backlight module 402 and an LCD panel 404 disposed thereon.** The backlight module 402 comprises not only an LED light source assembly structure 406 but also at least one light guide plate 408. The LED light source assembly structure 406 can be any LED light source assembly structure disclosed in the present invention. **The light emitted from the LED light source assembly 406 is emitted into the light guide plate 408 and then through an optical mechanism (not shown) inside the light guide plate 408 to become a uniform surface light source, and then directed to the LCD panel 404 before finally producing an image after continuous refraction of the liquid crystal molecules 412 in the LCD panel 404.**

EX1003-Liu, 15. Thus, Liu teaches an “LCD panel 404” (claimed “*display*”) for “producing an image” (claimed “*displaying an image.*”). EX1003-Liu, 15; EX1002-Krames, ¶¶122-123.

Thus, Liu in view of the knowledge of a POSITA renders obvious limitation [13D]. EX1002-Krames, ¶¶121-125. Furthermore, in view of the above, Liu in view of the knowledge of a POSITA renders obvious all limitations, [13Pre]-[13D], of claim 13. EX1002-Krames, ¶¶104-125.

10. Claim 14. The display device as claimed in claim 13, wherein the display part is a liquid crystal panel.

Liu in view of the knowledge of a POSITA renders obvious “*wherein the display part is a liquid crystal panel.*” EX1002-Krames, ¶¶126-127. Liu discloses that “[t]he present invention discloses a light source assembly structure, especially a light emitting diode (LED) light source assembly structure used in a **liquid crystal display (LCD) backlight module.**” EX1003-Liu, 5. Furthermore, Liu discloses that Fig. 8 provides “an operational view of the LED light source assembly structure in the backlight module of the present invention when applied to an LCD 400.” EX1003-Liu, 15.

Thus, Liu in view of the knowledge of a POSITA renders obvious claim 14. EX1002-Krames, ¶¶126-127.

11. Claim 16. The display device as claimed in claim 13, wherein the bending part has a length identical to or shorter than a length of the LED module, and is located corresponding to a fixing position of the LED module.

Liu in view of the knowledge of a POSITA renders obvious the claimed “*the bending part has a length identical to or shorter than a length of the LED module, and is located corresponding to a fixing position of the LED module.*” EX1002-Krames, ¶¶128-132. As shown below in Fig. 5, Liu discloses a stamped protrusion part 308 (claimed “bending part”), but, given the side perspective of Fig. 5, its length in comparison to the length of the board 304 (claimed “LED module”) is not

illustrated.

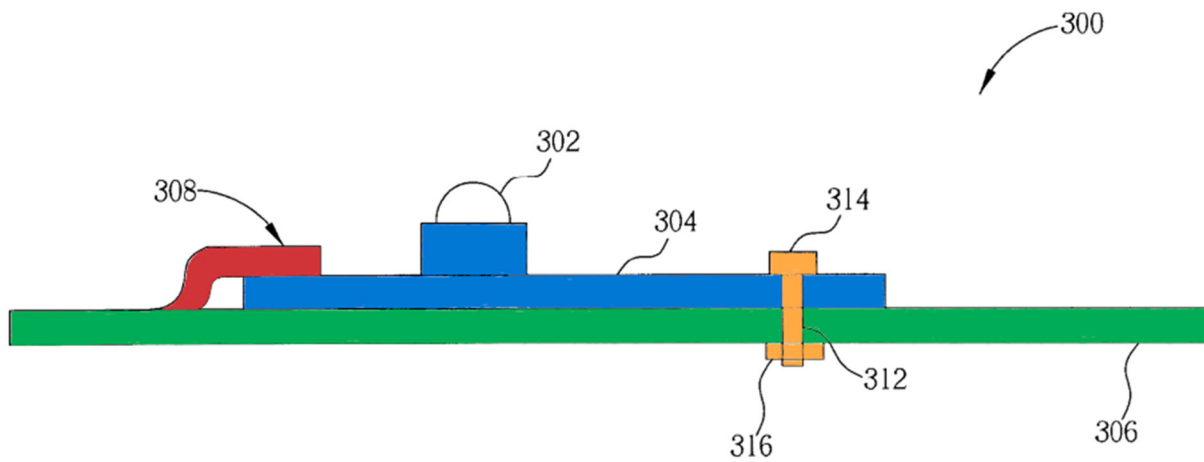


FIG. 5

EX1003-Liu, Fig. 5. However, Fig. 3 of the Liu, reproduced below, shows another embodiment in which the “backboard has at least one stamped protrusion part 108” and, as shown in Fig. 3, the “stamped protrusion part 108” (claimed “*bending part*”) has a length that is shorter than the board 104 (claimed “*LED module*”). EX1003-Liu, Fig. 3.

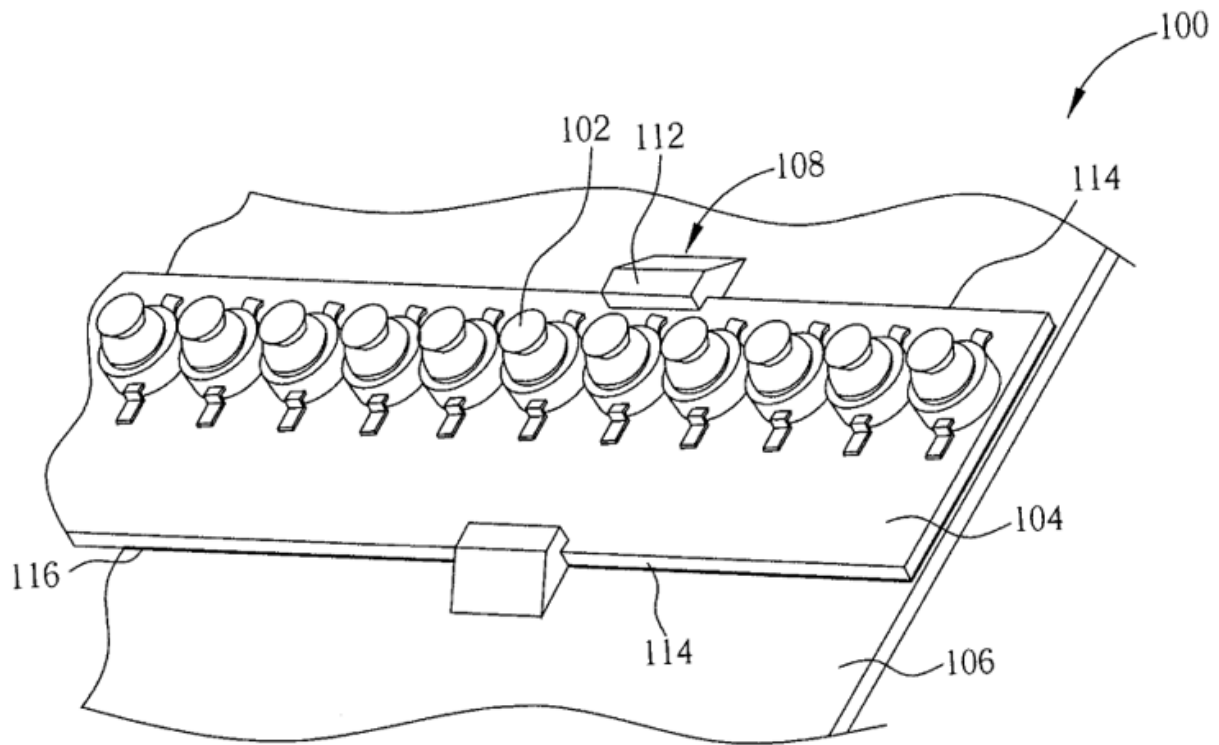


FIG. 3

Liu further discloses “**at least one corner or at least one side** of the board is tightly held by the backboard and the at least one protrusion part.” EX1003-Liu, 8. Accordingly, it would have been obvious to a POSITA for Liu’s “stamped protrusion part 308” (claimed “*bending part*”) in Fig. 5 to be arranged on at least one corner of the board, in which it would have a length shorter length than “board 304” (claimed “*LED module*”). EX1002-Krames, ¶¶129-130.

