

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO. LTD.,
Petitioner,

v.

LYNK LABS, INC.,
Patent Owner.

IPR2022-00052
Patent 10,492,251 B2

Before JON B. TORNQUIST, KEVIN C. TROCK, and
SCOTT RAEVSKY, *Administrative Patent Judges*.

TORNQUIST, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. *Background and Summary*

Samsung Electronics Co., Ltd. (“Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting an *inter partes* review of claims 2–5, 7–13, and 21–23 of U.S. Patent No. 10,492,251 B2 (Ex. 1001, “the ’251 patent”). Lynk Labs, Inc. (“Patent Owner”) filed a Preliminary Response to the Petition. Paper 9.

On March 18, 2022, and subsequent to the filing of the Preliminary Response, Patent Owner disclaimed claims 8–10 and 22 of the ’251 patent. Ex. 2001; Paper 15.

Upon review of the parties’ arguments and supporting evidence, we instituted review with respect to claims 2–5, 7, 11–13, 21, and 23 of the ’251 patent. Paper 20 (“Institution Decision” or “Dec.”); *see also* 37 C.F.R. § 42.107(e) (2021) (“No *inter partes* review will be instituted based on disclaimed claims.”).

Patent Owner filed a Response (Paper 23, “PO Resp.”), to which Petitioner filed a Reply (Paper 28, “Pet. Reply”), and Patent Owner filed a Sur-Reply (Paper 30, “Sur-Reply”).

Petitioner relies, *inter alia*, upon the declaration of R. Jacob Baker, Ph.D. (Ex. 1002) and Patent Owner submits a declaration from Thomas L. Credelle (Ex. 2002).

An oral hearing was held on March 7, 2023, and a transcript of the hearing is included in the record (Paper 37, “Tr.”).

For the reasons that follow, we conclude that Petitioner has proven by a preponderance of the evidence that claims 2–5, 7, 11–13, 21, and 23 of the ’251 patent are unpatentable.

B. Real Parties-in-Interest

Petitioner identifies itself and Samsung Electronics America, Inc. as the real parties-in-interest. Pet. 1.

Patent Owner identifies itself as the real party-in-interest. Paper 27, 1.

C. Related Matters

The parties identify *Samsung Electronics Co. v. Lynk Labs, Inc.*, No. 1:21-cv-02665 (N.D. Ill.) (consolidated with *Lynk Labs, Inc. v. Samsung Electronics Co., Ltd.*, No. 1:21-cv-05126 (N.D. Ill.)) and *Lynk Labs, Inc. v. Samsung Electronics Co.*, No. 1:21-cv-05021-MHC (N.D. Ga.) as related matters. Pet. 1; Paper 27, 1–2.

The '251 patent is also at issue in IPR2022-00051.

D. The '251 Patent

The '251 patent “relates to alternating current (‘AC’) driven LEDs, LED circuits, and AC drive circuits and methods.” Ex. 1001, 1:41–44. The '251 patent explains that LEDs “are intrinsically DC devices that only pass current in one polarity and historically have been driven by DC voltage sources using resistors, current regulators and voltage regulators to limit the voltage and current delivered to the LED.” *Id.* at 1:63–67. With proper considerations, however, the '251 patent reports that “LEDs may be driven more efficiently with AC than with DC drive schemes.” *Id.* at 2:3–4.

The '251 patent discloses various methods of driving LEDs, including the use of a single bridge rectifier to drive parallel LEDs, using a capacitor to smooth the AC waveform to reduce ripple and to protect the LEDs, and using various driver designs to provide a relatively constant or fixed voltage and frequency to LED circuits. *Id.* at 4:14–18, 4:22–24, 5:24–26.

E. Illustrative Claims

Petitioner challenges claims 2–5, 7, 11–13, 21, and 23 of the '251 patent. Pet. 4. Claims 1, 11, and 13 are independent, with claims 2–5, 7, and 21 depending from claim 1, claim 12 depending from claim 11, and claim 23 depending from claim 13. Claims 1, 11, and 13 are illustrative of the challenged claims and are reproduced below:

1. An LED lighting system comprising:
 - an LED driver having an input and an output, wherein the input is configured to receive an AC or DC voltage source, and wherein output provides an AC or DC voltage;
 - at least one LED circuit having a plurality of LEDs connected to the output of the LED driver, wherein the at least one LED circuit is mounted on a reflective substrate; and
 - a data receiver, wherein the data receiver can receive data from at least one of a transmission line or an antenna.

Ex. 1001, 25:17–27.

11. An LED lighting system comprising:
 - an LED circuit array having a plurality of LED circuits, each LED circuit of the plurality of LED circuits comprising at least one LED;
 - an active current limiting device connected in series to at least one of the plurality of LED circuits; and
 - an LED driver connected to the LED circuit array, wherein the LED driver has an input of a first voltage and a first frequency and provides an output of a second voltage, wherein the first voltage is an AC voltage;
- wherein an LED of at least one of the plurality of LED circuits in the LED circuit array is coated or doped with at least one of a phosphor, nano-crystals, or a light changing or enhancing substance, at least one of the coated or doped LEDs in the LED circuit array producing a different color of light than another coated or doped LED in the LED circuit array

Id. at 25:60–26:9.

13. A lighting system comprising:

a driver having an input and an output, the input receiving an input voltage from a mains power source and the output providing an output voltage, wherein the driver includes a bridge rectifier; and

at least one LED circuit mounted on a reflective substrate, wherein the at least one LED circuit is connected to the output of the driver and has one or more LEDs connected in series or parallel sufficient to approximately match the input voltage or the output voltage of the driver.

Id. at 26:12–23.

F. Prior Art and Asserted Grounds

Petitioner asserts that claims 2–5, 7, 11–13, 21, and 23 are unpatentable on the following grounds (Pet. 4):

Claims Challenged	35 U.S.C. §¹	Reference(s)/Basis
2–5, 7, 10, 13, 21–23 ²	103	Birrell ³ , Schultz ⁴
8, 9 ⁵	102	Birrell
11, 12	102	Nagai ⁶

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. §§ 102 and 103, effective March 16, 2013. Petitioner contends the pre-AIA versions of §§ 102 and 103 apply in this proceeding, and Patent Owner does not dispute Petitioner’s assertions. Pet. 4–5. Accordingly, on this record, we apply the pre-AIA versions of §§ 102 and 103. *See* 35 U.S.C. § 100(i)(1)(B).

² Because claims 10 and 22 were disclaimed, we do not address these claims below.

³ AU Patent No. AU 2003100206 A4, published July 17, 2003. Ex. 1005 (“Birrell”).

⁴ US Publication No. 2005/0116235 A1, published June 2, 2005. Ex. 1046 (“Schultz”).

⁵ Because claims 8 and 9 were disclaimed, we do not address them below.

⁶ US Publication No. 2002/0113246 A1, published August 22, 2002. Ex. 1040 (“Nagai”).

Claims Challenged	35 U.S.C. § ¹	Reference(s)/Basis
11, 12	103	Piepgras ⁷ , Kasegi ⁸

II. ANALYSIS

A. *Legal Standards*

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) if in the record, objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. *Level of Ordinary Skill in the Art*

In determining the level of skill in the art, we consider the type of problems encountered in the art, the prior art solutions to those problems, the rapidity with which innovations are made, the sophistication of the technology, and the educational level of active workers in the field. *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962 (Fed. Cir. 1986).

⁷ US Publication No. 2003/0137258 A1, published July 24, 2003. Ex. 1030 (“Piepgras”).

⁸ US 5,086,294, issued February 4, 1992. Ex. 1014 (“Kasegi”).

Petitioner contends a person of ordinary skill in the art as of the priority date of the '251 patent “would have had at least a bachelor’s degree in electrical engineering, computer engineering, computer science, physics, or the equivalent, and two or more years of experience with LED devices and/or related circuit design, or a related field.” Pet. 5–6 (citing Ex. 1002 ¶¶ 20–21).

For purposes of this proceeding, “Patent Owner does not dispute Petitioner’s definition of a [person of ordinary skill in the art].” PO Resp. 14.

