

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LEDUP MANUFACTURING GROUP LTD.,
Petitioner,

v.

SEASONAL SPECIALTIES, LLC, Patent Owner.

IPR2024-01259
Patent 11,533,794 B2

Before KRISTEN L. DROESCH, MICHELLE N. WORMMEESTER, and
ANDREW L. NALVEN, *Administrative Patent Judges*.

DROESCH, *Administrative Patent Judge*.

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

I. INTRODUCTION

This Final Written Decision is issued pursuant to 35 U.S.C. §§ 6, 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, Petitioner has established by a preponderance of the evidence that claims 1, 2, 4–7, and 9–15 of U.S. Patent No. 11,533,794 B2 (Ex. 1001, “’794 Patent”) are unpatentable. Petitioner has not, however, established by a preponderance of the evidence that claims 3 and 8 are unpatentable.

A. Procedural History

LEDup Manufacturing Group Limited (“Petitioner”) filed a Petition requesting *inter partes* review of claims 1–15 of the ’794 Patent. Paper 2 (“Pet.”). Seasonal Specialties, LLC (“Patent Owner”) timely filed a Preliminary Response. Paper 9. With our authorization and to address objective indicia of nonobviousness, Petitioner filed a Preliminary Reply to the Preliminary Response (Paper 12), and Patent Owner filed a Sur-reply to the Preliminary Reply (Paper 13). Pursuant to 35 U.S.C. § 314, we instituted trial on February 20, 2025, as to all of the challenged claims and all of the grounds raised in the Petition. Paper 14 (“Institution Decision,” “Dec. on Inst.”).

After institution of trial, Patent Owner filed a Response (Paper 16, “PO Resp.”), Petitioner filed a Reply to the Response (Paper 17, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 18, “PO Sur-reply”).

Petitioner relies on a Declaration of E. Fred Schubert, Ph.D., (Ex. 1013) in support of its Petition and a Reply Declaration of Dr. Schubert (Ex. 1017) in support of its Reply, and Patent Owner relies on a Declaration of Ted. K. Higman, Ph.D., (Ex. 2002) to support its Response.

Oral argument was held on November 19, 2025. A transcript of the oral argument is included in the record. Paper 26.

B. Real Parties In-Interest

Petitioner indicates that the real party in-interest is LEDup Manufacturing Group Ltd. Pet. 75. Patent Owner indicates that Seasonal Specialties, LLC is the real party in-interest. Paper 4, 2.

C. Related Matters

The parties indicate that the '794 Patent is the subject of *Seasonal Specialties, LLC v. LEDup Manufacturing Group Ltd.*, 2:23-cv-06318 (C.D. Cal.). Pet. 75; Paper 4, 2.

D. The '794 Patent (Ex. 1001)

The '794 Patent is directed to “[a] resistor bypass circuit for a series lighting circuit.” Ex. 1001, code (57); *see id.* at code (54), 2:25–27. The circuit “includes a plurality of serially connected light sources and a bypass resistor being connected in parallel with at least one of the respective light sources.” *Id.* at code (57); *see id.* at 4:9–10. “[E]ach respective light source” is “low wattage and . . . capable [of] operating on a one hundred percent duty cycle as desired.” *Id.* at code (57). The advantage provided by the bypass circuit of the '794 Patent is that, “by continuing to conduct electricity through the series light circuit even when a light source is broken, loose, poor connection, or defective live source,” the “remainder of lights within a series lighting circuit” remain lit “when a light source is missing from, or becomes loose in, one or more light source sockets or circuits, or becomes defective.” *Id.* at 4:16–23.

Figure 2 of the '794 Patent is reproduced below.

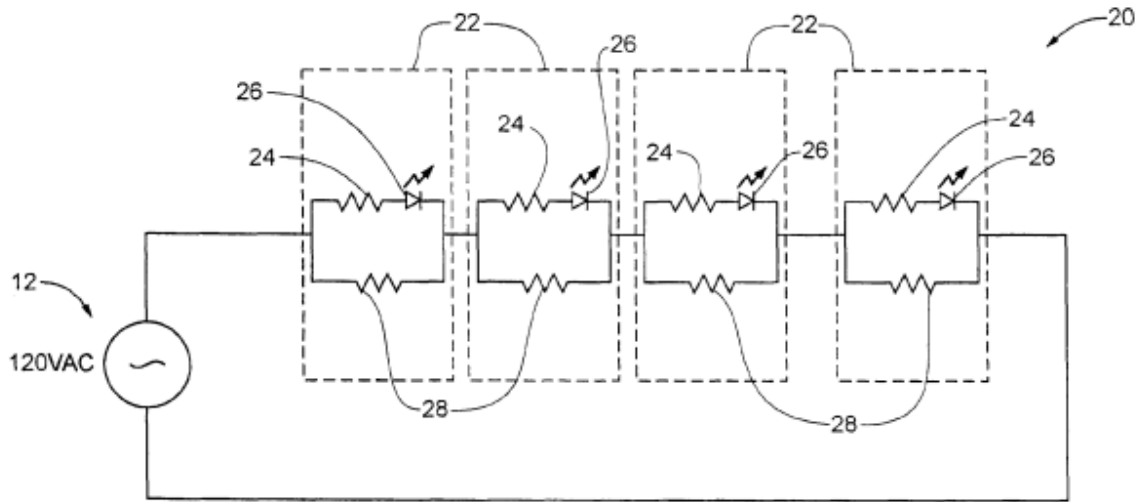


Figure 2 depicts a resistive bypass circuit 20 including a power source 12, light sources 26, optional current limiting resistors 24, and bypass resistors 28, with the light sources 26 as a single LED. *Id.* at 5:66–6:7. The power source 12 provides power to bypass circuit 20. *Id.* at 6:14–15. “When all light sources 26 are operable, current flows through the circuit, with a portion of the total current flow[ing] through the path containing current limiting resistor 24 and light source 26, while the remainder flows through bypass resistor 28,” and “[w]hen current flow is interrupted through a light source 26, total current flows through the corresponding bypass resistor 28, allowing the remaining light sources 26 to operate.” *Id.* at 6:15–22.

E. Illustrative Claim

Claims 1, 9, 10, and 15 are independent, and claims 2–8 and 11–14 depend directly or indirectly from claims 1 and 10, respectively. *See* Ex. 1001, 13:56–15:11. Claim 1 is illustrative and reproduced below:

1. A resistor bypass circuit for a lighting circuit comprising a plurality of serially connected LED light sources and a bypass resistor being connected in parallel with at least one of the respective light

sources, said bypass resistor being in circuit and conducting current at all times across the light sources when current is flowing through the circuit regardless of whether the LED light sources are conducting current therethrough.

Id. at 13:56–63.

F. Asserted Patentability Challenges and Prior Art

Petitioner asserts that claims 1–15 would have been unpatentable based on the following grounds (Pet. 24–25):

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1	102(b) ¹	Inoue ²
1, 10, 15	103(a)	Inoue, Holler ³
1, 10, 11, 15	103(a)	Holler, Smith ⁴
1, 5–7, 9	103(a)	Fisherman, ⁵ Callahan ⁶
2–6, 8, 9	103(a)	Inoue, Smith
10–14	103(a)	Holler, Callahan
1, 2, 10, 15	102(e)	Yu ⁷

II. ANALYSIS

A. Claim Construction

In an *inter partes* review proceeding, the Board applies the same claim construction standard as that applied in federal courts in a civil action under 35 U.S.C. § 282(b), which is generally referred to as the *Phillips* standard. *See*

¹ The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011), amended 35 U.S.C. §§ 102 and 103 effective March 16, 2013. Because the '794 Patent claims an effective filing date prior to the effective date of the applicable AIA amendment, we refer to the pre-AIA version of §§ 102 and 103.

² US 2005/0168162 A1, published Aug. 4, 2005 (Ex. 1003).

³ US 1,510,847, issued Oct. 7, 1924 (Ex. 1004).

⁴ US 4,675,575, issued June 23, 1987 (Ex. 1007).

⁵ US 2,760,120, issued Aug. 21, 1956 (Ex. 1008).

⁶ US 2004/0207341 A1, published Oct. 21, 2004 (Ex. 1009).

⁷ US 2008/0025024 A1, published Jan. 31, 2008, filed July 31, 2006 (Ex. 1010).

37 C.F.R. § 42.100(b); *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). Under the *Phillips* standard, “words of a claim ‘are generally given their ordinary and customary meaning.’” *Phillips*, 415 F.3d at 1312.

Petitioner offers claim constructions for the following terms and phrases: “plurality,” “said bypass resistor being in circuit,” and “conducting current at all times across the light sources when current is flowing through the circuit regardless of whether the LED light source are conducting current therethrough,” in claim 1 (Pet. 18–19); “series-parallel circuit” in claim 2 (Pet. 19); “wherein at least one of the light sources is a semiconductor providing a twinkling effect” in claim 3 (Pet. 20); “said bypass resistor being in circuit and conducting current at all times when current is flowing through the circuit regardless of whether the LED lights sources are conducting current therethrough,” in claim 9 (Pet. 20); “wherein the resistance of the bypass resistor is equal to or greater than the inherent resistance of the light source” and “said bypass resistor connected across the at least one light sources and being in circuit and conducting current at all times when current is flowing through the circuit regardless of whether the LED light sources are conducting current therethrough” in claim 10 (Pet. 21); “color changing characteristics” in claim 11 (Pet. 21); and “LED packages” in claim 12 (Pet. 22); the preamble, “a resistance greater than or equal to the predetermined resistance of said LED light source,” “the ability to carry all of the current in the light string,” and “the ability to operate at 100% duty cycle,” in claim 15 (Pet. 22–23). Petitioner also offers that “Claim 8 is a Markush claim that includes a Markush group.” Pet. 20.

Patent Owner addresses claim construction for the preamble recitation “[a] resistor bypass circuit for a series lighting circuit.” *See* PO Resp. 7–8.

I. “A resistor bypass circuit for a series lighting circuit”

Patent Owner contends that “[a] resistor bypass circuit for a series lighting circuit” as recited in the preamble of independent claim 1, and similarly recited in the preambles of independent claims 9 and 10 should be limited to a bypass that continues to conduct electricity, and keeps the remaining lights lit, even when one or more individual lighting elements in the series are burned out, missing, or defective. *See* PO Resp. 8–9. In support of its argument, Patent Owner directs attention to the ’794 Patent Specification and the claim limitation “conducting current at all times when current is flowing through the circuit regardless of whether the LED light sources are conducting current therethrough,” of claims 1, 9, and 10. *See id.* (citing Ex. 1001, 4:16–24, 13:52–60).