Liu also discloses that “the board 304 is . . . tightly held by the backboard 306 and the stamped protrusion part 308.” EX1003-Liu, 13. Thus, as shown in Fig. 5

above, Liu teaches that the stamped protrusion part 308 (claimed “*bending part*”) is located “*corresponding to a fixing position*” of the board 304 (claimed “*LED module*”). EX1002-Krames, ¶131.

Thus, Liu in view of the knowledge of a POSITA renders obvious claim 16. EX1002-Krames, ¶¶128-132.

12. Claim 17. The display device as claimed in claim 13, wherein the bending part comprises at least one bent area formed corresponding to a fixing position of the LED module.

Liu in view of the knowledge of a POSITA renders obvious the claimed “*the bending part comprises at least one bent area formed corresponding to a fixing position of the LED module.*” EX1002-Krames, ¶¶133-135. As shown below in Fig. 5, Liu discloses a stamped protrusion part 308 (claimed “*bending part*”) comprising “*at least one bent area,*” as highlighted in the annotations to Fig. 5 provided below.

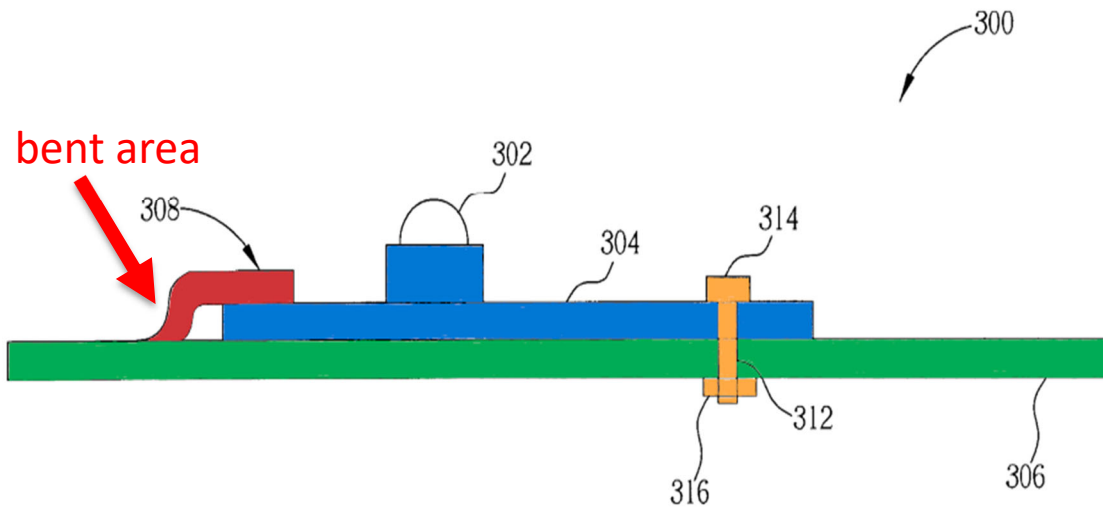


FIG. 5

EX1003-Liu, Fig. 5. As shown above in Fig. 5, the stamped protrusion part 308 (claimed “*bending part*”) is bent to accommodate the board 304 (claimed “*LED module*”), and Liu discloses that the “the board is detachably installed on the backboard and the board is tightly held by the backboard and the protrusion part.” EX1003-Liu, 8. Accordingly, Liu teaches that the stamped protrusion part 308 (claimed “*bending part*”) is located “*corresponding to a fixing position*” of the board 304 (claimed “*LED module*”). EX1002-Krames, ¶134.

Thus, Liu in view of the knowledge of a POSITA renders obvious claim 17. EX1002-Krames, ¶¶132-135.

- 13. Claim 19. The display device as claimed in claim 13, wherein the fixing part fixes the LED module to the case in another end area of the LED module in which the bending**

part is not formed.

Liu in view of the knowledge of a POSITA renders obvious the claimed “wherein the fixing part fixes the LED module to the case in another end area of the LED module in which the bending part is not formed.” EX1002-Krames, ¶¶136-137. As shown in Fig. 5, reproduced below, bolt 314 and nut 316 (claimed “fixing part”) can be fastened to help in fixing the board 304 (claimed “LED module”) to the backboard 306 (claimed “case”) and the bolt 314 and nut 316 (claimed “fixing part”) are fastened to the backboard 306 (claimed “case”) on the end of the board 304 (claimed “LED module”) that is opposite to end of the board 304 (claimed “LED module”) that provides the stamped protrusion part 308 (claimed “bending part”).

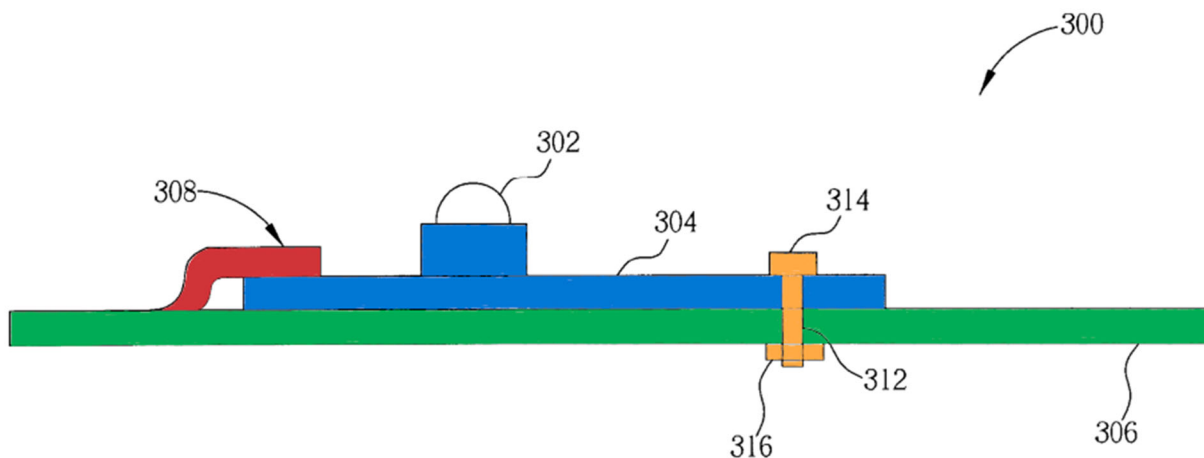


FIG. 5

EX1003-Liu, Fig. 5; EX1002-Krames, ¶136.

Thus, Liu in view of the knowledge of a POSITA renders obvious claim 19.
EX1002-Krames, ¶¶136-137.

14. Claim 20. The display device as claimed in claim 13, wherein the bending part is formed integrally with or separately from the case.

