

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Astera Manufacturing Ltd.,
and
Chauvet & Sons, LLC

v.

ElectraLED Inc.,
Patent Owner.

Case [To be assigned]
U.S. Patent No. 7,651,245

**PETITION FOR *INTER PARTES* REVIEW OF
CLAIMS 21-28 OF U.S. PATENT NO. 7,651,245
UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. §42.100 *et seq.***

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I. INTRODUCTION

Petitioners Astera Manufacturing Ltd. and Chauvet & Sons, LLC challenge Claims 21-28 of US 7,651,245 (“’245”) (EX1001). The ’245 claims an LED light fixture that includes (1) an LED assembly mounted to a housing, (2) a power supply located within a rear receptacle of the housing, and (3) an array of fins which define the rear receptacle and dissipate heat generated by the LEDs. The ’245 also recites that its array of fins dissipates heat generated by LEDs, without requiring use of a fan.

However, this was not new at the time of the ’245. LED light fixtures having heat dissipation fins that define a rear receptacle for a power supply before this were well-known. For example, TW94204571U, published as TWM277876, (“**Lin**”) (EX1005, EX1006), discloses an LED fixture which includes an array of heat dissipation fins that define a rear receptacle for a power supply:

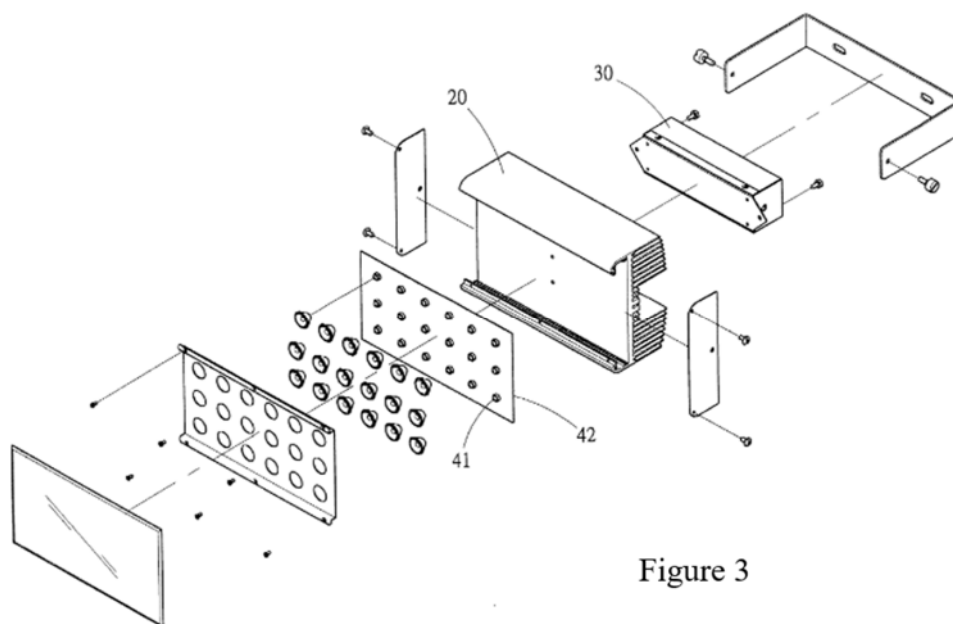


Figure 3

(Lin, Fig. 3.)

Similarly, U.S. 7,465,066 (“**Chen**”) (EX1007) discloses a lighting fixture having an array of fins, including fins which surround, and thereby define, a rear receptacle into which a power supply is placed.

Neither Lin nor Chen was considered during prosecution of the ’245. Each primary reference, alone and in combination with certain other prior art, renders claims 21-28 of the ’245 invalid.

II. MANDATORY NOTICES

A. Real Parties-in-Interest

Astera Manufacturing Limited and Chauvet & Sons, LLC are Petitioners. Astera Distribution Limited and Astera LED Technology GmbH are real parties-

in-interest of Astera Manufacturing Limited.

B. Related Matters

Patent Owner ElectraLED, Inc. asserted the '245 in two lawsuits in the Eastern District of Texas on July 10, 2024:

- Case No. 2-24-cv-00512 against Astera LED Technology GmbH. Patent Owner filed an amended complaint on November 19, 2024 additionally naming Petitioner Astera Manufacturing Ltd. and Astera Distribution Ltd. as defendants (“**Astera case**”).
- Case No. 2-24-cv-00511 against Chauvet & Sons, LLC (“**Chauvet case**”).

Patent Owner asserted the '245 in a third lawsuit in the Eastern District of Texas on September 10, 2024:

- Case No. 2-24-cv-00741 against Traxon Technologies limited (“**Traxon case**”).

Patent Owner asserted the '245 in a fourth lawsuit in the Eastern District of Texas on April 4, 2025:

- Case No. 2-25-cv-00338 against LMPG Inc. (“**LMPG case**”).

C. Counsel and Service Information

Lead counsel is Joe Raffetto (Reg. No. 66,218). Backup counsel is Scott Hughes (Reg. No. 68,385). Service information is as follows:

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III. NOTICE OF FEES PAID

Fees are submitted herewith. If additional fees are due during the proceeding, the undersigned authorizes the Office to charge them to Deposit Account No. 50-1349.

IV. CERTIFICATION OF GROUNDS FOR STANDING

Petitioners certify that the '245 is available for *inter partes* review, and that it is not barred or estopped from requesting this review.

V. PRECISE RELIEF REQUESTED

The relief requested is cancellation of the challenged claims, as follows:

Ground	References	Claims ¹	Basis
1	Lin	21-23, 25-26	102/103
2	Lin, Zeng, Lodhie	24	103
3	Lin, Moriyama	27	103
4	Lin, Nishimoto, Cunningham	28	103

¹ Independent claims in bold.

Ground	References	Claims ¹	Basis
5	Chen	21-23, 26	102/103
6	Chen, Lodhie	24	103
7	Chen, Lin	25	103
8	Chen, Moriyama	27	103
9	Chen, Nishimoto, Cunningham	28	103

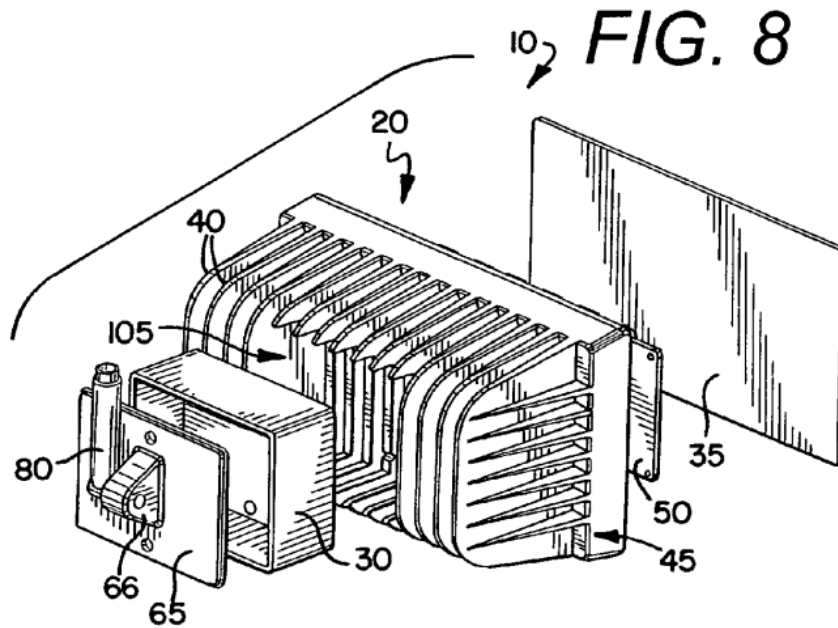
VI. OVERVIEW OF THE '245

A. Subject Matter of the '245

The '245 explains that “conventional light fixtures” for commercial use include “an externally-mounted power supply,” which is “prone to being struck by forklifts and other large objects” in “high-traffic” commercial settings. ('245, 3:8-11.) However, an internal power supply “is susceptible to failure from heat generated by the light engine.” (*Id.*, 1:59-61.) Therefore, the '245 allegedly provides an “LED light engine” with an “internal power supply” that “includes several novel heat management features designed to thermally isolate the power supply.” (*Id.*, 1:48-53; 1:61-64.) For example, the '245 lists “heat management components” designed to reduce “risk of failure,” including “fins 40 arrayed about the aluminum housing,” a “thermal pad,” and a “void 125 between the power module 70 and the main body.” (*Id.*, 8:3-16.)

Independent Claim 21 of the '245 focuses on physical features of the LED light fixture as shown in the figures and described in the specification. (*Id.*, Claim

21, Figs. 5, 7-8.) For example, Claim 21 recites an “array of fins” which “define a rear receptacle” in which a “power supply” resides:



(*Id.*, Claim 21, Fig. 8.) Claim 21 lists several additional features of the LED “light engine assembly” and the “housing” in which it is mounted, and notes that “during operation, heat generated by the LEDs” is “dissipated by the array of fins without the use of a fan.” (*Id.*, Claim 21.)

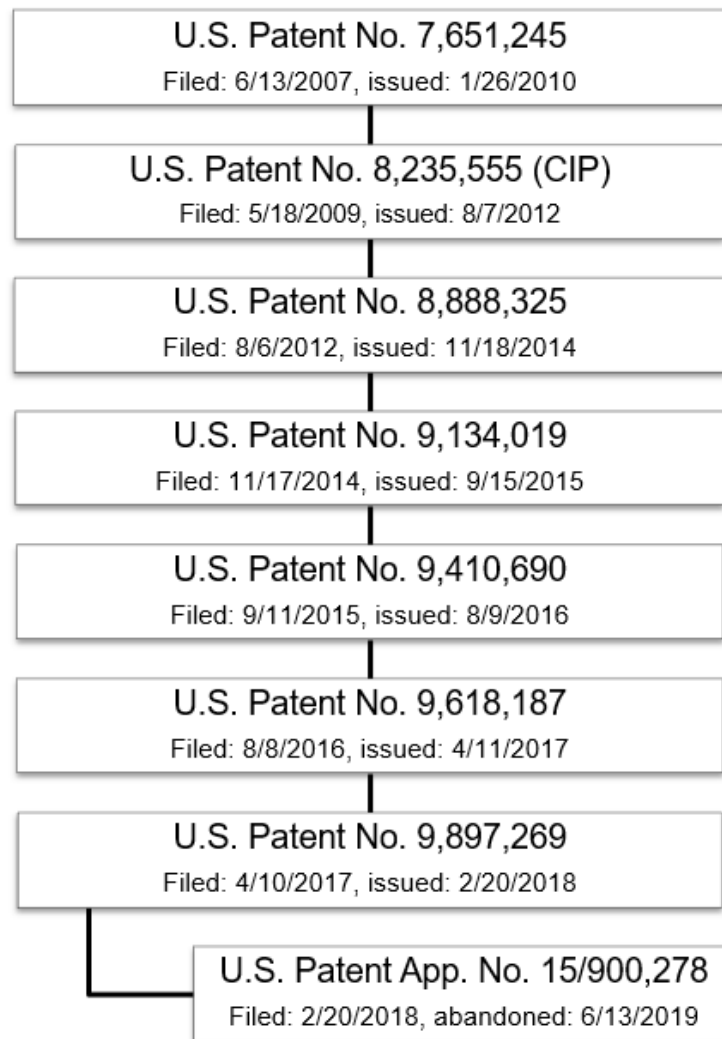
B. Prosecution History of the '245

The '245 was filed on June 13, 2007, and issued on January 26, 2010.

The Examiner issued one prior art rejection during prosecution, rejecting certain claims based on US 2005/0128752 (“Ewington”), US 7,274,302 (“Stevenson”), and US 7,431,477 (“Chou”). (EX1002, ’245 File History at 56-61, Non-Final Rejection mailed Jan. 29, 2009.) In response, Patent Owner made no

arguments, instead cancelling the rejected claims and submitting several new claims in their place. (*Id.*, 74-80, Non-Final Rejection Response dated July 6, 2009.) A Notice of Allowance was then issued in September 2009. (*Id.*, 84-90, Notice of Allowance and Fees Due mailed Sep. 9, 2009.)

The '245 is the ultimate parent of the following patent family:



VII. CLAIM CONSTRUCTION AND POSITA DEFINITION

A. Claim Construction

Claims in an *inter partes* review “shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” 37 C.F.R. § 42.100(b). Unless indicated otherwise, all claim terms herein are given such ordinary and customary meaning.

B. Definition of a Person of Ordinary Skill in the Art

A person of ordinary skill in the art (“**POSITA**”) in the field of the ’245 would have had a good working knowledge of electrical engineering and lighting systems. (Coleman Decl., ¶¶19-20.)² She would have gained this through an undergraduate degree in electrical engineering, physics, optical engineering, physics, or similar disciplines, along with two years of experience working with lighting devices and lighting systems. The more education one has, the less experience needed to attain an ordinary level of skill. (*Id.*) Similarly, more experience in the field may serve as a substitute for formal education. (*Id.*)

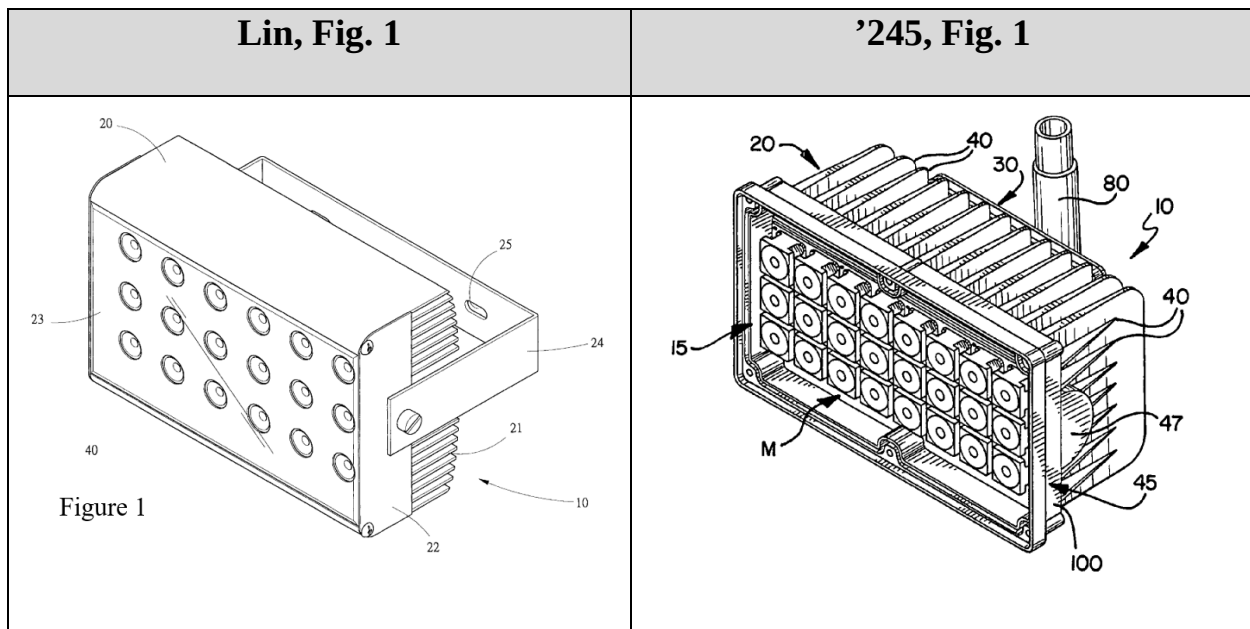
VIII. ANALYSIS OF GROUNDS FOR UNPATENTABILITY

² Dr. Coleman is an expert in LED lighting systems, among other things. His Declaration is included as EX1003.

A. Ground 1 – Lin Anticipates and Renders Obvious Claims 21-23, 25, and 26

Lin is TW94204571U³ Lin was filed March 24, 2005, and published October 11, 2005. Lin is prior art under at least pre-AIA § 102(b).

Lin discloses an “LED searchlight” which is nearly identical to the ’245’s LED light fixture:



(Compare Lin, Fig. 1, with '245 Fig. 1)

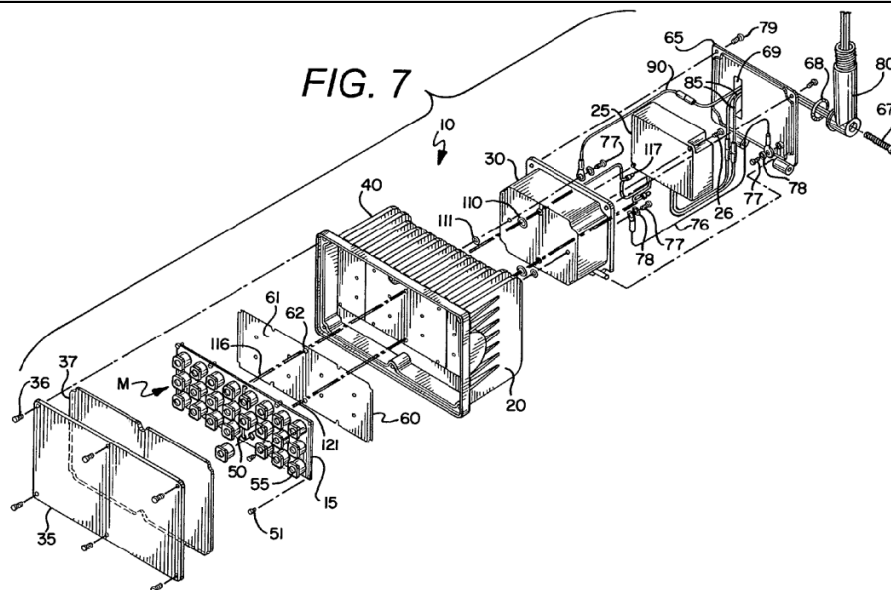
In Lin, as in the '245, a “power supply unit” is located in a recess defined by “heat dissipation fins” of different lengths in the “back end” of a “heat

³ Citations to “Lin” refer to the Certified English Translation of TW94204571U, published as TWM277876, attached as EX1006. Page numbers and line numbers refer to the page and line numbers shown in EX1006, and do not correspond to the page and line numbers in the original Chinese version.

(Compare Lin, Fig. 3, with '245 Fig. 7)

Figure 3

'245, Fig. 7



(Compare Lin, Fig. 3, with '245 Fig. 7)

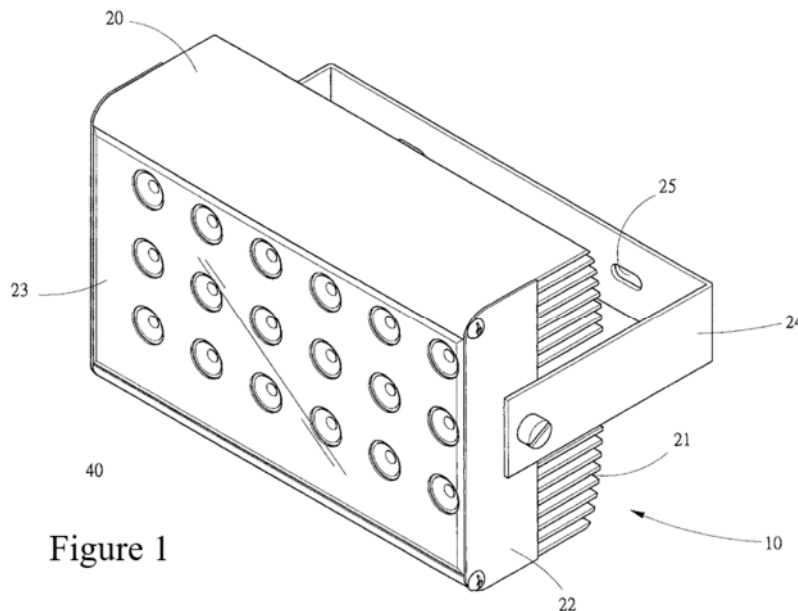
Lin explains that its LED fixture serves to “increase the heat energy released during the operation of the searchlight through the heat dissipation fins...thereby prolonging the service life of the LEDs.” (*Id.*, 4:14-16.)

1. Independent Claim 21

Lin anticipates and renders obvious Claim 21. (Coleman Decl., ¶¶36-56.)

21[Pre]: A LED light fixture comprising:

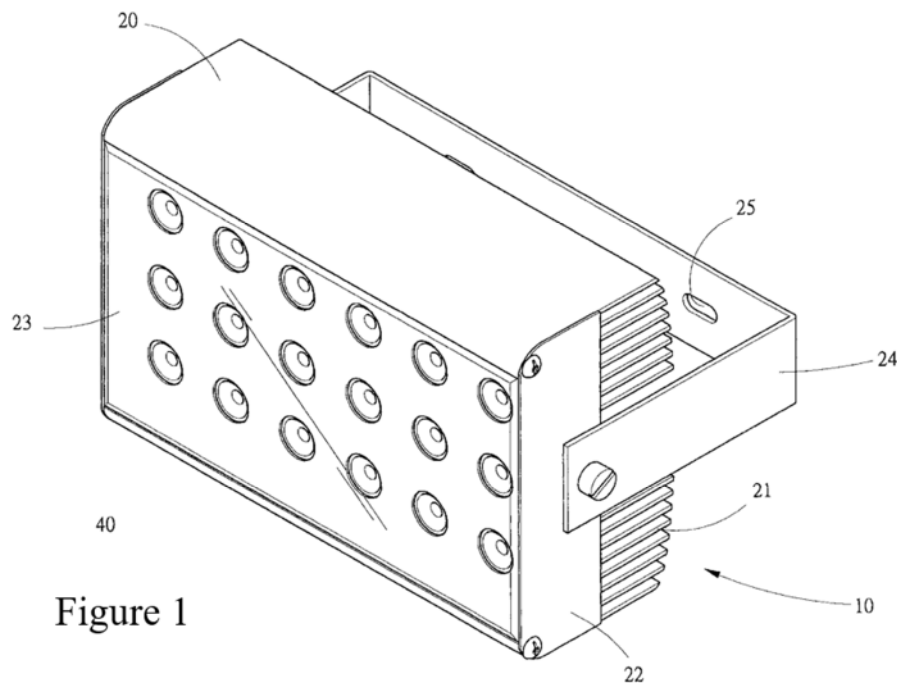
Lin discloses Claim 21[Pre] to the extent limiting. (*Id.*, ¶37.) Lin discloses “an LED searchlight” lighting fixture:



(Lin, Fig. 1; 3:4-5, 3:29-4:3, Figs. 2-3; *see also infra* Section VIII(A)(1), Ground 1, Claim 21[B.i-ii].) For example, Lin’s LED searchlight “can be fixed to [a] wall surface” for use as “emergency lighting.” (*Id.*, 6:6-11.).

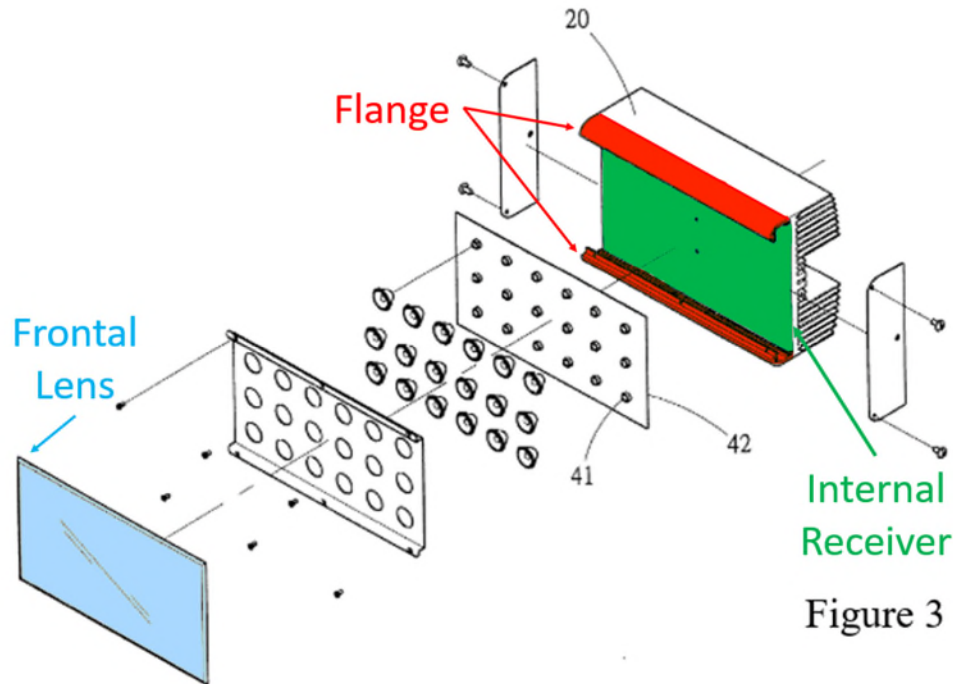
21[A.i]: a housing including a flange, an internal receiver, a frontal lens, and an array of fins...

Lin discloses Claim 21[A.i]. (Coleman Decl., ¶¶38-45.) Lin discloses a housing including “heat dissipation unit (20)” having a flange, “plurality of heat dissipation fins (21),” “baffle plates (22),” “light-transmissive plate (23),” and “power supply unit (30)”:



(Lin, Fig. 1; 4:4-10; 4:26-30; 4:33-5:10; *see also* Lin, Figs. 2-3.) In addition, Lin discloses “a housing space is formed by the baffle plates (22) on both sides and the light-transmissive plate (23) at the front end as well as the heat dissipation unit (20).” (*Id.*, 4:26-30.) And, the “light-emitting unit (40)...is arranged in the housing space at the front end of the heat dissipation unit (20).” (*Id.*, 4:33-5:1.)

First, Lin’s housing has a flange.⁴ (Coleman Decl., ¶¶39-41.) For example, the “heat dissipation unit (20)” includes a flange at its “front end” that defines the “housing space” in which the LEDs are arranged and to which the light-transmissive plate (23) (*i.e.* lens) is mounted:



(Lin, Fig. 3 (annotated), 4:26-30; *see also* Fig. 2; Coleman Decl., ¶¶40-41.) As can be seen in Figure 3 above, the “flange” in Lin is a protrusion or extension on the

⁴ The '245 does not require any particular flange, and explains that a “flange” simply defines an “inwardly extending receiver 95” and provides a mounting surface for the lens. ('245, 4:12-16, Fig 5.) This is precisely what Lin’s “flange does.” (Coleman Decl., ¶39, n.3.)

front of the heat dissipation device 20, which includes a lip or protrusion for attachment of the “light-transmissive plate (23)” (*i.e.*, frontal lens). (Lin, Figs. 1-3; Coleman Decl., ¶¶40-41.) Additionally, Lin discloses a “cover plate (44)” which is “fixed on the heat dissipation unit (20).” (*Id.*, Fig. 2, 5:4-7; *see also* Fig. 3; Coleman Decl., ¶¶40-41.)

Second, Lin’s housing includes an internal receiver.⁵ (Coleman Decl., ¶42.) Lin discloses that “an “internal receiver” at the front end of the heat dissipation unit 20 defined by the flange portions:

⁵ The ’245 explains the receiver is “defined by a flange” and “provides a mounting surface for the light engine.” (’245, 4:12-16.)