We do not agree with Patent Owner’s argument because it advocates for the importation of functional limitations from the ’794 Patent Specification into the claims—namely the disclosure that the bypass circuit continues to conduct electricity, and keeps the remaining lights lit, even when one or more individual lighting elements in the series are burned out, missing, or defective. *See* PO Resp. 7–9. It is well settled that it is improper to read an extraneous limitation into a claim from the specification. *See e.g., Commark Comm’s Inc. v. Harris Corp.*, 156 F.3d 1182, 1186 (Fed. Cir. 1998); *E.I. du Pont de Nemours & Co. v. Phillips Petroleum Co.*, 849 F.2d 1430, 1433 (Fed. Cir. 1988). An extraneous limitation is “a limitation read into a claim from the specification wholly apart from any need to interpret what the patentee meant by particular words or phrases in the claim.” *E.I. du Pont de Nemours*, 849 F.2d at 1433. Moreover, the language that Patent Owner wishes to import into the claim from the Specification is functional language that describes the function of the resistor bypass circuit. As explained below in the section addressing the subsequent claim recitation “conducting current at all times

across the light sources when current is flowing through the circuit regardless of whether the LED light source are conducting current therethrough,” functional language is evaluated in view of the applied prior art to determine whether it imparts additional structure to distinguish the claimed invention over the prior art.

Accordingly, to the extent the preamble recitation is limiting, we need not provide an express construction for “[a] resistor bypass circuit for a series lighting circuit.”

2. *“conducting current at all times across the light sources when current is flowing through the circuit regardless of whether the LED light sources are conducting current therethrough”*

Petitioner asserts that this recitation of independent claim 1, and nearly identical recitation of claims 9, and 10, is a functional statement in an apparatus claim, and, therefore, is not a limitation in the claims. *See* Pet. 19. Petitioner contends that this functional statement should not be treated as a distinguishing feature to determine patentability. *See id.* (quoting *Hewlett Packard v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, (Fed. Cir. 1990); citing *In re Swinehart*, 439 F.2d 210 (CCPA 1971)). According to Petitioner, “[i]n any event, the structure of Inoue and Yu is the same as the structure claimed in Claim 1. The circuits of Inoue and Yu therefore have inherent properties that correspond to the claimed function.” *Id.*

Although it is permissible to define an apparatus in terms of function, *see In re Swinehart*, 439 F.2d at 212–13, apparatus claims must still be distinguished from the prior art in terms of structure rather than function. *See In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997). In some circumstances, functional language can be used to add limitations to an apparatus claim. *See K-2 Corp. v. Salomon S.A.*, 191 F.3d 1356, 1363 (Fed. Cir. 1999). However, functional language may not be given patentable weight if the prior art discloses, teaches, or suggests a structure that inherently possesses the functionally defined limitations—that is, a

structure capable of performing the function. *See In re Schreiber*, 128 F.3d at 1478–79; *see also In re Swinehart*, 439 F.2d at 212–13 (“it is elementary that the mere recitation of a newly discovered function or property inherently possessed by things in the prior art, does not cause a claim drawn to those things to distinguish over the prior art”).

Accordingly, we need not explicitly construe this claim recitation. Instead, as set forth below in Sections II.D. through II.F., II.H., and II.I., we evaluate this functional language recited in claims 1, 9, and 10, against the applied prior art to determine whether it imparts any additional structure to the claimed apparatus that distinguishes the apparatus from the applied prior art.

3. “*Inherent Resistance*”

Independent claim 10 uses the term “inherent resistance of the light source to which the light resistor is attached.” *See* Ex. 1001, 14:46–48. Petitioner asserts that “there is no ‘inherent resistance’ of an LED, but only the resistance of the LED at any particular operating current flowing through, and voltage across, the LED.” Pet. 21 (citing Ex. 1013, 29 ¶¶ 6–9). Petitioner also points out that the term *inherent* is not used in the ’794 Patent Specification. *See id.*

Patent Owner does not explicitly address “inherent resistance” in terms of a claim construction. *See* PO Resp. 7–9. In any event, when addressing an alleged lack of motivation to combine the teachings of the references, Patent Owner compares and contrasts incandescent bulbs, which according to Patent Owner, have an inherent resistance, and LEDs, which according to Patent Owner, do not exhibit self-regulating resistance. *See id.* at 21 (citing Ex. 2002 ¶ 67); *see also id.* at 23 (similar argument, citing Ex. 2002 ¶ 73). Indeed, Patent Owner asserts that “the word resistance is not useful when describing LEDs as opposed to incandescent bulbs. . . . LED lights have an exponential current vs. voltage

relationship . . . rather than a linear current vs. voltage relationship as found in a simple resistance, such as seen in incandescent light bulbs.” *Id.* at 20 (citing Ex. 2002 ¶ 66).

We understand the term “inherent resistance” to mean the resistance at a particular operating current or voltage across the LED light source. Neither party disputes our understanding of the term “inherent resistance.” *See* Dec. on Inst. 9–10; PO Resp. 7–9; Pet. Reply.

4. “*the ability to carry all of the current in the light string*”

Petitioner asserts that this recitation of independent claim 15 is not a limitation in an apparatus claim, and, therefore, should not be treated as a distinguishing feature to determine patentability. *See* Pet. 23 (quoting *In re Hutchinson*, 154 F.2d 135 (CCPA 1946)).

We need not explicitly construe this claim recitation. Instead, as set forth below in Sections II.E., and II.H. we evaluate this functional language recited in claim 15 against the applied prior art to determine whether it imparts any additional structure to the claimed invention that distinguishes the apparatus from the applied prior art.

5. “*the ability to operate at 100% duty cycle*”

Petitioner asserts that this recitation of independent claim 15 is not a limitation in an apparatus claim, and, therefore, should not be treated as a distinguishing feature to determine patentability. *See* Pet. 24. Petitioner further asserts that, because the term 100% duty cycle is not defined in the ’794 Patent Specification, it should be given its ordinary and customary meaning. *See id.* (citing *Phillips*). Petitioner contends that the definition is that a duty cycle is the portion of the time occupied by a cycle of operation of a device, especially as a percentage of available time. *See id.* According to Petitioner, “[s]ince current is

constantly flowing through the bypass resistors in a series resistive bypass circuit, current passes through the bypass resistors 100% of the time which is [a] 100% duty cycle.” *Id.* (citing Ex. 1013, 56 ¶ 3). Patent Owner does not explicitly address “capable of 100% duty cycle.”

We need not explicitly construe this claim recitation. Instead, as set forth below in Sections II.E., and II.H. we evaluate this functional language recited in claim 15 against the applied prior art to determine whether it imparts any additional structure to the claimed invention that distinguishes the apparatus from the applied prior art.

6. Remaining Claim Terms and Phrases

As demonstrated in the analysis below, we need not explicitly construe any additional claim terms and phrases. *See, e.g., Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (“[W]e need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy.’” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

B. Level of Ordinary Skill in the Art

Petitioner asserts that a person of ordinary skill in the art “would have had a bachelor’s degree in electrical engineering, physics, materials science, or a related discipline, and four years of practical experience in designing or fabricating LED lighting systems, including controlling and driving LEDs,” or alternatively “would have had a master’s degree and three years of experience, or a Ph.D. degree and two years of experience.” Ex. 1013, 31 ¶ 3; *see also* Pet. 18. Patent Owner does not dispute Petitioner’s proposed definition of a person of ordinary skill in the art for the purpose of institution. *See* PO Resp. 2.

We adopt Petitioner’s definition of a person of ordinary skill in the art because it is consistent with the level of skill reflected by the ’794 Patent Specification and the asserted prior art.

C. Principles of Law

“Under 35 U.S.C. § 102 a claim is anticipated ‘if each and every limitation is found either expressly or inherently in a single prior art reference.’” *King Pharm., Inc. v. Eon Labs, Inc.*, 616 F.3d 1267, 1274 (Fed. Cir. 2010) (quoting *Celeritas Techs. Ltd. v. Rockwell Int’l Corp.*, 150 F.3d 1354, 1360 (Fed. Cir. 1998)).

“Anticipation requires the presence in a single prior art disclosure of all elements of a claimed invention arranged as in the claim.” *Therasense, Inc. v. Becton, Dickinson & Co.*, 593 F.3d 1325, 1332 (Fed. Cir. 2010) (quoting *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 1548 (Fed. Cir. 1983)).

A claim is unpatentable under 35 U.S.C. § 103 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 the subject matter pertains. *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 skill in the art; and (4) if in evidence, so-called secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

D. Challenge to Claim 1 as Anticipated by Inoue

1. Overview of Inoue (Ex. 1003)

Inoue is directed to “a lighting system that allows a plurality of light sources to light up at different luminance levels from each other.” Ex. 1003 ¶ 2. Inoue discloses “a lighting device that allows a plurality of serially-connected light

sources to light up” that “includes: current setting sections that are connected in series to the light sources respectively to constitute serial circuits . . . and shunt sections that are connected in parallel to at least one of the serial circuits constituted by the current setting sections and light sources.” *Id.* ¶ 11.

Figure 3 of Inoue is reproduced below:

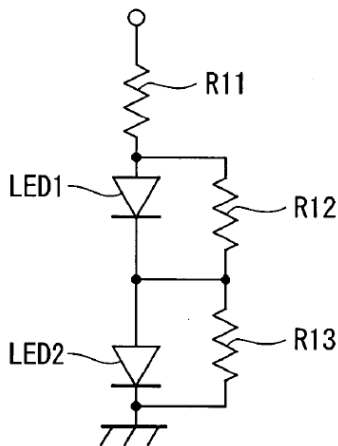


Figure 3 is a circuit diagram showing resistors R12 and R13 are connected to the serially-connected LEDs 1 and 2, respectively in parallel. *See id.* at ¶ 8. The resistance values of the resistors R12 and R13 are set to shunt current appropriately. *See id.*

2. Analysis of Claim 1

Petitioner asserts that Inoue discloses the preamble recitation and the limitation “a plurality of serially connected LED light sources and a bypass resistor being connected in parallel with at least one of the respective light sources,” as recited in claim 1, based on Inoue’s disclosure of LED 1 and LED 2 that have bypass resistors R12 and R13, respectively connected in parallel with each of the LEDs. *See* Pet. 25–26 (reproducing Ex. 1003, Fig. 3). Petitioner contends that Inoue discloses the limitation “said bypass resistor being in circuit and conducting current at all times across the light sources when current is flowing through the

circuit regardless of whether the LED light sources are conducting current therethrough,” as recited in claim 1, based on Inoue’s disclosure in Figure 3. *See* Pet. 26. According to Petitioner, “[a]s shown in Figure 3, if both LED 1 and LED 2 are conducting current, current also flows through R12 and R13, since LED 1 and LED 2 have a resistance when current is flowing through these LEDs.” *Id.* (citing Ex. 1013, 52 ¶ 1, 55 ¶ 8).