Liu in view of the knowledge of a POSITA renders obvious the claimed “*wherein the bending part is formed integrally with ... the case.*” EX1002-Krames, ¶¶138-139. Liu discloses that “backboard 106 [claimed “case”] has at least one stamped protrusion part 108” (claimed “bending part”). Liu further discloses that in some embodiments, “the backboard and the first protrusion part are integrally formed.” EX1003-Liu, 21. Accordingly, a POSITA would have understood that the bending part is formed integrally with the case. EX1002-Krames, ¶138.

Thus, Liu in view of the knowledge of a POSITA renders obvious claim 20.
EX1002-Krames, ¶¶138-139.

B. Ground 2: Claims 2, 6, 7, 15, and 18 are rendered obvious by Liu in view of Roberts and the knowledge of a POSITA

1. Overview of the combination; motivation to combine; expectation of success

Ground 2 relies on Liu in view of Roberts and addresses claims 2, 6, 7, 15, and 18. Liu explains that “[w]hile improving the luminous efficacy of the backlight module, improving the luminous efficacy of the light-emitting device is a commonly used improvement solution.” EX1003-Liu, 5. Liu further discloses that “the industry

has invested manpower and other resources in order to design and manufacture suitable products that not only meet the needs of LCD products, but also meet the requirements in terms of luminous efficacy and heat dissipation performance.” EX1003-Liu, 6.

Similar to Liu’s disclosure of a “a light emitting diode (LED) light source assembly structure used in a liquid crystal display (LCD) backlight module” (EX1003-Liu, 5), Roberts discloses a “lighting panel according to some embodiments of the invention includes at least one tile, or an LED module having one or more LEDs mounted thereon” (EX1004-Roberts, ¶13). Roberts explains the benefits of using printed circuit boards for electrical connections for the LEDs, encapsulant (“*mold parts*”) for the LEDs, and reflective materials to improve LCD backlight units. EX1004-Roberts, ¶¶60-62, 77-79. Roberts discloses a “solid state lighting tile 10 [that] may include thereon a number of solid state lighting elements 12 arranged in a regular and/or irregular one- or two-dimensional array. The tile 10 may include, for example, a **printed circuit board (PCB)** on which one or more circuit elements, such as discrete light emitting components, may be mounted.” EX1004-Roberts, ¶60. Roberts discloses that “a tile 10 may include a metal core PCB (MCPCB) including a metal core having thereon a polymer coating on which patterned metal traces (not shown) may be formed.” EX1004-Roberts, ¶60.

Roberts further discloses that the LEDs “may be covered by an encapsulant

14, which may be clear and/or may include light scattering particles, phosphors, and/or other elements to achieve a desired emission pattern, color and/or intensity.”

EX1004-Roberts, ¶66. Accordingly, a POSITA would have understood that encapsulating Robert’s LEDs would have improved the emissions from the LEDs.

EX1002-Krames, ¶¶140-142.

Roberts discloses that “[i]n order to provide and/or improve light recycling in the lighting panel 40, a reflector sheet 50 may be provided on the same side of the tile 10 as the lighting elements 12.” EX1004-Roberts, ¶77. Roberts disclose that “in addition to reflecting incident light, the reflector sheet 50 may help disperse the incident light so that it is reflected in a random direction (i.e. a Lambertian reflector), which may improve the uniformity of the lighting panel 40.” EX1004-Roberts, ¶79. Accordingly, Roberts teaches that the adding the “reflector sheet 50” to the “lighting panel 40” improves the uniformity of the image displayed by the “lighting panel 40.” EX1004-Roberts, ¶¶77-79.

Based on the foregoing a POSITA would have been motivated to improve Liu’s LED module based on Robert’s teachings regarding a printed circuit board, encapsulant (“*mold parts*”) for the LEDs, and reflective sheets to improve electrical connectivity for the LEDs, the emissions from the LEDs, and the uniformity of the image with reflective sheets. EX1002-Krames, ¶¶143-144. A POSITA would have seen benefits in configuring Liu to have easily connected LEDs and LEDs that

provide a brighter and more uniform reflection of light from the reflective sheets. *Id.* “[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious.” *KSR*, 550 U.S. at 417. In other words, this combination would have involved “the mere application of a known technique”—Robert’s teachings regarding a printed circuit board, a mold part, and reflective sheets —“to a piece of prior art”—Liu’s LED module—that is “ready for the improvement.” EX1002-Krames, ¶144.

A POSITA would have reasonably expected to succeed in making the combination because POSITAs were aware of the benefits of using printed circuit boards, encapsulants (“*mold parts*”) for the LEDs, and reflective sheets for LEDs. EX1002-Krames, ¶145. These components were commonly considered by a POSITA in designing LCD backlight modules. EX1002-Krames, ¶145.

2. Claim 2. The backlight unit as claimed in claim 1, wherein the LED module comprises a printed circuit board, the LED on the printed circuit board, and a mold part on the LED.

Liu in view of Roberts and the knowledge of a POSITA renders obvious the claimed “*the LED module comprises a printed circuit board, the LED on the printed circuit board, and a mold part on the LED.*” EX1002-Krames, ¶¶146-153. Liu discloses:

In addition, the **board 104** acts not only to support the **LED light source 102** and conduct heat, but also has the function of providing the **LED light source 102** with **electrical connections to other components** because **various circuits (not shown) are installed thereon**. For this reason, the heat dissipation problem of the LED light source assembly structure 100 must be properly handled. If heat dissipation is not handled properly, not only will the circuits (not shown) on the board 104 and the backboard 106 be damaged, but the LED light source 102 may also be easily damaged. Since the structure provided in this embodiment does not use any bolts, there will be no problems such as overly complicated assembly and increased cost.

EX1003-Liu, 11. Although Liu teaches that its board 104 (claimed “*LED module*”) provides “**electrical connections to other components** because various circuits (not shown) are installed thereon,” Liu does not expressly disclose that claimed “*the LED module comprises a printed circuit board, the LED on the printed circuit board.*” However, Roberts expressly discloses a similar backlight unit with an LED module including a printed circuit board. EX1004-Roberts, ¶60. Roberts also discloses a “lighting panel according to some embodiments of the invention includes at least one tile, or an LED module having one or more LEDs mounted thereon.” EX1004-Roberts, ¶13. Specifically, Roberts discloses a “solid state lighting tile 10 may

include thereon a number of solid state lighting elements 12 arranged in a regular and/or irregular one- or two-dimensional array. The tile 10 may include, for example, a **printed circuit board (PCB)** on which one or more circuit elements, such as discrete light emitting components, may be mounted,” as illustrated in Fig. 1 reproduced below. EX1004-Roberts, ¶60.