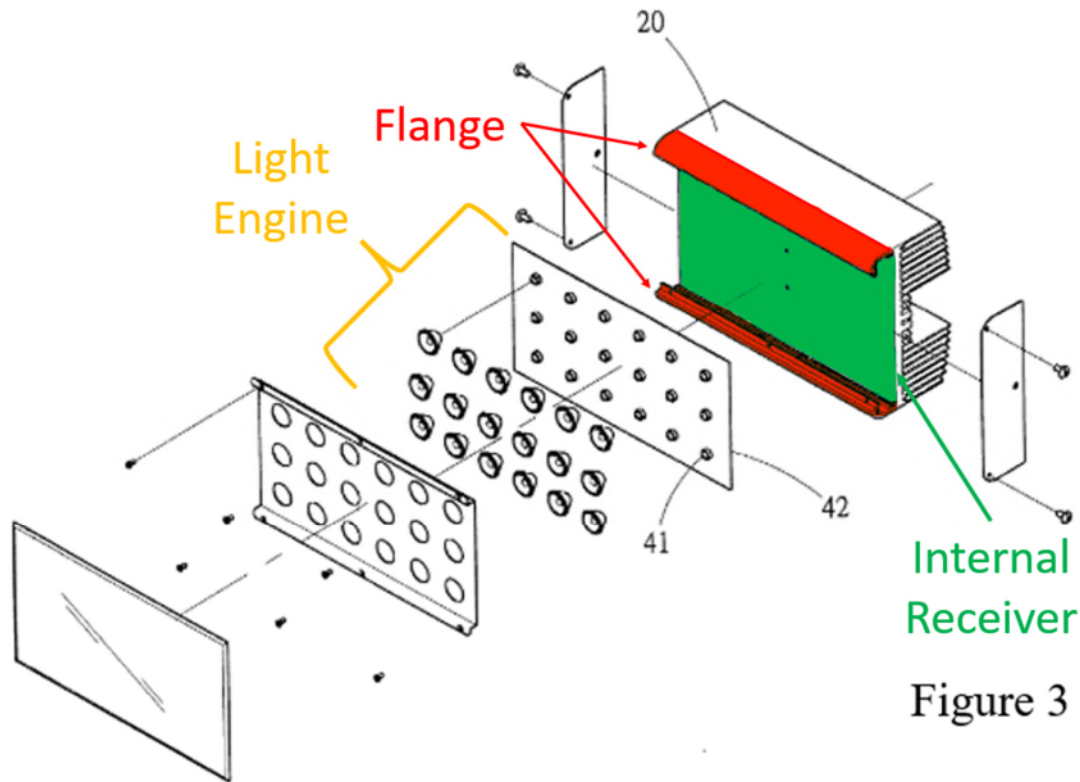


Figure 3

(Lin, Fig. 3 (annotated), 4:33-5:10, 6:21-26; *see also* Fig. 2.) This internal receiver, which Lin refers to as part of its “housing space” at the front of the unit, provides a mounting surface for the “light-emitting units” that include LEDs and printed circuit boards. (*Id.*, 4:33-5:10 (noting that the “light emitting unit is arranged in the housing space at the front end of the heat dissipation unit (20)” and is “fixed on the heat dissipation unit (20).”) In particular, as shown in Figure 2 above, Lin’s “heat dissipation unit 20” has a flat front surface, defined by the flange portion, on which the “light-emitting unit (40)” is mounted. (*Id.*, Figs. 2-3; Coleman Decl., ¶42.)

Third, Lin discloses the housing includes a frontal lens. (Coleman Decl., ¶43.) Lin discloses “a light-transmissive plate (23),” or lens, that is “arranged at the front end” of the “heat dissipation unit (20)”:

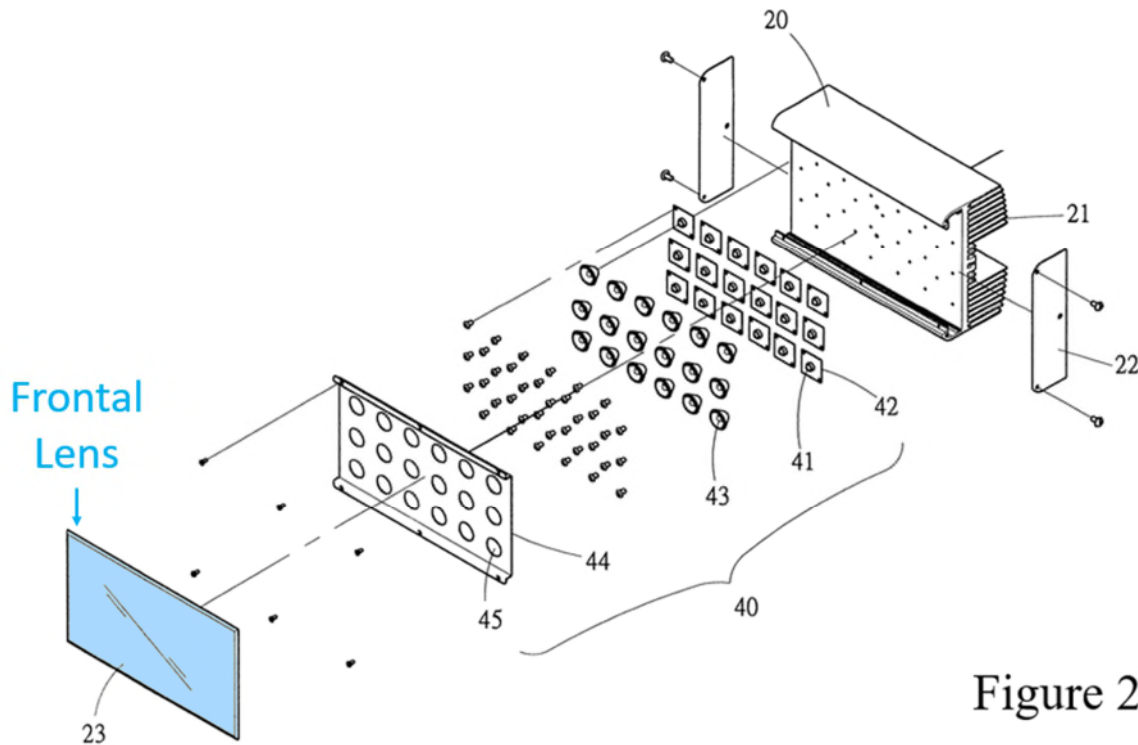
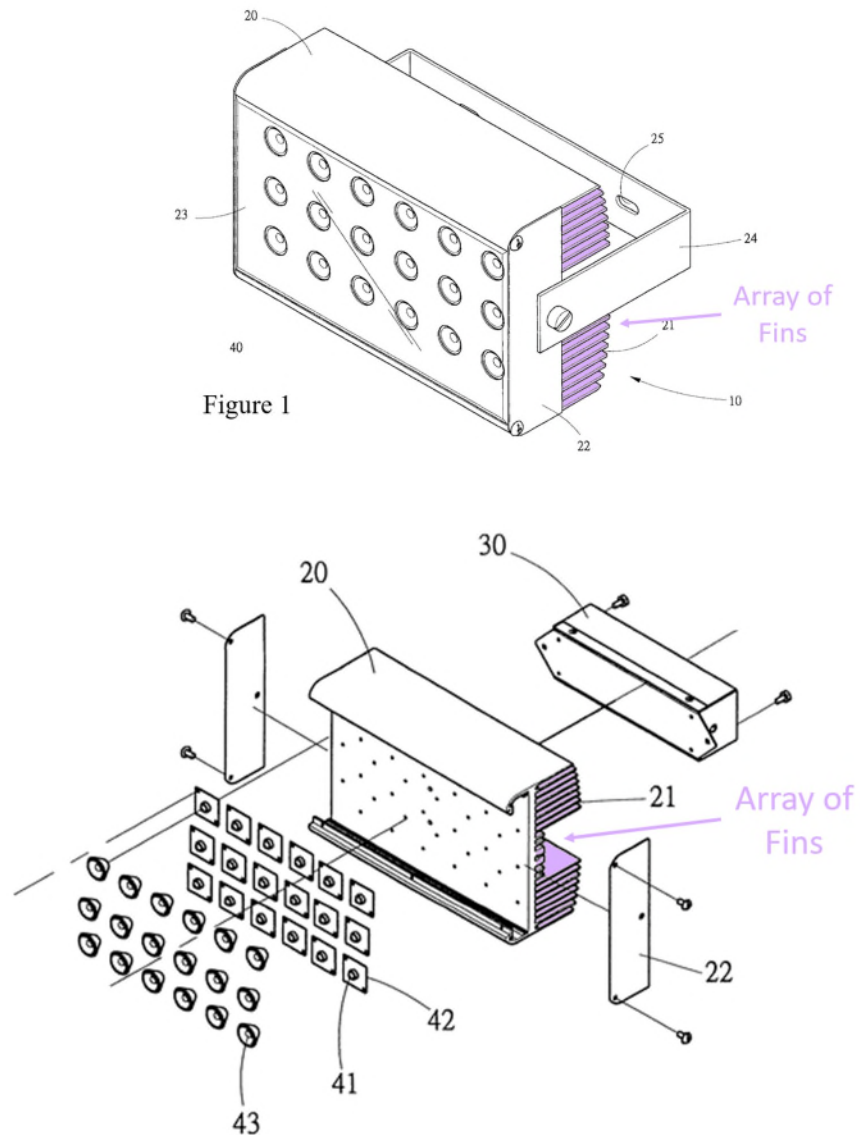


Figure 2

(*Id.*, Fig. 2 (annotated), 4:18-30; *see also* Figs. 1, 3.) Lin explains that “light emitted by the LEDs (41) is converged after passing through the cover bodies, and the converged light passes through the through holes (45) on the cover plate (44) and the light-transmissive plate (23) at the front end of the heat dissipation unit (20) before being released outward.” (*Id.*, 5:11-19.) That is, the “light-transmissive plate (23)” is the final lens that the light passes through before being emitted from the lighting fixture. (Coleman Decl., ¶43.)

Fourth, Lin discloses that the housing includes an array of fins. (Coleman Decl., ¶44; *see also infra* Section VIII(A)(1), Ground 1, Claim 21[A.ii].) Lin discloses that “the rear of the heat dissipation unit (20) is provided with a plurality of heat dissipation fins (21)”:

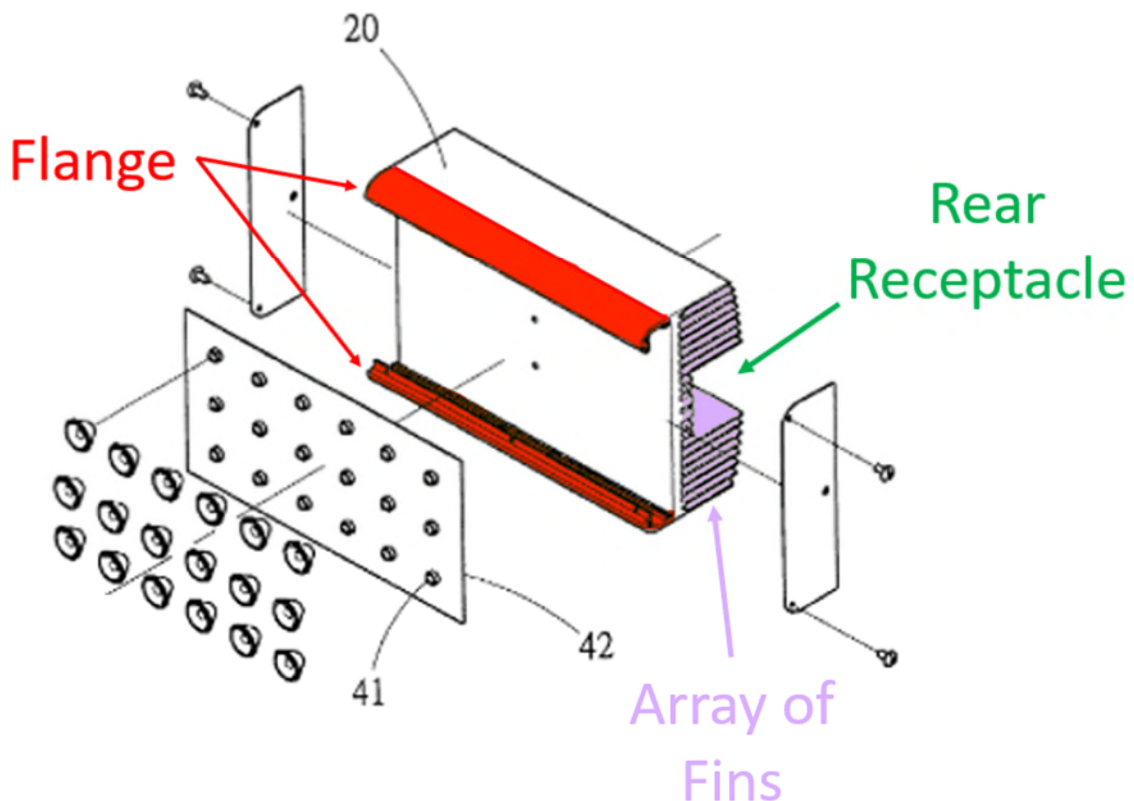


(*Id.*, Figs. 1-2 (annotated), 4:4-10, 4:18-32, 6:1-5; *see also* Fig. 3.)

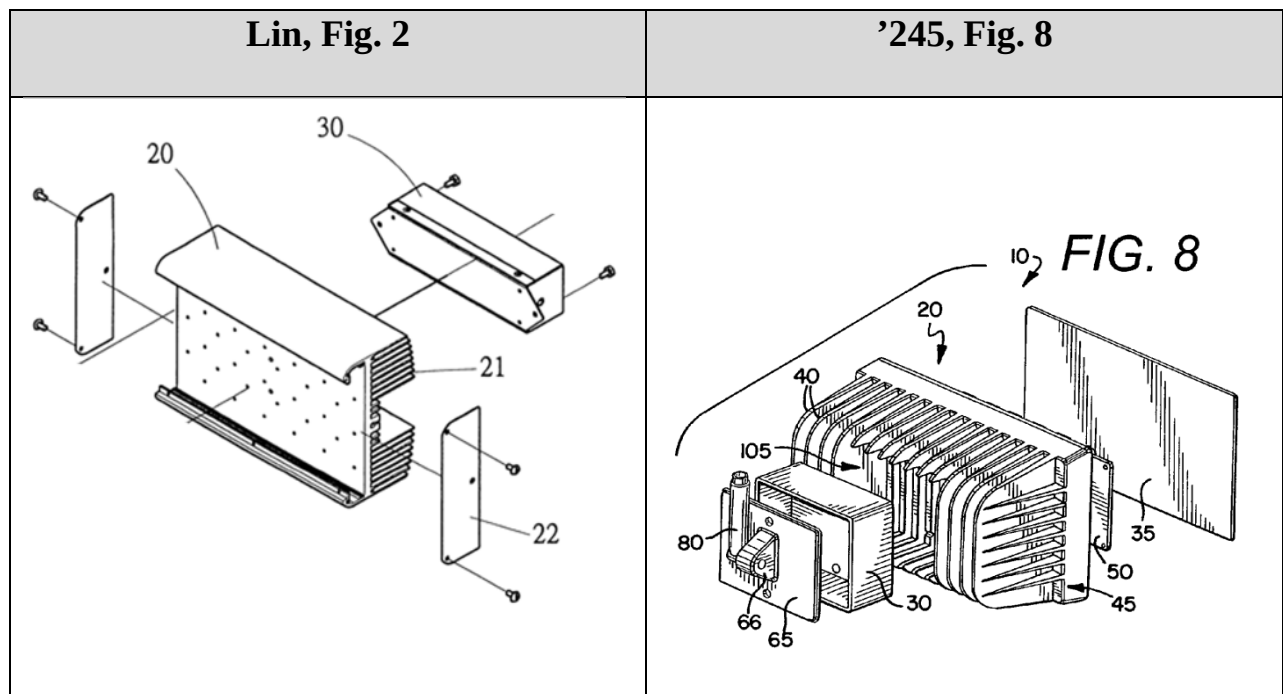
Accordingly, Lin discloses a housing including a flange, an internal receiver, a frontal lens, and an array of fins. (Coleman Decl., ¶45.)

21[A.ii]: ...[the array of fins] extending rearward from the flange to define a rear receptacle that extends forward towards the flange,

Lin discloses Claim 21[A.ii]. (Coleman Decl., ¶¶46-47.) Again, Lin discloses that “the back of the heat dissipation unit is provided with a plurality of heat dissipation fins.” (Lin, 4:4:-10, 4:18-32, 6:1-5, Figs. 1-3.) These fins extend rearward from the flange portion of the front of the “heat dissipation unit 20,” and define a rear receptacle, or recessed space, that extends from the back of the unit towards the flange portion:



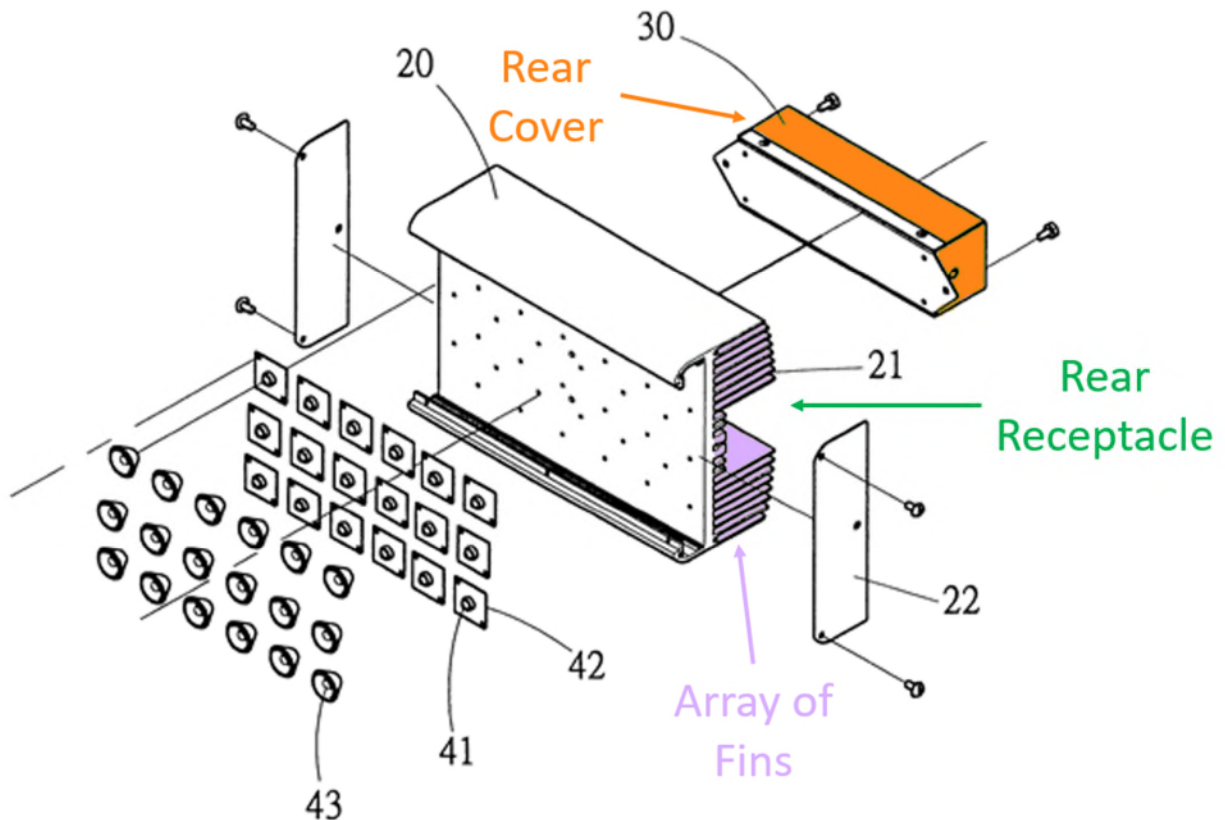
(*Id.*, Fig. 3 (annotated); *see also* Figs. 1-2.) Notably, this “rear receptacle” of Lin is nearly identical to the “rear receptacle” of the ’245, as both are defined by fins of different lengths creating a recess, or cavity, on the back of the lighting unit:



(Compare Lin, Fig. 2, with ’245, Fig. 8; Coleman Decl., ¶47.)

21[A.iii]: *the housing further including a rear cover that encloses the rear receptacle;*

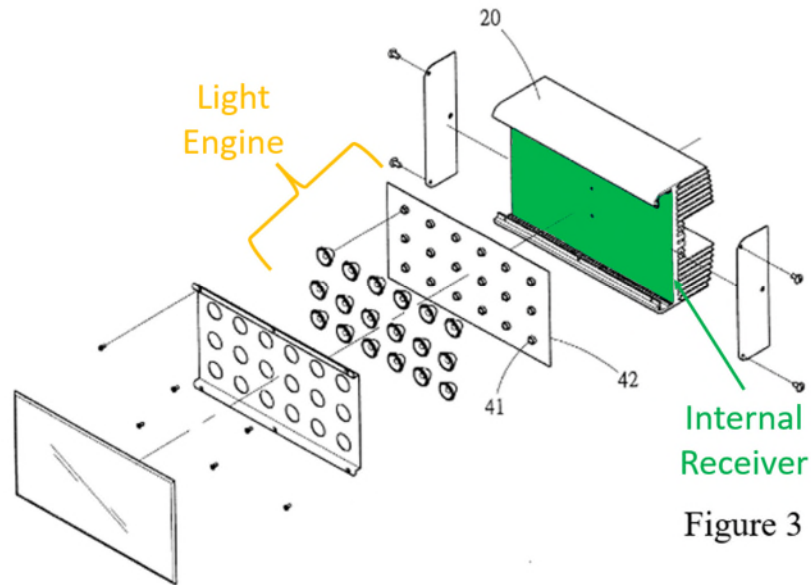
Lin discloses Claim 21[A.iii]. (Coleman Decl., ¶¶48-49.) Lin discloses that its housing includes a “power supply unit (30)” that is “arranged at the back end of the heat dissipation unit (20).” (Lin, 4:4-10, 4:18-5:10, Figs. 2-3.) In particular, this “power supply unit (30)” fits into the “rear receptacle” formed by the fins at the back of the “heat dissipation unit (20),” and is illustrated as having a rear cover portion that encloses the area of the rear receptacle::



(*Id.*, Fig. 2 (annotated), Fig. 3, 4:4-10, 4:18-5:10; Coleman Decl., ¶¶48-49; see also *infra* Ground 1, Claim 21[C].)

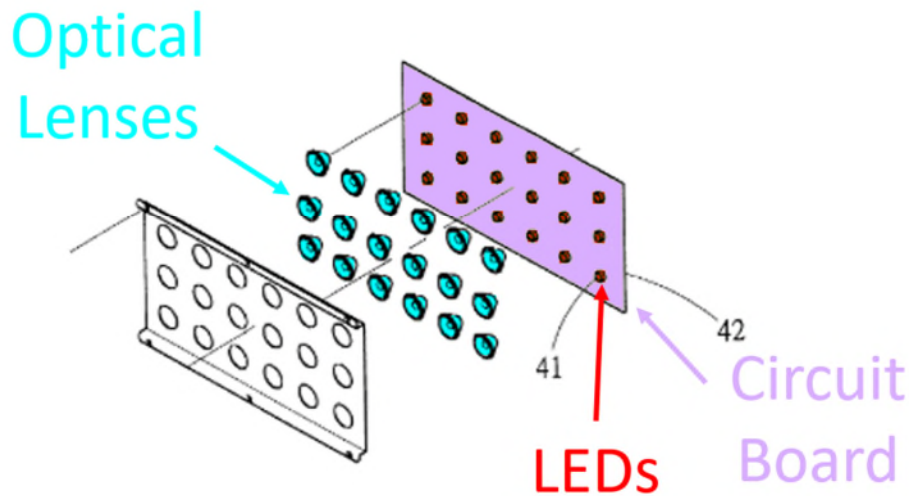
21[B]: a light engine assembly mounted to the receiver, the light engine having a plurality of light modules, wherein each module includes both a LED mounted to a printed circuit board and an optical lens extending from the printed circuit board;

Lin discloses Claim 21[B]. (Coleman Decl., ¶¶50-52.) Lin discloses that its lighting device includes a “light-emitting unit (40) [(i.e., light engine assembly)] composed of a plurality of LEDs (41)” and that “is arranged in the housing space at the front end of heat dissipation unit 20 [(i.e., the receiver)]:”



(Lin, Fig. 3 (annotated), 4:26-5:1, 6:21-26; *see also* Fig. 2.) Lin discloses that the light emitting unit is mounted to the receiver, for example stating that “the LEDs (41) are fixed on the heat dissipation unit (20) through the circuit boards (42)” and that a “cover plate (44)” for the light emitting unit is also “fixed on the heat dissipation unit (20).” (*Id.*, 4:33-5:10, 6:21-26, Figs. 2-3.)

Moreover, as shown in Figs. 2-3 of Lin, the “light-emitting unit” includes a plurality of light modules, with each module including an “LED (41),” a “circuit board (42),” and a “cover body (43)” (*i.e.*, a lens) that extends from the circuit board:



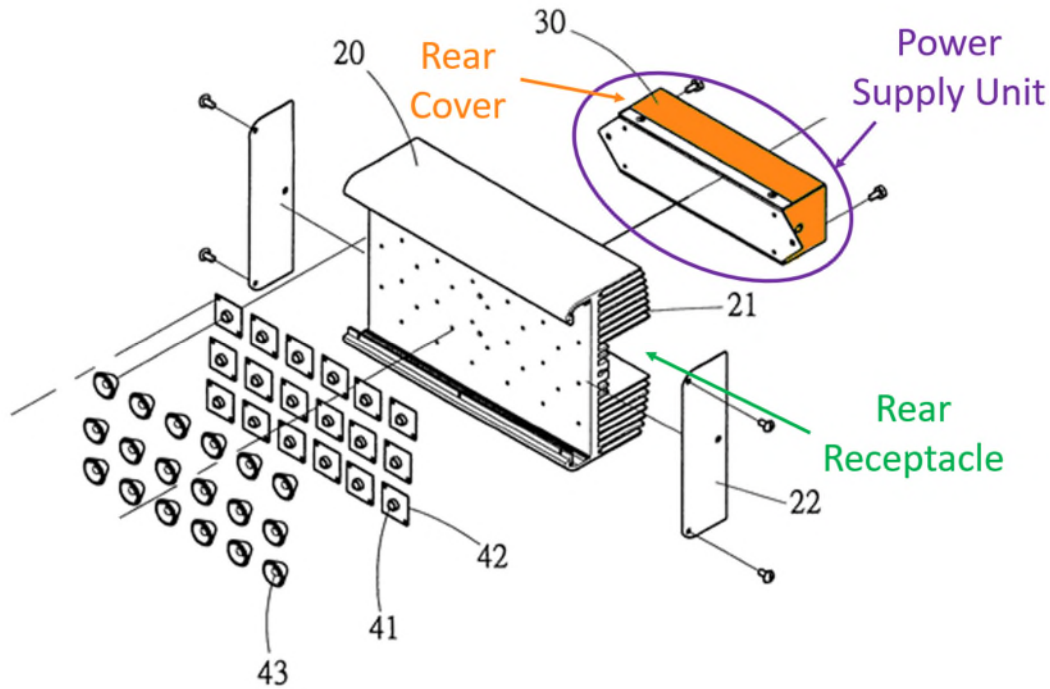
(*Id.*, Fig. 3 (annotated), 4:33-5:19, 6:21-26; *see also* Fig. 3.). For example, Lin discloses that “a circuit board (42) is arranged behind each LED (41), and the LEDs (41) are fixed on the heat dissipation unit (20) through the circuit boards (42) ... At the same time, an outer side of each LED (41) may be further covered with a cover body (43); and a front end of each cover body (43) can be further provided with a cover plate (44), the cover plate (44) is fixed on the heat dissipation unit (20), and then the cover bodies (43) are fixed on the LEDs (41).” (*Id.*, 4:33-5:10, 6:21-26 (noting the “LEDs can further be fully integrated on the circuit board (42), thereby being fixed on the heat dissipation unit (20) through the circuit board.”), Figs. 2-3.) Lin teaches that the cover bodies are lenses, as they are shaped and positioned to “converge” light that is emitted by the LEDs. (Lin, 5:1-16; Coleman Decl., ¶¶51-52.) In particular, “light emitted by the LEDs (41) is

converged after passing through the cover bodies (43), and the converged light passes through the through holes (45) on the cover plate (44) and the light-transmissive plate (23) at the front end of the heat dissipation unit (20) before being released outward, thereby achieving the lighting effect.” (Lin, 5:11-19.)