Patent Owner argues that “Inoue’s bypass is not a resistor bypass that continues to conduct electricity and keeps the remaining lights lit, even when one more individual lighting elements in the series are out, loose, broken, missing/removed, or defective.” PO Resp. 16 (citing Ex. 2002 ¶ 57); *see id.* at 16–17 (citing Ex. 1013, 54 ¶ 4; Ex. 2002 ¶ 60). Patent Owner asserts that “Inoue does not disclose that LED2 in Figure 3 will remain lit if LED1 burns out or stops carrying current, for example if the LED is loose, missing, or removed from the circuit, and that all current will flow through the bypass containing R12.” *Id.* at 16 (citing Ex. 2002 ¶ 59).

We do not agree with Patent Owner’s arguments because, as explained above in Section II.A., we decline to import functional language into the claim from the Specification to construe the preamble recitation as requiring the function of “continu[ing] to conduct electricity and keeps the remaining lights lit, even when one more individual lighting elements in the series are out, loose, broken, missing/removed, or defective.”

Having considered both parties’ arguments and corresponding cited supporting evidence, we are persuaded that Inoue discloses each of the limitations of claim 1. Based on the entire record, we determine Petitioner shows by a preponderance of the evidence that claim 1 is anticipated by Inoue. *See* Pet. 25–26.

E. Challenge to Claims 1, 10, and 15 over Inoue and Holler

1. Overview of Holler (Ex. 1004)

Holler is directed to “means for lighting Christmas trees by electricity.”

Ex. 1004, page 1⁸, lines 9–10.

Figure 2 of Holler is reproduced below:

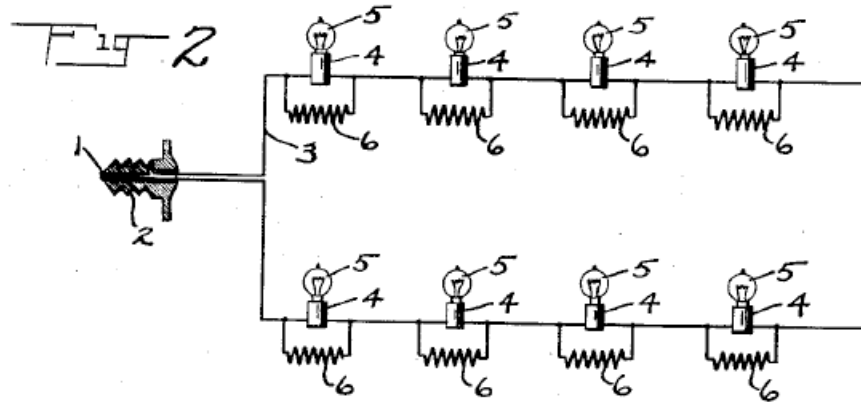


Figure 2 depicts screw sleeve contact 2 with center contact 1, lighting loop comprising conductor 3 connected in series with lamp sockets 4 and lamps 5 and resistances 6 connected across the terminals of each lamp socket 4. *See id.* at page 1, lines 66–67, 77–96. Holler further discloses “[i]t has been found that good results are obtained if each of the resistances 6 is made of a resistance equal to that of the lamp with which it is in shunt and of approximately twice the current carrying capacity.” *Id.* at page 1, lines 96–101. Holler further discloses lighting equipment that provides “that the discontinuance of one of the lamps will slightly increase the resistance of the circuit so that the remaining lamps will be slightly dimmed, but not to any objectionable extent,” and that “all of the lamps except one may be extinguished and that will continue to burn with considerable brilliancy.” *Id.* at page 2, lines 7–16.

⁸ We refer to pages 1 and 2 of the written description of Holler.

2. Analysis of Independent Claims 1, 10, and 15

Independent claim 10 is substantially similar to claim 1, and additionally recites: “wherein the resistance of the bypass resistor is equal to or greater than the inherent resistance of the light source to which the resistor is attached.” Ex. 1001, 14:46–48. Petitioner’s arguments addressing the common limitations of claim 10 are substantially similar to its arguments addressing the proposed unpatentability of claim 1 as anticipated by Inoue. *Compare* Pet. 28–30, *with* Pet. 25–26. Petitioner asserts that the combination of Inoue and Holler teach “wherein the resistance of the bypass resistor is equal to or greater than the inherent resistance of the light source to which the resistor is attached,” as recited in claim 10. *See* Pet. 30–31.

Petitioner asserts that independent claim 15 is a product-by-process claim and contends that patentability is based on the product itself. *See* Pet. 31. Petitioner asserts that Inoue’s Figure 3 teaches a serially connected light string having at least one light source based, as recited in the preamble of claim 15. *See* Pet. 31–32 (citing Ex. 1013, 47 ¶ 1, 49 ¶ 2, 51 ¶ 5). Petitioner asserts that the teachings of Inoue combined with Holler teach “the ability to carry all of the current in the light string” and “the ability to operate at 100% duty cycle.” *See* Pet. 32 (citing Ex. 1003, Fig. 3; Ex. 1013, 52 ¶ 1, 55 ¶ 8; Pet. 30). Petitioner further contends that “predetermined resistance” does not have meaning because LEDs do not have a predetermined resistance, but only a resistance based upon the voltage drop across the LED divided by the current flowing through the LED at a particular time. *See id.* (citing Ex. 1013, 27 ¶ 2, 28 ¶¶ 6–9). Petitioner asserts that the combination of Inoue and Holler teaches “a resistance greater than or equal to the predetermined resistance of said LED light source,” as recited in claim 15. *See id.* (citing Ex. 1013, 27 ¶ 2).

In support of its obviousness contentions, Petitioner asserts that Holler teaches that it is advantageous to have bypass resistor 6 equal to the resistance of the filament of lamp 5. *See* Pet. 30 (citing Ex. 1004, page 1, lines 96–101; Ex. 1013, 62 ¶ 3, 66 ¶ 7; Pet. 26–28); *see also* Pet. 33 (similar argument, citing Ex. 1004, page 1, lines 96–101; Ex. 1013, 52 ¶ 1, 55 ¶ 8, 54 ¶¶ 5–6). Incorporating its claim construction position regarding “inherent resistance,” Petitioner asserts the claim recitation “wherein the resistance of the bypass resistor is equal to or greater than the inherent resistance of the light source to which the resistor is attached,” “does not have meaning except to the extent that the resistances are equal to or greater than the LED resistance at any particular time which depends on the operating condition of the LED.” Pet. 31 (citing Ex. 1013, 27 ¶ 2, 28 ¶¶ 6–9). Petitioner asserts that Inoue teaches that its circuit can work equally as well with LEDs or electric bulbs. *See* Pet. 27 (citing Ex. 1003 ¶ 21). According to Petitioner, a person of ordinary skill in the art “would certainly use the teachings of Holler to select resistors for a series LED circuit” and “using the teachings of Holler regarding the resistive values of bypass resistors in the circuit of Inoue, would produce the same results as the results produced by Holler, even though Inoue uses LEDs.” Pet. 27, 31 (citing Ex. 1013, 65 ¶ 6). Petitioner asserts that “there is a **record-supported reason** for combining Inoue and Holler since both Inoue and Holler use bypass resistive elements for directing current in their circuits to convert illumination.” Pet. 27.

Petitioner asserts that one with ordinary skill in the art would have been “motivated to use the resistive value as taught by Holler in the circuit of Inoue to control the illumination of the light sources so that the other illumination devices in the serial light string will not go dark or change illumination if one of the LEDs fails or becomes disconnected.” Pet. 27. According to Petitioner, a person of

ordinary skill in the art would have made “the modification with a reasonable expectation of success since Holler expressly teaches that the other serially connected LEDs will remain lit with the same illumination if a light source fails.” Pet. 27–28 (citing Ex. 1004, page 1, lines 51+). Petitioner further contends that “[t]he combination provides a predictable result of having serially connected LEDs staying lit with uniform illumination even if one of the LEDs of Inoue goes dark.” Pet. 28 (citing Ex. 1013, 52 ¶ 1, 55 ¶ 8).

Patent Owner argues that “[t]he Petition fails to show that a POSITA would have been motivated to combine the LED disclosed in Inoue with the circuit configuration in Holler’s 1924 patent.” PO Resp. 17; *see also id.* (“the Petition fails to offer a reasoned explanation why a POSITA would have been motivated to use the bypass circuit in Holler with the LED light disclosed in Inoue.”). According to Patent Owner, “[t]he Petition contends a POSITA would have been motivated to use the drive circuit in Holler with the LED light sources of Inoue.” *Id.* (citing Pet. 26–27; Ex. 1013, 60 ¶ 2). In support of its argument, Patent Owner also addresses testimony by Petitioner’s witness Dr. Schubert to support the contentions of obviousness. *See id.* (citing Ex. 1013, 57). Patent Owner asserts that “[a] POSITA would not have a reasonable expectation that use of the shunt in Holler’s circuit would be successful for use with the LED disclosed in Inoue.” *Id.* at 19 (citing Ex. 2002 ¶ 64); *see id.* at 19–22 (addressing differences between LEDs and incandescent bulbs, citing Ex. 2002 ¶¶ 65–69).

We do not agree with Patent Owner’s arguments as they are misplaced. Contrary to Patent Owner’s arguments, the Petition does not propose using Holler’s drive circuit with Inoue’s LED light sources. *See* Pet. 26–28. Instead, Petitioner proposes “using the teachings of Holler regarding the resistive values of

bypass resistors in the circuit of Inoue” and “us[ing] the resistive value as taught by Holler in the circuit of Inoue.” Pet. 27.

Patent Owner further argues that the Petition suggests that Holler’s selective resistance values suggest replacement of an incandescent bulb with an LED. *See* PO Resp. 18 (citing Pet. 27). According to Patent Owner, “[a] POSITA would not be motivated to replace an incandescent light bulb with an LED.” *Id.* at 18–19 (citing Ex. 2002 ¶ 63). We do not agree with Patent Owner’s arguments because these arguments too are misplaced. The Petition does not propose modifying Holler to substitute LEDs in place of incandescent lights. *See* Pet. 26–28.

Based on Petitioner’s cited support to Holler, Inoue, and Dr. Schubert’s testimony (Ex. 1013), we are persuaded Petitioner sets forth sufficient articulated reasoning with rational underpinning to support the conclusion that it would have been obvious to one of ordinary skill in the art to “use the resistive value as taught by Holler in the circuit of Inoue to control the illumination of the light sources so that the other illumination devices in the serial light string will not go dark or change illumination if one of the LEDs fails or becomes disconnected.” Pet. 27; *see KSR*, 550 U.S. at 418.