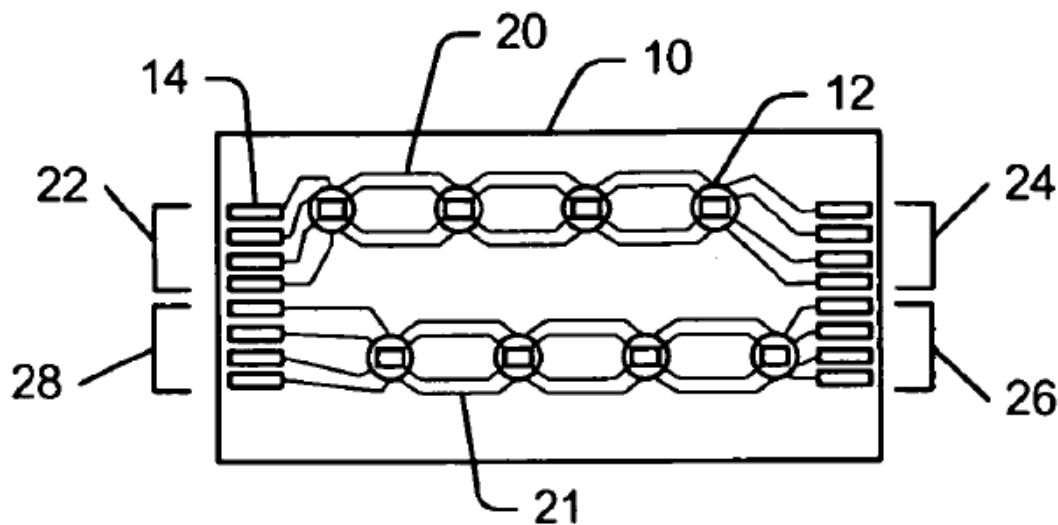


FIGURE 1

EX1004-Roberts, Fig. 1. Roberts further discloses that “[i]n the tile 10, four lighting elements 12 are serially arranged in a first path 20, while four lighting elements 12 are serially arranged in a second path 21,” and the “lighting elements 12 of the first path 20 are connected, for example via printed circuits.” EX1004-Roberts, ¶61. Roberts discloses that the “lighting elements 12” are “chip-on-board clusters including one or more LEDs.” EX1004-Roberts, ¶62. Roberts discloses that “a tile

10 may include a metal core PCB (MCPCB) including a metal core having thereon a polymer coating on which patterned metal traces (not shown) may be formed.” EX1004-Roberts, ¶60. Thus, as shown above, Roberts teaches the claimed “*the LED module comprises a printed circuit board, the LED on the printed circuit board,*” as it discloses that its “a **printed circuit board (PCB)** on which one or more circuit elements, such as discrete light emitting components, may be mounted.” EX1004-Roberts, ¶¶60.

It would have been obvious to a POSITA to modify Liu’s board 104 (claimed “*LED module*”), disclosed as providing “electrical connections to other components because various circuits (not shown) are installed thereon,” to implement the printed circuit board described in Roberts to provide the “electrical connections to other components.” EX1002-Krames, ¶¶148-150.

As to the claimed, “*mold part on the LED,*” Fig. 5 of Liu discloses LED light source 302. EX1003-Liu, Fig. 5. Although Liu’s light source 302 shown in Fig. 5 does not distinguish LED chip and a mold on the LED chip, a POSITA would have understood that the light source 302 would have included an encapsulant on the LED chip (claimed “*a mold part on the LED*”).

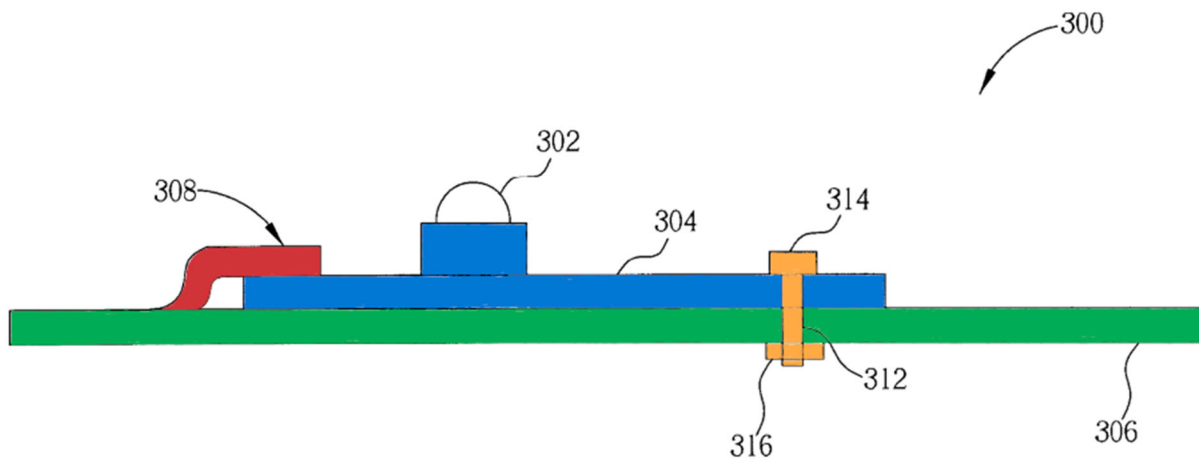


FIG. 5

EX1003-Liu, Fig. 5. Specifically, Roberts discloses that the LEDs “may be covered by an encapsulant 14, which may be clear and/or may include light scattering particles, phosphors, and/or other elements to achieve a desired emission pattern, color and/or intensity.” EX1004-Roberts, ¶66. Accordingly, it would have been obvious to a POSITA, in view of Robert’s teachings, to encapsulate the Liu’s LED light source (i.e. provide the claimed “*mold part on the LED*”) to improve the emissions from the LED. EX1002-Krames, ¶¶151-152.

Thus, Liu in view of Roberts and the knowledge of a POSITA renders obvious limitations claim 2. EX1002-Krames, ¶¶146-153.

3. Claim 6. The backlight unit as claimed in claim 1, comprising a reflective sheet on the LED module comprising an opening such that the LED is exposed.

Claim 7. The backlight unit as claimed in claim 6, wherein the reflective sheet reflects light emitted from the LED

upward.

Liu in view of Roberts and the knowledge of a POSITA renders obvious the claimed “*comprising a reflective sheet on the LED module comprising an opening such that the LED is exposed,*” and “*wherein the reflective sheet reflects light emitted from the LED upward.*” EX1002-Krames, ¶¶154-158.

As explained previously, it was obvious to a POSITA to apply Robert’s reflector sheet teachings to Liu with expected success, wherein a reflector sheet is arranged with Liu’s LEDs to improve a lighting panel. EX1002-Krames, ¶155. Indeed, Roberts explains the benefits of using reflective materials to improve LCD backlight units. EX1004-Roberts, ¶¶77-79. Roberts also discloses that “in addition to reflecting incident light, the **reflector sheet 50** may help disperse the incident light so that it is reflected in a random direction (i.e. a Lambertian reflector), which may improve the **uniformity** of the lighting panel 40.” EX1004-Roberts, ¶79.