21[C]: a power supply residing within the rear receptacle and enclosed by the cover; and,

Lin discloses Claim 21[C]. (Coleman Decl., ¶¶53-55.) Lin discloses that “a power supply unit (30) is arranged at the back end of the heat dissipation unit (20) to provide power.” (Lin, 4:31-32, 4:4-10, 4:33-5:19, 6:14-26, Figs. 2-3.) In particular, power provided by the power supply unit (30) is passed to the circuit boards so that it “drives each LED” to emit light. (*Id.*, 5:11-19, 6:14-26.) This power supply unit can “use a battery to provide power,” or it can “be connected with a general power line to be directly plugged into a general plug [sic: socket], thereby achieving the purpose of providing power. However, when the power supply unit is connected to the power line, the power supply unit needs to be further provided with a transformer inside, so as to convert a current of 110 Volts into a current acceptable to the LEDs (41) to avoid burning of the LEDs (41) due to overly large currents.” (*Id.*, 6:14-20.) That is, the power supply unit can have a battery inside of it, or can include a transformer inside to convert voltage provided from a general wall plug into the appropriate current for the LEDs to operate without being burned out. (Coleman Decl., ¶54.)

Further, Lin discloses that the power supply (whether a battery or transformer and other circuitry) resides in the rear receptacle defined by the fins:



(Lin, Fig. 2 (annotated), Fig. 3.) Again, Lin discloses that “power supply unit (30) is arranged at the back end of the heat dissipation unit (20),” and clearly illustrates this as inserting the power supply into the recess, or “receptacle” defined by the open area between the shorter and longer fins. (*Id.*, Figs. 1-3, 4:4-10, 4:31-5:19, 6:14-26 4:10-32; Coleman Decl., ¶¶55-56.) Further, as shown in annotated Fig. 2 above, the power supply unit has a rear cover that encloses the power supply. (Lin, Fig. 2; Coleman Decl., ¶¶55-56; see also Figs. 1, 3.) See also *supra* Ground 1, Claim 21[A.iii].

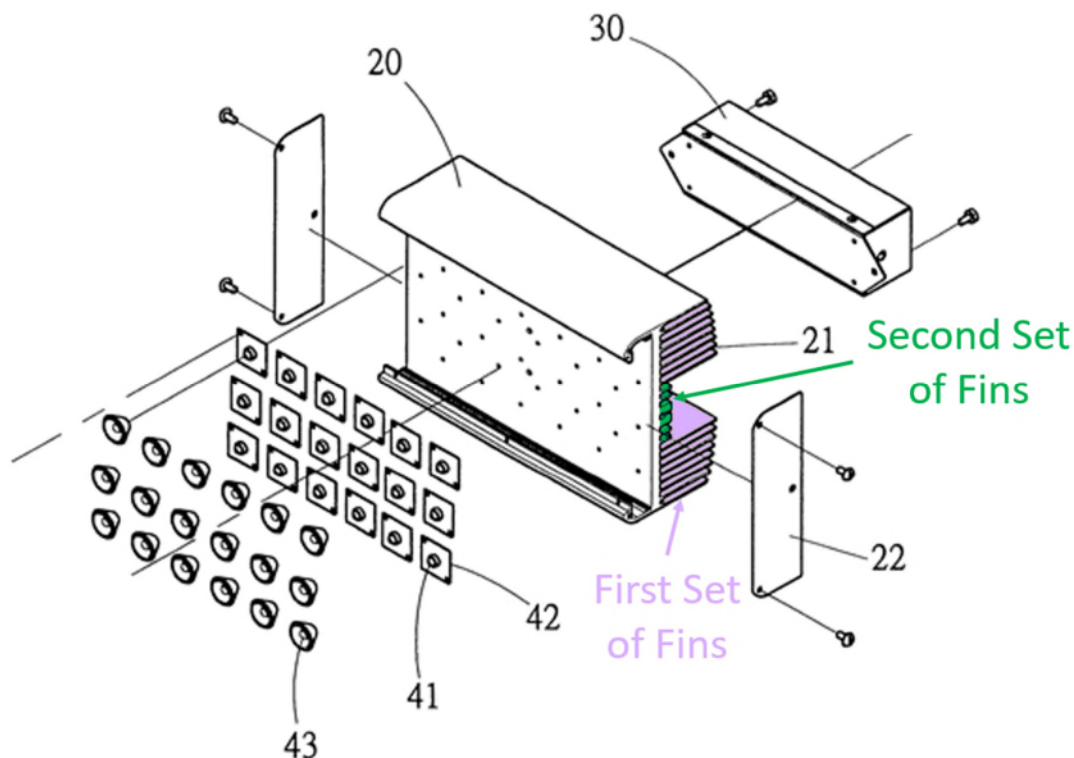
21[D]: wherein during operation, heat generated by the LEDs passes through the circuit board and then said heat is dissipated by the array of fins without the use of a fan.

Lin discloses Claim 21[D]. (Coleman Decl., ¶56.) Lin discloses that during operation, “the heat energy produced when the LEDs (41) are driven is transmitted to the heat dissipation unit (20), and undergoes heat exchanges with air through the heat dissipation fins (21) at the back end of the heat dissipation unit (20), thereby effectively achieving the heat dissipation effect, and prolonging the service life of the LEDs (41).” (Lin, 5:11-19, 4:4-10, 4:14-16, 4:26-30, 6:1-5, 6:21-7:2.) As noted above, the LEDs are “fixed on the heat dissipation unit (20) through the circuit boards (42),” and thus heat generated by the LEDs passes through the circuit board so that it is transmitted to the heat dissipation unit and dissipated into the air by the fins. (*Id.*, 5:1-4, 6:21-26; Coleman Decl., ¶56.) Notably, Lin makes no mention of a fan, nor does Lin illustrate a fan in any of the figures showing its lighting device. (Coleman Decl., ¶56.) Further, a POSITA would have understood that no fan is used in Lin, as Lin clearly states that the dissipation of the heat from the LEDs is achieved by this heat being “transmitted” to the heat dissipation unit and undergoing “heat exchanges” with the ambient air through the heat dissipation fins. (Coleman Decl., ¶56.) *See also supra* Ground 1, Claim 21[A.i]-[A.iii].

2. Dependent Claim 22

The LED light fixture of claim 21, wherein the array of fins includes a first set of fins with a first fin length and a second set of fins with a second fin length, wherein the first fin length exceeds the second fin length.

Lin anticipates and renders obvious Claim 22. (Coleman Decl., ¶57.) Lin discloses its array of “heat dissipation fins (21)” has fins of different lengths. (Lin, 4:4:-10, 4:18-32, 6:1-5, Figs. 1-3.) *See supra* Ground 1, Claims 21[A.i]-[A.iii], [D]. In particular, Lin’s heat dissipation fins include fins of a first fin length and fins of a second fin length, where the first fin length exceeds the second fin length as shown in figure 2:

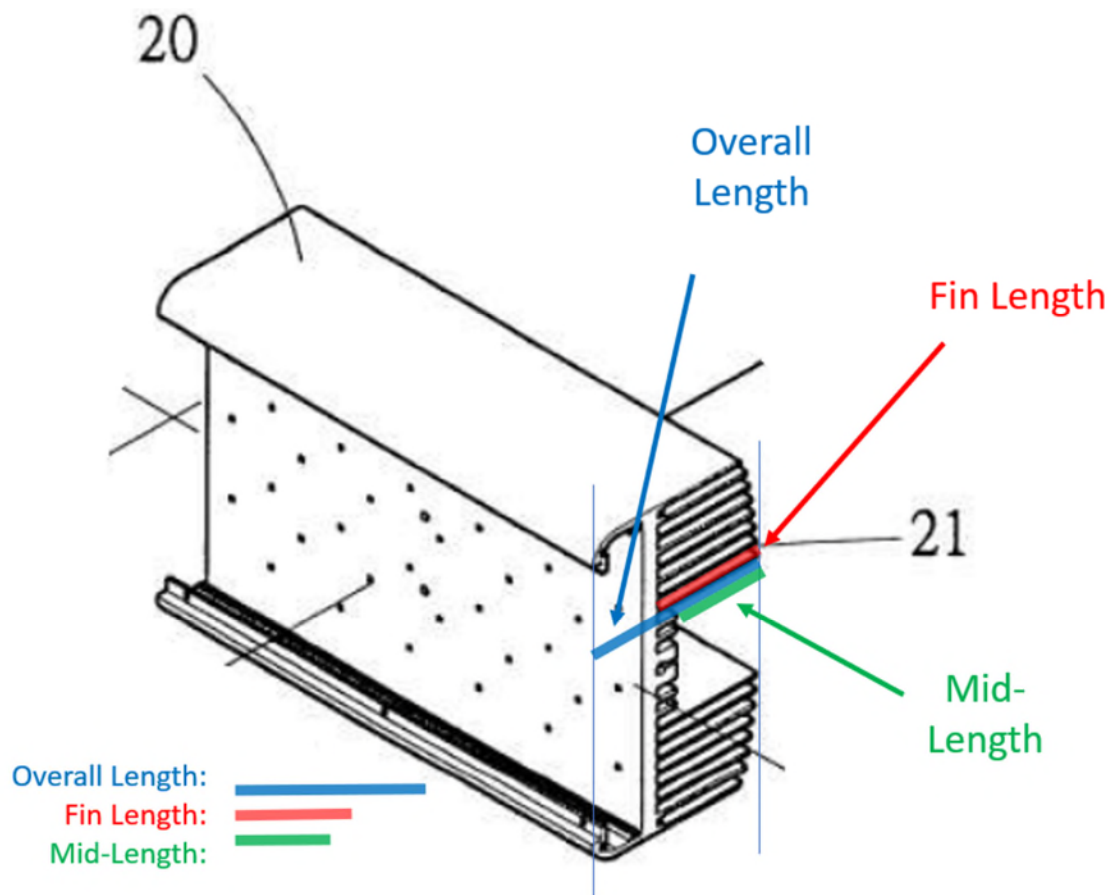


(Lin, Fig. 2 (annotated); *see also* Fig. 3 (showing same); Coleman Decl., ¶57.)

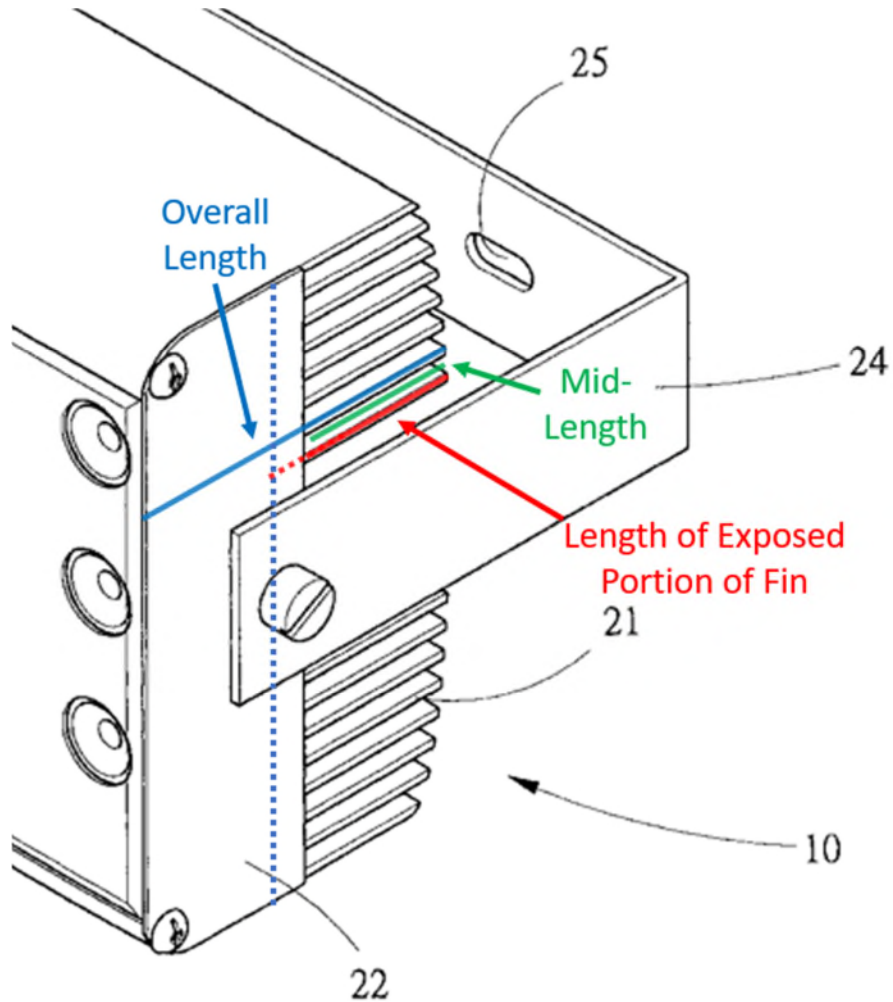
3. Dependent Claim 23

The LED light fixture of claim 21, wherein the housing has an overall length and a mid-length, and wherein the array of fins has a length that exceeds said mid-length.

Lin anticipates and renders obvious Claim 23. (Coleman Decl., ¶¶58-61.) As previously explained, Lin discloses a housing including an array of fins. *See supra* Cls. 21[A.i]-21[A.iii], 21[D], 22. As shown in Fig. 2, Lin discloses a housing with an overall length spanning from the front end of the heat dissipation unit 20, where the light-transmissive plate (*i.e.*, frontal lens) is attached, to the rear edge of the fins. (Lin, 4:4-16, 4:26-5:11, 6:1-5, Figs. 2-3; Coleman Decl., ¶58.) Accordingly, the mid-length is half this distance. (Coleman Decl., ¶58.) Fig. 2 of Lin shows that the array of fins has a length that exceeds this mid-length:



(Lin, Fig. 2 (annotated); Coleman Decl., ¶¶58-61.) Moreover, even when baffle plates 22 are attached on both sides of the housing and covering a portion of the array of fins, the length of the exposed portion of the fin alone is close to (if not great than) the mid-length of the housing as shown in Fig. 1:



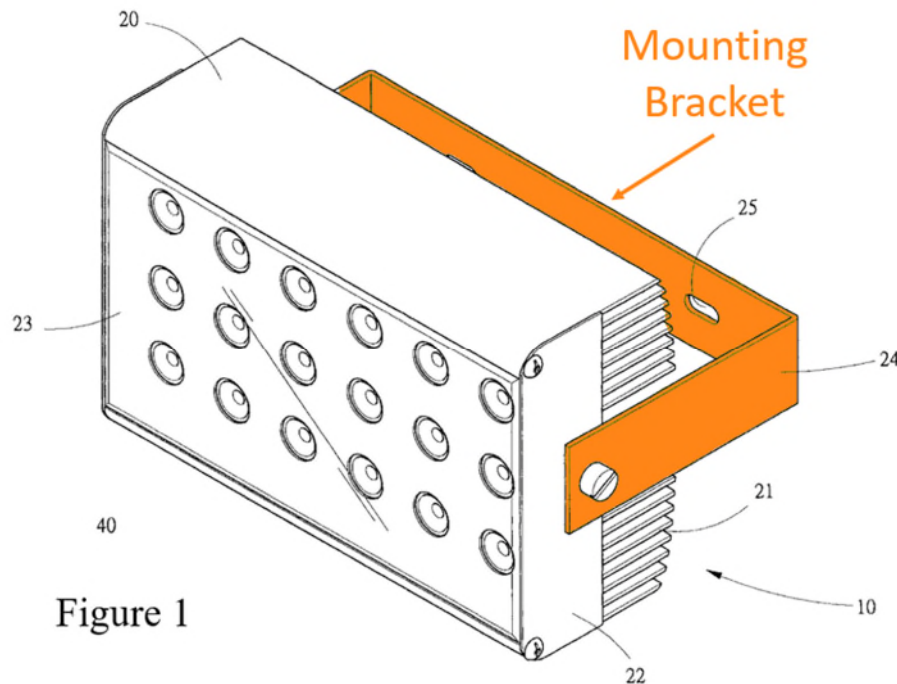
(Lin, Fig. 1 (annotated); Coleman Decl., ¶¶58-61.)

Further, it would have been obvious, given the figures and disclosures in Lin, to have fins with a length that exceeds a mid-length of the overall lighting fixture housing, including to provide a larger surface area of fins to dissipate heat into the surrounding air. (Coleman Decl., ¶¶58-61.)

4. Dependent Claim 25

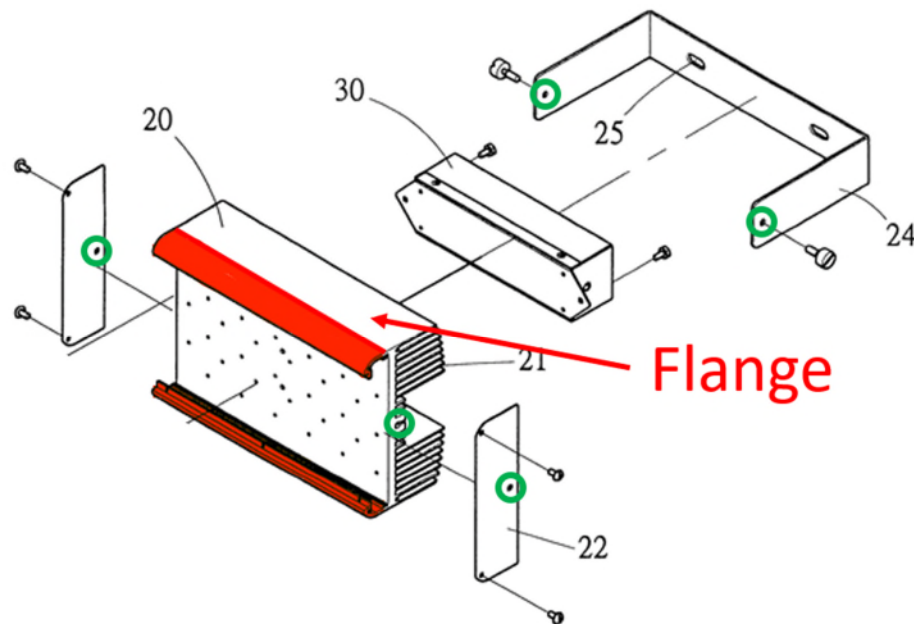
The LED light fixture of claim 21, further comprising a mounting bracket having opposed side segments that are secured to opposed sides of the housing rearward of the flange.

Lin anticipates and renders obvious Claim 25. (Coleman Decl., ¶62.) Lin discloses “a grab handle (24)” [(i.e., a mounting bracket)] with two ends that “are fixed on two corresponding sides of the heat dissipation unit (20)”:



(Lin, Fig. 1 (annotated), 6:6-11, Figs. 2-3.) As seen in Figs. 1-3, the mounting bracket is secured to the heat dissipation unit housing by two screws that connect rearward of the flange. (Lin, Figs. 1-3; Coleman Decl., ¶62.) Looking at Figs. 2 and 3, for example, it can be seen that there is a hole in the side baffle plates (22)

positioned rearward of the flange through which the screws securing the grab handle to the unit are inserted:



(Lin, Fig. 2 (annotated), Figs. 1, 3; Coleman Decl., ¶62.)

Lin further explains that “the grab handle (24) may further be provided with a slotted hole (25), so that the LED searchlight (10) can be fixed to the wall surface through the slotted hole (25).” (*Id.*, 6:6-11.)

5. Dependent Claim 26

The LED light fixture of claim 21, wherein the frontal lens is secured to the flange by a plurality of fasteners arranged at the periphery of both the frontal lens and the flange.

Lin anticipates and renders obvious Claim 26. (Coleman Decl., ¶63.) Lin discloses that light-transmissive plate 23 (*i.e.*, frontal lens) is secured to the flange

portion at the front end of heat dissipation unit 20. (Lin, 4:26-30; *see also* 5:11-19, Figs. 1-3.) Lin discloses “baffle plates (22) arranged on both sides,” and these baffle plates have holes for screws to be inserted at the periphery of the flange and light-transmissive plate so that the light-transmissive plate is secured to the flange and housing. (*Id.*, Figs. 1-3, 4:26-30; *see also* cls. 2, 9.) Thus, Lin’s frontal lens is secured to the flange by a plurality of fasteners at the periphery of the frontal lens and flange that pass through the baffle plates into the flange:

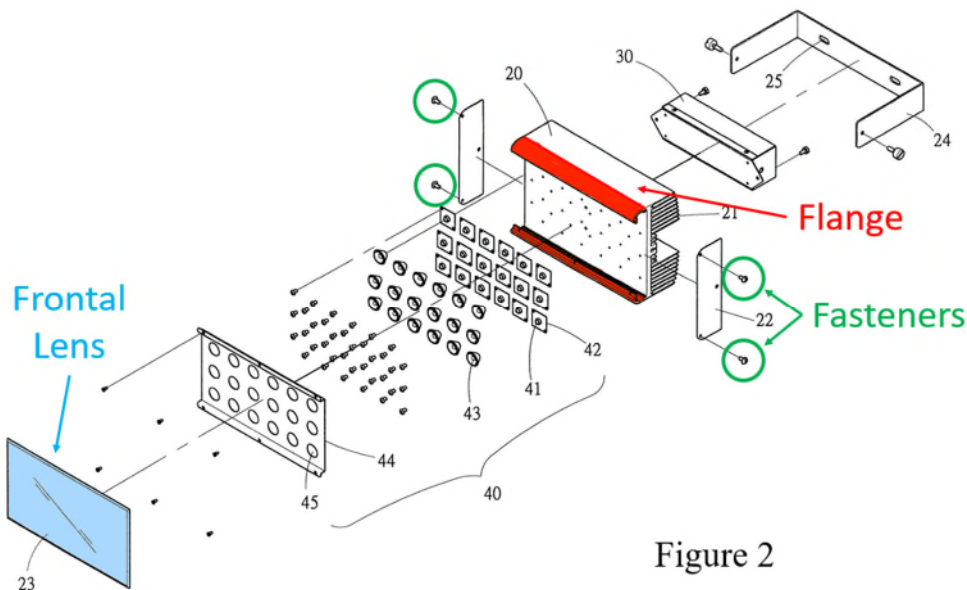
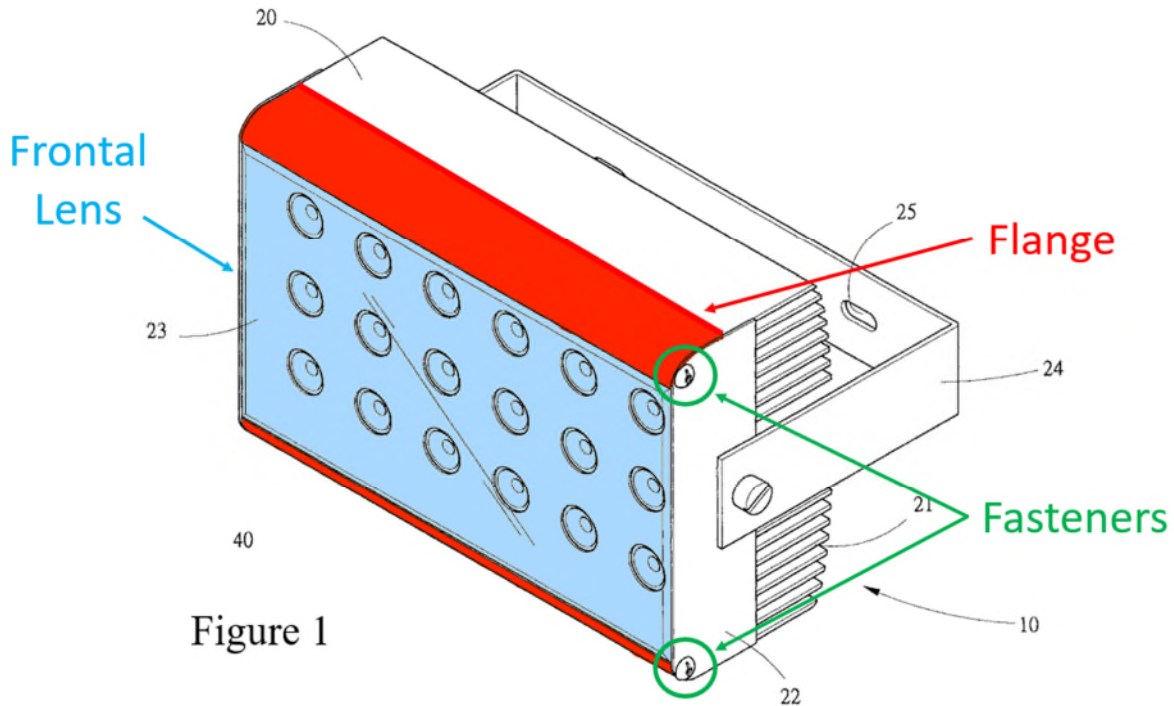


Figure 2

(Lin, Fig. 2 (annotated), Fig. 3; Coleman Decl., ¶63.) Further, as shown in Fig. 1, Lin’s frontal lens is secured in place by the fasteners passing through the baffle plates and into the flange portion of the heat dissipation plate at the periphery of the frontal lens and flange, thereby securing the frontal lens in the flange:



(Lin, Fig. 1 (annotated); see also Coleman Decl., ¶63.)

B. Ground 2 – Lin in view of Zeng and Lodhie Renders Obvious Claim 24

Zeng (EX1009) is US20060146553. Zeng was filed October 7, 2005 and published July 6, 2006. Zeng is prior art under at least pre-AIA § 102(a),(e).

Lodhie (EX1008) is US5,577,832. Lodhie issued November 26, 1996, and is prior art under at least pre-AIA § 102(b).

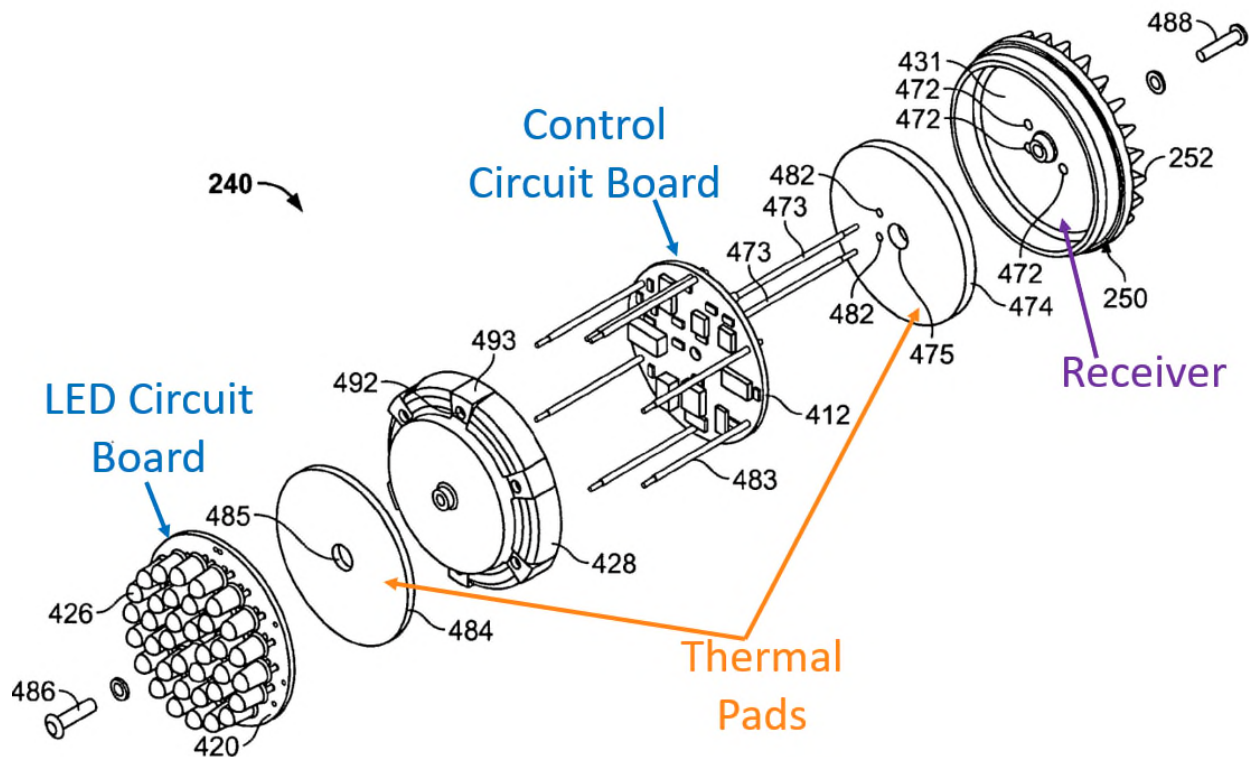
1. Dependent Claim 24

The LED light fixture of claim 21, further comprising a thermal pad residing between the receiver and the printed circuit board, wherein both the thermal pad

and the printed circuit board have at least one opening that receives a lead extending between the power supply and the printed circuit board.