Upon review of the parties’ arguments, the prior art of record, and the '251 patent, we adopt Petitioner’s undisputed level of ordinary skill in the art for purposes of this Decision.

C. *Claim Construction*

In this proceeding, the claims of the '251 patent are construed “using the same claim construction standard that would be used to construe the claim[s] in a civil action under 35 U.S.C. [§] 282(b).” 37 C.F.R.

§ 42.100(b). Under that standard, the words of a claim are generally given their “ordinary and customary meaning,” which is the meaning the term would have had to a person of ordinary skill at the time of the invention in the context of the entire patent including the specification. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc).

Neither party contends that any terms of the '251 patent require express construction, with each party relying on the plain and ordinary meaning of each claim term. PO Resp. 13–14; Pet. Reply 1. Upon review of the parties’ arguments and evidence, we agree that no claim terms require express construction. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (quoting *Vivid Techs., Inc.*

v. Am. Sci. & Eng'g, Inc., 200 F.3d 795, 803 (Fed. Cir. 1999) (“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.”)).

D. Claims 2–5, 7, 13, 21, and 23 Birrell and Schultz

Petitioner contends the subject matter of claims 2–5, 7, 13, 21, and 23 would have been obvious over the combined disclosures of Birrell and Schultz. Pet. 8–31.

1. Birrell

Birrell discloses “systems and methods for connecting electrical devices to power sources.” Ex. 1005, 2:3–5. Figure 1 of Birrell is reproduced below:

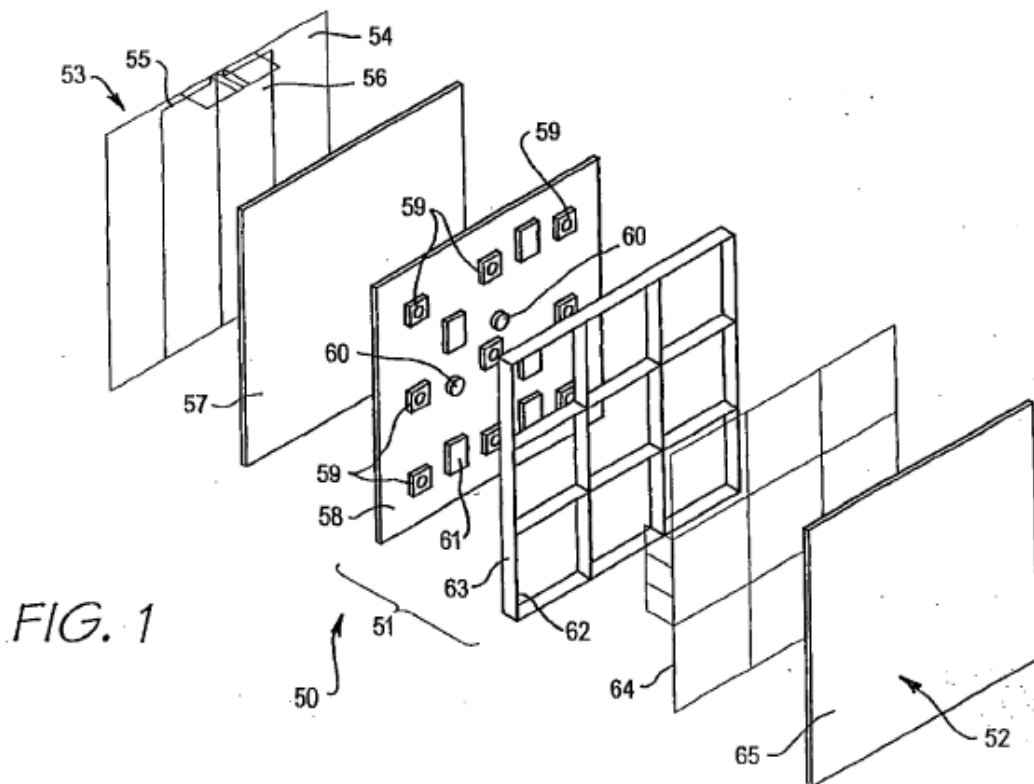


Figure 1 is an exploded view of a lighting tile for use in the lighting system of Birrell. *Id.* at 13:31–33. As shown in Figure 1, lighting tile 50 has “a thin body 51 having opposite first and second major surfaces” 52 and 53. *Id.* at

14:27–29. Back face 53 of body 51 includes metallized strips 55 and 56, which act as electrical coupling elements for tile 50 to “enable it to be capacitively coupled to a power source.” *Id.* at 14:31–37. Flexible magnetic sheet 57 provides an active magnetic force to secure the lighting tile to a magnetic receptive element. *Id.* at 15:5–8. Printed circuit board subassembly 58 supports LEDs 59 (which are set out in a 3 x 3 grid format), sensors 60, and microcontroller 61. *Id.* at 15:15–36. Circuit board 58 also supports power supply circuitry, such as bridge rectifiers, energy storage components, and data circuits that are used to modulate and demodulate signals. *Id.* at 16:6–10. Support frame 62 provides physical protection for the lighting components, and metallized polymer film 64 acts as a touch sensor to enable lighting tile 50 to be controlled, as least to some extent, by human touch on first major surface 52 of the tile body. *Id.* at 16:11–21.

Figure 8 of Birrell is reproduced below:

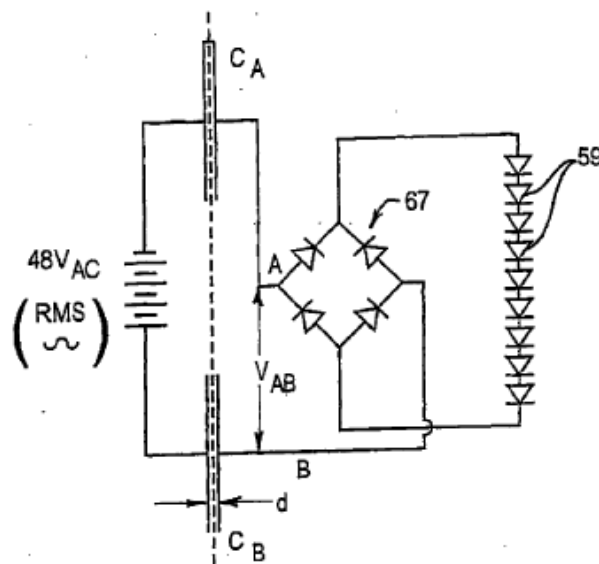


FIG 8

Figure 8 is a simplified circuit diagram of the lighting element of Birrell. *Id.* at 20:26–28. In the circuit depicted in Figure 8, a 48 Volt AC power supply is coupled to capacitors C_A and C_B and used to power LEDs 59. *Id.* at

20:26–28, 21:15–34. Diodes 67 are configured to form a bridge rectifier, ensuring “that light is emitted from the LEDs during both the positive and negative cycles of the AC power supply.” *Id.* at 19:1–7.

2. *Schultz*

Schultz discloses an illumination assembly. Ex. 1046, code (57).