Roberts discloses that “[i]n order to provide and/or improve light recycling in the lighting panel 40, a **reflector sheet 50** may be provided on the same side of the tile 10 as the lighting elements 12.” EX1004-Roberts, ¶77. Fig. 5A of Roberts, reproduced below, illustrates the “**reflector sheet 50.**”

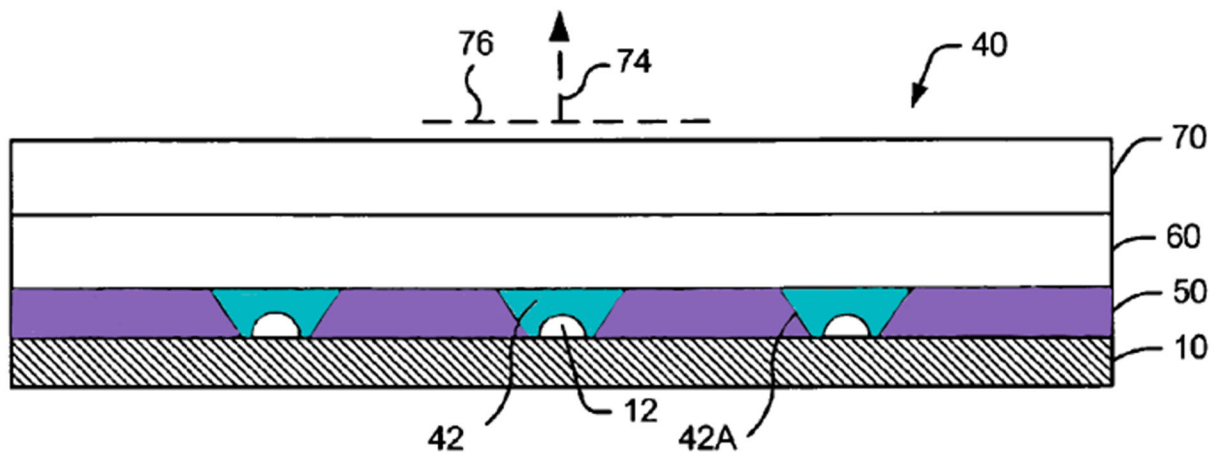


FIGURE 5A

EX1004-Roberts, Fig. 5A. Roberts further discloses that “**reflector sheet 50** may include a **plurality of apertures 42** therein, which **apertures 42** may align with the lighting elements 12 on the tile 10.” EX1004-Roberts, ¶79. Roberts disclosure of a “**reflector sheet 50**” teaches the claimed “*reflective sheet on the LED module*” and its “**plurality of apertures 42**” teaches the claimed “*opening such that the LED is exposed.*” Further, as shown in FIG. 5A, above, the “*the reflective sheet reflects light emitted from the LED upward.*” Indeed, a POSITA would have understood that the reflection by the reflector sheet 50 would have included “*upward,*” as it improves the uniformity of the image. EX1002-Krames, ¶¶156-157.

Thus, Liu in view of Roberts and the knowledge of a POSITA renders obvious claims 6-7. EX1002-Krames, ¶¶154-158.

4. **Claim 15. The display device as claimed in claim 13, wherein the LED module comprises a printed circuit board,**

the LED on the printed circuit board, and a mold part on the LED.

Liu in view of Roberts and the knowledge of a POSITA renders obvious the claimed “*the **LED module** comprises a printed circuit board, the **LED** on the printed circuit board, and a mold part on the **LED**.*” EX1002-Krames, ¶¶159-166. Liu discloses:

In addition, the **board 104** acts not only to support the **LED light source 102** and conduct heat, but also has the function of providing the **LED light source 102** with **electrical connections to other components because various circuits (not shown) are installed thereon**. For this reason, the heat dissipation problem of the LED light source assembly structure 100 must be properly handled. If heat dissipation is not handled properly, not only will the circuits (not shown) on the board 104 and the backboard 106 be damaged, but the LED light source 102 may also be easily damaged. Since the structure provided in this embodiment does not use any bolts, there will be no problems such as overly complicated assembly and increased cost.

EX1003-Liu, 11. Although Liu teaches that its board 104 (claimed “*LED module*”) provides “**electrical connections to other components** because various circuits (not shown) are installed thereon,” it does not expressly disclose that claimed “*the LED module comprises a printed circuit board, the LED on the printed circuit board.*”

However, Roberts expressly discloses a similar backlight unit with an LED module including a printed circuit board. Specifically, Roberts discloses a “lighting panel according to some embodiments of the invention includes at least one tile, or an LED module having one or more LEDs mounted thereon.” EX1004-Roberts, ¶13. Roberts also discloses a “solid state lighting tile 10 may include thereon a number of solid state lighting elements 12 arranged in a regular and/or irregular one- or two-dimensional array. The tile 10 may include, for example, a **printed circuit board (PCB)** on which one or more circuit elements, such as discrete light emitting components, may be mounted.,” as illustrated in Fig. 1 reproduced below. EX1004-Roberts, ¶60.

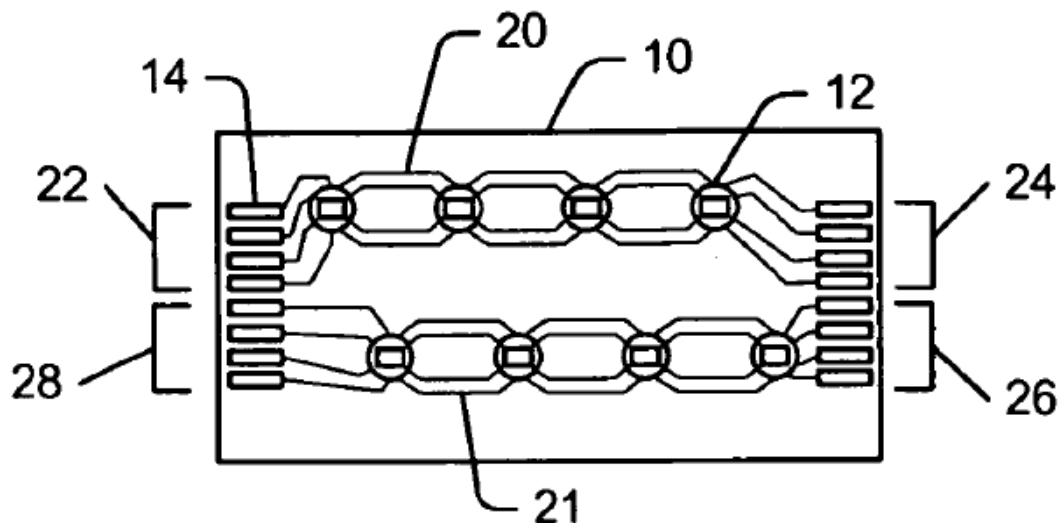


FIGURE 1

EX1004-Roberts, Fig. 1. Roberts further discloses that “[i]n the tile 10, four lighting

elements 12 are serially arranged in a first path 20, while four lighting elements 12 are serially arranged in a second path 21,” and the “lighting elements 12 of the first path 20 are connected, for example via printed circuits.” EX1004-Roberts, ¶61. Roberts discloses that the “lighting elements 12” are “chip-on-board clusters including one or more LEDs.” EX1004-Roberts, ¶62. Roberts discloses that “a tile 10 may include a metal core PCB (MCPCB) including a metal core having thereon a polymer coating on which patterned metal traces (not shown) may be formed.” Thus, Roberts teaches the claimed “*the LED module comprises a printed circuit board, the LED on the printed circuit board*” as it discloses that its “a **printed circuit board (PCB)** on which one or more circuit elements, such as discrete light emitting components, may be mounted.” EX1004-Roberts, ¶¶60.

It would have been obvious to a POSITA to modify Liu’s board 304 (claimed “*LED module*”), disclosed as providing “electrical connections to other components because various circuits (not shown) are installed thereon,” to implement the printed circuit board described in Roberts to provide the “electrical connections to other components.” EX1002-Krames, ¶¶161-162.

As to the claimed, “*mold part on the LED*,” Fig. 5 of Liu discloses an LED light source 302. EX1003-Liu, Fig. 5. Although Liu’s light source 302 shown in Fig. 5 does not distinguish LED chip and a mold on the LED chip, POSITA would have understood that light source 302 would have included an encapsulant on the LED

chip (claimed “a mold part on the LED”). EX1003-Liu, Fig. 5; EX1002-Krames, ¶163.