Based on the entire record and including the reasons explained above in Section II.D.2. addressing anticipation of claim 1 by Inoue, we determine Petitioner shows by a preponderance of the evidence that the subject matter of claims 1, 10, and 15 would have been obvious over Inoue and Holler. *See* Pet. 26–34.

F. Challenge to Claims 1, 5–7, and 9 over Fisherman and Callahan

1. Overview of Fisherman (Ex. 1008)

Fisherman is directed to “strings of electrical lights” in a configuration “so constructed that an increase in electrical current will not disrupt the illumination in

its entirety.” Ex. 1008, 1:15–18, 1:26–30. Fisherman aims to provide that the “electrical circuit will not be interrupted.” *Id.* at 1:47–48.

Figure 1 of Fisherman is reproduced below:

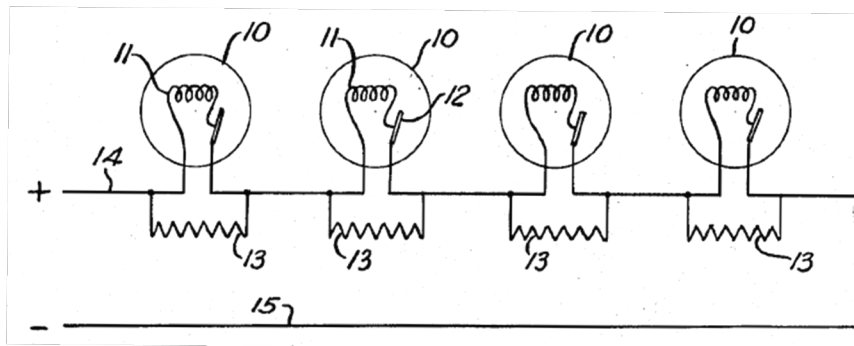


Figure 1 illustrates a string of Christmas tree lamps including a plurality of lamps 10 of the same construction connected in series and supplies with electrical energy through wires 14 and 15. *See id.* at 1:71–2:2, 2:14–17. Each lamp 10 comprises a lighting filament 11 and a bimetallic strip 12 connected in series with filament 11 and a resistance connected in parallel with lamp 10. *See id.* at 2:6–14.

Fisherman discloses:

The resistances 13 are so dimensioned that when the system functions normally, the electrical current will flow through the filaments 11 of the lamps 10, so that all the lamps 10 will be illuminated.

As soon as the supply of electrical current becomes excessive, instead of burning out the filament, the current will overheat a bi-metallic strip 12, so that the strip 12 of one lamp will move away from the filament 11 of that lamp. Then, that lamp will cease to be illuminated. However, the electrical current will be diverted to the shunt 13 of the lamp with the result that all the remaining lamps 10 will continue to function. Any further increase in the electrical current will affect the bi-metallic strip of the next lamp without affecting the lamps as a whole.

As soon as the electrical current has become normal, the bi-metallic strips will return to their initial positions and will remain therein, so that the electrical lamps will be illuminated again.

If the current continues to be excessive, the bi-metallic strips may move in and out of contact with the filaments 11, thereby providing a blinking effect.

Id. at 2:18–39.

2. Overview of Callahan (Ex. 1009)

Callahan is directed to a “decorative lighting system.” Ex. 1009, code (57). Callahan discloses “individually addressed decorative LEDs used in lighting systems controlled by a remotely located microcontroller.” *Id.* ¶ 2. According to Callahan, “[l]ight emitting diodes provide advantages over previous incandescent and other types of lighting systems due to improved power conservation and reliability. In the context of decorative lighting system, LEDs permit more latitude of control over the decorative product solutions by permitting communication with LEDs through control systems.” *Id.* ¶ 3.

Figure 1 of Callahan is reproduced below:

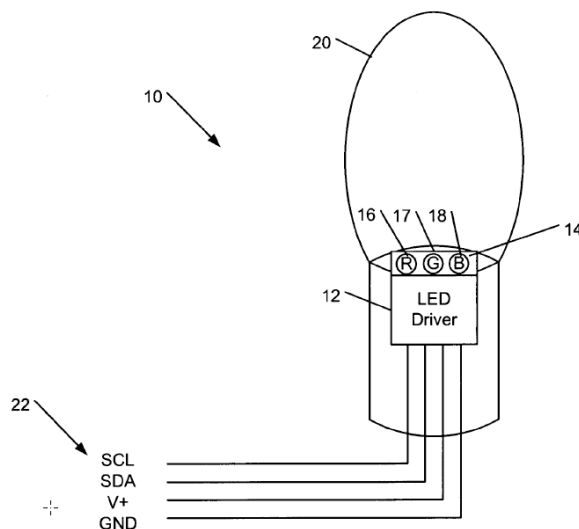


Figure 1 depicts illumination device 10 that includes optical diffuser 20 that approximates the size and shape of a Christmas bulb, application specific integrated circuit (ASIC) light emitting diode (LED) driver 12 for individual and precise control of high brightness decorative color tunable LEDs 14 comprising

RGB LED elements 16, 17, 18. *See id.* ¶¶ 8, 18, 20. “According to one embodiment of an illumination device, variable color, blink rates, and brightness of a single-dye RGB LEDs are controlled via an I²C communicating integrated circuit, the LED driver.” *Id.* ¶ 18; *see id.* ¶¶ 6, 23, 32. Callahan discloses, in one embodiment, an LED illumination device that may be disposed in an e12 connector, which permits retrofitting older light displays with LEDs. *See id.* ¶ 36.

3. Analysis of Independent Claims 1 and 9

Petitioner asserts that the combination of Fisherman and Callahan teaches the preamble recitation and the limitation “a plurality of serially connected LED light sources and a bypass resistor being connected in parallel with at least one of the respective light sources,” as recited in claims 1 and 9, based on Fisherman’s disclosure of one or more light sources 10 connected in series with a bypass/shunt resistor 13 connected in parallel with each of the light sources, as modified by Callahan’s disclosure of LEDs capable of replacing incandescent lamps. *See* Pet. 42–43 (reproducing Ex. 1008, Fig. 1; citing Ex. 1009 ¶ 36; Ex. 1013, 92 ¶¶ 1–3, 93 ¶¶ 4–6, 94 ¶ 9). Petitioner asserts that Fisherman teaches the limitation “said bypass resistor being in circuit and conducting current at all times across the light sources when current is flowing through the circuit regardless of whether the LED light sources are conducting current therethrough,” as recited in claim 1 and similarly recited in claim 9. *See* Pet. 43–44. According to Petitioner:

If the lamp 10 of Fisherman is substituted with an LED as taught by Callahan, each bypass resistor 13 also conducts current at all times in accordance with a parallel circuit operation. . . . Accordingly, the current passing through each resistor 13 is the ratio of the resistive value of the resistor 13 and the varying resistive value of the corresponding LED. If the lamp 10 of Fisherman, fails and is an open circuit, all of the current for the lamp 10 and resistor 13 flows through resistor 13. . . . Thus, current continues to flow through resistor 13

whether or not current is flowing through the parallel connected light source 10.

Pet. 44 (citing Ex. 1013, 92 ¶¶ 1–2, 93 ¶¶ 4–6, 94 ¶ 9, 101 ¶¶ 3–4).

Petitioner asserts that the combination of Fisherman and Callahan teaches the limitation “further including an LED flashing light source which includes a flashing circuit which causes the entire light circuit to flash,” as recited in claim 9, based on Callahan’s disclosure that the illumination device is an LED that may be selectively driven at a particular blink rate. *See* Pet. 47–48 (citing Ex. 1009 ¶¶ 20, 23; Ex. 1013, 91 ¶ 3). According to Petitioner:

A POSITA will recognize that the LED disclosed in Callahan, substituted for the lamps 10 of Fisherman, may be a blinking LED as also disclosed by Callahan. Of course, to cause the whole circuit to flash, a bypass resistor may be removed from one of the flashing LEDs. This is certainly within the skill of a POSITA.

Pet. 48 (citing Ex. 1013, 30 ¶¶ 16–17).

Petitioner asserts that Callahan teaches that LEDs can replace and have advantages over conventional incandescent bulbs, including improved power conservation and reliability and permit more latitude of control over lighting solutions. *See* Pet. 41–42 (citing Ex. 1009 ¶ 3; Ex. 1013, 36 ¶ 1, 37–38, 52 ¶ 1, 53, 65 ¶ 3, 66 ¶¶ 4–6). According to Petitioner, “[t]he record-supported advantages, set forth in Callahan, provides a clear motivation for the replacement of incandescent bulbs with LEDs to enjoy those advantages of using LEDs instead of incandescent bulbs as set forth in Callahan.” Pet. 42.

Patent Owner argues that “[t]he Petition fails to show that a POSITA would have been motivated to use the lighting circuit in Fisherman with the LED light sources of Callahan.” PO Resp. 25 (citing Pet. 38–39; Ex. 1013, 87 ¶ 3). In support of its argument, Patent Owner addresses testimony by Petitioner’s witness Dr. Schubert to support Petitioner’s obviousness contentions. *See id.* (citing

Ex. 1013, 87 ¶ 4). According to Patent Owner, “neither the Petition nor Petitioner’s expert explain[s] why a POSITA would have expected to successfully incorporate Callahan’s LED in Fisherman’s circuit from 1956.” *Id.* (citing Ex. 2002 ¶ 81); *see also id.* at 26 (“A POSITA would not have a reasonable expectation that use of the shunt in Fisherman’s circuit would be successful for use with the LED disclosed in Callahan,” citing Ex. 2002 ¶ 83). Patent Owner contrasts incandescent bulbs and LEDs and contends the substituting LEDs in the Fisherman’s circuit would be “impractical without significant redesign of the circuit.” *Id.* at 25–26; *see id.* at 25–27 (citing Ex. 1008, 1:36–44, 2:22–29; Ex. 1009 ¶ 25; Ex. 2002 ¶¶ 81, 83, 85). Patent Owner further argues that “[a] POSITA would not be motivated to replace an incandescent light bulb with an LED as incandescent light sources still have a place in decorative lighting, compared to other industries, both lighting and non-lighting.” *Id.* at 26 (citing Ex. 2002 ¶ 82; Exs. 2007, 2008).

We do not agree with Patent Owner’s arguments. Although incandescent light sources still have a place in decorative lighting, Patent Owner does not address sufficiently Petitioner’s assertion, supported by record evidence, that LEDs have several advantages over incandescent bulbs. We also do not agree with Patent Owner’s arguments that a POSITA would not have had a reasonable expectation of success in modifying the teachings of Fisherman in view of Callahan because the substitution of LEDs would be “impractical without significant redesign of the circuit.” Patent Owner does not meaningfully address whether the substitution of LEDs and a redesign of the circuit would have been beyond the skill level of a person of ordinary skill in the art at the time of the invention—a person that “would have had a bachelor’s degree in electrical engineering, physics, materials science, or a related discipline, and four years of

practical experience in designing or fabricating LED lighting systems, including controlling and driving LEDs,” or “a master’s degree and three years of experience, or a Ph.D. degree and two years of experience.” Ex. 1013, 31 ¶ 3; *see* Pet. 18. Moreover, “a person of ordinary skill is a person of ordinary creativity, not an automaton.” *KSR*, 550 U.S. at 421.