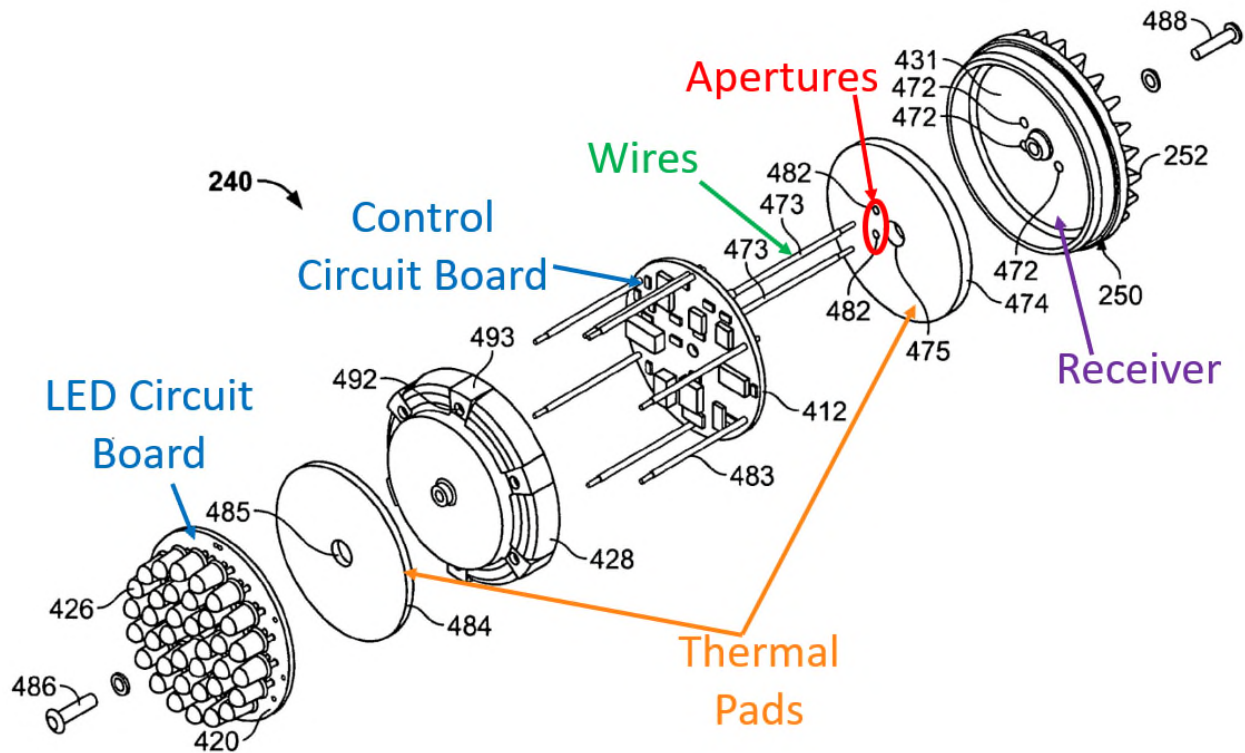
Lin in view of Zeng and Lodhie renders obvious Claim 24. (Coleman Decl., ¶¶65-75.) Lin discloses a lighting fixture with a heat dissipation unit to “increase the heat energy released during the operation of the searchlight . . . thereby prolonging the service life of the LEDs.” (Lin, 4:4-10, 4:14-16.) *See supra* Ground 1, Cl. 21.

Zeng, in the same field as Lin, discloses an LED light assembly that includes “a plurality of LEDs” and a “heat sink with a plurality of fins . . . at its distal end that dissipate heat generated by the plurality of LEDs.” (Zeng, [0019], [0021], Figs. 2-4, Abstract.) Zeng discloses that its LEDs, like those of Lin, are “mounted on a board 420 (e.g., a PCB),” and that “circuit board 412” having power and control components thereon may also be included and linked to the LED circuit board via wires. (*Id.*, [0021]-[0024], Figs. 4-5.) Zeng further discloses that a “front thermal pad 484 is interposed between the front portion 428 [of the heat sink] and the [LED] board 420,” and that a “rear thermal pad 474 that may be similar or different from front thermal pad 484 is interposed between the circuit board 412 and rear portion 431 of heat sink 250”:



(Zeng, Fig. 4 (annotated), [0021]-[0022].) Zeng explains that when the “LED board 420” and “circuit board 412” are mounted to the front and rear thermal pads, respectively, “[h]eat generated by the plurality of LEDs 426 on board 420 is transferred via conduction to the front portion 428 of heat sink 250. Heat flows radially outward to the outer circumference 493 of the front portion 428 and then rearward to the plurality of fins 252 for dissipation, thereby preventing overheating of both the LEDs 426 and circuit board 412.” (*Id.*, [0023]; *see also* [0021]-[0022], Figs. 2-4.)

Further, Zeng discloses that the thermal pads may include a “plurality of apertures” (*e.g.*, holes) for “receiving the wires” going to a circuit board:



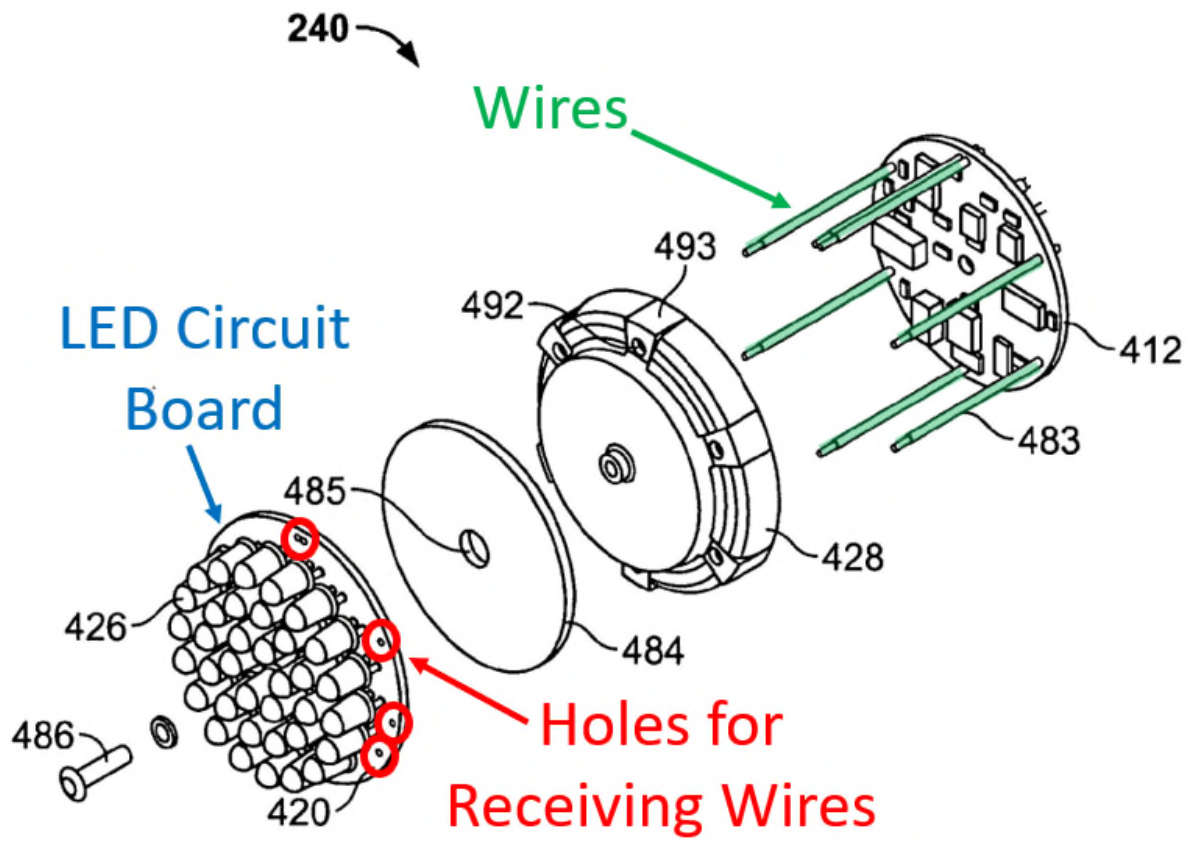
(Zeng, Fig. 4 (annotated), [0021]-[0022].) Zeng notes that such wires may include wires to receive “power” for the circuit board, and further discloses that the “apertures 482” in the thermal pad may line up with corresponding apertures in the heat sink such that the wires can extend externally through the heat sink to a power input source. (*Id.*, Figs. 1, 4, [0014]-[0015], [0021], [0022] (stating that “[a]pertures 482 are aligned with apertures 472 of the rear portion 431 of heat sink 250 so that wires 473 may extend externally.”).) While Zeng expressly discloses such apertures in the rear thermal pad connected to the control circuit board 412, a POSITA would have readily understood that such apertures could also be included in the front thermal pad on which the LED circuit board 420 is mounted to achieve the same purpose. (Coleman Decl., ¶¶65-70.)

It would have been obvious to modify Lin to include a thermal pad having holes for wires between Lin's LED circuit board and its heat dissipation unit housing, as taught by Zeng. (*Id.*, ¶69.) Lin and Zeng are analogous art; both disclose lighting devices with heat dissipating elements to prevent overheating of the LEDs. (Lin, 4:4-10, 4:14-16; Zeng, [0021]-[0023].) Zeng discloses that the thermal pads assist in heat being "transferred via conduction" to a heat sink, such as Lin's heat dissipating unit's body, where it can then be dissipated by fins at the rear of the heat sink. (Zeng, [0023], Coleman Decl., ¶69.) That is, both a thermal pad and a housing with fins can be used in combination to dissipate heat from LED circuit boards. (Coleman Decl., ¶69.) Moreover, a POSITA would have been motivated to include holes in the thermal pad used in Lin, as also taught by Zeng, in order to have a pathway for wire connections coming from the power supply to reach the LED power and power the LEDs. (*Id.*) I Thus, it would have been obvious to a POSITA to use Zeng's thermal pad, having holes for receiving wires, in Lin between the LED circuit board and heat dissipating unit surface to which it is fixed, to further dissipate heat generated by the operation of Lin's LEDs thereby achieving Lin's goal of prolonging service life of the device. (Lin, 4:14-16; Coleman Decl., ¶69.)

A POSITA have had a reasonable expectation of success, as using a thermal pad between Lin's LED circuit board and heat sink housing body would have

simply been the application of a known component to improve a similar device in the same way. (Coleman Decl., ¶70.) Moreover, Lin's lighting unit was ready for such an improvement, as it has a similar receiver space in front of a heat sink having a plurality of fins as Zeng, and holes or apertures in the heat sink for attachment to a power source as also taught by Zeng. (Lin, Fig. 3 (showing two holes in the receiver face of the heat dissipating unit for receiving wires from the power supply), Fig. 2 (same); Coleman Decl., ¶70.) Being mounted to such a thermal pad, Lin's LEDs would continue to function in the same way when powered by the power supply, but with a thermal pad to assist in conducting heat from the LEDs through the housing to the fins where it can be dissipated, while providing apertures, or holes, for running wires to make a direct connection between the power source and the LEDs. (*Id.*) A POSITA would have understood this would provide the benefit of not having to run the wires around the unit from the power supply, where they could potentially get crimped, damaged, or crimped, including by the baffle plates secured to the sides. (*Id.*)

It would have further been obvious to a POSITA to include holes in the LED circuit board corresponding to lead wires connecting to the circuit board in Lin. (Coleman Decl., ¶¶71-75.) For example, Zeng discloses power leads, or wires, which connect to the LED circuit board, and illustrates these being received by holes in the LED circuit board:



(Zeng, Fig. 4 (annotated), [0021]-[0023]; *see also* [0014], [0015], [0024]-[0027], Fig. 5; Coleman Decl., ¶¶71-75.) A POSITA would have been motivated to include such receiving holes in the LED board in order to have a direct, straight path connection for the wires. (Coleman Decl., ¶71.) A POSITA would have found this at least obvious to try, as it is one of a limited ways of connecting the wires to the circuit board, and a POSITA would have had a reasonable expectation of success as it would be simply the use of a known method of connecting power lead wires to an LED circuit board such that the LEDs can be activated. (*Id.*)

In addition, Lodhie discloses an LED lighting unit like those of Lin and Zeng, with a power supply that provides power to LEDs through wires running

from the power supply to the LEDs on a circuit board. (Lodhie, Abstract, 1:46-63, 2:16-67, 3:23-62, 4:1-7, Figs. 2-3, 5.) Lodhie discloses that, for example, “wires 43 and 45 are electrically conductive wires, one of which passes through base 13 and is in electrical contact with one of contacts 15a and 15b at one end and a lead of an LED, preferably on printed circuit board 11a' at the other end. The other of wires 43 and 45 passes through base 13 and is in electrical contact with the other of contacts 15a and 15b, the other end of which is in electrical contact with a lead of an LED, preferably on printed circuit board 11c.” (*Id.*, 3:31-48.) Lodhie further discloses that, to connect the wires to the LED contacts, the wires may pass through “holes” in the circuit boards:

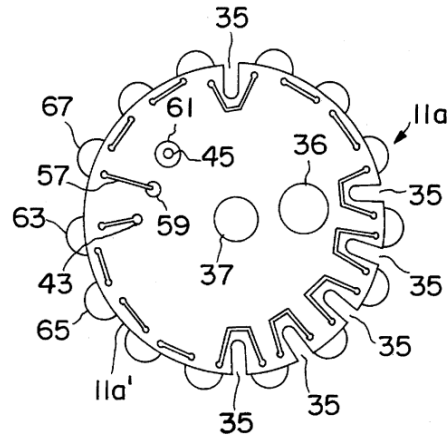


FIG. 5

(*Id.*, Fig. 5, 3:49-67, 2:39-47, Fig. 2.) In particular, Lodhie discloses that “wire 43 is shown connected to one lead of LED 63 in LED layer 11a. ... One lead of LED 67 is connected to a wire 57 which passes through hole 59 to the second LED layer

and is connected to one lead of an LED on the second layer. Wire 45 passes through hole 61 and through a corresponding hole in printed circuit board 11b' and is coupled to one lead of an LED on the third layer. In this manner a complete circuit is formed so that the LEDs in each layer are connected in a series relationship and are electrically connected to contacts 15a and 15b so that when appropriate power is applied to contacts 15a and 15b, all the LEDs in each layer become lit.” (*Id.*, 3:49-67.) That is, Lodhie discloses that lead wires may be passed through holes in LED circuit boards in order to power LEDs, and Lodhie further discloses that the use of holes for passing the wires allows for the wires to be “kept as short as possible” to avoid problems during installation and to avoid crimping. (*Id.*, 4:1-7.)

A POSITA been motivated to include holes in the LED PCBs of Lin (and Zeng) as taught by Lodhie for providing a pathway to receive wires from the power supply in order to power the LEDs. (Lodhie, 1:46-63, 2:16-67, 3:23-62, 4:1-7, Figs. 2-3, 5; Coleman Decl., ¶¶72-75.) A POSITA would have understood that providing a hole for the power supply wires to connect to the LED contacts on the circuit boards would have been simply use of a well-known technology, forming a hole in the PCB for wires to pass, to provide a pathway for physical wires to make the required connections to power the LEDs. (Coleman Decl., ¶¶72-75.) A POSITA would have had a reasonable expectation of success because using a PCB

hole, or opening, as taught by Lodhie, would allow the wires to pass through to their connections even when there is not space within a housing for the wires to go from an opening and then around a circuit board. (*Id.*) This would have also allowed the wires to be kept as short as possible, avoiding problems with tangling or crimping during installation as taught by Lodhie. (*Id.*, Lodhie, 4:1-7.) At the very least, a POSITA would have found it obvious to try a hole, or opening, in the PCBs of Lin for the power supply wires to pass through and connect to the traces and other electronic components on the PCBs requiring power, as this would be one of a limited known ways of making such connections. (Coleman Decl., ¶¶72-75.) For example, a POSITA found it obvious to try creating a hole in the LED PCB for the wires to pass through where space is more constrained or a direct connection from the thermal pad opening is desired such that the wires do not need to bend or be potentially pinched. (*Id.*) In Lin, where the power supply is directly behind the LED circuit board, a POSITA would have found it obvious to have corresponding holes in the heat dissipating unit (as shown in Figures 2-3 of Lin), thermal pad, and PCB so that the wires could extend directly through to the power supply without potentially being pinched or damages during installation or connection of the side baffles. (Coleman Decl., ¶¶72-75.)

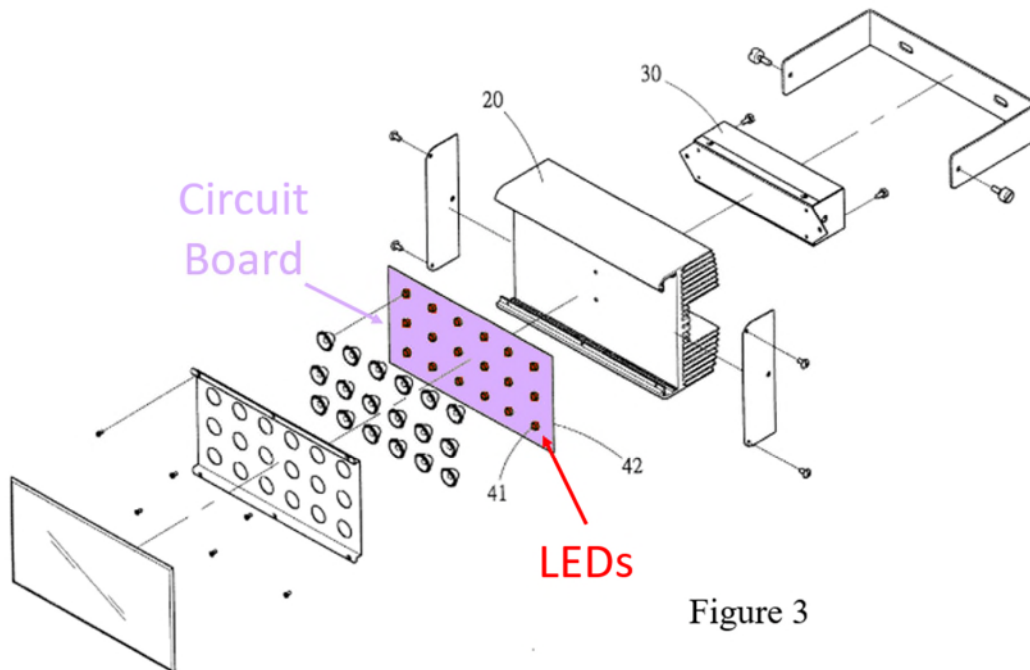
C. Ground 3 – Lin in view of Moriyama Renders Obvious Claim 27

Moriyama is US2005/0239342 (EX1010). Moriyama was filed on October 24, 2003, and published October 27, 2005. Moriyama is prior art under at least pre-AIA § 102(b).

1. Dependent Claim 27

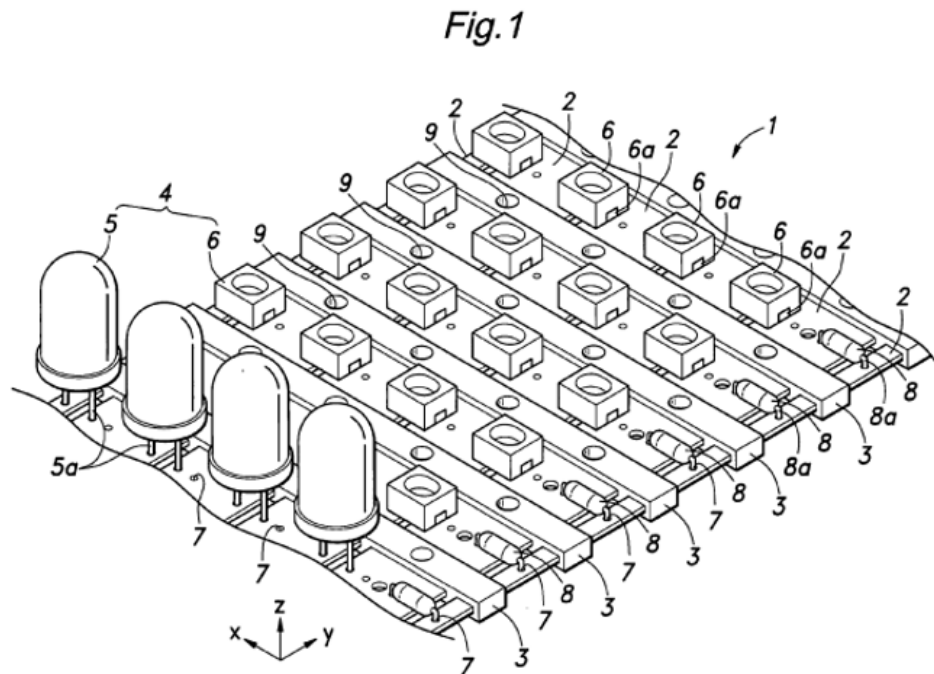
The LED light fixture of claim 21, wherein each module of the light engine includes a zener diode in a one to one parallel relationship with the LED.

Lin in view of Moriyama renders obvious Claim 27. (Coleman Decl., ¶¶77-81.) Lin discloses a plurality of LEDs 41 and a circuit board 42 arranged behind each LED. (Lin, 4:33-5:4, Fig. 3.) Lin further discloses that “the LEDs (41) can further be fully integrated on the circuit board (42).” (*Id.*, 6:21-24.)



(*Id.*, Fig. 3 (annotated).)

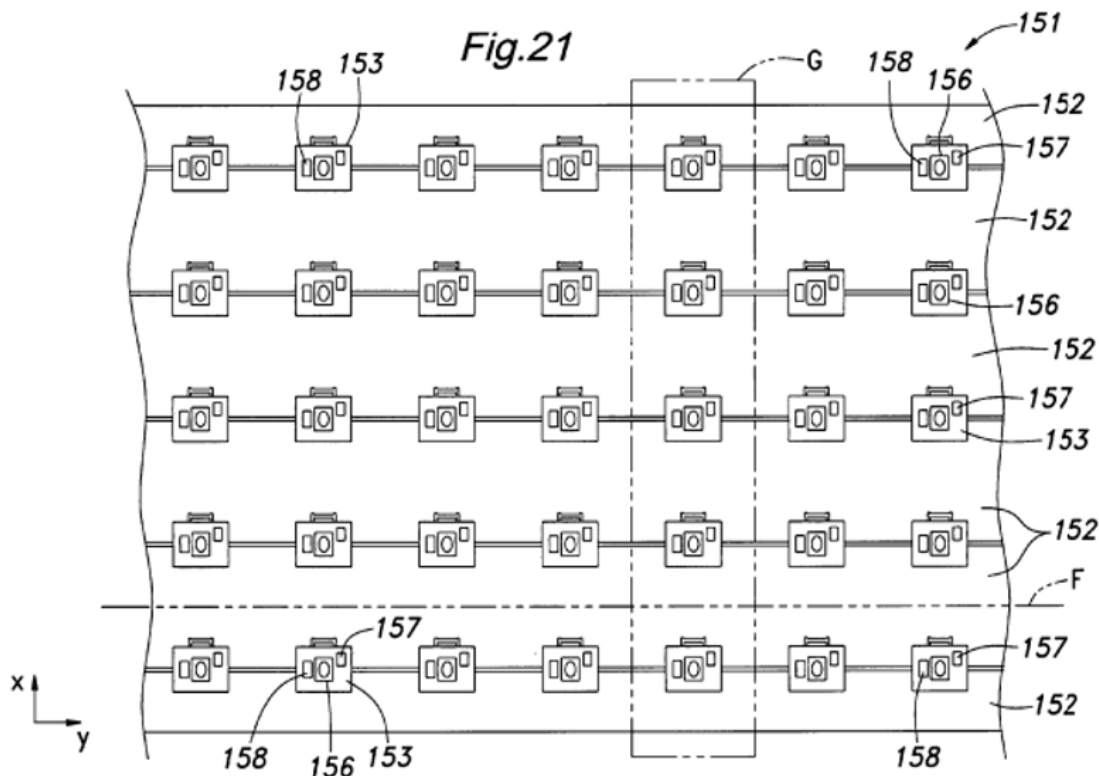
Moriyama, in the same field of LED lighting fixtures as Lin, similarly discloses “a light emitting module comprising one more light sources” and that, like Lin, has “an improved heat dissipation property.” (Moriyama, [0002], [0007].) Moriyama discloses a light emitting module with “a plurality of plate-shaped conductors 2 spaced apart from each other” and “a plurality of LEDs 4 mounted between adjoining conductors 2 to serve as light sources.” (*Id.*, [0079]-[0080].)



(Moriyama, Fig. 1) Moriyama discloses “insulating joint members 3 expose both sides of various portions of the conductors 2 inclusive of the portions where the LEDs 4 are mounted, and the thickness of the joint members 3 serves to ensure that a space is created between the conductors 2 and the Support member (not shown)

when the light emitting module 1 is secured to the support member, whereby achieving favorable heat dissipation characteristics.” (*Id.*, [0084].)

Moriyama additionally discloses that “a resistor 157 and a Zener diode 158” may be “provided for each LED 156.” (*Id.*, [0120].)



(Moriyama, Fig. 21.) Moriyama explains that “Zener diode 158 connected in parallel with LED 156 functions to prevent an overvoltage from being applied to LED 156.” (*Id.*, [0121].)

It would have been obvious to a POSITA to modify Lin’s LEDs and circuit boards to include a Zener diode for each LED, connected in parallel with the LED, as taught by Moriyama. (Coleman Decl., ¶81.) Lin already uses an array of LEDs

like the LED module taught by Moriyama. (Lin, Figs. 2-3; Coleman Decl., ¶81.) Lin was also concerned with protecting his LEDs “to avoid burning of the LEDs (41) due to overly large current. (Lin, 6:14-20.) It would have been obvious for a POSITA to use the Zener diodes as disclosed in Moriyama to also protect from overly large voltage in Lin. Including a Zener diode for each of Lin’s LED would be using a known technique and electrical component to improve a similar device in the same way, that is, to prevent an overvoltage from being applied to one of the LEDs. (Coleman Decl., ¶81.) A POSITA would have been motivated to include Zener diodes with the LEDs in Lin’s array in order to protect the LEDs and extend their service life, something that Lin notes is one of its goals. (*Id.*)

D. Ground 4 – Lin in View of Nishimoto and Cunningham Renders Obvious Claim 28

Nishimoto (EX1011) is WO2005/029185. Nishimoto was filed September 7, 2004 and published March 31, 2005. Nishimoto is prior art under at least pre-AIA § 102(b). Cunningham (EX1012) is US2004/0021859. Cunningham was filed August 1, 2002, and published February 5, 2004. Cunningham is prior art under at least pre-AIA § 102(b).