Figure 1 of Schultz is reproduced below:

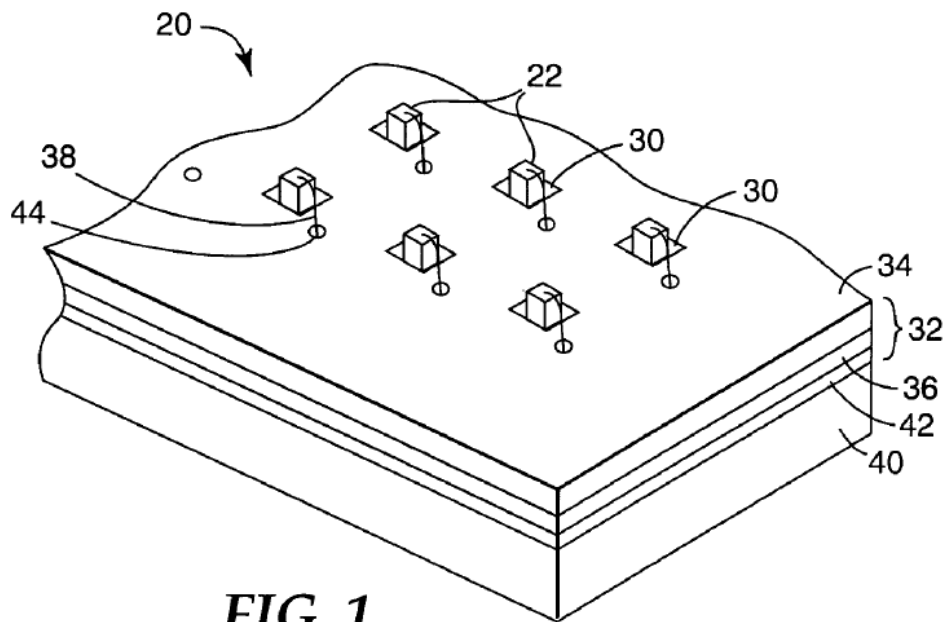


FIG. 1

Figure 1 of Schultz is a schematic perspective view of one embodiment of an illumination assembly. *Id.* ¶ 13. As shown in Figure 1, illumination assembly 20 includes LED dies 22 disposed in an array and within vias 30 of substrate 32. *Id.* ¶¶ 28–29. Substrate 32 is comprised of electrically insulative dielectric layer 34, patterned conductive layer 36, and thermally conductive material 42, which separates substrate 32 from heat dissipation assembly 40. *Id.* ¶ 29.

Schultz explains that electrically insulative dielectric layer 34 may be comprised of any suitable material, including polyimide, polyester, polyethyleneterephthalate (PET), and a multilayer optical film (MOF). *Id.*

¶ 30. Electrically and thermally conductive layer 36 may be comprised of various materials, including copper, nickel, gold, aluminum, tin, lead, and combinations thereof. *Id.* ¶ 31.

Schultz notes that there exist “a wide variety of LED die arrays available on rigid,” “non-reflective circuit boards.” *Id.* ¶ 48. Schultz further notes that in these non-reflective circuit boards “[a]ny light from the LED die that strikes the circuit board is unutilized due to absorption or scattering of the light.” *Id.* According to Schultz, “[b]y using reflective surfaced materials, such as a multilayered optical film, for the insulative layer 34 in the embodiments described herein, the light reflected from the attached LED dies has a higher probability of being reflected toward” a focusing element. *Id.* ¶ 49. In addition, by mounting the LED dies on a reflective, flexible circuit, “the utilization of the light” may be “improved.” *Id.* ¶ 48.

Figures 10A–C are reproduced below:

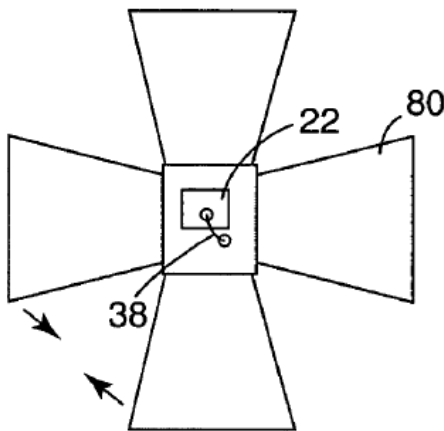


FIG. 10A

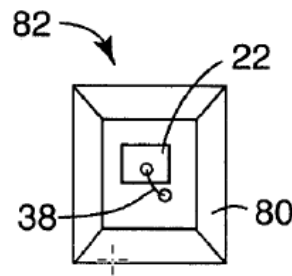


FIG. 10B

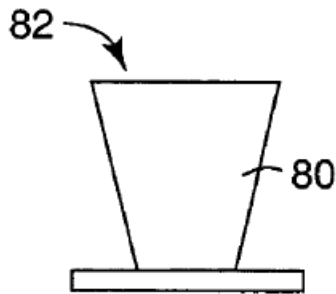


FIG. 10C

Figures 10A–10C schematically illustrate an embodiment of an illumination assembly using multilayer optical film. *Id.* ¶ 24. As illustrated in Figures 10A–C, LED die 22 can be attached to a planar MOF substrate and “[t]he multilayer optical film 80 that surrounds the LED die 22 is then folded to create a reflective concentrator 82 around the LED die 22.” *Id.* ¶ 49.

3. *Analysis: Claims 2, 4, 5, 7, and 21*

Challenged claims 2, 4, 5, 7, and 21 each depend, directly or indirectly, from independent claim 1. Petitioner contends that Birrell discloses the majority of the limitations of claim 1, including an LED lighting system, an LED driver having an input from an AC voltage source and an output of a rectified DC voltage, an LED circuit having a plurality of LEDs connected to the output of the LED driver, and a data receiver that can receive data from a transmission line. Pet. 8–19. Petitioner concedes that Birrell does not expressly describe an LED circuit mounted on a reflective substrate, but contends “the use of a reflective substrate to provide mechanical support for an array of LEDs was well known in the art,” and is expressly disclosed in Schultz. *Id.* at 13–14. Petitioner further contends that one of ordinary skill in the art would have sought to use a reflective substrate on the circuit board of Birrell in order to increase the optical efficiency of the lighting system. *Id.* at 14–15.

With respect to challenged claims 2, 4, 5, 7, and 21, Petitioner contends that: (1) the LED lighting system of Birrell receives both data and power (claim 2) (Pet. 19 (citing Ex. 1005, 8:31–9:10, 13:15–23, 23:30–24:2; Ex. 1002 ¶¶ 89–90)); (2) the LED lighting system of Birrell has LEDs of at least two different colors (claim 4) (*id.* at 20 (citing Ex. 1005, 11:26–34 (“In one form the at least three light sources are red, green, and blue LEDs.”))); (3) the lighting tile of Birrell and Schultz may have a flexible substrate (claim 5) (*id.* at 20–21 (citing Ex. 1005, 11:4–6; Ex. 1046 ¶¶ 12, 32, 47–49)); (4) the LED lighting system of Birrell may include a proximity sensor (claim 7) (*id.* at 21–22 (citing Ex. 1005, 8:4–30, 15:15–33; Ex. 1002 ¶ 96)); and (5) Birrell teaches or suggests the use of a reflective glass substrate (claim 21) (*id.* at 30–31 (citing Ex. 1005, 11:18–25)).

Patent Owner contends the disclosures of Birrell and Schultz would not have rendered claims 2, 4, 5, 7, and 21 obvious because: (a) the combination of Birrell and Schultz does not disclose “at least one LED circuit is mounted on a reflective substrate,” as recited in independent claim 1, and (b) the Petition fails to show that a person of ordinary skill in the art would have arrived at the Birrell-Schultz combination. PO Resp. 14–30. We address these arguments in turn.

*a) “at least one LED circuit is mounted
on a reflective substrate”*

The Petition contends that “the use of a reflective substrate to provide mechanical support for an array of LEDs was well known in the art.” Pet. 14. In support of this contention, the Petition points to Schultz’s use of a substrate that is either made of a reflective material or laminated with such a material. *Id.* (citing Ex. 1046 ¶¶ 47–49). The Petition also points to US Patent Publication No. 2002/0021573 A1 (Zhang), published February 21,

2002, which discloses coating a layer of high reflection material on the surface of a circuit board to collect light from LEDs mounted thereon. *Id.*; Ex. 1022 ¶¶ 18, 34, 81, Fig. 2.1, codes (43), (57).