Based on Petitioner’s cited support to Fisherman, Callahan, and Dr. Schubert’s testimony (Ex. 1013), we are persuaded Petitioner sets forth sufficient articulated reasoning with rational underpinning to support the conclusion that it would have been obvious to one of ordinary skill in the art to “replace[] . . . incandescent bulbs with LEDs to enjoy those advantages of using LEDS instead of incandescent bulbs.” Pet. 41; *see* Pet. 41–42; *KSR*, 550 U.S. at 418. Based on the entire record, we determine that Petitioner shows by a preponderance of the evidence that the subject matter of independent claims 1 and 9 would have been obvious over Fisherman and Callahan. *See* Pet. 41–44, 47–48.

4. Analysis of Dependent Claims 5–7

Claims 5 through 7 depend from claim 1, and further recite limitations directed to at least one of the light sources providing a twinkling effect, at least one of the light sources utilizing electronic circuits that control the flashing rate, and the light source is a blinking LED. *See* Ex. 1001, 14:6–20. We have reviewed Petitioner’s contentions and cited supporting evidence addressing how Callahan discloses, teaches, or suggests each of the limitations recited in dependent claims 5–7. *See* Pet. 43–47.

Patent Owner does not substantively address the limitations of dependent claims 5–7 apart from its arguments addressing claims 1 and 9. *See* PO Resp. 25–27.

Based on the entire record, including the reasons explained immediately above addressing claims 1 and 9, we determine that Petitioner shows by a preponderance of the evidence that the subject matter of dependent claims 5–7 would have been obvious over Fisherman and Callahan.

G. Challenge to Claims 2–6, 8, and 9 over Inoue and Smith

1. Overview of Smith (Ex. 1007)

Smith is directed to a “light string system having a first and second electrical conductor and a plurality of either mono-color, bi-color or multi-color light-emitting diodes electrically connected between the first and second conductors.” *See* Ex. 1007, 6:35–39. Relatively long or short strings (i.e., conductors) can be provided and using AC, DC, batteries, rectified AC, or pulses can be used for driving and illuminating the light-emitting diodes. *See id.* at 6:51–54. “The light-emitting diodes may be adapted for use as Christmas tree strings and various AC and DC control circuits are provided for driving the light-emitting diodes, for blinking effects, for alternating between two colors, for alternating between three colors, for improving the length of the string and uniformity of intensity of illumination and the like.” *Id.* at code (57). The light string system “uses a series-parallel configuration wherein the upper and lower portion of the master trunk line and the individual light-emitting diodes within each limb line are connected in series while the limb line sets are connected in parallel with each other.” *Id.*

Smith discloses that, in comparison to the shortcomings of standard incandescent bulbs (*see id.* at 1:15–2:32),

The plurality of light-emitting diodes is operatable for extremely long periods of time without burning out, require an extremely low amount of electrical power for energy-efficient operation, produce substantially no heat thereby eliminating burn and fire hazards, and enable relatively long strings of lights to be used without loss of

intensity down the string, and provide a means for supplying electrical power to the conductors.

Id. at 6:39–47.

2. Analysis of Independent Claim 9 and Dependent claims 3, 5, and 6

Independent claim 9 is substantially similar to claim 1, and additionally recites: “further including an LED flashing light source which includes a flashing circuit which causes the entire light circuit to flash.” Ex. 1001, 14:35–37.

Claims 3, 5, and 6 depend from claim 1 and recite limitations similar to claim 9 as to flashing and blinking. *Id.* at 13:66–14:15. Petitioner incorporates by reference its arguments addressing claim 1 to address the common limitations of claim 9. Pet. 57 (citing Pet. 25–26). Petitioner asserts that the combination of Inoue and Smith teaches the addition limitation of claim 9 based on Smith’s disclosure of circuitry for creating blinking and switching. *See id.* (citing Ex. 1007, Fig. 39, col. 33, l. 67+; Ex. 1013, 104 nn.37–38, 114 n.47, 30 ¶¶ 16–17).

Petitioner directs attention to Smith’s disclosure of LEDs in a lighting circuit, that LEDs can readily replace incandescent bulbs and have superior advantages to incandescent bulbs, and incandescent bulbs and LEDs are known in the art and well-known substitutes for each other. *See* Pet. 49 (citing Ex. 1007, 2:57–62; Ex. 1013, 36 ¶ 4, 41 ¶ 4, 65 ¶ 3, 66 ¶¶ 4–6, 68 ¶ 2, 69 ¶¶ 3–6). According to Petitioner, “[t]he numerous record-supported advantages, set forth in Smith provide a clear motivation for use of the teachings of Smith as applied to Inoue, so as to enjoy the advantages set forth in Smith.” *Id.*

Patent Owner asserts that the proposed combination of Inoue and Smith does not render obvious the subject matter of claims 1 and 9 because “Inoue fails to disclose a resistor bypass that continues to conduct electricity and [keep the] remaining lights lit, even when one more individual lighting elements in the series are burned out.” PO Resp. 28 (citing Ex. 2002 ¶ 88); *see id.* at 27–29 (citing

Ex. 1003 ¶¶ 5, 11, 34; Ex. 2002 ¶¶ 87, 89). We do not agree with Patent Owner’s arguments for the same reasons we explained above in Section II.D.2. addressing anticipation of claim 1 by Inoue.

In the Institution Decision, we indicated that there was not a reasonable likelihood that Petitioner would prevail in showing that the subject matter of claims 2–6, 8, and 9 was obvious over Inoue and Smith, and provided the following analysis:

Petitioner does not set forth sufficient articulated reasoning with rational underpinning to support the conclusion that it would have been obvious to one of ordinary skill in the art to combine the teachings of Inoue and Smith to render obvious the subject matter of independent claim 9 and dependent claims 2–6 and 8. For example, Petitioner does not explain sufficiently why a person of ordinary skill in the art would have modified the teachings of Inoue, which teaches the use of LEDs, in view of the teachings of Smith, which also teaches LEDs. . . . Furthermore, Petitioner does not explain sufficiently why a person of ordinary skill in the art would have modified the teachings of Inoue in view of Smith to arrive at the subject matter of claims 2–6, 8, and 9. . . . For example, independent claim 9 and dependent claims 3, 5, 6, . . . are directed to LEDs and associated circuits that provide a flashing, blinking, or twinkling effect, but Petitioner does not explain sufficiently why a person of ordinary skill in the art would have modified Inoue’s LED teachings in view of Smith to include LEDs and associated circuits that provide a flashing, blinking, or twinkling effect.

Dec. on Inst. 29; *see id.* at 29–30.

In the Response, Patent Owner does not address the Board’s analysis in the Institution Decision, and does not address the merits of Petitioner’s reasons for combining the teachings of Inoue and Smith. *See* PO Resp. 27–28.

In the Reply, Petitioner asserts that the Petition provided a clear articulation of motivation in explaining that “the numerous record-supported advantages, set forth in Smith[,] provide a clear motivation for use of the teachings of Smith as

applied to Inoue, so as to enjoy the advantages set forth in Smith.” Pet. Reply 6 (citing Pet. 49) (emphasis omitted). On the basis of this reasoning from the Petition, Petitioner asserts that it is permissible to expand the reasons in the Reply. *See id.*

In the Reply specifically addressing independent claim 9, as well as dependent claims 3, 5, and 6, Petitioner additionally asserts that “[a] POSA would have been motivated to use Smith’s teachings to modify Inoue because Smith provides advanced circuitry creating a blinking effect.” Pet. Reply 9; *see id.* at 10–11. According to Petitioner, “[b]linking effects draw attention to potentially important instruments. Blinking to draw attention is common sense. Blinking can also provide decoration. Blinking can be provided as sequencing between multiple colors, . . . which adds additional motivation to use the advanced functionalities of Smith because decorativeness can be appealing to a user who would be motivated to modify the lighting circuit of Inoue.” *Id.* at 9 (citing Ex. 1007, code (57), 7:59–61; Ex. 1013, 102–03; Ex. 1017 ¶ 71); *see id.* at 10–11. Petitioner contends that “[t]he advanced circuitry taught by Smith to create blinking and control pulse duration is a permissible expansion of the advantages provided by Smith.” *Id.* at 10 (citing Ex. 1013, 99 ¶¶ 37, 38, 102–03); *see id.* at 10–11.

Petitioner asserts that the expansion of the rationale is permissible because the Federal Circuit decision in *Rembrandt Diagnostics LP v. Alere, Inc.*, 76 F.4th 1376 (Fed. Cir. 2023) has a very similar fact pattern and is informative. Pet. Reply 12 (citing *Axonics, Inc. v. Medtronic, Inc.*, 75 F.4th 1374, 1381-1382 (Fed. Cir. 2023)). According to Petitioner, “Petitioner is replying to the statements of the Board that Petitioner has not adequately described *why* Smith’s teachings could be used by a POSA to modify Inoue.” *Id.* at 13. According to Petitioner,

[a]lthough the reasons why Smith's teachings should be used to modify Inoue are articulated in the Petition, it is permissible to expand the arguments of the Petition, to provide more clarity, with the statements and arguments set forth in the Expert Declaration and the teachings of the references, and Petitioner “does not point to any new embodiments not previously identified to advance a meaningful distinct contention from what it first asserted in its petition.”

Id. (citing *Rembrandt* at 1385) (Petitioner’s alterations omitted). Petitioner analogizes its Petition and Reply arguments to *Rembrandt* in which Alere had broadly argued in its Petition that the combination of references would be more efficient and later made arguments about cost savings. *See id.* at 13–15, 17. Petitioner asserts that, in *Rembrandt*, the Court held that Alere’s arguments about cost savings was a form of efficiency and found the arguments to be responsive and merely expands upon previously raised arguments. *See id.* at 14. According to Petitioner,

[h]ere, Petitioner has relied on the listing of advantages set forth in the Schubert Declaration and in the references themselves, to explain and expand its showing [of] motivation. The credible evidence set forth in Dr. Schubert's Declaration regarding blinking, . . . was unrebutted by P[atent Owner]. Dr. Schubert stated the motivation and reasons why a POSA would modify the disclosure of Inoue was to “*broaden the capabilities of the LED lighting circuits disclosed by Inoue*” and to “*include advanced functionality*” of Smith in Inoue.