1. Dependent Claim 28

The LED light fixture of claim 21, wherein during steady state operation of the fixture in 25 C ambient environment, the LED junction temperature at the

printed circuit board is approximately 55 C and the housing body temperature is approximately 45 C.

Claim 18 simply recites temperatures that could be measured when the light of claim 21 (which is disclosed by Lin) is in steady-state operation in 25°C ambient conditions. This is merely reciting the results of using the light in an environment with a standard reference temperature for measurements. (Coleman Decl., ¶83; Nishimoto, 11:15-26.)

Lin in view of Nishimoto and Cunningham renders obvious Claim 28. (Coleman Decl., ¶¶84-95.) Lin discloses an LED searchlight with a heat dissipating housing including heat dissipation fins to “increase the heat energy released during operation.” (Lin, 4:14-16.) *See supra* Ground 1, Claims 21-23. The temperature at the LED junction, where the heat is generated, would be higher than that of the heat-dissipating body, including the fins, which draw away heat from the LED circuit board and dissipate it into the environment around the lighting fixture. (Coleman Decl., ¶84.) In particular, the heat-dissipating body and fins are designed to dissipate heat away from the LEDs on the PCB, thereby preventing the LEDs from getting too hot, which could lead to thermal deterioration, reduced efficiency, or potentially failure of the LEDs. (Lin, 4:14-16, 5:11-19 (noting that heat dissipation prolongs “service life” of the LEDs); Nishimoto, 2:11-311, 6:4-14; Coleman Decl., ¶84.)

Nishimoto, in the same field as Lin, discloses “an LED lighting apparatus . . . for improving thermal dissipation properties.” (Nishimoto, Abstract, 1:5-7, 3:8-12, 11:15-28, 15:26-16:24, 28:19-30:21, Figs. 1, 10A-11B.) Nishimoto discloses there is a relationship between properties of the heatsink, LEDs, and circuit board components, and that junction temperature and the temperature of any attached heat sink body are dependent (and vary with respect to), for example, the thermal resistance of heatsink, volume of the heatsink, surface area of the heatsink, and the amount of current driving the LEDs. (*Id.*, 21:11-23:20, 24:1-25:1 (including Table 1), 30:22-33:24, Figs. 13-15 (showing the relationship between junction temperature and heat sink volume, surface area, and weight, respectively, for different driving currents); Coleman Decl., ¶85.) For example, Nishimoto notes that LED chip temperature, or junction temperature, “changes due to factors such as heatsink thermal resistance, enveloping volume, area, and weight.” (Nishimoto, 33:20-24.) Further, as recited in claim 28, Nishimoto discloses that it was-known to assess junction temperature at an ambient temperature of 25°C. (Nishimoto, 11:15-26, 24:1-28 (Table 1).)

Nishimoto includes Table 1, showing “the relationships between the enveloping volume of the heatsink and the heatsink thermal resistance” with respect to “junction temperature” at driving currents of 20mA, 30mA, 40mA, and 50mA. (*Id.*, 24:1-26:1.) As shown in Table 1, at an ambient temperature of 25°C,

various combinations of driving current and heat sink thermal resistance could result in a steady-state junction temperature around 55°C as recited in Claim 28:

TABLE 1

Relationship Between Heatsink and Junction Temperature

(Ambient Temperature: Ta=25°C)

Heatsink No.	Thermal Resistance (10 W) °C/W	Enveloping Volume cm ³	Junction Temperature (°C)			
			20 mA	30 mA	40 mA	50 mA
1	0.38	4464	34.8	38.7	41.7	44.5
2	0.56	2322	35.2	39.0	43.3	46.8
3	0.65	1108.8	35.8	41.8	46.7	50.3
4	1.0	816	36.5	42.8	48.3	52.8
5	1.24	571.2	38.5	44.4	51.5	55.0
6	1.7	400	39.5	46.1	52.3	57.7
7	1.9	280	41.2	48.7	56.5	62.3
8	2.2	208	43.2	52.9	61.4	69.7
9	2.6	145.6	46.1	57.6	66.8	74.2
10	2.9	144.06	44.1	56.0	65.6	73.8
11	3.3	104	47.2	56.8	64.5	74.8
12	3.4	108.78	46.8	59.3	69.0	78.0
13	3.9	100	47.6	60.3	69.5	79.5
14	4.3	73.5	47.2	64.4	70.8	81.3
15	4.5	59.5	53.2	57.5	69.8	82.5
16	5.2	52.5	51.3	69.0	78.5	86.4
17	5.6	42.5	52.6	68.6	92.0	

(Nishimoto, Table 1 (annotated).)

Thus, in view of these teachings from Nishimoto, a POSITA would have understood Lin's lighting fixture, comprised of a similar combination of LEDs, LED circuit boards, and a housing with a heat sink, would have had an LED junction temperature of around 55°C at an ambient temperature of 25°C, at least when the LEDs are driven with certain currents. (Coleman Decl., ¶¶86-89.) For example, a POSITA would have understood to vary the driving current, thermal

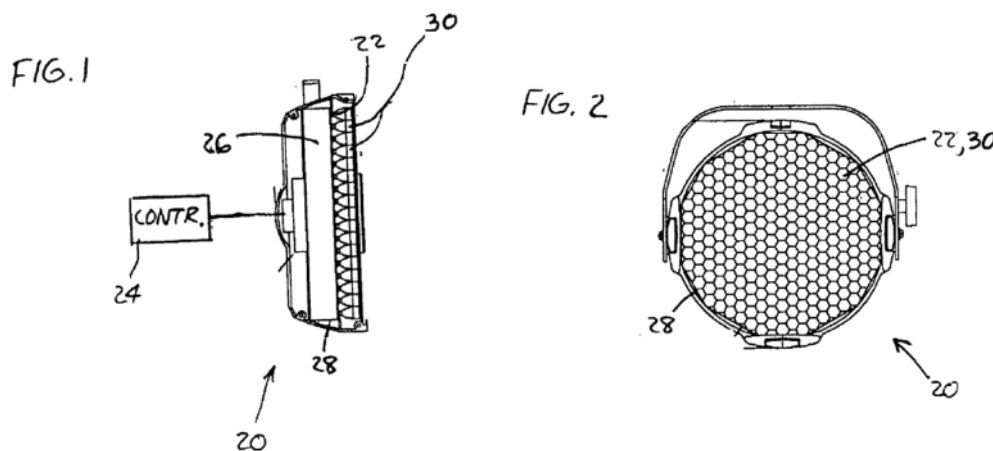
resistance of the heat sink housing and fins (such as by using different materials), and volume and layout of the heat sink and fins in order to achieve a junction temperature of around 55°C. (*Id.*) This would have been well within routine experimentation a POSITA could perform, as junction temperature is simply a result of the relationship between several known variables as disclosed in Nishimoto. (*Id.*) Moreover, a POSITA would have been motivated to achieve such an LED junction temperature in order to ensure that the LEDs do not become too hot, such that their performance would degrade or they could fail. (*Id.*) This is a stated goal of both Lin and Nishimoto. (*Id.*)

Further, a POSITA would have understood and expected that, when the LED junction temperature is around 55°C, the temperature of the heat dissipating body including the heat sink would be around 45°C in at least certain circumstances. (*Id.*) Both Lin and Nishimoto discloses that the heatsinks dissipate heat, and as such they pull heat away from the LEDs. (Lin, 4:14-16, 5:11-19 (noting that heat dissipation prolongs “service life” of the LEDs); Nishimoto, 2:11-311, 6:4-14; Coleman, Decl., ¶88.) A POSITA would have therefore understood that Lin’s LED lighting module could be made to have a junction temperature of 55°C and a housing temperature of 45°C when measured in 25°C ambient temperature, as this would merely involve the routine changing materials, heatsink thermal resistance (which could be easily changed by adjusting the volume or surface area of the heatsink), and the current or

power at which the LEDs are driven. (Nishimoto, 21:11-23:20, 24:1-25:1 (including Table 1), 30:22-33:24, Figs. 13-15, Figs. 17A-17C, 35:15-36:18.)

That the housing (or heat sink) temperature in Lin could be 45°C when the junction temperature is 55°C (at 25°C ambient conditions) can also be confirmed based on the teachings of Cunningham, which discloses the relationship between heatsink temperature and junction temperature. (Coleman Decl., ¶¶89-95.)

Cunningham, in the same field as Lin, discloses a method for controlling a lighting fixture. (Cunningham, Abstract, [0010].) Cunningham discloses the lighting fixture may comprise an array of LEDs:



(Cunningham, Figs. 1-2; *see also* Abstract, [0010], [0020]-[0021].) Cunningham teaches that when the heat sink has reached a steady state temperature, the junction temperature and the heat sink temperature have the following relationship:

$$T_{JX} = (P_X)(\theta_{JC} + \theta_{CS}) + T_S$$

where:

T_{JX} = junction temperature of a group X LEDs (°C)

P_X = power dissipated by each LED in group X (watts)

θ_{JC} = thermal resistance between junction and case of each LED ($\frac{^{\circ}\text{C}}{\text{watt}}$)

θ_{CS} = thermal resistance between case of each LED and heat sink ($\frac{^{\circ}\text{C}}{\text{watt}}$)

T_S = heat sink temperature (°C)

(Cunningham, [0056]-[0069].)

As explained by Dr. Coleman, this equation can be rearranged as shown below to determine the heatsink temperature:

$$T_S = T_{JX} - (P_X)(\theta_{JC} + \theta_{CS})$$

(Coleman Decl., ¶¶89-92.)

By applying the relationship between junction temperature and heatsink temperature disclosed by Cunningham to the data disclosed by Nishimoto's Table 1, a POSITA would have understood that an ambient temperature of approximately 25 °C, a heat sink temperature of approximately 45 °C, and a junction temperature of approximately 55 °C could be achieved by selecting various heatsinks and driving currents. (Coleman Decl., ¶¶89-92.) For example, when Nishimoto's Heatsink No. 6 is used with LEDs driven at 50 mA (power of 11 Watts) in an ambient temperature of 25 °C, the junction temperature as reflected in Table 1 is 57 °C (Nishimoto at 31:2-5, Table 1). The thermal resistance in Nishimoto between

the junction and the heat sink is referred to as the thermal substrate resistance, and is the thermal resistance represented by $\theta_{JC} + \theta_{CS}$ in Cunningham. (Coleman Decl., ¶¶89-92.) Nishimoto discloses that this substrate thermal resistance should not be greater than 3 °C/W and demonstrates that the substrate thermal resistance may be 1.2 °C/W and may be adjusted (Nishimoto, 16:3-11, 18:11-20, 19:1-5, 22:7-10, 19-23, 26:8-13, Figs. 8, 9). Using Nishimoto's disclosed substrate thermal resistance of 1.2 °C/W, and the data for Heatsink No. 6 from Table 1 in Nishimoto, the heatsink temperature is:

$$T_S = 57.7^{\circ}\text{C} - (11\text{W}) \left(1.2 \frac{^{\circ}\text{C}}{\text{W}} \right) = 44.5^{\circ}\text{C}$$

(Coleman Decl., ¶¶89-95; Nishimoto, 16:3-11, 18:11-20, 19:1-5, 22:7-10, 19-23, 26:8-13, Figs. 8, 9.) Similarly, Nishimoto's Heatsink No. 7 used with LEDs driven at 40 mA (9 Watts) in an ambient temperature of 25 °C would result in a heatsink temperature of approximately 45.7 °C. (Coleman Decl., ¶¶89-95.) Likewise, Nishimoto's Heatsink No. 15 used with LEDs driven at 20 mA (5 Watts) in an ambient temperature of 25 °C would result in a heatsink temperature of approximately 47.2 °C. (*Id.*) Thus, a POSITA would have understood that the heat sink housing in Lin could have temperature of around 45 °C during steady state operation of the LEDs at 55 °C junction temperature in an ambient temperature of 25 °C, as this would have merely been the routine result of using different materials, volumes, and power supplied to the LEDs.

Again, at the very least, it would have been obvious to a POSITA to have a heatsink temperature of approximately 45 °C, and a junction temperature of approximately 55 °C in an ambient temperature of approximately 25 °C because heatsink temperature and junction temperature are a function of the thermal resistance from the junction to the heatsink, the heatsink thermal resistance, and the current driving the LEDs. (*Id.*) A POSITA would have expected to arrive at the claimed temperatures at least as part of routine experimentation and operation of the lighting device in Lin, including varying the thermal resistance of the heatsink, the volume of the heatsink, and the amount of current driving the LEDs. (*Id.*)

E. Ground 5 – Chen Anticipates and Renders Obvious Claims 21-22, 23-, and 26

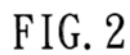
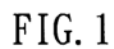
Chen (EX1007) is US7,465,066. Chen was filed on February 21, 2006, and issued December 16, 2008. Chen is prior art under at least pre-AIA § 102(e).

1. Independent Claim 21

Chen anticipates and renders obvious Claim 21. (Coleman Decl., ¶¶97-111.)

21[Pre]: A LED light fixture comprising:

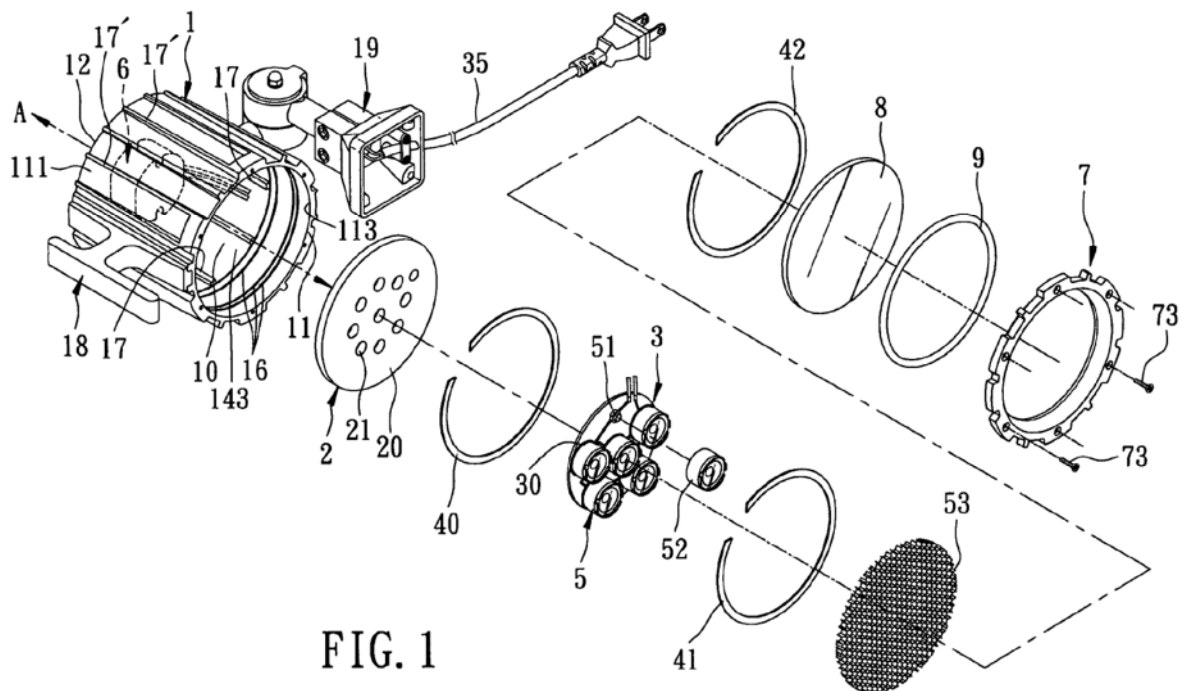
Chen discloses Claim 21[Pre] to the extent limiting. (*Id.*, ¶98.) Chen discloses an “illumination apparatus” or “lighting device” that “has a superior heat dissipating capability and longer service life.”(Chen, Abstract, 1:18-21.) The lighting device includes “a heat dissipating plate,” “lighting units, each having a



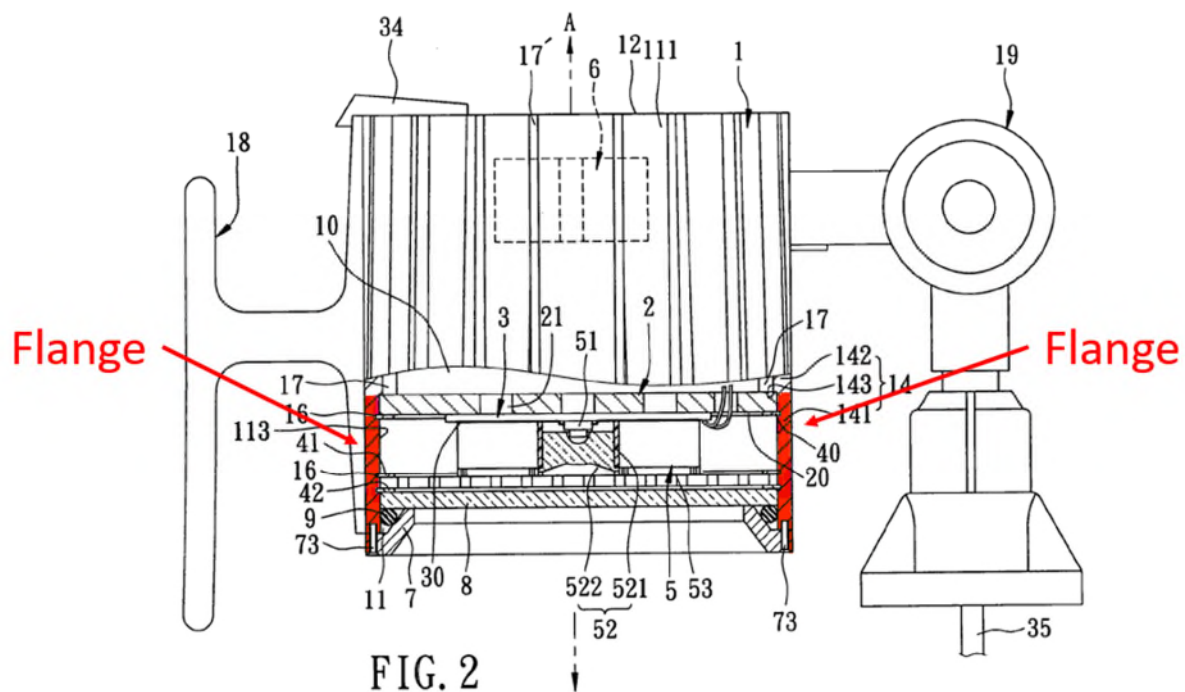
(Chen, Figs. 1-2, Abstract, 1:18-21) Moreover, as shown above, there is an “adjustable supporting frame 19” that supports the housing of the light. (*Id.*, 2:22-23.) Chen further discloses its lighting device has a “plurality of heat-dissipating ribs” such that the device “has a superior heat dissipating capability and longer service life.” (*Id.*, Abstract, 1:18-21, 2:18-22, 3:10-12.)

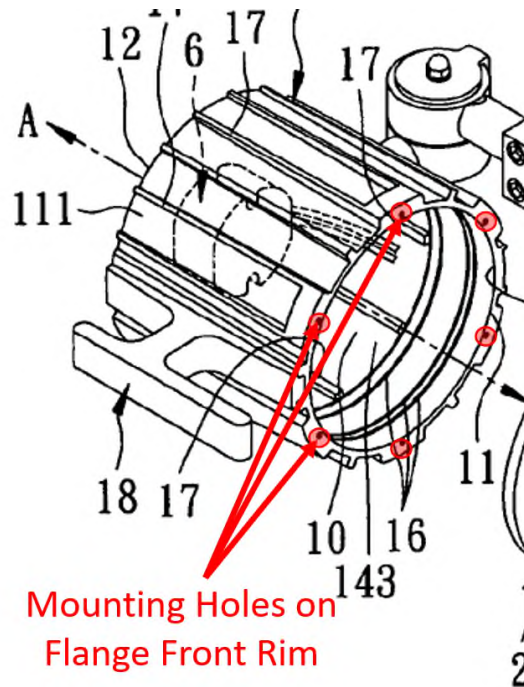
21[A.i]: a housing including a flange, an internal receiver, a frontal lens, and an array of fins...

Chen discloses Claim 21[A.i]. (Coleman Decl., ¶¶98-104.) Chen discloses “a tubular housing made of heat conductive material” that includes 1) a flange, 2) an internal receiver, 3) a frontal lens, and 4) an array of fins:



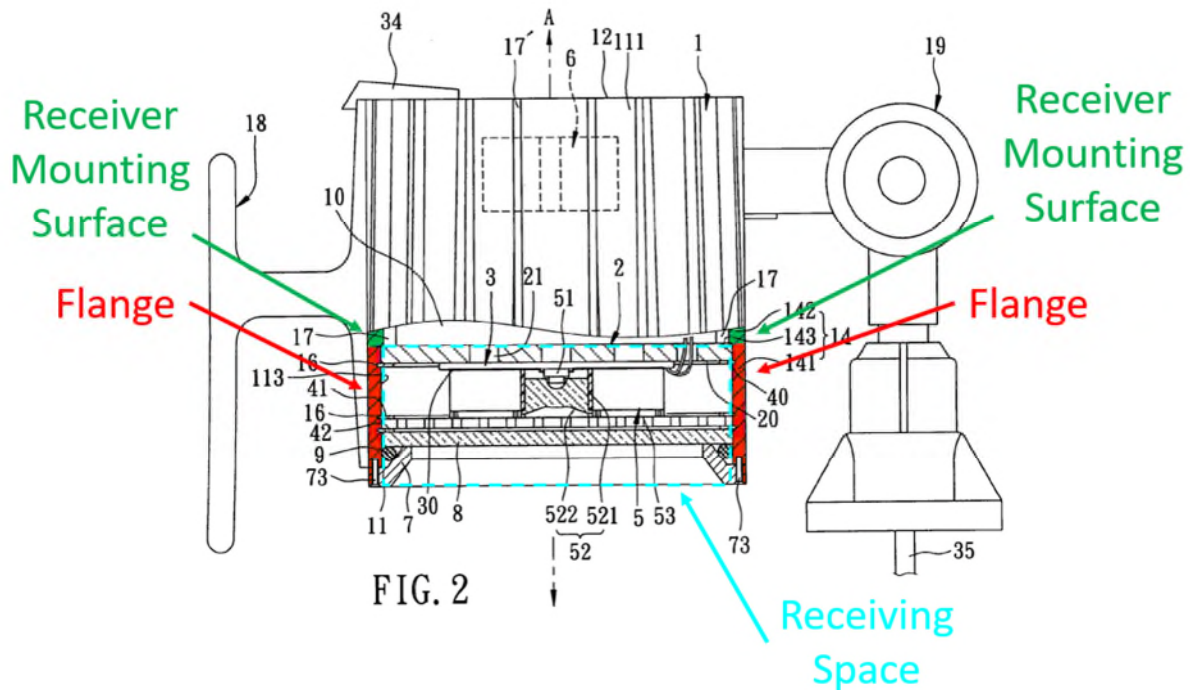
(Chen, Fig. 1, 1:24-27; *see also* 1:28-33, 1:39-50, 2:3-23.)





(Chen, Fig. 1 (annotated),

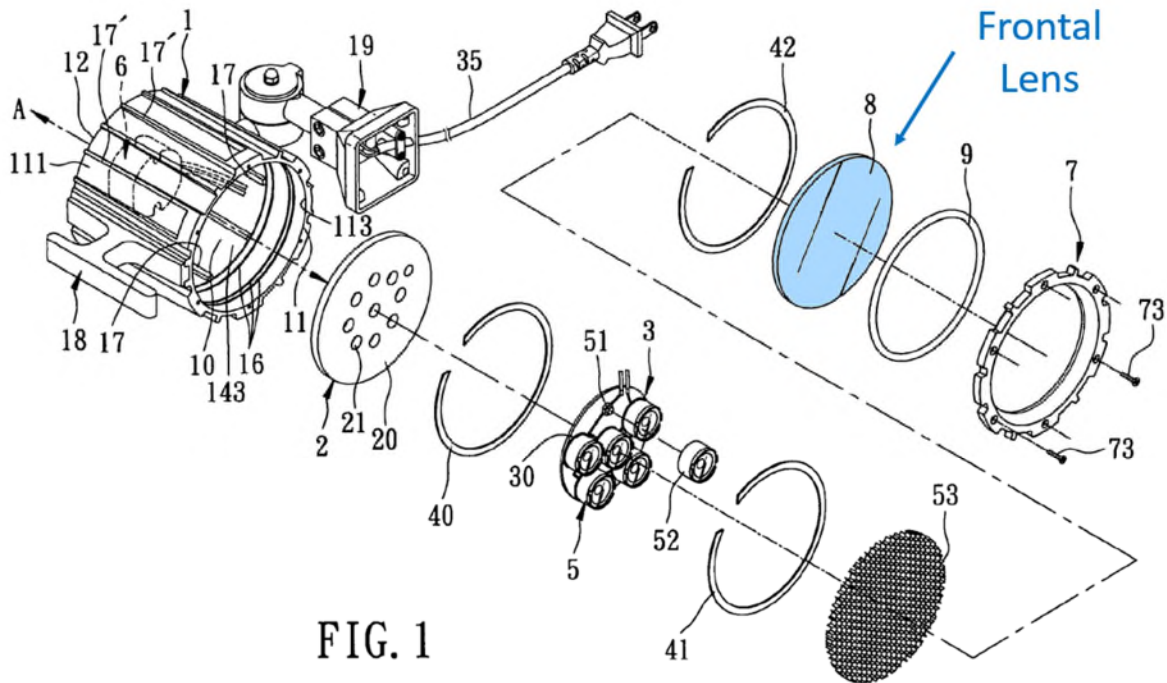
Second, Chen discloses an internal receiver. (Coleman Decl., ¶101.) Chen discloses that the housing 1 . . . is configured with receiving space 10” including an open space towards the front of the light:



(Chen, Fig. 2 (annotated), 2:3-6; *see also* Fig. 1, Cl. 1, 1:24-31, 1:45-46, 2:65-67.)