Patent Owner does not dispute that it was well known in the art to use a reflective substrate to provide mechanical support for an array of LEDs. Pet. Reply 2; Sur-Reply 4–5 (asserting only that the cited references are “largely adding an optical reflector to existing non-reflective substrates”). Patent Owner argues instead that Schultz teaches a specific type of reflective material, in the form of a multilayer optical film (MOF) or similar thin flexible substrates, that in each embodiment of Schultz is “folded or wrapped into ‘reflective concentrators’ placed around LEDs already mounted onto a substrate.” PO Resp. 14–15. According to Patent Owner, this type of folded, three-dimensional reflector “is not a planar structure on which LEDs and other circuit components, like the recited ‘LED driver’ are mounted.” *Id.* at 16 (asserting that “[a]pplying the teaching of Schultz to Birrell’s PCB 58 yields a flat non-reflective, printed circuit board substrate . . . with each of the LEDs 59 being surrounded by a reflective concentrator as taught by Schultz”). Patent Owner further contends that even if the reflective flexible substrate of Schultz were added to Birrell without the concentrators, “it would not make the Birrell printed circuit board reflective since the reflector would be a separate substrate.” *Id.* at 17 (citing Ex. 2006 ¶ 72).

The first embodiment of Schultz, depicted in Figure 1, has a single substrate 32 that is composed of electrically insulative dielectric layer 34, conductive layer 36, and thermally conductive material 42. Ex. 1046 ¶ 29, Fig. 1. Schultz discloses that the top layer of this substrate—electrically insulative dielectric layer 34—may be reflective. *Id.* ¶¶ 30, 47, 49, claim 3.

Thus, we agree with Petitioner that one of ordinary skill in the art would have understood that substrate 32 of Schultz, as used in the embodiment of Figure 1, may be a planar, reflective substrate. Pet. Reply 3.

As noted by Patent Owner, in the embodiments depicted in Figures 10A–C, the reflective coating is folded and shaped to form non-planar reflectors. Ex. 1046 ¶ 49; PO Resp. 15–16; Sur-Reply 4–5. We agree with Petitioner, however, that the reflector embodiments depicted in Figures 10A–C are just one potential way of utilizing a reflective layer in Schultz, and one of ordinary skill in the art would have understood that use of an unfolded reflective layer is contemplated, and would be beneficial in, the planar embodiments of Schultz, such as the planar embodiment depicted in Figure 1. Pet. Reply 3–4, 7; Ex. 1046 ¶ 49 (“By using reflective surfaced materials, such as multilayered optical film, for the insulative layer 34 *in the embodiments described herein*, the light reflected from the attached LED dies has a higher probability of being reflected toward” a focusing element) (emphasis added).

Finally, Patent Owner contends that “even if the Schultz reflective flexible substrate 32 were added to Birrell without the concentrator portion taught by Schultz, it would not make the Birrell printed circuit board reflective since the reflector would be a separate substrate.” PO Resp. 17. This argument is not persuasive because, as is expressly disclosed in Schultz, a reflective coating or layer that is added to a substrate, such as the circuit board of Birrell, would render the substrate reflective. Ex. 1046 ¶ 49, Fig. 1 (disclosing a multi-layered substrate that includes a reflective film); Ex. 1090, 19:25–21:13 (Mr. Credelle testifying that a substrate “could have a top layer that’s part of the substrate that’s reflective”).

In view of the foregoing, we determine that Birrell and Schultz, when viewed in light of the knowledge of one of ordinary skill in the art, teach or suggest mounting “at least one LED circuit” “on a reflective substrate,” as recited in claim 1 of the ’251 patent.

b) Reason to Combine

Petitioner contends one of ordinary skill in the art would have sought to use a reflective coating or substrate in Birrell because “the use of a reflective substrate to provide mechanical support for an array of LEDs was well known in the art.” Pet. 14. Petitioner further contends that Schultz expressly discloses that reflective coatings are beneficial as they prevent light from an LED die being “unutilized due to absorption or scattering of the light.” *Id.* at 14–15 (quoting Ex. 1046 ¶ 48); Ex. 1046 ¶ 49 (Schultz explaining that “reflective surfaced materials” provide a “higher probability” that light reflected from the LEDs will reach the focusing element).

Petitioner further contends that one of ordinary skill in the art would have used a reflective substrate in Birrell in view of Birrell’s expressed desire for a uniform optical reflection to provide a uniform light source. Pet. 15 (citing Ex. 1002 ¶ 104; Ex. 1018, 6:6–18; Ex. 1022 ¶ 81; Ex. 1023, 16:16–45).

Petitioner contends one of ordinary skill in the art would have had a reasonable expectation of success in using a reflective substrate in Birrell because this would have entailed “the use of known components and mounting techniques to produce the predictable result of an LED circuit that benefited from known properties of reflective base structures, as suggested by Schultz and the knowledge of a [person of ordinary skill in the art].” *Id.* at 16.

Patent Owner contends Petitioner’s reasons to combine Birrell and Schultz fail for multiple reasons. First, Patent Owner contends that Schultz

is specifically directed to improving light utilization through the use of “thin multilayer optical films deposited on a flexible substrate, not [on] rigid printed circuit boards like Birrell.” PO Resp. 23–24 (citing Ex. 2006 ¶ 82; Ex. 2007, 182:7–183:3). This argument is not persuasive because Birrell discloses that its lighting tile, which includes the substrate used to mount the LEDs, may be rigid or flexible. Ex. 1005, 11:4–6 (noting that the body of the lighting tile may “be rigid or flexible”), 15:15–18 (noting that the tile body includes the substrate that mounts the LEDs). In addition, Schultz contemplates both rigid and flexible substrates and the use of reflective coatings on either type of substrate. Ex. 1046 ¶¶ 12 (“In one embodiment, the substrate is flexible . . .”), 32 (“In one preferred embodiment according to the invention, substrate 32 is flexible and deformable.”), claim 2 (“The illumination assembly of claim 1, wherein the substrate is flexible.”), claim 3 (depending from claim 1, which encompasses substrates that are rigid or flexible, and further including a reflective insulating layer on the first side of the substrate). As such, we agree with Petitioner that one of ordinary skill in the art would have understood that Schultz’s disclosures related to the use of a reflective substrate are applicable to the circuit board of Birrell, whether in its rigid or flexible configurations. Pet. Reply 1–3.

Second, Patent Owner contends that “[t]he purpose of using the flexible MOF in Schultz is to shape the film into parabolic or tubular shapes for focusing or directing light,” and one of ordinary skill in the art would not have sought to use such a film in place of Birrell’s printed circuit board because Birrell’s components, such as the microcontroller, require multilayer complex circuit boards. PO Resp. 24–26.

Patent Owner’s arguments are not persuasive because, as noted above, Schultz’s MOF layer may be used as a coating on planar embodiments (i.e.,

no parabolic shapes), and Petitioner’s proposed combination does not require that the specific MOF of Schultz be used as the reflective substrate in Birrell. Pet. 29–30; *see* Ex. 1046 ¶ 29 (explaining that the substrate of the embodiment depicted in Figure 1 of Schultz is composed of electrically insulative dielectric layer 34, patterned layer 36, and thermally conductive material 42). Rather, Petitioner contends that one of ordinary skill in the art would have sought to use any suitable reflective layer in Birrell, such as the well-known reflective substrates or coatings available in the art. Pet. 13–15.

Third, Patent Owner argues that Schultz relies upon the use of wire bonded, bare-die LEDs and a single metal conductive layer, whereas Birrell discloses using a complex printed circuit board that uses LED packages. PO Resp. 27 (citing Ex. 1046 ¶¶ 40–45; Ex. 2006 ¶ 85). Patent Owner further contends that it “would be difficult for Schultz’s MOF film to support packaged LEDs and other integrated circuits (e.g., microcontrollers and sensors) as taught in Birrell because Schultz teaches that the thin optical film 34 is necessarily attached to a heat sink assembly 40 for support.” *Id.* (citing Ex. 2006 ¶ 86).

Patent Owner’s arguments related to the type of LED mounting used in Birrell and Schultz are not persuasive because they assume a bodily incorporation of Schultz’s specific bare-die LEDs and MOF reflective layer on, or in place of, Birrell’s circuit board. Pet. Reply 9. Bodily-incorporation is not required to prove obviousness, and the Petition never advocates for the use of Schultz’s specific bare-die LEDs or reflective MOF layer in Birrell. *In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012) (“It is well-established that a determination of obviousness based on teachings from multiple references does not require an actual, physical substitution of elements.”).