Id. at 15 (citing Ex. 1013, 100). Petitioner contends that Dr. Schubert testifies “that a POSA would be familiar with the design of basic electrical circuits and understand that such electrical circuits work in a *predictable manner*.” *Id.* (citing Ex. 1013, 99).

Petitioner contends that it has not asserted any new legal arguments or relied on new embodiments in Smith or Inoue. *See* Pet. Reply 15. According to Petitioner,

[t]hese are the same legal grounds identified in the Petition and in the Expert Declaration that further explain Petitioner's legal argument. These reasons are based on the same references, that simply identify the advantages of the advanced functionalities of Smith. No new embodiments in the references were identified. These advantages were specifically identified in EX 1013, 98–99.

Id. at 17.

In the Sur-reply, Patent Owner asserts that Petitioner's Reply sets forth improper new arguments that should not be considered by the Board. *See* PO Sur-reply 2, 4–5 (citing *Intel Corp. v. Besang Inc.*, IPR2023-00991, Paper 39 at 32 (PTAB Dec. 11, 2024)). According to Patent Owner, “[t]hese late-stage attempts to remedy deficiencies in the petition are prohibited by statute, regulations, and the Board’s guidelines.” *Id.* at 2 (citing 35 U.S.C. § 312(a)(3); 37 C.F.R. § 42.23(b); Consolidated Trial Practice Guide (December 2025) (“CTPG”)⁹ § II.I). Patent Owner reproduces portions of page 49 of the Petition and contends that “[t]he Petition touts only the advantages of substituting LEDs for incandescent lights. Entirely absent from it is any rationale for combining the LEDs of Smith with those LEDs of Inoue—a defect the Board pointed out in its I[n]sitution Decision] at 29.” *Id.* at 3–4. Patent Owner contends that the fact pattern here is not like in *Rembrandt*. *See id.* at 4. According to Patent Owner, “[h]ere, any rationale for combining two references both teaching LEDs is entirely absent in the Petition; thus there is nothing to expound upon on reply. This is precisely a ‘newly raised rationale to combine that the Board’s Trial Practice Guide prohibits.” *Id.* (footnote omitted).

We do not agree with Petitioner that the fact pattern before us is analogous to *Rembrandt*. The rationale to combine the teachings of Inoue and Smith

⁹ Available at: <https://www.uspto.gov/patents/ptab/trial-practice-guide>

provided in the Petition focuses on replacing incandescent bulbs with LEDs, and includes the generic statement that “[t]he numerous record-supported advantages, set forth in Smith provide a clear motivation for use of the teachings of Smith as applied to Inoue, so as to enjoy the advantages set forth in Smith.” Pet. 47; *see* Pet. 46. The testimony in Dr. Schubert’s Declaration at pages 98–100 cited in support of Petitioner’s Reply arguments was not cited or otherwise referenced in the Petition. *See* Pet. 49–57. We find that the Petitioner’s Reply is not responsive to the Institution Decision and is improper because it presents a new rationale to combine the teachings of Inoue and Smith that was not expressed in the Petition. *See* 37 C.F.R. § 42.23; CTPG § II.I. Petitioner could have presented its rationale to make out a *prima facie* case of unpatentability in the Petition. *See* 37 C.F.R. § 42.23; CTPG § II.I. Accordingly, we do not consider Petitioner’s new rationale to combine the teachings of Inoue and Smith presented for the first time in the Reply.

Based on the entire record, but not including Petitioner’s new rationale and newly cited support to Smith and Dr. Schubert’s testimony (Exs. 1013, 1017) presented for the first time in the Reply, we are not persuaded that Petitioner sets forth in the Petition sufficient articulated reasoning with rational underpinning to support the conclusion that it would have been obvious to one of ordinary skill in the art to modify the circuit of Inoue to include a light source or LED light source with a twinkling or flashing effect in view of Smith’s teachings. *See* Pet. 49, 51–52, 54–56, 57. Accordingly, we determine that Petitioner has not demonstrated by a preponderance of the evidence that the subject matter of independent claim 9 and dependent claims 3, 5, and 6 would have been obvious over the teachings of Inoue and Smith.

3. Analysis of Dependent Claim 2

Claim 2 depends directly from claim 1 and further recites “wherein the circuit is series-parallel connected.” Ex. 1001, 13:64–65. Petitioner relies on the teachings of Smith’s “series/parallel wiring system 124” of Figure 32 to address the limitations of claim 2. *See* Pet. 50–51 (reproducing Ex. 1007, Fig. 32; citing Ex. 1007, 22:3–11, 22:37–61; Ex. 1013, 40 ¶ 2, 41 ¶ 4, Fig. 2). Petitioner relies on the same rationale for combining the teachings of Inoue and Smith as claims 3, 5, 6, and 9 in the Petition as explained immediately above in Section II.G.2. *See* Pet. 49–51.

In the Reply for the first time, and specifically addressing dependent claim 2, Petitioner asserts that “Smith discloses that an advantage of using the series-parallel circuit will result in ‘enabling *more lights* to be illuminated with *less power*, for increasing the *uniformity of illumination* along the length of the string and for minimizing light outage due to bulb burnout.’” Pet. Reply 6 (citing Ex. 1007, code (57); Ex. 1017 ¶ 68). According to Petitioner, a person of ordinary skill in the art “would have been motivated to use Smith’s teachings regarding series-parallel circuits because series-parallel circuits provide uniform illumination and improve the length of the string, . . . which allows the enjoyment of the advantages of Smith.” *Id.* at 7 (citing Pet. 47; Ex. 1013, 99). Petitioner contends that “[a] POSA, familiar with the Inoue prior art, would be motivated to adopt Smith’s series parallel lighting circuit configuration to increase ‘uniformity of illumination’ and minimize ‘light outage due to bulb burnout.’” *Id.* (citing Ex. 1017 ¶¶ 59, 71). According to Petitioner,

a POSA would know to connect series light strings in parallel to a single power source to obtain uniformity of illumination, because a POSA would want the LEDs to have the same illumination. Smith shows an example of connecting light circuits in parallel in July of

1984, in order to allow multiple parallel light strings to stretch across branches on a tree.

Id. at 8 (citing Ex. 1007, 7:20–23). Petitioner contends that “[e]xtensive use and notoriety of light strings being connected in parallel would certainly motivate a POSA to use a series-parallel connection of light strings, such as taught by Smith, for the purpose of creating uniform illumination and enabling more lights to be illuminated.” *Id.* (citing Ex. 1007, code (54), 7:50–55; Ex. 1013, 98–99).

According to Petitioner,

[t]hese arguments are a permissible expansion of the statement in the Petition because they provide more clarity with the reasons stated for motivation in the Petition, i.e., providing the numerous *record-supported advantages* provided by Smith *to enjoy the advantages of Smith*, and include the arguments of Dr. Schubert regarding uniformity of illumination and the statements in Smith[’s] Abstract that uniformity of illumination is achieved by series-parallel circuits.

Pet. Reply 9.

Patent Owner asserts that the Reply presents improper new arguments that should not be considered by the Board. *See* PO Sur-reply 2 (citing 35 U.S.C. § 312(a)(3); 37 C.F.R. § 42.23(b); CTPG § II.I.).

We agree that Petitioner’s arguments are improper and should not be considered. The rationale to combine the teachings of Inoue and Smith provided in the Petition focuses on replacing incandescent bulbs with LEDs, and includes the generic statement that “[t]he numerous record-supported advantages, set forth in Smith provide a clear motivation for use of the teachings of Smith as applied to Inoue, so as to enjoy the advantages set forth in Smith.” Pet. 49. The testimony in Dr. Schubert’s Declaration at pages 98–100 cited in support of Petitioner’s Reply arguments was not cited or otherwise referenced in the Petition. *See* Pet. 49–56. We find that the Petitioner’s Reply is not responsive to the Institution Decision and is improper because it presents a new rationale to combine the teachings of Inoue

and Smith that was not expressed in the petition. *See* 37 C.F.R. § 42.23; CTPG § II.I. Petitioner could have presented its rationale to make out a prima facie case of unpatentability in the Petition. *See* 37 C.F.R. § 42.23; CTPG § II.I. Accordingly, we do not consider Petitioner’s new rationale to combine the teachings of Inoue and Smith presented for the first time in the Reply.

Based on the entire record, but not including Petitioner’s new rationale and newly cited support to Smith and Dr. Schubert’s testimony (Exs. 1013, 1017) presented for the first time in the Reply, we are not persuaded that Petitioner sets forth in the Petition sufficient articulated reasoning with rational underpinning to support the conclusion that it would have been obvious to one of ordinary skill in the art to modify the circuit of Inoue to a series-parallel connected circuit in view of Smith’s teachings. *See* Pet. 49–51. Accordingly, we determine that Petitioner has not demonstrated by a preponderance of the evidence that the subject matter of dependent claim 2 would have been obvious over the teachings of Inoue and Smith.

4. Analysis of Dependent Claim 4

Claim 4 depends from claim 1 and further recites “wherein the LED light source uses 0.20 watts or less.” Ex. 1001, 14:3–4. Petitioner asserts that Inoue and Smith teach the claimed invention but do not explicitly address the limitations of dependent claim 4. *See* Pet. 52. Petitioner contends that “[i]t would have been obvious to one of ordinary skill in the art at the time of the invention to use a ‘LED light source uses 0.20 watts or less’ as a matter of design choice, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art.” Pet. 53 (citing *In re Aller*, 220 F.2d 454, 456 (CCPA 1955)). Petitioner asserts that Patent Owner admits in their disclosure that the specifically claimed range or value

does not yield previously unexpected results. *See id.* (citing Ex. 1001, 7:29–37).

According to Petitioner,

[o]ne of ordinary skill would be motivated to use an LED that uses 0.2 watts or less as a matter of convenience since that wattage is typical (as earlier explained by the '794 patent) and 0.08 watts falls within the claimed range, as well as having low power consumption, as also taught in Smith.

Pet. 53–54 (citing Ex. 1007, cols. 35–37; Ex. 1013, 103 n.35, 104 ¶ 2). In the Reply, Petitioner reiterates that “[a] POSA would be motivated to use LEDs that are .2 watts or less because LEDs of .2 watts or less have ‘extremely low energy consumption.’” Pet. Reply 11 (citing Pet. 52–54; Ex. 1013, 102–104). Petitioner asserts that the Petition stated that 0.2 watts or less is a matter of design choice, and Smith teaches the use of LEDS having 0.08 watts which falls within the range or 0.2 watts or less. *See id.* (citing Pet. 50).

Patent Owner asserts that the Reply presents improper new arguments that should not be considered by the Board. *See* PO Sur-reply 2 (citing 35 U.S.C. § 312(a)(3); 37 C.F.R. § 42.23(b); CTPG § II.I.).