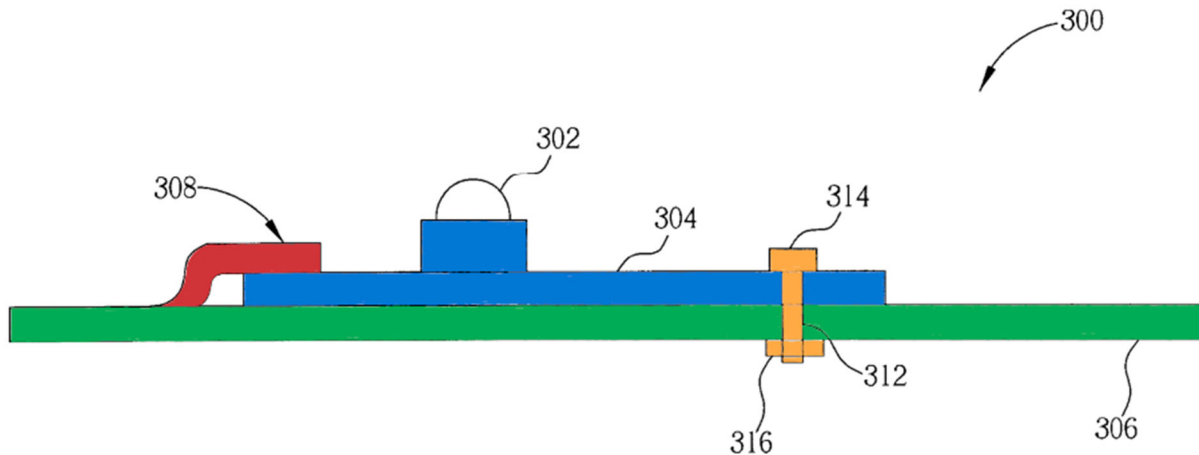


FIG. 5

EX1003-Liu, Fig. 5. Specifically, Roberts discloses that the LEDs “may be covered by an encapsulant 14, which may be clear and/or may include light scattering particles, phosphors, and/or other elements to achieve a desired emission pattern, color and/or intensity.” EX1004-Roberts, ¶66. Accordingly, it would have been obvious to a POSITA to encapsulate the Liu’s LED light source (i.e. provide the claimed “mold part on the LED”) to improve the emissions from the LED. EX1002-Krames, ¶164.

Thus, Liu in view of Roberts and the knowledge of a POSITA renders obvious claim 15. EX1002-Krames, ¶¶159-165.

5. Claim 18. The display device as claimed in claim 13, comprising a reflective sheet on the LED module

comprising an opening such that the LED is exposed.

Liu in view of Roberts and the knowledge of a POSITA renders obvious the claimed “*comprising a reflective sheet on the LED module comprising an opening such that the LED is exposed.*” EX1002-Krames, ¶166-170.

As explained previously, it was obvious to a POSITA to apply Robert’s reflector sheet teachings to Liu with expected success, wherein a reflector sheet is arranged with Liu’s LEDs to improve a lighting panel. EX1002-Krames, ¶167. Indeed, Roberts explains the benefits of using reflective materials to improve LCD backlight units. EX1004-Roberts, ¶¶77-79. Roberts also discloses that “in addition to reflecting incident light, the **reflector sheet 50** may help disperse the incident light so that it is reflected in a random direction (i.e. a Lambertian reflector), which may improve the **uniformity** of the lighting panel 40.” EX1004-Roberts, ¶79.

Roberts further discloses that “[i]n order to provide and/or improve light recycling in the lighting panel 40, a **reflector sheet 50** may be provided on the same side of the tile 10 as the lighting elements 12.” EX1004-Roberts, ¶77. Fig. 5A of Roberts, reproduced below, illustrates the “**reflector sheet 50.**”

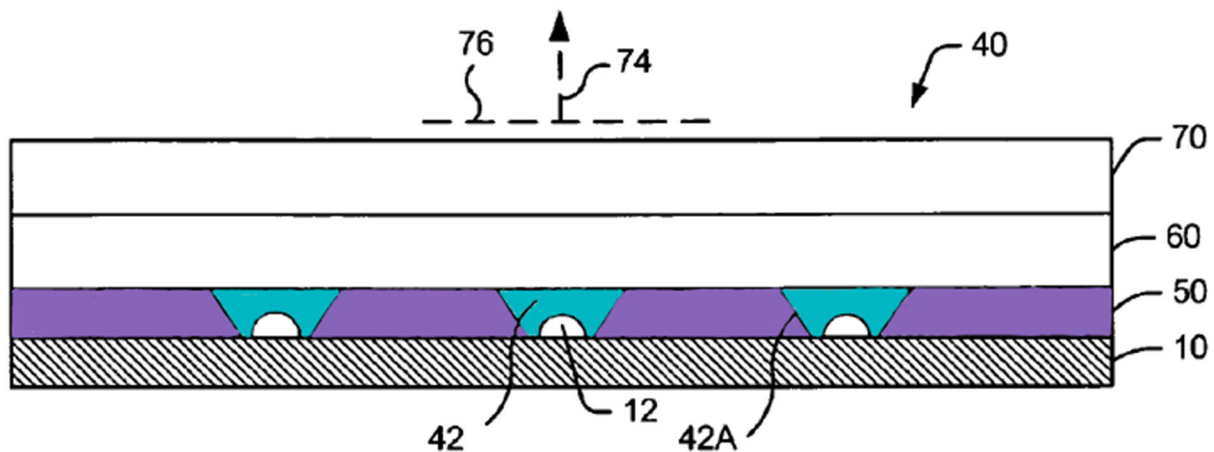


FIGURE 5A

EX1004-Roberts, Fig. 5A. Roberts further discloses that “**reflector sheet 50** may include a **plurality of apertures 42** therein, which **apertures 42** may align with the lighting elements 12 on the tile 10.” EX1004-Roberts, ¶79. Roberts’ disclosure of a “**reflector sheet 50**” teaches the claimed “*reflective sheet on the LED module*” and its “**plurality of apertures 42**” teaches the claimed “*opening such that the LED is exposed.*” EX1002-Krames, ¶¶168-169.

Thus, Liu in view of Roberts and the knowledge of a POSITA renders obvious claim 18. EX1002-Krames, ¶¶166-170.

C. Ground 3: Claim 10 is rendered obvious by Liu in view of Liu-660 and the knowledge of a POSITA

1. Overview of the combination; motivation to combine; expectation of success

Ground 3 relies on Liu in view of Liu-660 and addresses claim 10. Liu-660

and Liu share the same solo inventor, Pang-Hsuan Liu. Liu explains that “[w]hile improving the luminous efficacy of the backlight module, improving the luminous efficacy of the light-emitting device is a commonly used improvement solution.” EX1003-Liu, 5. Liu further discloses that “the industry has invested manpower and other resources in order to design and manufacture suitable products that not only meet the needs of LCD products, but also meet the requirements in terms of luminous efficacy and heat dissipation performance.” EX1003-Liu, 6.