Finally, Patent Owner argues that the protruding elements of Birrell, such as control and sensing devices 60 and 61, “would not be covered with the reflective layer and would cause ‘dark spots’ to form in the vicinity of these components.” PO Resp. 27–28. According to Patent Owner, “[t]his would create unacceptable luminous uniformity for the lighting system.” *Id.* at 28 (citing Ex. 2006 ¶ 87).

Birrell discloses that “[v]arious applied optical methods may be employed within the body [of the lighting tile] to produce even diffused light output, [or] focused or directional light output as required.” Ex. 1005, 13:5–7. Birrell also discloses that the body of the lighting tile “may be constructed to display uneven light diffusion or focused characteristics to produce a range of lighting effects.” *Id.* at 11:14–17. Thus, we disagree with Patent Owner that Birrell is limited to one particular type or quality of light output. Pet. Reply 11. Moreover, as noted by Petitioner, Patent Owner does not explain how control and sensing devices 60 and 61 would protrude any further than LEDs 59 to cause “dark spots,” or why the embodiments of the ’251 patent would not suffer from this same issue when mounted on a reflective substrate. *Id.* at 12; Ex. 1001, 15:23–29, Figs. 18, 63 (mounting resistors, capacitors, and/or a bridge rectifier, which are not described as being reflective, on the reflective circuit board). And, even if such “dark spots” would form in Birrell, we are not persuaded that such spots would have outweighed the significant benefits of using a reflective substrate for an LED circuit identified by Petitioner.

c) Conclusion: Claims 2, 4, 5, 7, and 21

For the reasons set forth above, and for the reasons set forth in the Petition, with which we agree, we determine that Petitioner demonstrates that Birrell and Schultz teach or suggest every limitation of claims 1, 2, 4, 5,

7, and 21. Petitioner also provides a persuasive explanation as to why one of ordinary skill in the art would have combined these references to arrive at the subject matter of these challenged claims with a reasonable expectation of success. Accordingly, Petitioner demonstrates by a preponderance of the evidence that claims 2, 4, 5, 7, and 21 of the '251 patent would have been obvious over the combined teachings of Birrell and Schultz.

4. *Analysis: Independent Claim 13*

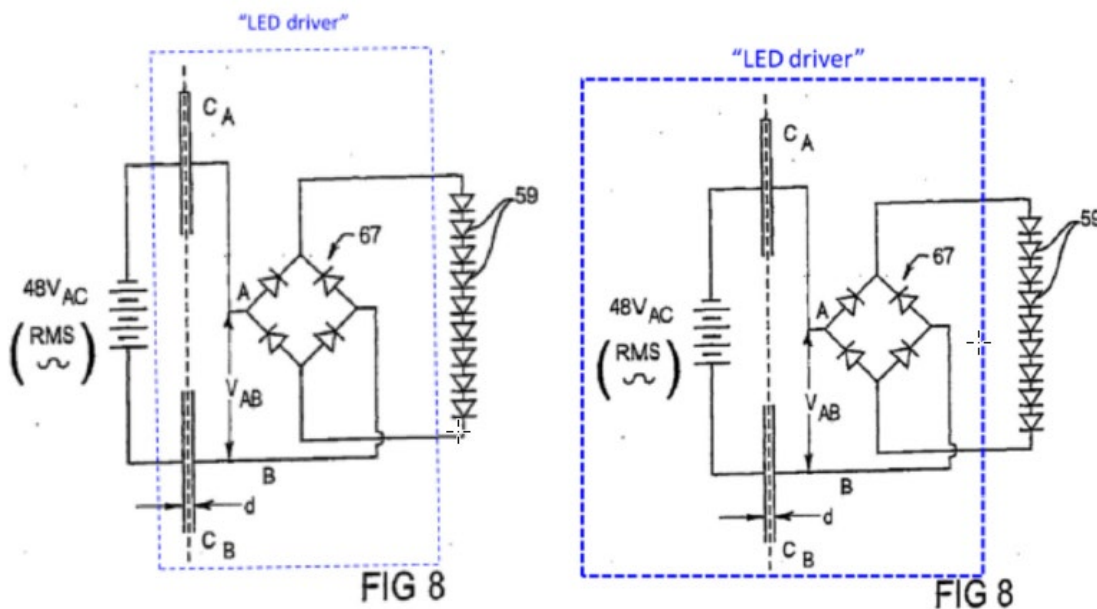
Petitioner contends Birrell and Schultz disclose every limitation of independent claim 13. Pet. 22–29. In its arguments for this claim, Petitioner identifies all of the components depicted in Figure 8 (the 48V AC power supply, capacitors C_A and C_B, the bridge rectifier formed of diodes 67, and the conductors connecting these components), except LEDs 59, as the claimed “driver.” *Id.* at 23–24. With respect to the requirement for “a driver having an input and an output, the input receiving an input voltage from a mains power source,” Ex. 1001, 26:13–14, Petitioner contends that one of ordinary skill in the art would have sought to connect Birrell’s power source (e.g., the 48V AC source) “to an AC mains power source to provide a reliable source of power.” Pet. 25. Petitioner further contends that one of ordinary skill in the art also would have configured the system with a transformer “to adjust the power (including voltage and frequency) to the appropriate level for proper operation for the various lighting system applications contemplated by Birrell.” *Id.* at 25–26 (emphasis omitted).

Patent Owner does not dispute that Birrell and Schultz disclose the majority of the limitations of claim 13, but contends that Petitioner’s arguments related to claim 13 are not persuasive because: (a) Petitioner improperly identifies different portions of Birrell as the claimed “driver” when addressing independent claims 1 and 13; (b) one of ordinary skill in

the art would not have combined Birrell and Schultz in the manner proposed in the Petition; and (c) Petitioner improperly “goes outside of the petitioned Ground 1 (Birrell and Schultz) to extraneous references . . . to supply the transformer” and the “mains power source.” PO Resp. 31. We address these arguments in turn.

a) Mapping of Driver

As reproduced below, Petitioner identifies different portions of Birrell as the “LED driver” of claim 1 and the “driver” of claim 13.



The annotated figures above depict Petitioner’s mapping of the “LED driver” of claim 1 (left) and the “driver” of claim 13 (right). Pet. 12, 24. As shown in these figures, for claim 1 Petitioner excludes the 48V AC power source and LEDs 59 from the “LED driver,” whereas for claim 13 Petitioner includes the power source as part of the “driver” and excludes only LEDs 59. *Id.*

Patent Owner contends that Petitioner “cannot have it both ways,” changing the understanding of an LED driver “to fit the particular language

of the claim.” PO Resp. 33. According to Patent Owner, the different mappings provided by Petitioner demonstrate that it is using hindsight reasoning to assert claim 13 would have been obvious. *Id.*

Contrary to Patent Owner’s arguments, for distinct independent claims, such as claims 1 and 13, it is not improper to identify different components as satisfying the “LED driver” or “driver” limitations, so long as the identified elements constitute an “LED driver” or “driver,” as those terms are properly construed.

On that point, Patent Owner contends Petitioner’s mapping for claim 13 fails because one of ordinary skill in the art “would not understand a driver in a lighting system to include an AC power source because the power source is the input to the driver.” PO Resp. 33 (citing Ex. 2002 ¶ 96; Ex. 1001, claim 13). Patent Owner’s argument is not persuasive. First, the ’251 patent explicitly discloses that a mains power source may act as a driver. *See* Ex. 1001, 3:20–30, 4:47–54, 7:26–27 (“the LED circuit driver is a mains power source.”); Pet. Reply 19. Second, in the proposed combination, a transformer may act as the 48V AC supply and this transformer (part of the claimed driver) would receive an AC mains voltage as an input. Pet. 25–26; PO Resp. 30–31; Pet. Reply 17, 19; Ex. 1002 ¶¶ 102–107; Ex. 1001, 9:1–2 (noting that the driver may include the output of a transformer).