For dependent claim 4, we do not agree that Petitioner’s arguments are improper and should not be considered. The rationale to combine the teachings of Inoue and Smith in the Petition and the Reply are substantially the same: it would have been a matter of design choice to modify the teachings of Inoue to provide LEDs using less than 0.2 watts, as taught by Smith. *Compare* Pet. 50–51, *with* Pet. Reply 11. Patent Owner does not otherwise challenge the merits of Petitioner’s patentability challenge to claim 4, aside from its arguments addressing patentability based on Inoue for independent claim 1. *See* PO Resp. 27–28; PO Sur-reply 1–5.

Based on Petitioner’s cited support to Inoue, Smith, and Dr. Schubert’s testimony (Ex. 1013), we are persuaded Petitioner sets forth sufficient articulated

reasoning with rational underpinning to support its conclusion that it would have been a matter of design choice to modify the teachings of Inoue to provide LEDs using less than 0.2 watts, as taught by Smith. *See* Pet. 52–54; *KSR*, 550 U.S. at 418. Based on the entire record, we determine that Petitioner shows by a preponderance of the evidence that the subject matter of dependent claim 4 would have been obvious over Inoue and Smith. *See* Pet. 52–54.

5. Analysis of Dependent Claim 8

Claim 8 depends from claim 1 and further recites “[t]he resistor bypass circuit of claim 1 being utilized in AC or DC circuits powered from a power source selected from the list consisting of batteries, step down transformers, AC utility power, or converters from AC to DC or DC to AC power, pulsed DC, and filtered or unfiltered DC, or partially filtered AC.” Ex. 1001, 14:22–27. Petitioner points out that claim 8 recites a Markush group, and asserts that Smith discloses AC and DC circuit power supplies. *See* Pet. 56–57 (citing Ex. 1007, 30:33–39, 36:19–68, 39:10–11, 40:52–53); *see also* Pet. Reply 12 (similar argument, citing Ex. 1007, 16:20–56; Pet. 56–57). Petitioner relies on the same rationale for combining the teachings of Inoue and Smith as the rationale addressing claims 3, 5, 6, and 9 explained above in Section II.G.2. *See* Pet. 49, 56–57.

In the Reply for the first time, Petitioner asserts that “[a] POSA would have been motivated to modify Inoue’s battery power with Smith’s AC power, e.g., to obtain continuous power,” and “would have been a simple substitution of one known element for another.” Pet. Reply 12. (citing *KSR*, 550 U.S. at 417). Petitioner asserts that, like the fact pattern in *Rembrandt*, the Reply arguments are a permissible expansion of arguments raised in the Petition. *See id.* at 12–17. More specifically, Petitioner contends that “Petitioner’s arguments of using the advanced functionalities and advantages of Smith in Inoue, such as . . . AC power

sources for continuity. . . are similar to arguments the Court found permissible in [*Rembrandt*].” *Id.* at 17.

Patent Owner asserts that the Reply presents improper new arguments that should not be considered by the Board. *See* PO Sur-reply 2 (citing 35 U.S.C. § 312(a)(3); 37 C.F.R. § 42.23(b); CTPG § II.I.).

We agree that Petitioner’s arguments are improper and should not be considered. The rationale to combine the teachings of Inoue and Smith provided in the Petition focuses on replacing incandescent bulbs with LEDs, and includes the generic statement that “[t]he numerous record-supported advantages, set forth in Smith provide a clear motivation for use of the teachings of Smith as applied to Inoue, so as to enjoy the advantages set forth in Smith.” Pet. 49. We further find that the Petitioner’s Reply is not responsive to the Institution Decision and is improper because it presents a new rationale for combining the teachings of Inoue and Smith—to obtain continuous power and a simple substitution of one known element for another—that was not expressed in the petition. *See* 37 C.F.R. § 42.23; CTPG § II.I. Petitioner could have presented this new rationale to make out a prima facie case of unpatentability in the Petition. *See* 37 C.F.R. § 42.23; CTPG § II.I. Accordingly, we do not consider Petitioner’s new rationale to combine the teachings of Inoue and Smith presented for the first time in the Reply.

Based on the entire record, but not including Petitioner’s new rationale and newly cited support to Smith presented for the first time in the Reply, we are not persuaded that Petitioner sets forth in the Petition sufficient articulated reasoning with rational underpinning to support the conclusion that it would have been obvious to one of ordinary skill in the art to modify the circuit of Inoue to include an include a DC or AC power source in view of Smith’s teachings. *See* Pet. 49, 56–57. Accordingly, we determine that Petitioner has not demonstrated by a

preponderance of the evidence that the subject matter of dependent claim 8 would have been obvious over the teachings of Inoue and Smith.

H. Challenge to Claims 1, 10, 11, and 15, over Holler and Smith

1. Analysis of Claims 1, 10 and 15

Petitioner asserts that the combination of Holler and Smith teaches the preamble recitation and the limitation “a plurality of serially connected LED light sources and a bypass resistor being connected in parallel with at least one of the respective light sources,” as recited in claims 1 and 10, based on Holler’s disclosure of a series lighting circuit comprising conductor 3 connected in series to incandescent bulbs 5, where each light bulb 5 has a bypass resistor 6 connected in parallel with the bulb 5, as modified by Smith’s teachings of replacing incandescent bulbs with LEDs. *See* Pet. 35–37 (reproducing Ex. 1004, Fig. 2; citing Ex. 1007, col. 1 ¶ 3, col. 2 “Summary of the Invention;” Ex. 1013, 41 ¶ 4, 59 ¶ 2, 60 ¶¶ 3–4, 68 ¶¶ 2–3, 69 ¶¶ 4–6). Petitioner asserts the combination of Holler in view of Smith provides a serial light string having LED light sources with resistive bypass elements 6. *See* Pet. 36 (citing Ex. 1013, 68 ¶¶ 1–3, 69 ¶¶ 4–5).

Petitioner contends that Holler as modified by Smith teaches the limitation “said bypass resistor being in circuit and conducting current at all times across the light sources when current is flowing through the circuit regardless of whether the LED light sources are conducting current therethrough,” as recited in claim 1 and similarly recited in claim 10. *See* Pet. 37. According to Petitioner:

The bypass resistors 6 in Figure 2 of Holler conduct current at all times in accordance with the ratio of the resistive value of the resistor 6 and the lamp 5 or LEDs as taught by Smith. . . . Again, if the lamp 5 of Holler, or the substitute LED from Smith, fails and is an open circuit, all of the current flows through resistor 6. So current

continues to flow through resistor 6 whether or not current is flowing through the parallel connected light source.

Pet. 37 (citing Ex. 1013, 74 ¶ 1, 75 ¶¶ 2–4, 76 ¶¶ 5–7).

Petitioner asserts that Holler as modified by Smith teaches the limitation “wherein the resistance of the bypass resistor is equal to or greater than the inherent resistance of the light source to which the resistor is attached,” as recited in claim 10, and similarly recited in claim 15. *See* Pet. 38. Petitioner further contends that Holler teaches that it is advantageous to have bypass resistor 6 equal to the resistance of the filament of lamp 5. *See* Pet. 38 (citing Ex. 1004, page 1, lines 96–101).

To address the limitations of independent claim 15, Petitioner incorporates by reference its analysis of the patentability challenge to claim 15 over Inoue and Holler as well as its analysis of the patentability challenge to claims 1 and 10 over Holler and Smith. *See* Pet. 40–41 (citing Pet. 31–34, 37–39; Ex. 1013, 59 ¶ 2, 60 ¶ 3). Petitioner also contends that Holler as modified by Smith teaches “the ability to operate at 100% duty cycle” as recited in claim 15 because current is flowing through resistors 6 of Holler at all times. *See* Pet. 41 (citing Ex. 1013, 59 ¶ 2, 60 ¶ 3).

Petitioner contends that the combination of Holler and Smith is a simple substitution of one known element for another with a reasonable expectation of success with predictable results of solving the problems of incandescent bulbs, as disclosed in Smith. *See* Pet. 36 (citing Ex. 1013, 37–38, 53; *KSR*, 550 U.S. at 417). In support, Petitioner asserts that Smith teaches that the replacement of LEDs for incandescent bulbs is a known technique to improve a product and LEDs have the advantages of a longer lifespan, generate a much lesser amount of heat, consume less power, and are less expensive than incandescent bulbs. *See* Pet. 34–35 (citing Ex. 1007, col. 1 “Prior Art,” col. 2 “Summary of the Invention,” col. 6,

lines 35–47; Ex. 1013, 35 ¶ 1, 41 ¶ 4, 68 ¶ 2, 69 ¶¶ 4–6). According to Petitioner, “[t]he record-supported advantages, set forth in Smith, provides a clear motivation with a reasonable expectation of success for the replacement of incandescent bulbs with LEDs to enjoy the advantages of using LEDs instead of incandescent bulbs, as set forth in Smith.” Pet. 35.

Patent Owner argues that “[t]he Petition fails to show that a POSITA would have been motivated to use the drive circuit in Holler with the LED light sources of Smith.” PO Resp. 22 (citing Pet. 32–33; Ex. 1013, 69–71 ¶ 6). In support of its argument, Patent Owner also addresses testimony by Petitioner’s witness Dr. Schubert to support its obviousness contentions. *See id.* (citing Ex. 1013, 69–71 ¶ 6). Patent Owner further contends that “[t]he Petition does not explain, however, why a POSITA would have expected to successfully overcome the very different current vs. voltage characteristics of incandescent bulbs versus LEDs.” *Id.* (citing Ex. 2002 ¶ 71); *see also id.* at 23 (“A POSITA would not have a reasonable expectation that use of the shunt in Holler’s circuit would be successful for use with the LED disclosed in Smith.”). Patent Owner contrasts incandescent bulbs and LEDs and contends that Holler’s bypass resistors would fail to protect the LED and create a mismatch in voltage distribution across the bypass circuit, result in significant overcurrent flowing through the LED during normal operations, and would not function safely in Holler’s circuit without additional current limiting components. *See id.* at 23–25 (citing Ex. 1004, page 1, lines 85–87; Ex. 1013, 79 ¶ 3; Ex. 2002 ¶¶ 73, 76–79). Patent Owner further argues that “[a] POSITA would not have been motivated to replace an incandescent light bulb with an[] LED as incandescent light sources still have a place in decorative lighting, compared to other industries, both lighting and non-lighting.” *Id.* at 23 (citing Ex. 2002 ¶ 72; Exs. 2007, 2008).