Similar to Liu’s disclosure of a “a light emitting diode (LED) light source assembly structure used in a liquid crystal display (LCD) backlight module” (EX1003-Liu, 5), Liu-660 discloses various embodiments of “backlight module[s]” having LEDs (EX1006-Liu-660, ¶7). Liu-660 discloses that “backlight module 2 is composed of a backboard 21 and a plurality of lighting units 22 arranged in equal space and in parallel to one another on the backboard 21” and “[e]ach lighting unit 22 comprises a plurality of lighting elements 221 and a metal board 222 carrying the lighting elements 221.” EX1006-Liu-660, ¶17. Fig. 2A of Liu-660, reproduced below, illustrates these components of the backlight module 2.

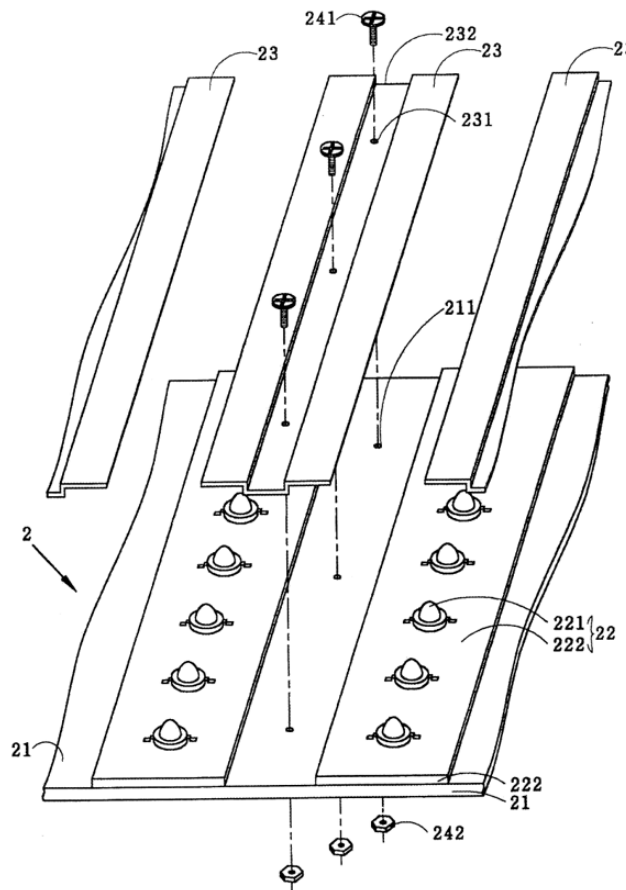


FIG. 2A

EX1006-Liu-660, Fig. 2A. Liu-660 further discloses that “when the rigid metal board 23 is moved and configured between two adjacent metal boards 222, the two sides of the rigid metal board 23 with good rigidity lap over the adjacent portions of the metal boards 222,” and “when the bolts 241 are passed through the holes 231 of the concave portion 232 and the holes 211 of the backboard 21, and locked together with nuts 242 (not shown in the figure), the rigid metal board 23 can be fastened on the backboard 21.” EX1006-Liu-660, ¶19. Liu-660 further discloses that “the strength of the compressing provided by the rigid metal board 23 can fasten the

adjacent boards 222 on the backboard 21.” EX1006-Liu-660, ¶19. As shown in Fig. 2A above, the rigid board 23 is separated from the case, backboard 21.

Based on the foregoing a POSITA would have been motivated to improve Liu’s LED module with the Liu-660s teachings regarding a member separate from the case (rigid board 23) to help exert a compressing force between the LED modules (lighting unit 22) and the case (backboard 21). EX1002-Krames, ¶¶1723-174. A POSITA would have seen benefits in configuring Liu to quickly and easily secure the LED modules with the separate member, rigid board 23, taught in Liu-660. *Id.* “[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious.” *KSR*, 550 U.S. at 417. In other words, this combination would have involved “the mere application of a known technique”—Liu-660’s teachings regarding using a separate member to hold the LED module—“to a piece of prior art”—Liu’s LED module—that is “ready for the improvement.” EX1002-Krames, ¶174.

A POSITA would have reasonably expected to succeed in making the combination because POSITAs were aware of the technique of using separate members to hold LED modules, as taught by Liu-660. EX1002-Krames, ¶175. These components were commonly considered by a POSITA in designing backlight modules, as taught by Liu-660. EX1002-Krames, ¶175.

2. Claim 10. The backlight unit as claimed in claim 1, wherein the bending part is formed with a member separated from the case.

Liu in view of Liu-660 and the knowledge of a POSITA renders obvious the claimed “*wherein the bending part is formed with a member separated from the case.*” EX1002-Krames, ¶¶176-181.

As established in Ground 1, claim 9, Liu expressly discloses an embodiment where “*the bending part is integrated with the case.*” However, Liu does not expressly disclose a “*bending part*” that “*formed with a member separated from the case,*” as recited in claim 10. Nonetheless, the related reference of Liu-660, which shares the same inventor as Liu, discloses a “*bending part*” that “*formed with a member separated from the case.*” EX1002-Krames, ¶177.

As shown in Fig. 2A of Liu-660 reproduced below, Liu-660 discloses that “backlight module 2 is composed of a backboard 21 and a plurality of lighting units 22 arranged in equal space and in parallel to one another on the backboard 21” and “[e]ach lighting unit 22 comprises a plurality of lighting elements 221 and a metal board 222 carrying the lighting elements 221.” EX1006-Liu-660, ¶17.

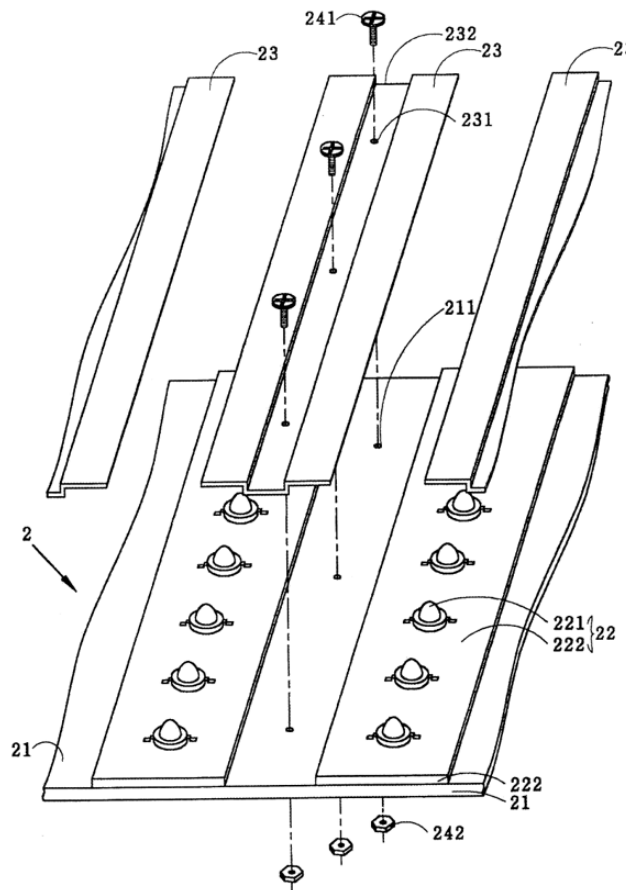


FIG. 2A

EX1006-Liu-660, Fig. 2A. Liu-660 discloses that “when the rigid metal board 23 is moved and configured between two adjacent metal boards 222, the two sides of the rigid metal board 23 with good rigidity lap over the adjacent portions of the metal boards 222,” and “when the bolts 241 are passed through the holes 231 of the concave portion 232 and the holes 211 of the backboard 21, and locked together with nuts 242 (not shown in the figure), the rigid metal board 23 can be fastened on the backboard 21.” EX1006-Liu-660, ¶19. Liu-660 further discloses that “the strength of the compressing provided by the rigid metal board 23 can fasten the adjacent

boards 222 on the backboard 21.” EX1006-Liu-660, ¶19. As shown in Fig. 2A above, the “rigid board 23” is a member separated from the case. EX1002-Krames, ¶¶178-179. Further, Liu-660 discloses that “**the rigid board exerts a compressing strength** to fasten the adjacent lighting unit or units onto the backboard.” EX1006-Liu-660, ¶8. Thus, Liu-660 teaches the claimed a “*bending part*” that is “*formed with a member separated from the case.*” EX1002-Krames, ¶¶178-179.