In view of the foregoing, we find that Petitioner persuasively identifies where Birrell and Schultz disclose a “driver,” as recited in claim 13.

b) Reason to Combine

Birrell teaches that its lighting tile may be used in residential properties. Ex. 1005, 8:34–36. As residential properties typically obtain

power from an AC mains power source, we agree with Dr. Baker that Birrell at least suggests that its lighting tile has an input from an AC mains power source. Ex. 1002 ¶¶ 45, 102. Regardless, Petitioner persuasively explains why one of ordinary skill in the art would have adapted Birrell to use “common,” “predictable,” and “convenient” AC mains power. Pet. 25–26.

Patent Owner contends that one of ordinary skill in the art would not simply substitute AC mains in place of the 48V AC power supply of Birrell because the system of Birrell depicted in Figure 8 “was designed specifically to operate with 48VAC” and at a frequency of 80 MHz. PO Resp. 32–35. Patent Owner contends a frequency on the order of 80 KHz is “quite different” than the 60 Hz of AC mains, and Birrell teaches against using mains power because its high voltage would present an electric shock hazard. *Id.* (citing Ex. 1006, 15:34–36).

Patent Owner’s counter-arguments regarding frequency and safety are not persuasive because Petitioner does not propose a combination in which AC mains voltage or frequency are provided to the capacitors of Birrell. Rather, Petitioner contends a transformer would be used to modify the voltage and frequency obtained from AC mains to an appropriate level for use in Birrell’s lighting tile, e.g., 48V AC. Pet. 25–26; Pet. Reply 16–17, 20–21.

c) Allegedly Extraneous References

Although Birrell does not explicitly identify what component acts as the power supply in Figure 8 of Birrell, the parties contend this element could be AC mains (modified with a transformer), a DC to AC converter, a battery, or a generator. Pet. 25; Sur-Reply 12. Among these possibilities, Petitioner demonstrates that in the residential applications contemplated in Birrell, the most reliable and predictable source of power would be

AC mains. Pet. 25–26. Petitioner also persuasively demonstrates that one of ordinary skill in the art would have understood that a transformer would be used to adjust the voltage and frequency of the AC mains power to a level optimal for use in the chosen lighting tile. *Id.*

Patent Owner asserts that Birrell does not expressly disclose that the driver receives an input from an AC mains power source, and that Petitioner improperly seeks to use the knowledge of one of ordinary skill in the art to supply a missing claim limitation. Sur-Reply 11 (citing *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, 1361 (Fed. Cir. 2016)). According to Patent Owner, background knowledge is typically used to provide a “known motivation to combine,” not a missing claim limitation, and requires a showing that the limitation in question is “unusually simple,” pertains to a technology that is “particularly straightforward,” and does not “play a major role in the subject matter claimed.” *Id.* at 11–12 (quoting *Arendi*, 832 F.3d at 1362).

We are not persuaded by Patent Owner’s arguments. First, we are required to consider the background knowledge possessed by a person of ordinary skill in the art, and this background knowledge can supply a missing claim limitation. *Koninklijke Philips N.V. v. Google LLC*, 948 F.3d 1330, 1337 (Fed. Cir. 2020) (explaining that the general knowledge of one of ordinary skill in the art may “supply a missing claim limitation in an inter partes review”); *Randall Mfg. v. Rea*, 733 F.3d 1355, 1362 (Fed. Cir. 2013) (“As *KSR* established, the knowledge of . . . [a person of ordinary skill in the art] is part of the store of public knowledge that must be consulted when considering whether a claimed invention would have been obvious.”). Second, relying on the knowledge of one of ordinary skill in the art does not require that a limitation be “unusually simple” or constitute a “particularly

straightforward” technology, as asserted by Patent Owner. *Koninklijke Philips*, 948 F.3d at 1338–39. Rather, what is required is persuasive evidence that a particular limitation was within the general knowledge of a skilled artisan. *Id.* at 1338 (explaining that evidence that a limitation was known in the art requires more than “conclusory statements and unspecific expert testimony”). Here, Petitioner provides multiple sources of evidence, which are not disputed by Patent Owner, demonstrating that the use of AC mains power in residential applications was well known in the art, as was adjusting the power obtained from AC mains via a transformer to provide a voltage and frequency suitable for circuitry and/or devices to be powered. Pet. 25 (citing Ex. 1002 ¶¶ 104–105; Ex. 1009, 2:43–48, 2:60–67, 4:25–31; Ex. 1012, 12, 34–40; Ex. 1013, 157, 161–162, 165–166; Ex. 1022 ¶¶ 43, 83, 103; Ex. 1024, 1:9–28, 1:35–48, Fig. 1; Ex. 1025, 1:10–25, Fig. 1; Ex. 1008 ¶¶ 4, 5, 9, 63, 149).

In view of the foregoing, we determine that Petitioner properly relies upon the background knowledge of one of ordinary skill in the art to support its obviousness arguments for claim 13.

d) Conclusion with Respect to Independent Claim 13

For the reasons set forth above and in the Petition, with which we agree, Petitioner persuasively explains where Birrell and Schultz, when considered in light of the knowledge of one of ordinary skill in the art, teach or suggest every limitation of claim 13. Petitioner also provides a persuasive explanation as to why one of ordinary skill in the art would have combined Birrell and Schultz (and the knowledge of the ordinarily skilled artisan) to arrive at the subject matter of claim 13 with a reasonable expectation of success. Accordingly, Petitioner demonstrates by a preponderance of the evidence that claim 13 would have been obvious over Birrell and Schultz.

5. *Analysis: Claim 3*

Claim 3 depends from claim 1 and further requires that the LED lighting system comprises “a transformer.” Ex. 1001, 25:30–31. For the reasons discussed above with respect to claim 13, Petitioner contends that one of ordinary skill in the art would have added a transformer in Birrell to adjust the voltage and frequency of the AC mains power. Pet. 30.

Patent Owner contends claim 3 would not have been obvious for the same reasons discussed above with respect to claim 1. PO Resp. 36.

For the reasons discussed above with respect to claim 13, Petitioner persuasively explains why one of ordinary skill in the art would have used a transformer in the LED lighting device of Birrell. And, for the reasons discussed above, we do not find Patent Owner’s arguments with respect to claim 1 to be persuasive. Accordingly, Petitioner demonstrates by a preponderance of the evidence that claim 3 would have been obvious over Birrell and Schultz.

6. *Analysis: Claim 23*

Claim 23 depends from independent claim 13 and further requires that “the reflective substrate is a glass substrate.” Ex. 1001, 27:13–14. Petitioner contends claim 23 would have been obvious for the same reasons as claims 13 and 21. Pet. 31.

Patent Owner contends claim 23 would not have been obvious for the same reasons discussed above with respect to independent claim 13. PO Resp. 36.

Upon review of the parties’ arguments and supporting evidence, we determine that Petitioner demonstrates by a preponderance of the evidence that claim 23 would have been obvious over Birrell and Schultz. *See* Ex.

1005, 11:18–25 (noting that the “light source” may be “attached” to a “material such as glass”).

E. Claims 11 and 12 over Piepgras and Kasegi

Petitioner contends that the subject matter of claims 11 and 12 would have been obvious over the combined disclosures of Piepgras and Kasegi. Pet. 44–58.

1. Piepgras

Piepgras discloses “high-brightness, processor-controlled LEDs in combination with diffuse materials to produce color-changing effects.”