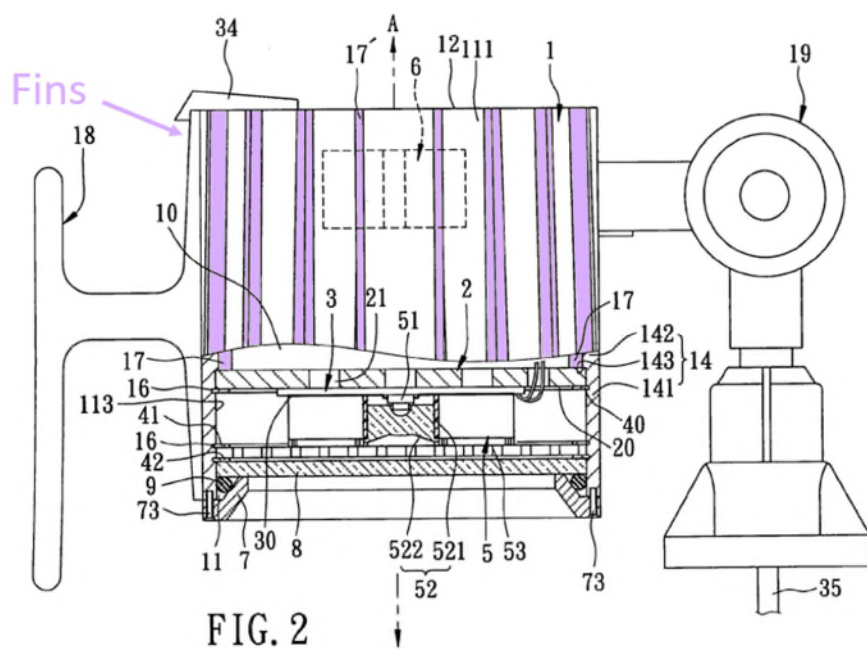
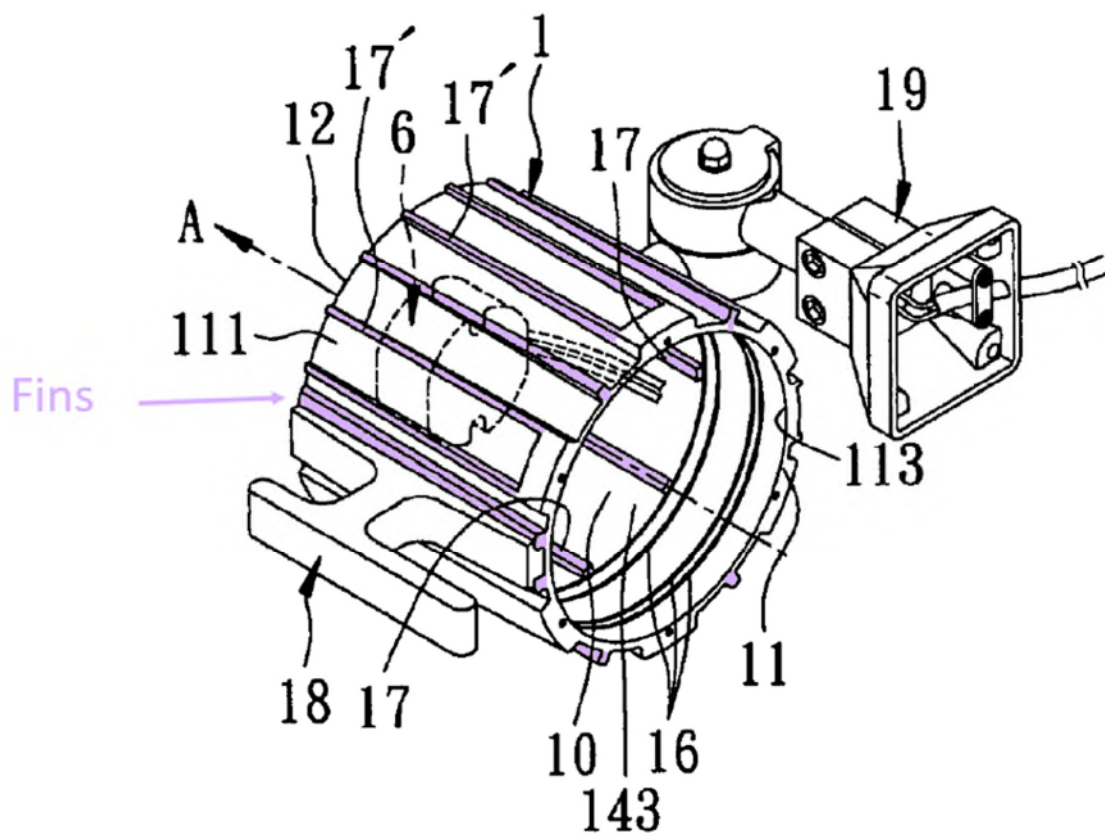
In particular, Chen discloses that a “lighting device is disposed in the receiving space 10 . . . and includes a heat dissipating plate 2, a circuit board 3, a plurality of lighting units 5, and a driving unit 6.” (*Id.*, 2:24-27.) The circuit board and LEDs are attached to a “mounting surface 20” of the heat dissipating plate, which itself “abuts against the intermediate shoulder portion 143” (*i.e.*, internal receiver) of the tubular body. (*Id.*, 2:24-39.) Thus, the shoulder portion 143 is an internal receiver on which the heat dissipating plate, circuit board, and lighting units (including the LEDs) are mounted when they “abut” against it during installation. (Coleman Decl., ¶101.)

Third, Chen discloses a frontal lens. (Coleman Decl., ¶102.) Chen discloses the housing for its lighting device includes “a transparent plate 8” (*i.e.*, a frontal lens):



(Chen, Fig. 1 (annotated), 1:66-2:2; *see also* 2:62-65, 3:1-7.) This “transparent plate 8 is disposed in the housing 1 and in front of the lighting units 5.” (*Id.*, 2:62-65, Figs. 1-3.)

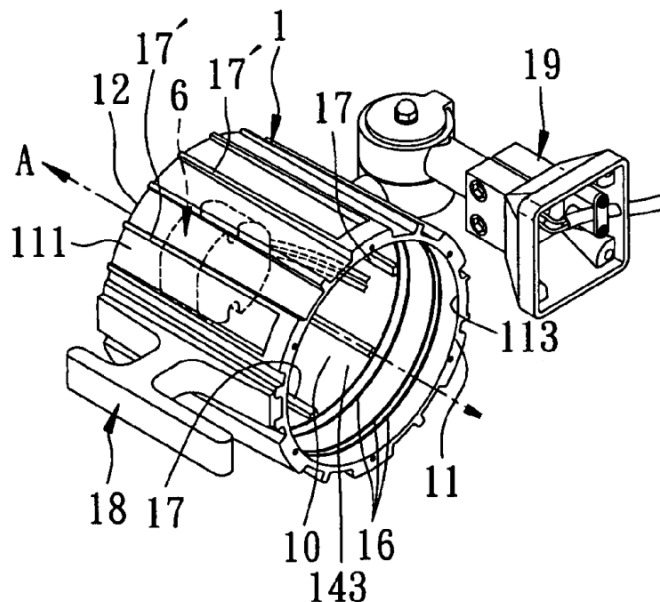
Fourth, Chen includes an array of fins. (Coleman Decl., ¶¶103-104; see also *infra* Ground 5, Claim 21[A.ii].) Chen discloses the tubular body 14 of the heat conductive housing 1 is formed “with a plurality of heat-dissipating ribs” 17 and 17’ (*i.e.*, an array of fins):

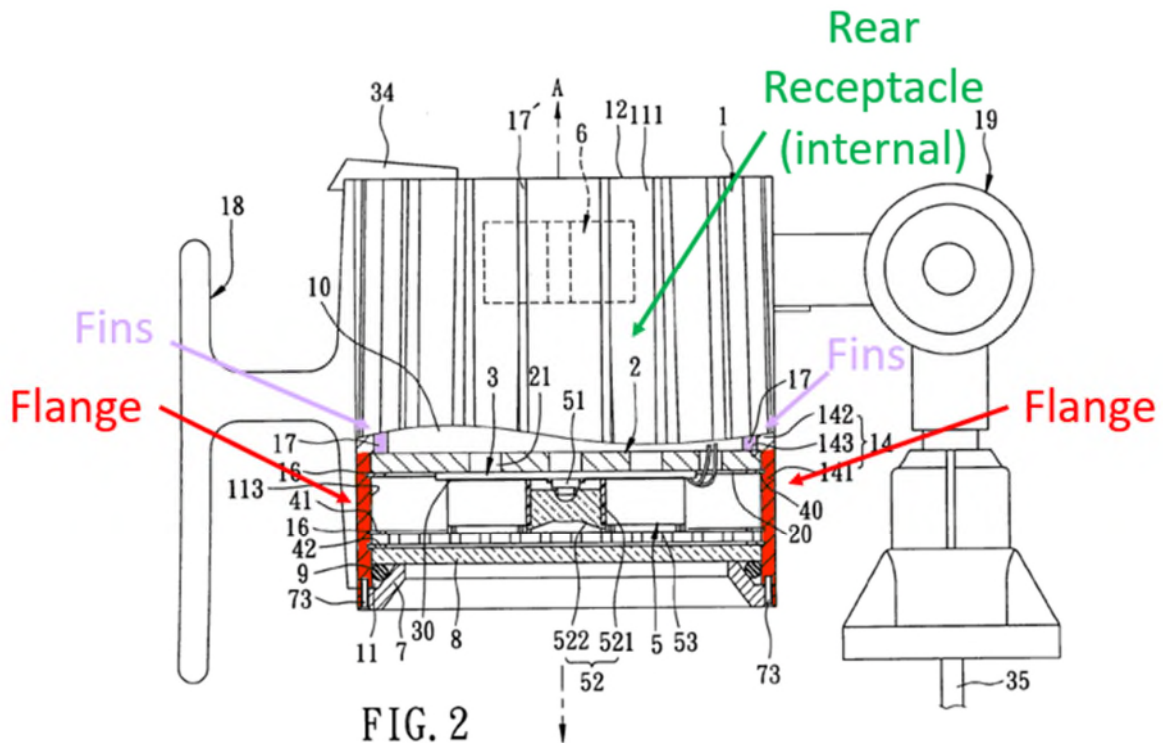


(Chen, Figs. 1-2 (annotated), 2:18-24.) In particular, Chen discloses that the “rear end portion 142 of the tubular body 14 has an inner surface formed with a plurality of heat-dissipating ribs 17 extending in the axial direction (A). Also, the tubular body 14 of the housing 1 has an outer surface 111 formed with a grip 18, and a plurality of heat-dissipating ribs 17’ extending in the axial direction (A).” (*Id.*, 2:8-24, 3:10-12.)

21[A.ii]: ...[the array of fins] extending rearward from the flange to define a rear receptacle that extends forward towards the flange,

Chen discloses Claim 21[A.ii]. (Coleman Decl., ¶105.) Chen discloses that the fins, including “heat-dissipating ribs 17” formed on the inner surface of the housing, extend rearward from the shoulder portion 143 of the flange, and rib 17’ on the outer surface of the housing that extend rearward from the top portion 141 of the flange:

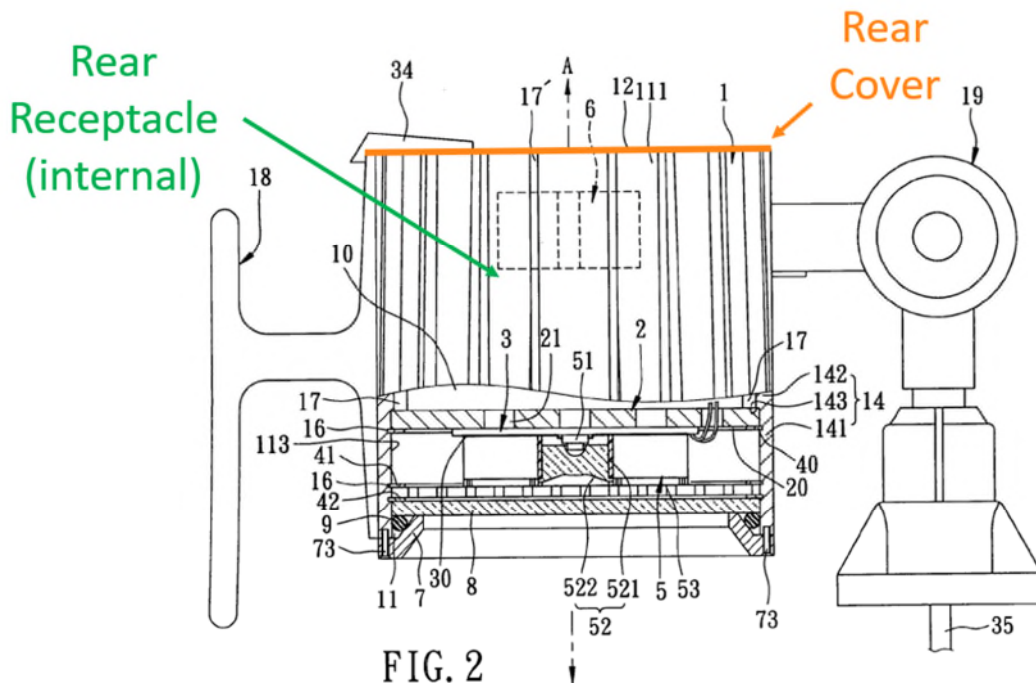




(Chen, Figs. 1-2, (annotated), 2:18-23; *see also* Fig. 3.) These ribs define an interior recess space within the housing, as, for example, the interior ribs 17 surround the interior “receiving space 10” inside of the housing rearward of the shoulder 143 of the flange. (*Id.*, Figs. 1-3, 2:18-27; Coleman Decl., ¶105.) *See also infra* Ground 5, Claim 21[C].

21[A.iii]: *the housing further including a rear cover that encloses the rear receptacle;*

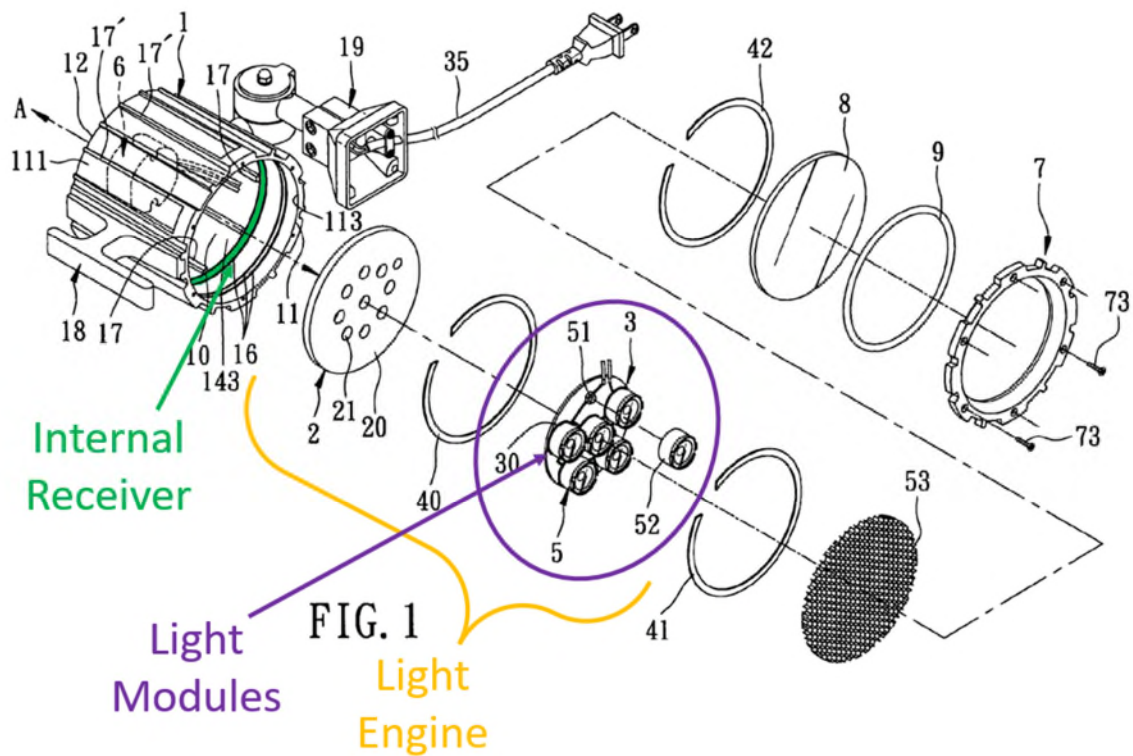
Chen discloses Claim 21[A.iii]. (Coleman Decl., ¶106.) Chen discloses that the housing includes “a rear wall connected to a rear end of the tubular body 14”:



(*Id.*, Fig. 2 (annotated), 2:3-8 (stating the housing has a “closed rear end 12”); see also Fig. 3 Cl. 1, 1:24-27.) This rear wall encloses the interior receiving space 10 between the interior fins 17. (*Id.*; Coleman Decl., ¶106.)

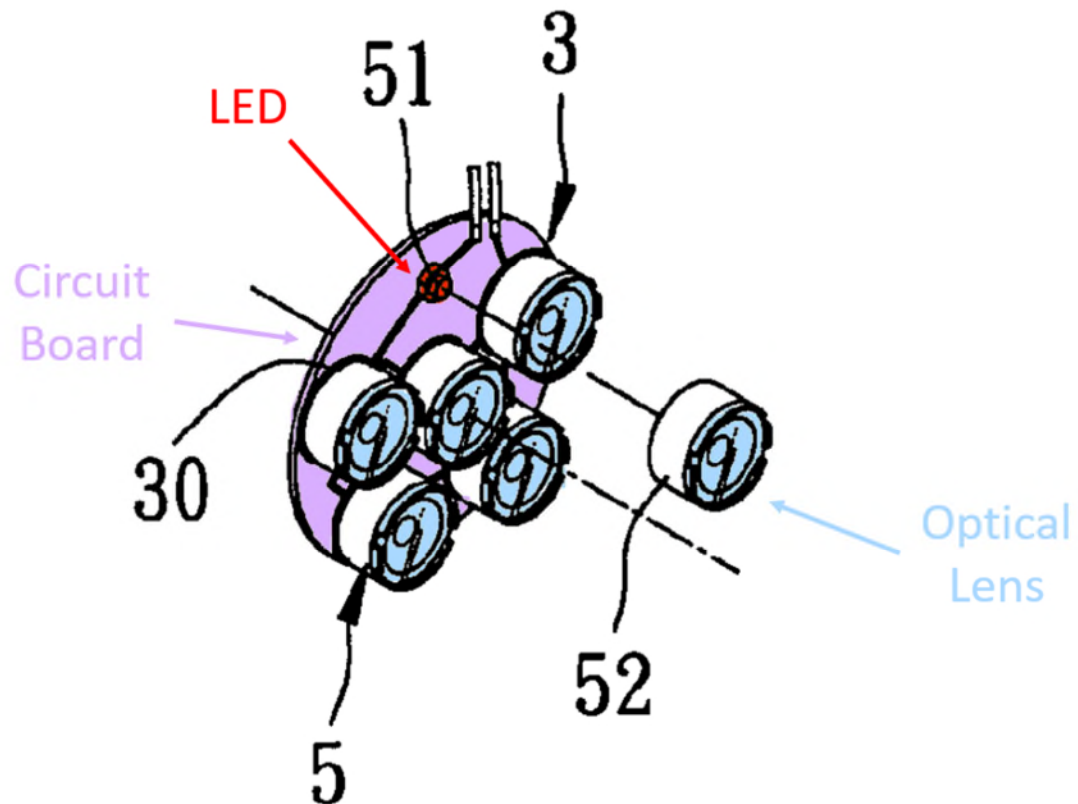
21[B]: a light engine assembly mounted to the receiver, the light engine having a plurality of light modules, wherein each module includes both a LED mounted to a printed circuit board and an optical lens extending from the printed circuit board;

Chen discloses Claim 21[B.i]. (Coleman Decl., ¶¶107-108.) Chen discloses “a “lighting device” comprising a plurality of “lighting units” attached to a heat dissipating plate 2 (together, a light engine assembly) mounted in “the receiving space in the housing” (*i.e.*, the receiver):



(Chen, Fig.1 (annotated), 1:28-39, Fig. 2.) For example, Chen discloses that the lighting units are mounted to a “mounting surface 20” of the heat dissipating plate, which “abuts against the intermediate shoulder portion 143”) of the tubular body. (*Id.*, 2:24-39.) Thus, the “lighting units” (*i.e.*, lighting modules) and heat dissipating plate making up the light engine assembly in Chen are mounted to a receiver (*i.e.*, the intermediate shoulder portion) in the housing. (Coleman Decl., ¶¶107-108.)

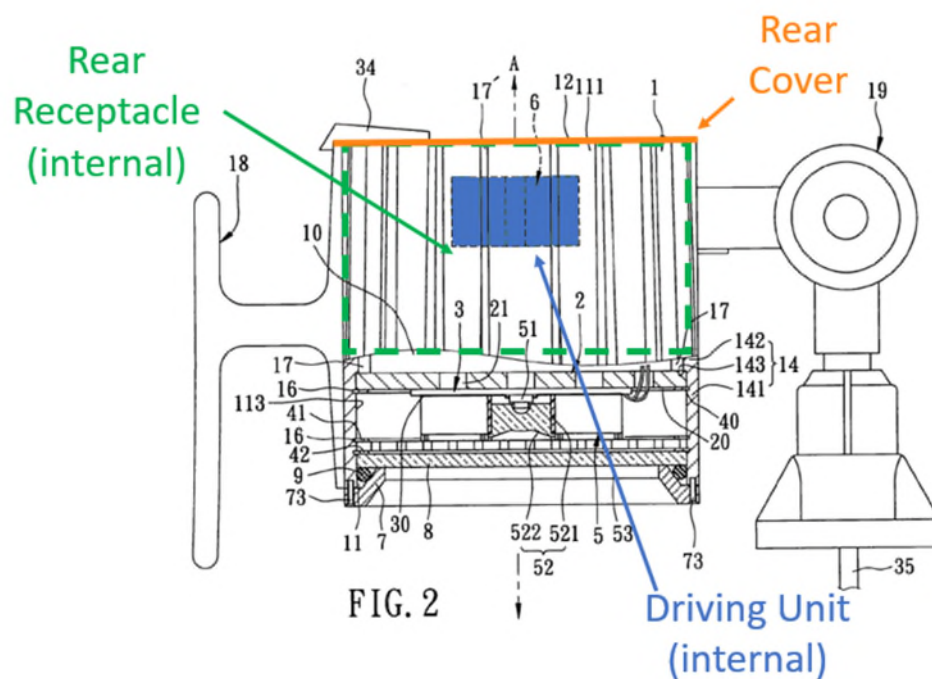
Chen further discloses that the “plurality of lighting units” each have “a light emitting diode 51 . . . mounted on the circuit board 3, and a condensing member 52 mounted on the circuit board 3 and disposed around the light emitting diode 51”:



(Chen, Fig. 1 (annotated), 2:40-44; *see also* 1:35-38.) These condensing members are “lenses,” and extend from the circuit board, with Chen disclosing that condensing members are in fact “mounted on” the circuit board with each having “a condensing lens 522”:

21[C]: a power supply residing within the rear receptacle and enclosed by the cover; and,

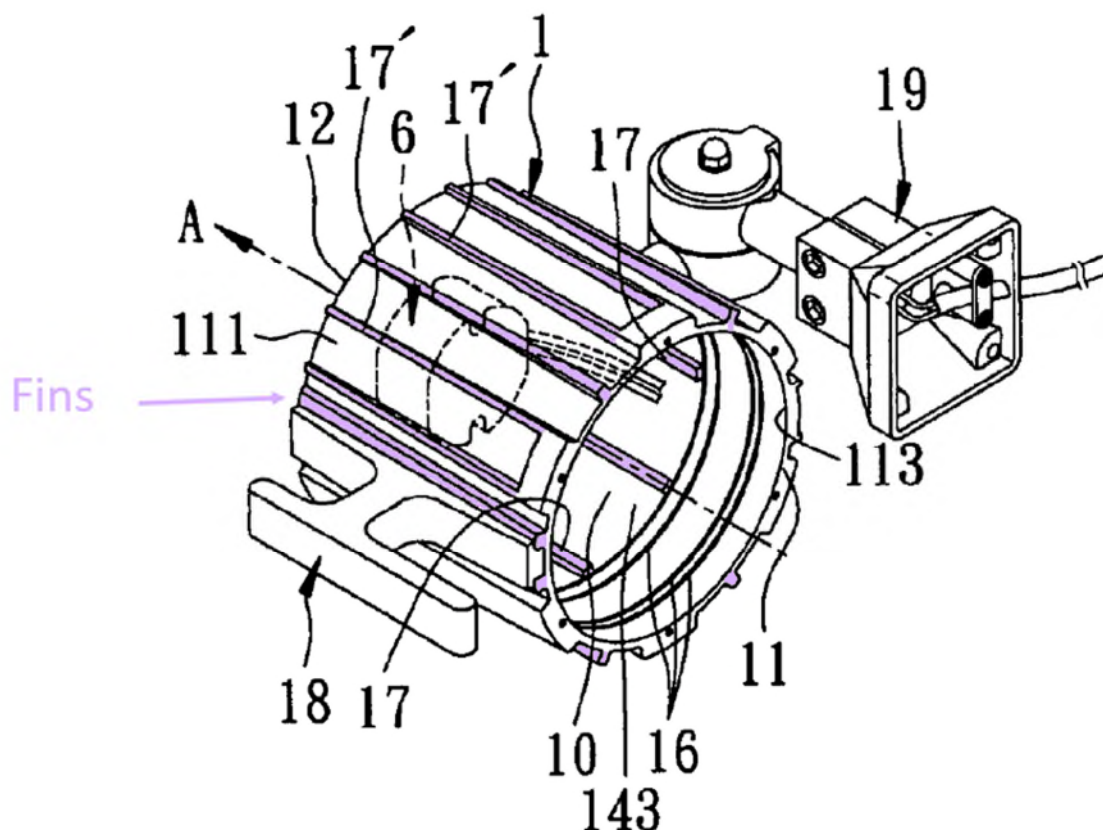
Chen anticipates and renders obvious Claim 22. (Coleman Decl., ¶¶109-110.) Again, Chen discloses “housing 1” which includes “a receiving space 10” in the rear portion thereof between “heat dissipating ribs 17” that extend from an inner surface of the housing, and which is enclosed by a “a rear wall connected to a rear end of the tubular body 14”. (Chen, 1:24-27, 2:3-24, Figs. 1-3; *see also* Cl. 1.) *See also supra* Ground 5, Claim 21[A.iii]. Chen further discloses “driving unit 6 is disposed fixedly in the housing 1” within this receiving space, or rear receptacle, as shown in Fig. 2:



(Chen, Fig. 2 (annotated), 2:24-27, 2:52-58.) Chen explains that driving unit 6 “is connected electrically to the circuit board 3 . . . and is adapted to be coupled electrically to an external power source . . . for activating the light emitting diodes 52.” (*Id.*, 2:51-57; see also Cl. 1, 1:39-42, 2:24-27.) That is, the driving unit 6 is a power supply, as it provides power to the LEDs so that they can be “activated.” (Coleman Decl., ¶¶109-110.)

21[D]: wherein during operation, heat generated by the LEDs passes through the circuit board and then said heat is dissipated by the array of fins without the use of a fan.

Chen anticipates and renders obvious Claim 21[D]. (Coleman Decl., ¶111.) As previously discussed, Chen discloses heat-dissipating ribs 17 and 17' (*i.e.*, fins) that extend from the inner and outer surfaces of the housing:



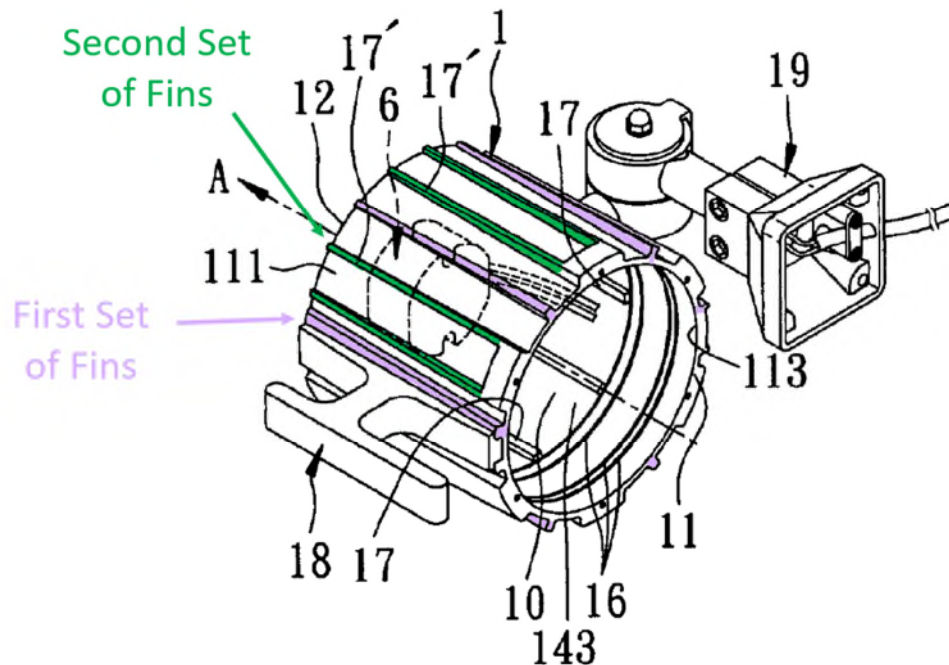
(Chen, Fig. 1 (annotated), 2:18-24.) *See also supra* Ground 5, Claim 21[A.i]-[A.ii].