As discussed above in Section VIII(C)(1), it would have been obvious to improve Liu’s LED module with the Liu-660’s teachings regarding a member separate from the case (rigid board 23) to help exert a compressing strength between the LED modules (lighting unit 22) and the case (backboard 21). EX1002-Krames, ¶180. A POSITA would have seen benefits in configuring Liu to quickly and easily secure the LED modules with the separate member, rigid board 23, as taught in Liu-660. *Id.* Both the “stamped protrusion part 308” in Liu and the “rigid board 23” in Liu-660 serve to clamp the LED module to the case. *Compare* EX1003-Liu, 8 (“By utilizing the clamping force applied to the board by the backboard and the protrusion part, the board can not only be tightly held onto the backboard, but the contact surface between the board and the backboard will also be intact and good”), *with* EX1006-Liu-660, ¶8 (“the rigid board exerts a compressing strength to fasten the adjacent lighting unit or units onto the backboard.”). Accordingly, improving Liu’s “stamped protrusion part 308” with Liu-660’s “rigid board 23” would have been a

simple substitution obvious to one of skill in the art. EX1002-Krames, ¶180.

Thus, Liu in view of Liu-660 and the knowledge of a POSITA renders obvious claim 10. EX1002-Krames, ¶¶176-181.

IX. MANDATORY NOTICES

A. Real Party-In-Interest

The real parties-in-interest are: Hisense USA Corp., Hisense Company Ltd., Hisense Visual Technology Co. Ltd., Hisense International Co. Ltd., Hisense International (Hong Kong) America Investments Co. Ltd., Hisense International (HK) Co. Ltd., Guiyang Hisense Electronics Co., Ltd., Hisense Electronics Manufacturing Company of America Corp., Hisense Electronica Mexico S.A. de C.V.

B. Related Matters

The '537 Patent is asserted in the following litigation: *Light Guide Innovations LLC v. Hisense Co. Ltd. et al.*, Case No.: 2:25-cv-00051-RWS-RSP (Eastern District of Texas) (“the Litigation”).

Petitioner further notes that it has filed, or intends to file, inter partes reviews against the following additional patents owned by Patent Owner, which patents are also the subject of the Litigation:

- *Inter Partes* Review No. 2025-01526 challenging U.S. Patent No. 8,408,778; and

- *Inter Partes* Review No. 2025-01537 challenging U.S. Patent No. 7,936,415.

The undersigned is unaware of any other any other judicial or administrative matter that would affect, or be affected by, a decision in this proceeding.

C. Lead and Back-Up Counsel

X. PETITIONER DESIGNATES THE FOLLOWING LEAD AND BACK-UP COUNSEL:

Lead Counsel	Back-Up Counsel
Heath J. Briggs (Reg. No. 54,919) Greenberg Traurig, LLP 1144 15th St. Suite 3300 Denver, CO 80202 Telephone: 303-685-7418 Facsimile: 720-904-6118 BriggsH@gtlaw.com	Trenton A. Ward (Reg. No. 59,157) Greenberg Traurig, LLP Terminus 200 333 Piedmont Road NE, Suite 2500 Atlanta, GA 30305 Telephone: 678-553-2470 Facsimile: 678-553-2212 Trenton.Ward@gtlaw.com
Back-Up Counsel	Back-Up Counsel
Stephen M. Ullmer (<i>pro hac vice</i> to be filed) Greenberg Traurig, LLP 0260 SW Greenburg Road Suite 400 Portland, OR 97223 Tel: 303-572-6579 ullmers@gtlaw.com	Benjamin P. Gilford (Reg. No. 72,072) Greenberg Traurig, LLP 90 South Seventh Street, Suite 3500 Minneapolis, MN 55402 Telephone: 612-259-9683 Facsimile: 312-873-4694 GilfordB@gtlaw.com

A. Service Information under 37 C.F.R. §42.8(b)(4)

Service on Petitioner may be made by mail or hand delivery to: Greenberg Traurig, LLP, 1144 15th St., Suite 3300, Denver, CO 80202. Petitioner consents to and prefers electronic service by emailing GT-Hisense-IPRs@gtlaw.com and

counsel of record (shown above).

XI. STIPULATION

Petitioner hereby stipulates that, if this IPR is instituted, Petitioner will not pursue any grounds raised in this Petition, or any grounds Petitioner could have reasonably raised in this Petition, in the Litigation or any parallel proceeding. *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 at 12-13 (PTAB Dec. 1, 2020) (precedential). Petitioner further stipulates that, if the PTAB institutes review in this proceeding, it will not rely in the Litigation on any product or system that is “based on the same evidence presented” in this IPR and will not advance a theory of obviousness based on the combination of prior art that is asserted in any ground presented in the Petition with any other prior art, including product or system prior art, against the challenged claims. Cf. *SAP America, Inc. v. Cyandia, Inc.*, IPR2024-01496, Paper 13 at 9 (PTAB Apr. 7, 2025).

XII. FEES

The required fee is being paid electronically through P-TACTS.

Dated: September 16, 2025

Respectfully Submitted,

By: /s/ Heath J. Briggs
Heath J. Briggs (Reg. No. 54,919)
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Denver, CO 80202
Telephone: 303-685-7418
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BriggsH@gtlaw.com

Counsel for Petitioner

CERTIFICATE OF COMPLIANCE

This petition complies with the word count limits set forth in 37 C.F.R. § 42.24(a)(i), effective May 2, 2016, because this Petition contains 11,300 words, excluding the parts of the petition exempted by 37 C.F.R. § 42.24(a), as determined using the word count provided by Microsoft Word, which was used to prepare this Petition.

Dated: September 16, 2025

Respectfully Submitted,

By: /s/ Heath J. Briggs
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BriggsH@gtlaw.com

Counsel for Petitioner

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 42.6(e) and 42.105(a), the undersigned certifies that on September 16, 2025, I caused a true and correct copy of the Petition together with the exhibits to be served via Priority Mail Express® (or by means at least as fast and reliable as Priority Mail Express®) on the Patent Owner at the correspondence address of record for U.S. Patent No. 8,267,537 as follows:

BIRCH STEWART KOLASCH & BIRCH, LLP
2600 Park Tower Drive
Suite 600
Vienna, VA 22180-7371
UNITED STATES

Dated: September 16, 2025

Respectfully Submitted,

By: /s/ Heath J. Briggs
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1144 15th St. Suite 3300
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Counsel for Petitioner