Ex. 1030 ¶ 32. Figure 1 of Piepgras is reproduced below:

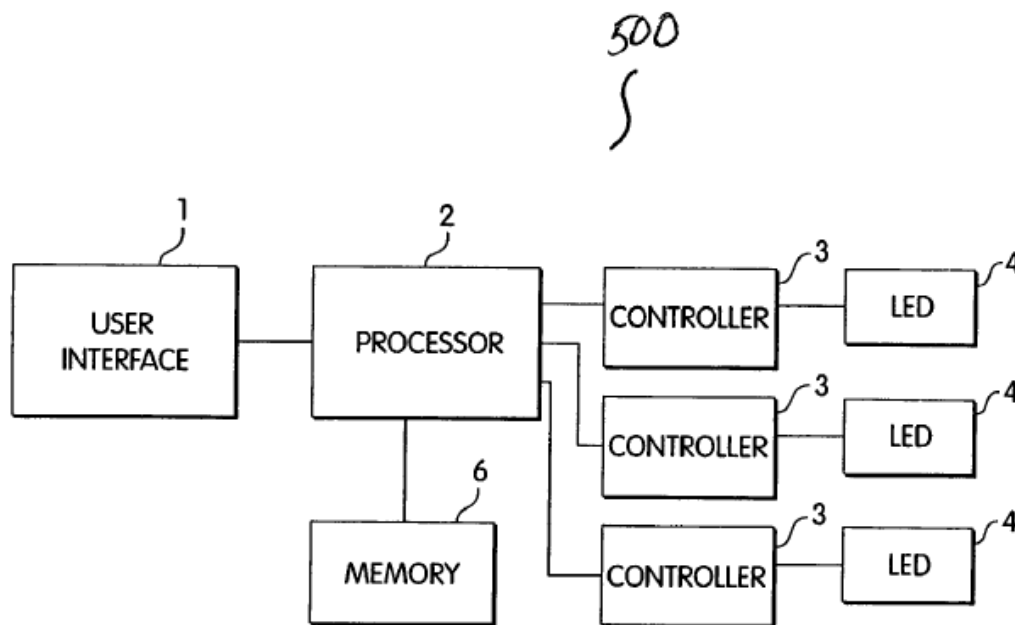


Fig. 1

Figure 1 is a block diagram of one embodiment of Piepgras. *Id.* ¶ 33. As depicted in Figure 1, lighting system or device 500 includes user interface 1, processor 2, one or more controllers 3, one or more LEDs 4, and memory 6. *Id.* ¶ 88. “In general, the processor 2 may execute a program stored in the memory 6 to generate signals that control stimulation of the LEDs 4. The

signals may be converted by the controllers 3 into a form suitable for driving the LEDs 4, which may include controlling the current, amplitude, duration, or waveform of the signals impressed on the LEDs 4.” *Id.*

Figure 5 of Piegras is reproduced below:

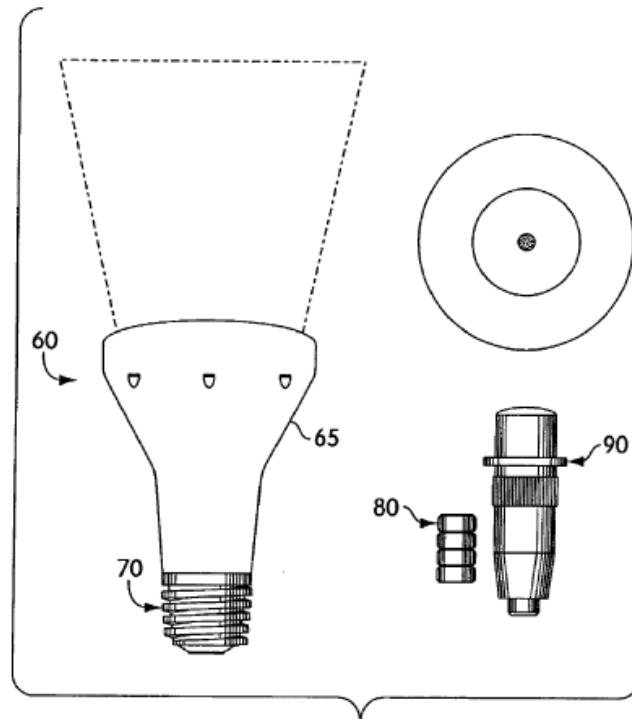


Fig. 5

Figure 5 shows spotlight 60, which may include a system such as that depicted in Figure 1 for controlling a plurality of LEDs within the spotlight. Ex. 1030 ¶ 108. Spotlight 60 has a housing 65 suitable for use in conventional lighting fixtures, such as those used with AC spotlights. *Id.* Spotlight 60 may draw power for illumination from an external power source through connection 70, which may include a converter to convert received power to power that is useful for the spotlight. *Id.* “For example, the converter may include an AC to DC converter to convert one-hundred twenty Volts at sixty Hertz into a direct current at a voltage of, for example, five Volts or twelve Volts.” *Id.*

2. *Kasegi*

Kasegi discloses an indicator circuit that uses a light emitting device to indicate the states of electronic components and circuits. Ex. 1014, 1:11–13. Kasegi explains that LEDs are sensitive to voltage fluctuations. For example, “[i]f the applied voltage is excessively high, the light emitting diode may be destroyed. Conversely, if the applied voltage is excessively low, the brightness of the light may become insufficient and may even stop producing any light.” *Id.* at 1:22–28.

To overcome these voltage limitations, Kasegi discloses the use of a “constant current diode” that produces a constant current when the applied voltage is within, for example, 10 to 100 volts. *Id.* at 1:55–57, 2:49–60. Kasegi explains that, because a constant current is supplied to the LEDs, “a constant brightness can be obtained even when the power source voltage fluctuates.” *Id.* at 2:57–60.

3. *Analysis: Claim 11*

Petitioner contends Piepgras and Kasegi disclose every limitation of claim 11. In particular, Petitioner contends that Piepgras discloses an LED lighting system having a plurality of LED circuits, with each LED circuit containing at least one LED. Pet. 44–48. Petitioner further contends that Piepgras discloses an LED driver (controllers 3, or processor 2 in combination with controllers 3) connected to the LED circuit array that has an input of a first AC voltage and frequency and provides an output of a second voltage. *Id.* at 51–52 (citing Ex. 1030 ¶ 158). Petitioner further asserts that Piepgras discloses using an AC to DC converter to convert AC voltage to DC voltage, resulting in an LED driver consisting of controllers 3,

processor 2, and the AC to DC converter circuitry.⁹ *Id.* at 53–54 (citing Ex. 1002 ¶¶ 160–162) (asserting that controllers 3 convert signals generated by processor 2 “into a form suitable for driving the LEDs 4”).

Petitioner concedes that Piepgras does not expressly disclose an active current limiting device, but contends that Kasegi expressly discloses such a device (constant current diode 5) and asserts that one of ordinary skill in the art would have sought to use this device in Piepgras to expand the operable range of the input voltage of the LED circuit. *Id.* at 48–50.

Patent Owner contends Petitioner’s arguments with respect to claims 11 and 12 are not persuasive for at least two reasons. PO Resp. 40–46. We address these arguments below.

a) LED Driver

Claim 11 requires “an LED driver connected to the LED circuit array, wherein the LED driver has an input of a first voltage and a first frequency and provides an output of a second voltage, wherein the first voltage is an AC voltage.” Ex. 1001, 25:60–26:9. Patent Owner argues that Piepgras “does not disclose anything about the input voltage or frequency” that is provided to processor 2 and/or controller 3 and, although Piepgras includes embodiments that use AC power, “this does not mean that the input to the controller 3 or processor itself is an AC voltage signal as required by the claim.” PO Resp. 40–41 (citing Ex. 2002 ¶ 108).

⁹ To the extent that Piepgras does not disclose a driver that receives AC power at a first voltage and outputs a different voltage, Petitioner contends one of ordinary skill in the art would have found it obvious to modify Piepgras to receive AC voltage, which is “a reliable source of power,” and then convert this to an appropriate voltage for use by the LEDs. Pet. 54–55.

Piepgras discloses that spotlight 60 includes the system depicted in Figure 1. Ex. 1030 ¶ 108; Ex. 1002 ¶ 145. Spotlight 60 also includes connection 70 that is adapted for use in a screw socket, wall socket, etc., and may include an AC to DC converter to convert 120 Volts at sixty Hertz to direct current of a voltage of, for example, five Volts or twelve Volts. Ex. 1030 ¶¶ 108–109. Given these disclosures, we find persuasive Petitioner’s argument that the spotlight shown in Figure 5 of Piepgras has a driver (e.g., the AC to DC converter, processor 2, and controller 3) that has an input of an AC voltage, as recited in claim 11.