Chen further discloses that during operation, “[d]ue to the presence of the heat dissipating plate 2 and the heat conductive housing 1, heat generated by the light emitting diodes 51 can be dissipated.” (Chen, 3:10-12, 1:17-20, 2:3-51.) That is, the heat-dissipating fins, which are extensions of the housing, dissipate heat from the LEDs that passes through the circuit board and is conducted to heat dissipating plate and into the housing. (Coleman Decl., ¶¶111.) Notably, Chen makes no mention of a fan, nor does Chen illustrate a fan in any of the figures showing its lighting device. (*Id.*)

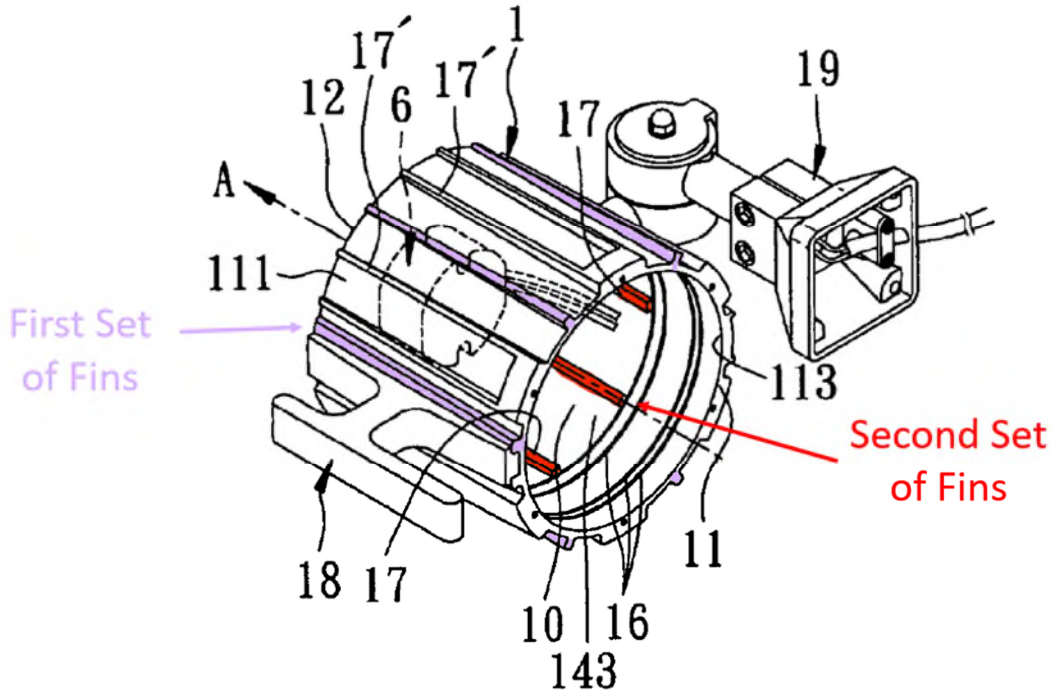
2. Dependent Claim 22

The LED light fixture of claim 21, wherein the array of fins includes a first set of fins with a first fin length and a second set of fins with a second fin length, wherein the first fin length exceeds the second fin length.

Chen anticipates and renders obvious Claim 22. (Coleman Decl., ¶¶112-1113.) Chen discloses “a plurality of heat-dissipating ribs” 17 and 17’ (i.e., an array of fins). See *supra* Cls. 21[A.iii], [D]. As shown in Fig. 2, Chen’s outer heat-dissipating ribs 17’ consist of a set of fins with a first fin length and a set of fins with a second fin length that is less than the first fin length:



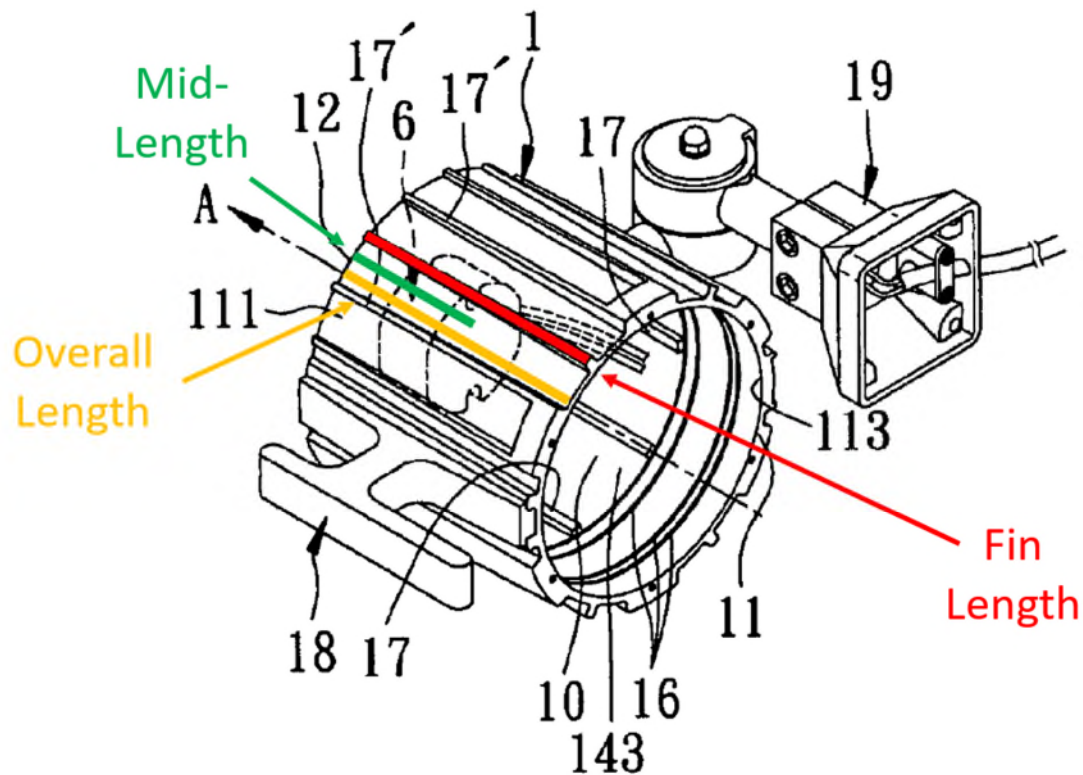
(Chen, Fig. 1 (annotated); see also Coleman Decl., ¶¶112-1113.) Moreover, Chen discloses inner heat-dissipating ribs 17 that span from the rear-most annular engaging groove 16 to the rear end of the tubular body. (Chen, 2:13-23, Fig. 2.) Inner



As previously explained, Chen discloses a housing including a plurality of heat-dissipating ribs (*i.e.*, an array of fins). *See supra* Ground 5, Claims. 21[A.i]-21[A.iii], 21[D], 22. As shown in Fig. 2, 2 discloses a housing with an overall length spanning from rear end 12 to front end 11. (Chen, 2:3-6; Coleman Decl.,

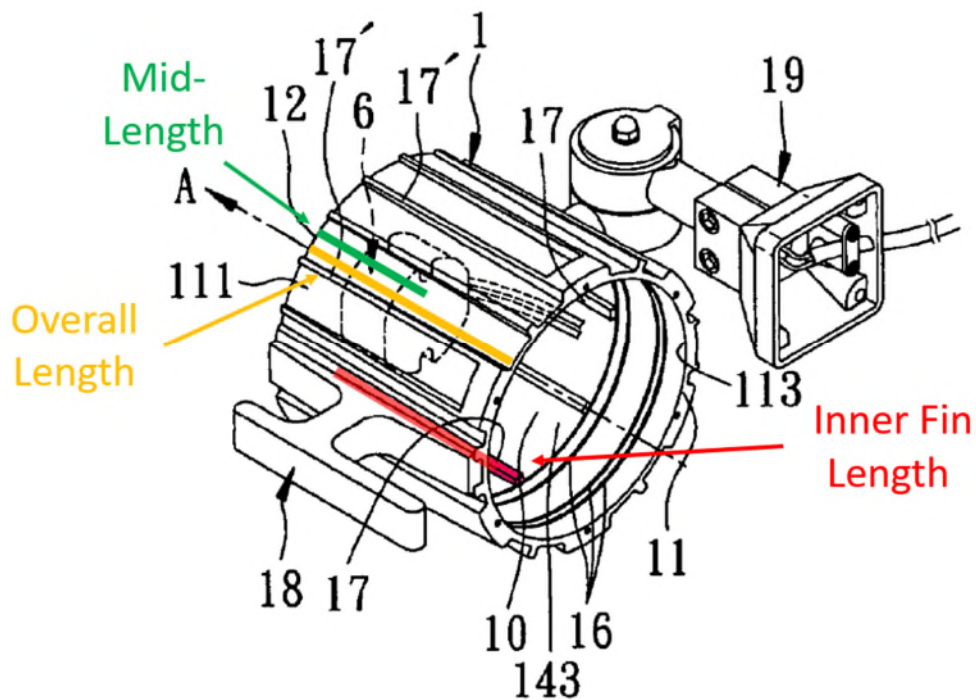
¶¶114-116.) Accordingly, Chen’s housing has a mid-length half this distance.

(Coleman Decl., ¶¶114-116.) Fig. 2 of Chen shows that the length of the array of fins has a length that exceeds said mid-length:



(Chen, Fig. 1 (annotated).)

Further, Chen discloses “the rear end portion 142 of the tubular body 14 has an inner surface formed with a plurality of heat-dissipating ribs 17.” (Chen, 2:17-19.) Chen shows the inner heat-dissipating ribs 17 (*i.e.*, inner fins) span from the rear end of the body to the rearmost engaging groove 16 at the intermediate shoulder portion 143 of the body:

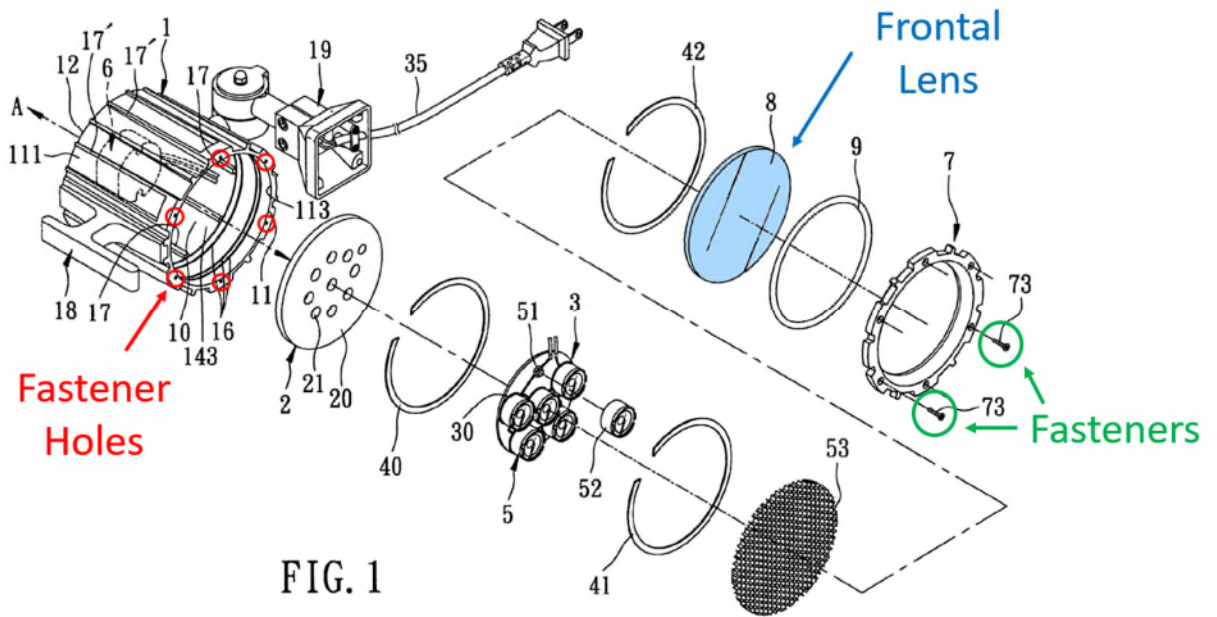


(Chen, Fig. 2 (annotated).) Accordingly, the length of Chen’s inner fins have a length that exceeds the mid-length. (Coleman Decl., ¶¶114-116.)

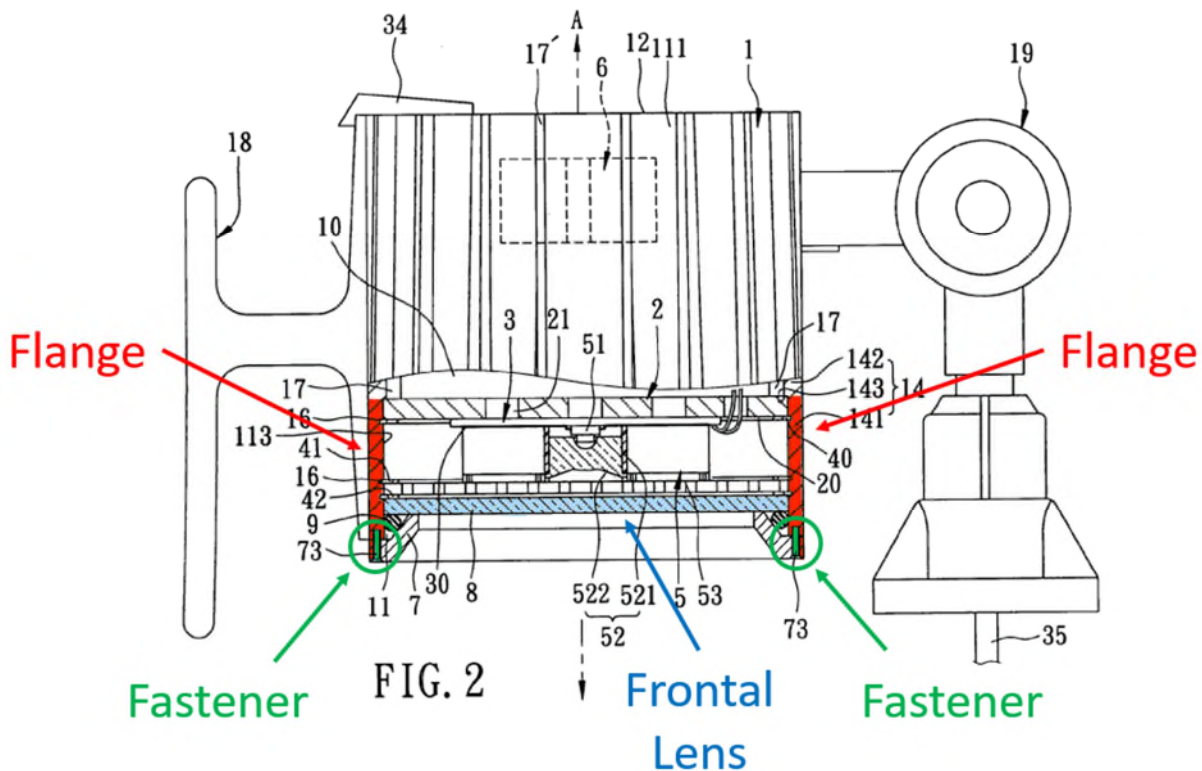
4. Dependent Claim 26

The LED light fixture of claim 21, wherein the frontal lens is secured to the flange by a plurality of fasteners arranged at the periphery of both the frontal lens and the flange.

Chen anticipates and renders obvious Claim 26. (Coleman Decl., ¶117.) Chen discloses transparent plate 8 [(i.e., the frontal lens)] is disposed in the housing 1” and is secured in place to the flange by “annular cap 7 . . . by means of a plurality of screw fasteners 73” arranged around the edges, or periphery, of the flange and lens:



(Chen, Fig. 1 (annotated), 2:61-67.) Screw fasteners 73 are arranged at the periphery of the frontal lens and flange, and secure the transparent plate (lens) to the flange. (Chen, Figs. 1-2, 2:61-67; Coleman Decl., ¶117.) For example, screw fasteners 73 extend through annular cap 73 and into the flange portion of the housing:



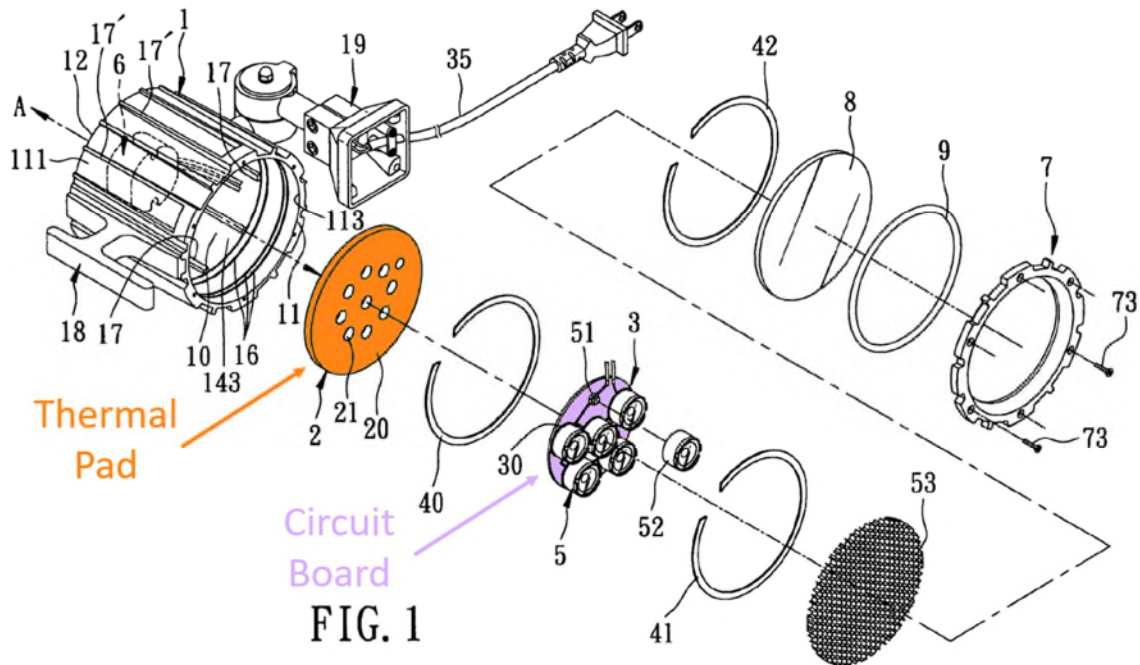
(Chen, Fig. 2 (annotated), Fig. 3; Coleman Decl., ¶117.)

F. Ground 6 – Chen in view of Lodhie Renders Obvious Claim 24

1. Dependent Claim 24

The LED light fixture of claim 21, further comprising a thermal pad residing between the receiver and the printed circuit board, wherein both the thermal pad and the printed circuit board have at least one opening that receives a lead extending between the power supply and the printed circuit board.

Chen in view of Lodhie renders obvious Claim 24. (Coleman Decl., ¶¶118-124.) Chen discloses its lighting device includes a housing including a tubular body 14, a heat dissipating plate 2 (i.e., thermal pad) and circuit board 3:



(Chen, Fig. 1 (annotated), 2:28-39.) Chen explains “circuit board 3 is attached to the mounting surface 20 of the heat dissipating plate 2 . . . so as to be in thermal contact therewith.” (*Id.*, 2:36-39.) Heat dissipating plate is, itself, attached to a mounting surface in a receiver of the housing, as it “abuts against the intermediate shoulder portion 143” in an open receiver space of the body housing. (*Id.*, 2:38-58, Figs. 1-2.) *See also supra* Ground 2, Claims 21[A.i], 24.) Heat dissipating plate 2 has a plurality of through holes 21 allowing driving unit 6 (*i.e.*, the power supply) to be “connected electronically to the circuit board 3 via wires passing through one of the through holes 21.” (*Id.*, 2:52-58, Figs. 1-2.)

Moreover, while Chen shows the wire leads from the power supply being passed around an edge of the circuit board for attachment (*see* Chen, Figs. 1-2), it would have been obvious to a POSITA that these wire leads could be passed through holes in the circuit board itself. (Coleman Decl., ¶¶118-121.) For example, Lodhie discloses an LED lighting unit similar to that of Chen, with power to LEDs running through wires and connectors from a power supply to the LEDs on a circuit board. (Lodhie, Abstract, 1:46-63, 2:16-67, 3:23-62, 4:1-7, Figs. 2-3, 5.) Lodhie discloses that, for example, “wires 43 and 45 are electrically conductive wires, one of which passes through base 13 and is in electrical contact with one of contacts 15a and 15b at one end and a lead of an LED, preferably on printed circuit board 11a' at the other end. The other of wires 43 and 45 passes through base 13 and is in electrical contact with the other of contacts 15a and 15b, the other end of which is in electrical contact with a lead of an LED, preferably on printed circuit board 11c.” (*Id.*, 3:31-48.) Lodhie further discloses that, to connect the wires to the LED contacts, the wires may pass through “holes” in the circuit boards. (*Id.*, 3:49-67, 2:39-47, Figs. 2, 5.) In particular, Lodhie discloses that “wire 43 is shown connected to one lead of LED 63 in LED layer 11a. ... One lead of LED 67 is connected to a wire 57 which passes through hole 59 to the second LED layer and is connected to one lead of an LED on the second layer. Wire 45 passes through hole 61 and through a corresponding hole in printed circuit board 11b' and is

coupled to one lead of an LED on the third layer. In this manner a complete circuit is formed so that the LEDs in each layer are connected in a series relationship and are electrically connected to contacts 15a and 15b so that when appropriate power is applied to contacts 15a and 15b, all the LEDs in each layer become lit.” (*Id.*, 3:49-67.) That is, Lodhie discloses that lead wires may be passed through holes in LED circuit boards in order to power LEDs, and Lodhie further discloses that the use of holes for passing the wires allows for the wires to be “kept as short as possible” to avoid problems during installation and to avoid crimping. (*Id.*, 4:1-7.)

A POSITA been motivated to include holes in the LED PCB of Chen as taught by Lodhie for providing a pathway to receive wires from the power supply in order to power the LEDs. (Lodhie, 1:46-63, 2:16-67, 3:23-62, 4:1-7, Figs. 2-3, 5; Coleman Decl., ¶¶122-124.) A POSITA would have understood that providing a hole for the power supply wires to connect to the LED contacts on the circuit boards would have been simply use of a well-known technology, forming a hole in the PCB for wires to pass, to provide a pathway for physical wires to make the required connections to power the LEDs. (Coleman Decl., ¶¶122-124.) A POSITA would have had a reasonable expectation of success, as using a PCB hole, or opening, as taught by Lodhie, would allow the wires to pass through to their connections even when there is not space within a housing for the wires to go from an opening and then around a circuit board (as is shown in Chen). (*Id.*) This would

have also allowed the wires to be kept as short as possible, avoiding problems with tangling or crimping during installation as taught by Lodhie. (*Id.*, Lodhie, 4:1-7.) At the very least, a POSITA would have found it obvious to try a hole, or opening, in the PCBs of Chen for the power supply wires to pass through and connect to the traces and other electronic components on the PCBs requiring power, as this would be one of a limited known ways of making such connections. (Coleman Decl., ¶¶122-124.) For example, a POSITA found it obvious to try passing wires around a circuit board, as taught in Chen, or to create a hole in the LED PCB for the wires to pass through where space is more constrained or a direct connection from the thermal pad opening is desired such that the wires do not need to bend or be potentially pinched. (*Id.*)

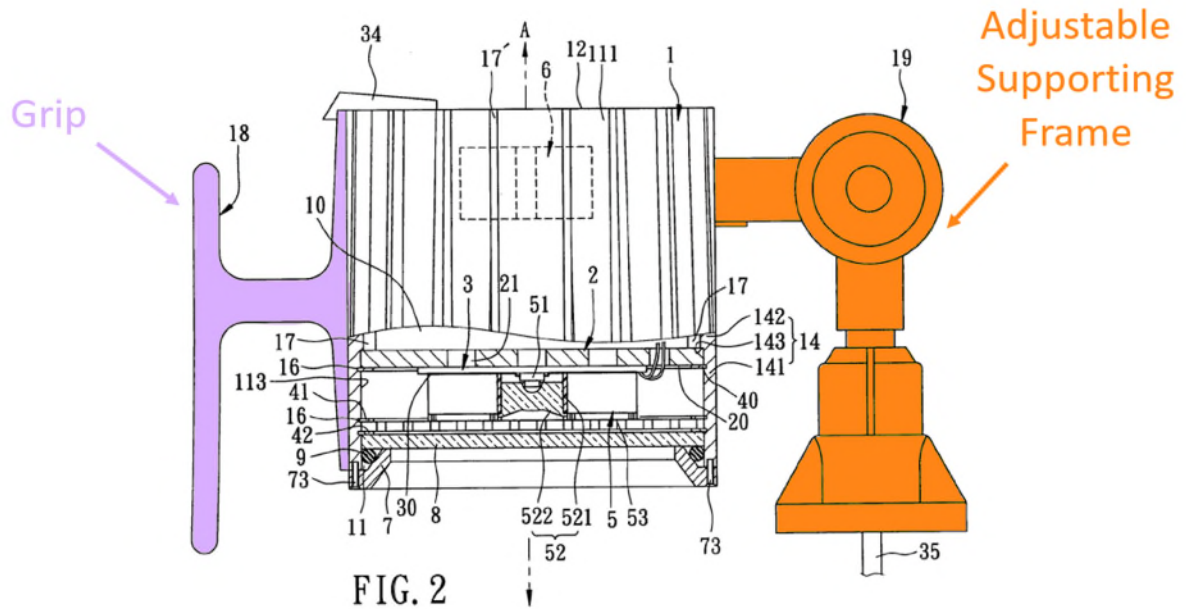
G. Ground 7– Chen in view of Lin Renders Obvious Claim 25

1. Dependent Claim 25

The LED light fixture of claim 21, further comprising a mounting bracket having opposed side segments that are secured to opposed sides of the housing rearward of the flange.

Chen in view of Lin renders obvious Claim 25. (Coleman Decl., ¶¶125-126.)

Chen discloses its device may include a grip 18 and an adjustable supporting frame 19:



(Chen, Fig. 2 (annotated), 2:19-23.) A POSITA would have understood Chen’s grip and adjustable supporting frame are used to hold the lighting device in position. (Coleman Decl., ¶¶125-126.)

Lin, in the same field as Chen, discloses “a grab handle (24), the two ends of the grab handle (24) [(i.e., a mounting bracket)] are fixed on two corresponding sides of the heat dissipation unit (2)” and “can be fixed to the wall surface through the slotted hole (25).”

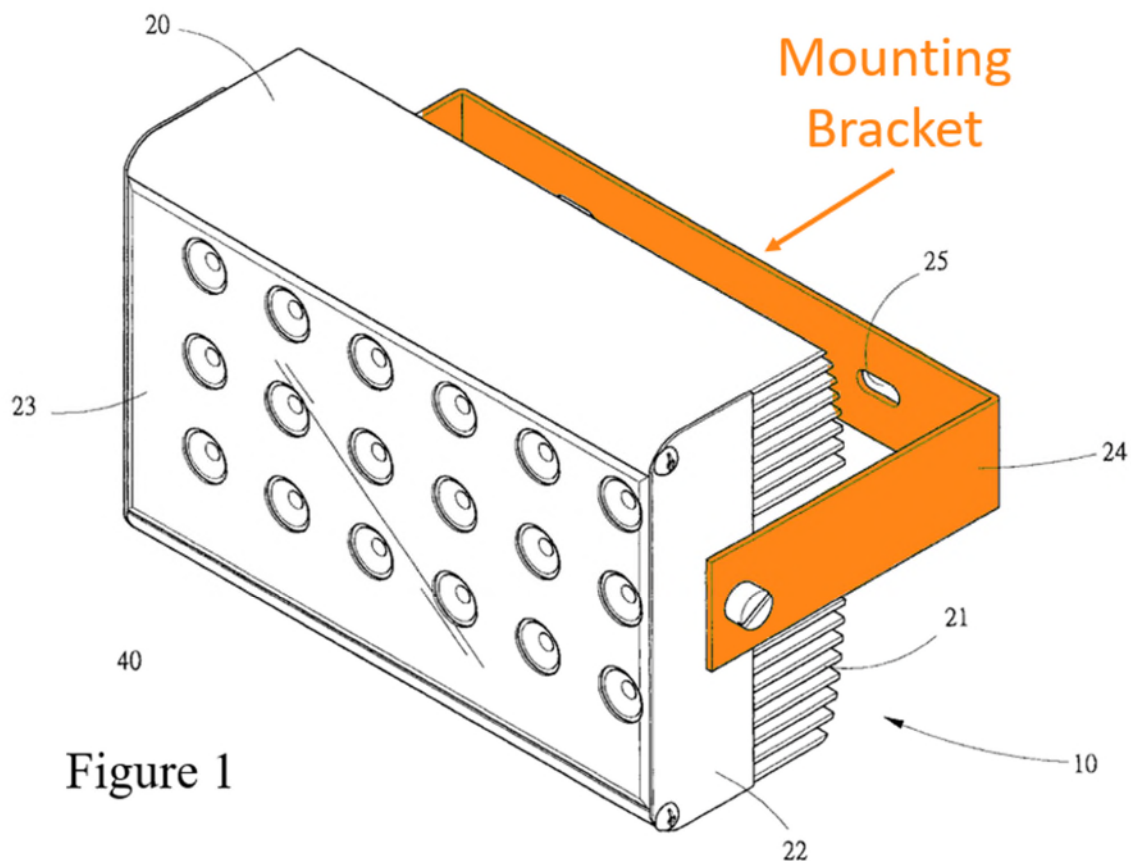


Figure 1

(Lin, Fig. 1 (annotated), 6:6-11.) *See supra* Ground 1, Claim 25.

A POSITA would have been motivated to modify Chen to include Lin's grab handle in place of or in addition to Chen's grip and adjustable supporting frame. (Coleman Decl., ¶¶125-126.) Lin and Chen both disclose lighting devices with LEDs and heat-dissipating elements, and both disclose components to hold or mount the light. (*Compare* Lin, 4:4-10, 4:14-16 *with* Chen, 1:18-21.) Using Lin's grab handle would have been a simple substitution of a known element for another to obtain predictable results, and would have provided a simple mechanism for the light to either be held or mounted to a wall using slotted holes in the grab handle.

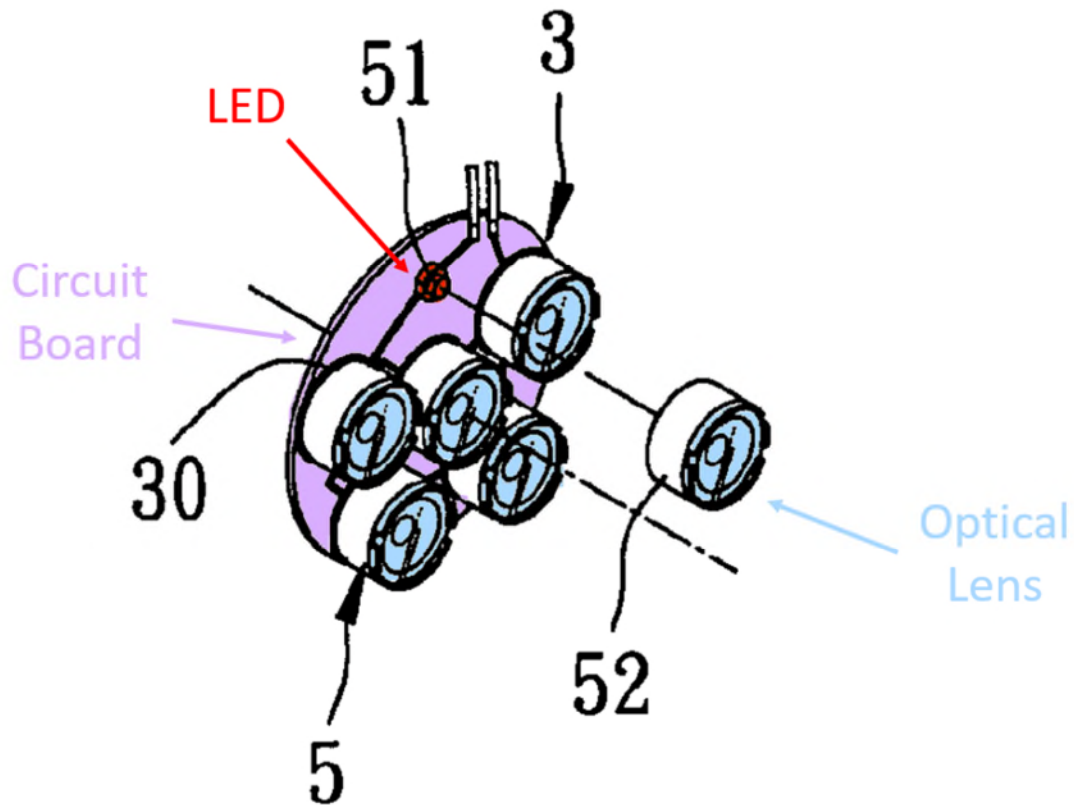
(Coleman Decl., ¶¶125-126.) Chen already teaches elements to stabilize the lighting device like Chen’s grip and adjustable supporting frame, and a POSITA would have understood to use a grab handle like that in Lin to be known alternative way to have a handle for a light that also allows for fixably mounting the light to a surface like a wall. (*Id.*) A POSITA would have found it obvious to try a mounting bracket like that in Lin, and would have had a reasonable expectation of success using it with the light in Chen, as using Lin’s grab handle would have been a simple alternative means to stabilize and support Chen’s lighting device, and Lin’s bracket could easily be attached at the same locations on the light as Chen’s grip and adjustable support to continue to perform its same function. (*Id.*) A POSITA would have also understood that Lin’s grab handle could be used in addition to Chen’s grip and adjustable supporting frame. (*Id.*)

H. Ground 8 – Chen in view of Moriyama Renders Obvious Claim 27

1. Dependent Claim 27

The LED light fixture of claim 21, wherein each module of the light engine includes a zener diode in a one to one parallel relationship with the LED.

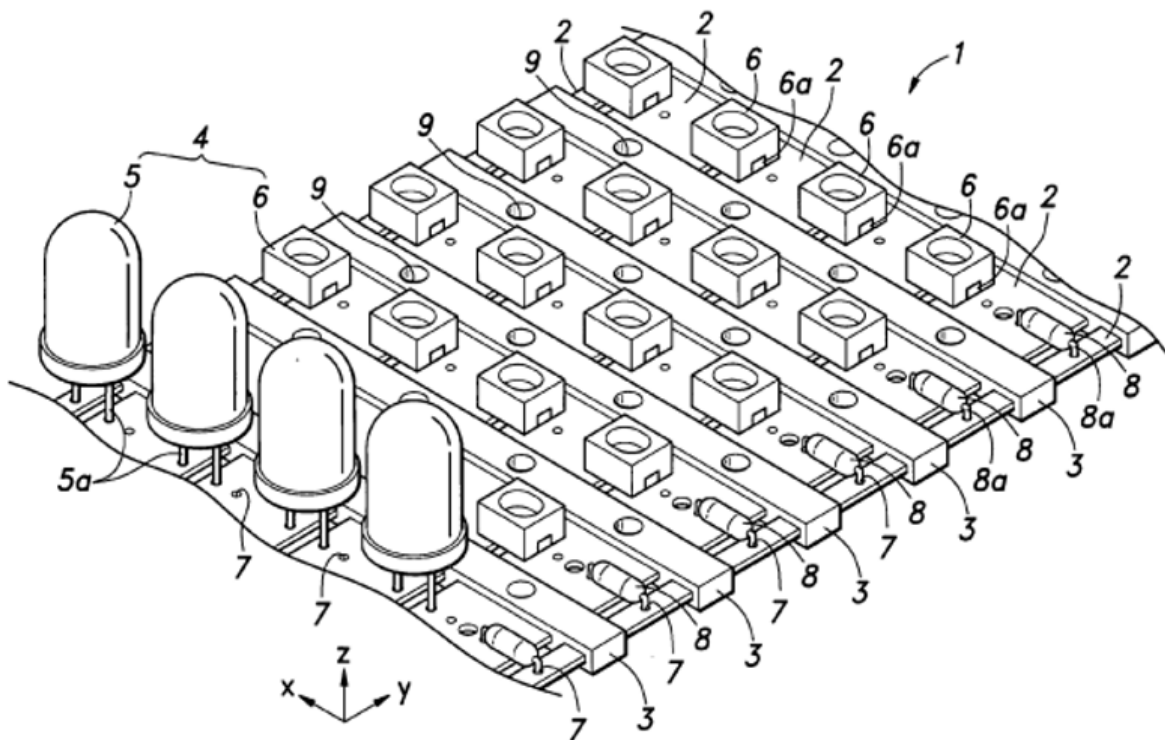
Chen in view of Moriyama renders obvious Claim 27. (Coleman Decl., ¶¶127-131.) As explained above, Chen discloses “a plurality of lighting units” that each have “a light emitting diode 51 . . . mounted on the circuit board 3, and a condensing member 52 mounted on the circuit board 3 and disposed around the light emitting diode 51”:



(Chen, Fig. 1 (annotated), 2:40-44; *see also* 1:35-38.)

Moriyama discloses “a light emitting module comprising one more light sources.” (Moriyama, [0002].) Moriyama teaches “a light emitting module which has an improved heat dissipation property.” (*Id.*, [0007].) Moriyama discloses a light emitting module with “a plurality of plate-shaped conductors 2 spaced apart from each other” and “a plurality of LEDs 4 mounted between adjoining conductors 2 to serve as light sources.” (*Id.*, [0079].) Moriyama further explains the LEDs may comprise “bullet-type LEDs (or lamp-type LEDs) 5” and “chip-type LEDs 6.” (*Id.*, [0080].) The LEDs used in the module may also “comprise LEDs of only one type.” (*Id.*)

Fig. 1



(Moriyama, Fig. 1) Moriyama discloses “insulating joint members 3 expose both sides of various portions of the conductors 2 inclusive of the portions where the LEDs 4 are mounted, and the thickness of the joint members 3 serves to ensure that a space is created between the conductors 2 and the Support member (not shown) when the light emitting module 1 is secured to the support member, whereby achieving favorable heat dissipation characteristics.” (*Id.*, [0084].)

Moriyama additionally discloses that “a resistor 157 and a Zener diode 158” may be “provided for each LED 156.” (*Id.*, [0120].)

A POSITA would have been motivated to include Zener diodes with the LEDs in Chen's array in order to protect the LEDs and extend their service life, something that Chen notes is one of its goals. (*Id.*)

I. Ground 9– Chen in View of Nishimoto and Cunningham Renders Obvious Claim 28

1. Dependent Claim 28

The LED light fixture of claim 21, wherein during steady state operation of the fixture in 25 C ambient environment, the LED junction temperature at the printed circuit board is approximately 55 C and the housing body temperature is approximately 45 C.

Chen in view of Nishimoto and Cunningham renders obvious Claim 28. (Coleman Decl., ¶¶132-142.) Again, Chen discloses an LED Lighting device with a “a housing made of heat conductive material” that has a “plurality of heat-dissipating rubs.” (Chen, Abstract, 1:18-27, 2:17-39, 3:10-16.) *See supra* Ground 5, Claims 21-23. A POSITA would have understood that the housing is acting as a heat sink because excess heat generated by the operation of the LEDs is conducted to the housing and its fins and into the surrounding air. (Coleman Decl., ¶132.) In particular, the heat sink is designed to dissipate heat away from the LEDs on the PCB, thereby preventing the LEDs from getting too hot, which could lead to thermal deterioration, reduced efficiency, or potentially failure of the LEDs. (Chen, 1:18-27, 2:17-39, 3:10-16; Nishimoto, 2:11-311, 6:4-14; Coleman Decl., ¶132.)

Nishimoto, in the same field as Chen, discloses “an LED lighting apparatus . . . for improving thermal dissipation properties.” (Nishimoto, Abstract, 1:5-7, 3:8-12, 11:15-28, 15:26-16:24, 28:19-30:21, Figs. 1, 10A-11B.) Nishimoto discloses there is a relationship between properties of the heatsink, LEDs, and circuit board components, and that junction temperature and the temperature of any attached heat sink body are dependent (and vary with respect to), for example, the thermal resistance of heatsink, volume of the heatsink, surface area of the heatsink, and the amount of current driving the LEDs. (*Id.*, 21:11-23:20, 24:1-25:1 (including Table 1), 30:22-33:24, Figs. 13-15 (showing the relationship between junction temperature and heat sink volume, surface area, and weight, respectively, for different driving currents); Coleman Decl., ¶133.) For example, Nishimoto notes that LED chip temperature, or junction temperature, “changes due to factors such as heatsink thermal resistance, enveloping volume, area, and weight.” (Nishimoto, 33:20-24.) Further, as recited in claim 28, Nishimoto discloses that it was well-known to assess junction temperature at an ambient temperature of 25°C. (Nishimoto, 11:15-26, 24:1-28 (Table 1).)

In particular, Nishimoto includes a table, Table 1, showing “the relationships between the enveloping volume of the heatsink and the heatsink thermal resistance” with respect to “junction temperature” at driving currents of 20mA, 30mA, 40mA, and 50mA. (*Id.*, 24:1-26:1.) As shown in Table 1, it was known in

the art that, at an ambient temperature of 25°C, various combinations of driving current and heat sink thermal resistance for a given junction to heat sink thermal resistance could result in a steady-state junction temperature around 55°C as recited in Claim 28:

TABLE 1

Relationship Between Heatsink and Junction Temperature

(Ambient Temperature: Ta=25°C)

Heatsink No.	Thermal Resistance (10 W)	Enveloping Volume	Junction Temperature (°C)			
	°C/W	cm ³	20 mA	30 mA	40 mA	50 mA
1	0.38	4464	34.8	38.7	41.7	44.5
2	0.56	2322	35.2	39.0	43.3	46.8
3	0.65	1108.8	35.8	41.8	46.7	50.3
4	1.0	816	36.5	42.8	48.3	52.8
5	1.24	571.2	38.5	44.4	51.5	55.0
6	1.7	400	39.5	46.1	52.3	57.7
7	1.9	280	41.2	48.7	56.5	62.3
8	2.2	208	43.2	52.9	61.4	69.7
9	2.6	145.6	46.1	57.6	66.8	74.2
10	2.9	144.06	44.1	56.0	65.6	73.8
11	3.3	104	47.2	56.8	64.5	74.8
12	3.4	108.78	46.8	59.3	69.0	78.0
13	3.9	100	47.6	60.3	69.5	79.5
14	4.3	73.5	47.2	64.4	70.8	81.3
15	4.5	59.5	53.2	57.5	69.8	82.5
16	5.2	52.5	51.3	69.0	78.5	86.4
17	5.6	42.5	52.6	68.6	92.0	

(Nishimoto, Table 1 (annotated).)

Thus, in view of Nishimoto's disclosures, a POSITA would have understood Chen's lighting fixture, comprised of a similar combination of LEDs, LED circuit boards, and a housing with a heat sink, would have had an LED junction temperature of around 55°C at an ambient temperature of 25°C, at least when the

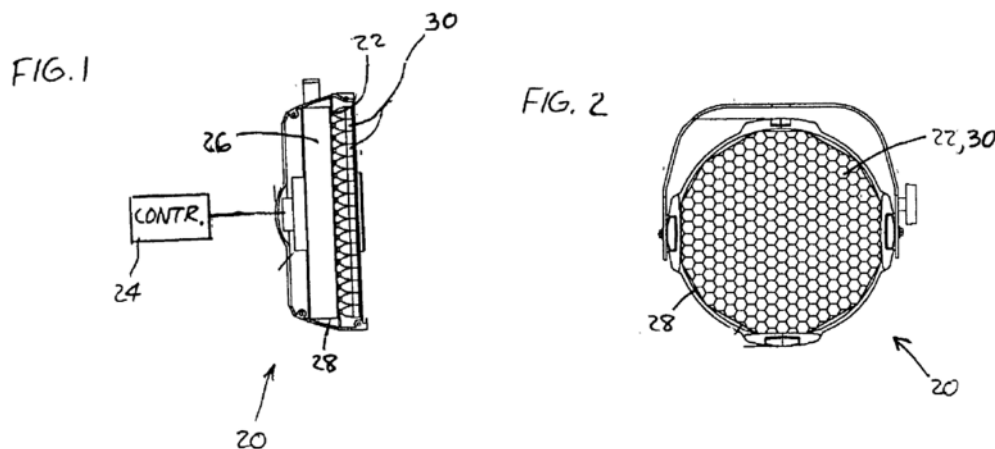
LEDs are driven with certain currents. (Coleman Decl., ¶¶134-136.) For example, a POSITA would have understood to vary the driving current, thermal resistance of the heat sink housing and fins (such as by different materials), and volume and layout of the heat sink and fins in order to achieve a junction temperature of around 55°C. (*Id.*) This would have been well within routine experimentation a POSITA could perform, as junction temperature is simply a result of the relationship between several known variables as disclosed in Nishimoto. (*Id.*) Moreover, a POSITA would have been motivated to achieve such an LED junction temperature in order to ensure that the LEDs do not become too hot, such that their performance would degrade or they could fail. (*Id.*) This is a stated goal of both Chen and Nishimoto. (*Id.*)

Further, a POSITA would have understood and expected that, when the LED junction temperature is around 55°C, the temperature of the heat dissipating body including the heat sink would be around 45°C in at least certain circumstances. (*Id.*) Both Chen and Nishimoto discloses that the heatsinks dissipate heat, and as such they pull heat away from the LEDs. (Chen, 1:18-27, 2:17-39, 3:10-16; Nishimoto, 2:11-311, 6:4-14; Coleman, Decl., ¶136.) A POSITA would have therefore understood that Chen's LED lighting module could be made to have a junction temperature of 55°C and a housing temperature of 45°C when measured in 25°C ambient temperature, as this would merely involve the routine changing materials,

heatsink thermal resistance (which could be easily changed by adjusting the volume or surface area of the heatsink), and the current or power at which the LEDs are driven. (Nishimoto, 21:11-23:20, 24:1-25:1 (including Table 1), 30:22-33:24, Figs. 13-15, Figs. 17A-17C, 35:15-36:18.)

That the housing (or heat sink) temperature in Chen could be 45°C when the junction temperature is 55°C (at 25°C ambient conditions) can also be confirmed based on the teachings of Cunningham, which discloses the relationship between heatsink temperature and junction temperature. (Coleman Decl., ¶¶137-142.)

Cunningham, in the same field as Chen, discloses a method for controlling a lighting fixture. (Cunningham, Abstract, [0010].) Cunningham discloses the lighting fixture may comprise an array of LEDs:



(Cunningham, Figs. 1-2; see also Abstract, [0010], [0020]-[0021].) Cunningham teaches that when the heat sink has reached steady state, isothermal condition, the junction temperature and the heat sink temperature have the following relationship:

$$T_{JX} = (P_X)(\theta_{JC} + \theta_{CS}) + T_S$$

where:

T_{JX} = junction temperature of a group X LEDs (°C)

P_X = power dissipated by each LED in group X (watts)

θ_{JC} = thermal resistance between junction and case of each LED ($\frac{^{\circ}\text{C}}{\text{watt}}$)

θ_{CS} = thermal resistance between case of each LED and heat sink ($\frac{^{\circ}\text{C}}{\text{watt}}$)

T_S = heat sink temperature (°C)

(Cunningham, [0056]-[0069].)

As explained by Dr. Coleman, this equation can be rearranged as shown below to determine the heatsink temperature:

$$T_S = T_{JX} - (P_X)(\theta_{JC} + \theta_{CS})$$

(Coleman Decl., ¶¶138-139.)

By applying the relationship between junction temperature and heatsink temperature disclosed by Cunningham to the data disclosed by Nishimoto's Table 1, a POSITA would have understood that an ambient temperature of approximately 25 °C, a heat sink temperature of approximately 45 °C, and a junction temperature of approximately 55 °C could be achieved by selecting various heatsinks and driving currents. (Coleman Decl., ¶¶138-140.) For example, when Nishimoto's Heatsink No. 6 is used with LEDs driven at 50 mA (power at 11 Watts) in an

ambient temperature of 25 °C, the junction temperature is 57.7 °C (Nishimoto at 31:2-5, Table 1). The thermal resistance in Nishimoto between the junction and the heat sink is referred to as the thermal substrate resistance, which is the sum of the thermal resistance from the junction to the heat sink, and is the thermal resistance represented by $\theta_{JC} + \theta_{CS}$ in Cunningham. (Nishimoto, 4:6-8, 15:18-22, 17:4-7, 12-16, 26:22-24, 30:10-12, Fig. 4; Coleman Decl., ¶¶138-141.) Nishimoto discloses that this substrate thermal resistance should not be greater than 3 °C/W and demonstrates that the substrate thermal resistance may be 1.2 °C/W and may be adjusted. (Nishimoto, 16:3-11, 18:11-20, 19:1-5, 22:7-10, 19-23, 26:8-13, Figs. 8, 9). Using this substrate thermal resistance and the data for Heatsink No. 6 from Table 1, the heatsink temperature is:

$$T_s = 57.7^{\circ}\text{C} - (11\text{W}) \left(1.2 \frac{^{\circ}\text{C}}{\text{W}} \right) = 44.5^{\circ}\text{C}$$

(Coleman Decl., ¶¶140.) Similarly, Nishimoto's Heatsink No. 7 used with LEDs driven at 40 mA (9 Watts) in an ambient temperature of 25 °C would result in a heatsink temperature of approximately 45.7 °C. (Nishimoto, 24, Table 1; Coleman Decl., ¶¶141.) Likewise, Nishimoto's Heatsink No. 15 used with LEDs driven at 20 mA (5 Watts) in an ambient temperature of 25 °C would result in a heatsink temperature of approximately 47.2 °C. (Nishimoto, 24, Table 1; Coleman Decl., ¶¶141-142.) Thus, a POSITA would have understood that the heat sink housing in Chen could have temperature of around 45 °C during steady state operation of the

LEDs at 55 °C junction temperature in an ambient temperature of 25 °C, as this would have merely been the routine result of using different materials, volumes, and power supplied to the LEDs.

Again, at the very least, it would have been obvious to a POSITA to have a heatsink temperature of approximately 45 °C, and a junction temperature of approximately 55 °C in an ambient temperature of approximately 25 °C because heatsink temperature and junction temperature are a function of the thermal resistance from the junction to the heatsink, the heatsink thermal resistance, and the current driving the LEDs. (*Id.*) A POSITA would have expected to arrive at the claimed temperatures at least as part of routine experimentation, including varying the thermal resistance of the heatsink, the volume of the heatsink, and the amount of current driving the LEDs. (*Id.*)

IX. TRIAL SHOULD BE INSTITUTED

A. *Fintiv* Factors

The Board should institute review because Petitioners have been diligent in filing and the circumstances surrounding the parallel district court cases do not warrant discretionary denial under § 314(a). *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 at 11-21 (Dec. 1, 2020) (precedential) (citing *Apple, Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (Mar 20, 2020) (precedential)). These district court cases are in the early stages: minimal fact discovery has taken place

other than with respect to venue; no *Markman* or substantive proceedings have taken place; and the cases are subject to pending venue-related motions—namely, a motion to dismiss for improper venue in the Chauvet case and a motion to transfer under 28 U.S.C. § 1404 in the Astera case.

The Federal Circuit has instructed that these venue issues must be addressed before *Markman*. See, e.g., *In re Apple Inc.*, 979 F.3d 1332, 1337-38 (Fed. Cir. 2020) (finding that *Markman* is one “of the most important and time intensive substantive tasks” and that disposal of venue motions “should unquestionably take top priority”); *In re Netflix, Inc.*, 2021 WL 4944826, at *1 (Fed. Cir. Oct. 25, 2021) (noting that a “stay of merits proceedings is appropriate relief if the district court cannot decide a venue motion quickly enough to avoid burdening the moving party with unnecessary expense and prejudice”). If the Court grants the motion to dismiss and motion to transfer, the existing scheduled trial deadlines would become moot. If the motions remain pending, it is likely the *Markman* dates would need to be pushed back, necessitating extensions of all scheduled case deadlines, including trial dates. Thus, it is at best speculative to conclude the district court cases will proceed to trial before a Final Written Decision may issue in this IPR.

Further, there is substantial non-overlap between issues raised in this Petition and the issues in the co-pending litigations. First, Petitioners challenge claims 21-28 in this Petition, whereas only claim 21 is at issue in the Chauvet and Astera cases.

Claims 22-28 contain limitations not found in claim 21, and resolution of the validity of claim 21 in the district court cases would not resolve the key issues regarding those claims in this IPR. Second, Petitioners stipulate that if the Board institutes this IPR proceeding, Petitioners will not pursue an invalidity defense in their respective district court cases that the claims subject to the instituted IPR are invalid on any grounds that were raised or that reasonably could have been raised in the IPR.

Petitioners therefore respectfully submit discretionary denial under § 314(a) is not warranted.

B. 35 U.S.C. § 325(d)

The Board should decline to exercise discretion under § 325(d).

First, this is Petitioners' first IPR challenge against the '245 Patent, and there have been no other post-grant proceedings involving the '245 Patent.

Second, the prior art relied upon, including Lin and Chen, was never considered by the Examiner, let alone applied in a rejection. Petitioners' grounds thus present art that is not the same or substantially the same as art previously considered by the Office. *Advanced Bionics v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 7-9 (Feb. 13, 2020).⁶

⁶ Should Patent Owner raise a *Fintiv* or § 325(d) discretionary denial challenge, Petitioners intend to respond.

X. CONCLUSION

Petitioners respectfully request that a Trial be instituted. Claims 21-28 of the '245 should be cancelled as anticipated and/or obvious over the prior art.

Dated: May 20, 2025

Respectfully submitted,

/s/ Joseph J. Raffetto

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Table of Exhibits

Exhibit No.	Description
1001	U.S. Patent No. 7,651,245 (“ ’245 Patent ”)
1002	File History for the ’245 Patent
1003	Declaration of Dr. Zane Coleman
1004	Curriculum Vitae of Dr. Zane Coleman
1005	TW94204571U, published as TWM277876 (“ Lin ”)
1006	TW94204571U, published as TWM277876 (“ Lin ”) – English Translation with Certification
1007	U.S. Patent No. 7,465,006 (“ Chen ”)
1008	U.S. Patent No. 5,577,832 (“ Lodhie ”)
1009	U.S. Patent Pub. No. 2006/0146553 (“ Zeng ”)
1010	U.S. Patent Pub. No. 2005/0239342 (“ Moriyama ”)
1011	WO2005/029185 (“ Nishimoto ”)
1012	U.S. Patent Pub. No. 2004/0021859 (“ Cunningham ”)
1013	Luxeon Application Brief AB05, 3, 10-11

Certificate of Word Count

I certify that, in accordance with 37 C.F.R. §42.24(d), the word count for the foregoing Petition totals 13,939 words. This is less than the permitted total under the 37 C.F.R. 42.24(a)(1)(i).

/s/ Joseph J. Raffetto

Joseph J. Raffetto (Reg. No. 66,218)

Attorney for Petitioners

Astera manufacturing Ltd. and

Chauvet & Sons LLC

Certificate of Service

I certify that on May 20, 2025, a copy of this Petition and supporting documents were served on Patent Owner via Federal Express at the following address of record for the Challenged Patent and addresses known to Petitioners as likely to effect service:

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/s/ Jason A. Bradley
Jason A. Bradley