Patent Owner argues that the AC to DC converters mentioned in Piepgras “are not part of the LED driver.” PO Resp. 41. Patent Owner reasons that Piepgras discloses that “the spotlight 60 may include a system such as that depicted in Fig[ure] 1” and that “spotlight 60 may draw power for illumination from an external power source through a connection 70.” *Id.* (quoting Ex. 1030 ¶ 108). Patent Owner contends that Piepgras therefore distinguishes the system of Figure 1 that is present in spotlight 60 from the AC to DC converter in connection 70, which a person of ordinary skill in the art would not consider to be part of an LED driver. *Id.* (citing Ex. 2002 ¶ 108); Sur-Reply 21–22.

Patent Owner’s argument that connection 70 is somehow not part of spotlight 60, or not connected to the components described in Figure 1 of Piepgras, is not persuasive because Piepgras indicates that spotlight 60 includes each of (1) the system depicted in Figure 1 for controlling the plurality of LEDs within the spotlight, (2) housing 65, and (3) connection 70, which provides power to the spotlight. Ex. 1030 ¶¶ 108–109 (noting that connector 70 is incorporated into spotlight 60). Thus, spotlight 60 and connector 70 are not disparate elements, but rather connector 70 is part of

spotlight 60 and electrically connected to the components described in Figure 1 of Piepgras. *Id.*

To the extent that Petitioner performs a “box drawing exercise” in identifying the AC to DC converter of Piepgras as part of the claimed “driver,” we discern no reason why such an approach is improper, as long as the identified components in combination act as a “driver.” *See* Ex. 1001, 15:39–42 (explaining that a rectifier may be part of a driver used to drive LEDs). On that point, Dr. Baker persuasively testifies that one of ordinary skill in the art would have understood that the AC to DC converter, processor 2, and controllers 3 of Piepgras in combination act as a “driver.” Ex. 1002 ¶ 161.

Patent Owner also argues that Piepgras “does not require AC power to power spotlight 60,” which may be powered, for example, by one or more batteries. Sur-Reply 22 (citing Ex. 1030 ¶ 108). This argument is not persuasive because Piepgras expressly describes connector 70 as allowing connection to an Edison mount, “an existing one-hundred and ten VAC socket,” or a “power outlet plug,” and Petitioner need not demonstrate the AC power is the only power type contemplated for use with spotlight 60. Ex. 1030 ¶¶ 108–109.

In view of the foregoing, Petitioner persuasively demonstrates that Piepgras discloses the “LED driver” limitations of claim 13.

b) Active Current Limiting Device

Petitioner concedes that Piepgras does not expressly disclose “an active current limiting device,” as recited in claim 11, but asserts that such a device is disclosed in Kasegi in the form of its “constant current diode.” Pet. 48–49 (citing Ex. 1014, 1:53–60, 2:40–45). Petitioner further asserts that one of ordinary skill in the art would have sought to use a constant current

diode in Piepgras because such a device would expand “the operable range of the input voltage” of the LED circuit, “keep[] the brightness of the light emitting device constant over a wide input voltage range,” and would mitigate or prevent destruction or damage to the LEDs in the LED circuit. *Id.* at 49–50 (citing Ex. 1014, 1:22–32, code (57)).

Mr. Credelle testifies that “[s]ince Piepgras already uses controllers 3 to regulate and control current, the suggestion that a series-connected current limiting diode will ‘expand the operable range of the input voltage’ is wrong,” and a person of ordinary skill in the art “would clearly understand that controllers 3 provide the protection Petitioners seek to add to Piepgras.” Ex. 2002 ¶ 113; PO Resp. 45. And, because Piepgras’s controllers already regulate the current, voltage, and/or power through the LEDs, Patent Owner contends “there is no motivation to combine Kasegi with Piepgras to solve a problem that is not present in Piepgras.” PO Resp. 45 (citing Ex. 2002 ¶ 113).

As noted by Patent Owner, controllers 3 of Piepgras are able to control, at least to some extent, the current and voltage provided to the LEDs. Ex. 1030 ¶ 88 (noting that controller 3 may control “the current, amplitude, duration, or waveform of the signals impressed on the LEDs 4”). There is no persuasive evidence, however, that controllers 3 are capable of providing the specific benefits obtained from the use of a constant current diode. Patent Owner’s and Mr. Credelle’s arguments on this point are not persuasive because they do not explain why Piepgras’ generic disclosure of controlling voltage or current would demonstrate to one of ordinary skill in the art that controllers 3 are able to provide the same benefits as a constant current diode, including the ability to expand “the operable range of the input voltage” and maintain “the brightness of the light emitting device . . .

over a wide input voltage range.” PO Resp. 44–45; Ex. 2002 ¶ 113; Pet. Reply 30; Ex. 1014, 2:49–60.¹⁰

In contrast, Petitioner persuasively demonstrates that the constant current diode of Kasegi would be beneficial in the lighting device of Piepgras, as it would improve the operating voltage range of the device, prevent damage to the LEDs caused by surges in current or voltage, and maintain the brightness of the LEDs over a wide input voltage range. Pet. 50–51 (noting that a current limiting diode would mitigate or prevent destruction, damage, or insufficient operation of the LEDs); Pet. Reply 29–30. As such, Petitioner persuasively explains why one of ordinary skill in the art would have sought to utilize the constant current diode of Kasegi in the system of Piepgras. Pet. 49–51; Pet. Reply 30.

c) Conclusion with Respect to Claim 11

For the reasons set forth above and in the Petition, with which we agree, Petitioner persuasively identifies where Piepgras and Kasegi disclose every limitation of claim 11. Petitioner also persuasively explains why one of ordinary skill in the art would have sought to combine the disclosures of Piepgras and Kasegi to arrive at the subject matter of claim 11 with a reasonable expectation of success. Accordingly, Petitioner demonstrates by a preponderance of the evidence that claim 11 would have been obvious over Piepgras and Kasegi.

¹⁰ As noted by Petitioner, to the extent Patent Owner contends Piepgras’s controllers 3 “regulate the current entering the LEDs,” then this would suggest that Piepgras already has an “active current limiting device,” as recited in claim 11. Pet. Reply 30–31.

4. *Analysis: Claim 12*

Claim 12 depends from claim 11 and further requires that the active current limiting device is a current limiting diode. Ex. 1001, 26:10–11. For the reasons set forth above for claim 11, Petitioner contends one of ordinary skill in the art would have sought to use a current limiting diode in Piepgras in view of the disclosures of Kasegi. Pet. 57–58.

Patent Owner contends Petitioner’s arguments with respect to claim 12 fail for the same reasons discussed above with respect to claim 11. PO Resp. 46.

For the reasons set forth above with respect to claim 11, we find persuasive Petitioner’s explanation as to why one of ordinary skill in the art would have sought to use a current limiting diode in the device of Piepgras. Accordingly, Petitioner demonstrates by a preponderance of the evidence that claim 12 would have been obvious over Piepgras and Kasegi.

F. *Claims 11 and 12 as Anticipated by Nagai*

Petitioner contends that claims 11 and 12 are anticipated by Nagai. Pet. 34–43. In view of our determination that claims 11 and 12 are unpatentable as having been obvious over the combined disclosures of Piepgras and Kasegi, we do not address the ground based on Nagai. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”); *Boston Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App’x 984, 990 (Fed. Cir. Apr. 30, 2020) (non-precedential) (recognizing that the “Board need not address issues that are not necessary to the resolution of the proceeding” and, thus, agreeing that the Board has “discretion to decline to decide additional instituted grounds once the petitioner has prevailed on all its challenged claims”).

III. CONCLUSION¹¹

In summary:

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
2–5, 7, 13, 21, 23	103	Birrell, Schultz	2–5, 7, 13, 21, 23	
11–12	102 ¹²	Nagai		
11–12	103	Piepgras, Kasegi	11–12	
Overall Outcome			2–5, 7, 11–13, 21, 23	

VI. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 2–5, 7, 11–13, 21, and 23 of the '251 patent are unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

¹¹ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

¹² As discussed in § II.F above, we do not address Petitioner's ground based on Nagai because we determine that claims 11 and 12 are unpatentable as having been obvious over the combined disclosures of Piepgras and Kasegi.

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