Based on the entire record, we do not agree with Patent Owner’s arguments. Although incandescent light sources still have a place in decorative lighting, Patent Owner does not address sufficiently Petitioner’s assertion, supported by record evidence, that LEDs have several advantages over incandescent bulbs. We also do not agree with Patent Owner’s arguments that a POSITA would not have had a reasonable expectation of success in modifying the teachings of Holler in view of Smith without additional current limiting components. Patent Owner does not meaningfully address whether the substitution of LEDs and the addition of current limiting components would have been beyond the skill level of a person of ordinary skill in the art at the time of the invention—a person that “would have had a bachelor’s degree in electrical engineering, physics, materials science, or a related discipline, and four years of practical experience in designing or fabricating LED lighting systems, including controlling and driving LEDs,” or “a master’s degree and three years of experience, or a Ph.D. degree and two years of experience.” Ex. 1013, 31 ¶ 3; *see* Pet. 18.

Based on Petitioner’s cited support to Holler, Smith, and Dr. Schubert’s testimony (Ex. 1013), we are persuaded Petitioner sets forth sufficient articulated reasoning with rational underpinning to support the conclusion that it would have been obvious to one of ordinary skill in the art to “replace[] . . . incandescent bulbs with LEDs to enjoy the advantages of using LEDS instead of incandescent bulbs.” Pet. 35; *see KSR*, 550 U.S. at 418. Based on the entire record, we determine that Petitioner shows by a preponderance of the evidence that the subject matter of independent claims 1, 10, and 15 would have been obvious over Holler and Smith. *See* Pet. 34–41.

2. Analysis of Dependent Claim 11

Claim 11 depends from claim 10, and further recites limitations directed to color changing characteristics of the light source. *See* Ex. 1001, 14:49–51. We have reviewed Petitioner’s contentions and cited supporting evidence addressing how Holler in view of Smith discloses, teaches, or suggests the limitations of claim 11. *See* Pet. 39–40.

Patent Owner does not substantively address the limitations of dependent claims 11 apart from its arguments addressing claims 1, 10, and 15. *See* PO Resp. 22–25.

Based on the entire record, including the reasons explained immediately above addressing claims 1, 10, and 15, we determine that Petitioner shows by a preponderance of the evidence that the subject matter of dependent claim 11 would have been obvious over Holler and Smith.

I. Challenge to Claims 10–14 over Holler and Callahan

1. Analysis of Independent Claim 10

Petitioner asserts that the combination of Holler and Callahan teaches the preamble recitation and the limitation “a plurality of serially connected LED light sources and a bypass resistor being connected in parallel with at least one of the respective light sources,” as recited in claim 10, based on Holler’s disclosure of a series lighting circuit comprising conductor 3 connected in series to incandescent bulbs 5, where each light bulb 5 has a bypass resistor 6 connected in parallel with the bulb 5, as modified by Callahan’s teachings of replacing incandescent bulbs with LEDs. *See* Pet. 60 (reproducing Ex. 1004, Fig. 2; citing Ex. 1004, page 1, lines 51–56; Ex. 1009 ¶¶ 3, 4, 36; Ex. 1013, 115 ¶¶ 2–3). Petitioner asserts that the combination of Holler in view of Smith provides a plurality of serially connected

LED light sources with bypass resistor 6 connected in parallel to each of the LED light sources. *See* Pet. 60–61 (citing Ex. 1013, 116 ¶ 1).

Petitioner contends that Holler as modified by Callahan teaches the limitation “said bypass resistor connected across the at least one light sources and being in circuit and conducting current at all times when current is flowing through the circuit regardless of whether the LED light sources are conducting current therethrough,” as recited in claim 10. *See* Pet. 59.¹⁰ According to Petitioner:

The bypass resistors 6 in Figure 2 of Holler conduct current at all times in accordance with the ratio of the resistive value of the resistor 6 and the lamp 5 or LEDs as taught by Smith. Again, if the lamp 5 of Holler, or the substitute LED from Smith, fails and is an open circuit, all of the current flows through resistor 6. So current continues to flow through resistor 6 whether or not current is flowing through the parallel connected light source.

Pet. 37, 61.

Petitioner also asserts that Holler as modified by Callahan teaches the limitation “wherein the resistance of the bypass resistor is equal to or greater than the inherent resistance of the light source to which the resistor is attached,” as recited in claim 10. *See* Pet. 61–62. Petitioner contends that Holler teaches that it is advantageous to have bypass resistor 6 equal to the resistance of the incandescent lamp 5 or its replacement LED. *See id.* at 61 (citing Ex. 1004, page 1, lines 94+).

Petitioner asserts that Callahan teaches LEDs can replace and have advantages over conventional incandescent bulbs, including improved power

¹⁰ The Petition incorporates by reference Section D.2.c. of the Petition which addresses the combination of Fisherman and Callahan. Section C.2. of the Petition addresses the combination of Holler and Smith. As a result, we treat Petitioner’s incorporation by reference of Section D.2.c. to be a typographical error when Section C.2. was intended.

conservation and reliability. *See* Pet. 59 (reproducing Ex. 1009, Fig. 3; citing Ex. 1009 ¶¶ 3, 4, 36; Ex. 1013, 41 ¶ 4, 55 ¶ 1, 68 ¶¶ 2–3, 69 ¶¶ 4–6). According to Petitioner, “[t]hese advantages . . . provide a clear motivation to change the incandescent bulbs 5 of Holler with LEDs, as taught by Callahan.” *Id.* (citing Ex. 1013, 41 ¶ 4, 68 ¶¶ 2–3, 69 ¶¶ 4–6).

Patent Owner argues that “the Petition offers no explanation why a POSITA would have been motivated to [combine the circuit configuration disclosed in Holler with the LED light disclosed in Callahan], given the significant technological difference between LEDS and incandescent bulbs.” PO Resp. 29 (citing Pet. 56–57; Ex. 1013, 111–28). In support of its argument, Patent Owner also addresses testimony by Petitioner’s witness Dr. Schubert to support the contentions of obviousness. *See id.* at 29–30 (citing Ex. 1013, 111–14, 122). Patent Owner contends that “[t]he Petition . . . does not offer a proposal for how a POSITA would have addressed the technological differences between LEDS and incandescent bulbs.” *Id.* (citing Ex. 2002 ¶ 91). Patent Owner contrasts incandescent bulbs and LEDs and contends that the bypass circuit in Holler is unsuitable for protecting LEDs from overcurrent. *See id.* at 30 (citing Ex. 1004, page 1, lines 96–101; Ex. 1009 ¶ 25; Ex. 2002 ¶ 92).

Based on the entire record, we do not agree with Patent Owner’s arguments. Patent Owner does not address sufficiently Petitioner’s assertion, supported by record evidence, that LEDs have several advantages over incandescent bulbs. In addition, Patent Owner does not meaningfully address whether the substitution of LEDs for incandescent light bulbs and addressing technological differences between LEDs and incandescent light bulbs would have been beyond the skill level of a person of ordinary skill in the art at the time of the invention—a person that “would have had a bachelor’s degree in electrical engineering, physics, materials

science, or a related discipline, and four years of practical experience in designing or fabricating LED lighting systems, including controlling and driving LEDs,” or “a master’s degree and three years of experience, or a Ph.D. degree and two years of experience.” Ex. 1013, 31 ¶ 3; *see* Pet. 18. Moreover, “[a] person of ordinary skill is also a person of ordinary creativity, not an automaton.” *KSR*, 550 U.S. at 421.

Based on Petitioner’s cited support to Holler, Callahan, and Dr. Schubert’s testimony (Ex. 1013), we are persuaded Petitioner sets forth sufficient articulated reasoning with rational underpinning to support the conclusion that it would have been obvious to one of ordinary skill in the art to “replac[e] the incandescent bulbs 5 of Holler with LEDs, as taught by Callahan.” Pet. 58–59; *see KSR*, 550 U.S. at 418. Based on the entire record, Petitioner demonstrates by a preponderance of the evidence that the subject matter of independent claim 10 would have been obvious over Holler and Callahan.

2. Analysis of Dependent Claims 11–14

Claims 11–14 depend ultimately from claim 10, and further recite limitations directed to at color changing characteristics of the light source, LED packages comprising LED chips and an integrated circuit controlling each LED chip in the respective LED packages independently. *See* Ex. 1001, 14:49–65. We have reviewed Petitioner’s contentions and cited supporting evidence addressing how Holler in view of Smith discloses, teaches, or suggests the limitations of claims 11–14. *See* Pet. 60–64.

Patent Owner does not substantively address the limitations of dependent claims 11–14 apart from its arguments addressing claim 10. *See* PO Resp. 29–30.

Based on the entire record, including the reasons explained immediately above addressing independent claim 10, we determine that Petitioner shows by a preponderance of the evidence that the subject matter of dependent claims 11–14 would have been obvious over Holler and Callahan.

J. Secondary Considerations of Nonobviousness

Patent Owner asserts that, prior to filing the Petition, Petitioner was aware of substantial evidence of commercial success and long-felt need. *See* PO Resp. 35. Patent Owner contends that Petitioner strategically chose not to address the evidence in the Petition. *See id.* at 36 (citing Pet. 71). According to Patent Owner, “Patent Owner asserted objective evidence of non-obviousness supported patentability of the Challenged Claims during district court litigation between Patent Owner and Petition[er] concerning the ’794 patent.” *Id.* Patent Owner directs attention to its response to Interrogatory No. 4 in the district court litigation, and asserts that Patent Owner identified evidence of commercial success and long felt need. *See* PO Resp. 36–42 (citing Ex. 2011, 18–19). Patent Owner points to Patent Owner’s product packaging which shows that products practicing the claims were sold at Menards, the advantages of the invention are promoted on the packaging, and the packaging includes the patent number. *See id.* at 40 (citing Ex. 2010 ¶ 37; Exs. 2012–2017). According to Patent Owner, “Patent Owner’s product packaging itself prominently displays the ‘Remains Lit’ branding indicating that ‘even if one or more bulbs are . . . burnt out, loose, broken, or missing,’ that the bulbs will ‘remain lit.’” *Id.*

In the Reply, Petitioner asserts that Patent Owner’s evidence consists of Interrogatory Response #4 which contains a bare assertion that Seasonal’s products have been commercially successful. *See* Pet. Reply 23. Petitioner contends that Patent Owner provided no factual evidence, such as sales figures, market share

data, revenue information, or other objective metrics and thus fails to meet its burden of production. *See id.* (citing *In re Huang*, 100 F.3d 135, 139–40 (Fed. Cir. 1996)). Petitioner further contends that there is no presumption of nexus because Patent Owner’s commercial product combines multiple features beyond those claimed in the patent and because Patent Owner’s marketing materials promote other features. *See id.* at 23–24 (citing Ex. 1021). Petitioner also asserts that Patent Owner’s reliance on an interrogatory response filed in district court (Ex. 2011) is not evidence of a long-felt need. *See id.* at 25. Petitioner contends that Federal Circuit precedent requires that a patent owner submit actual evidence of long-felt need, as opposed to argument. *See id.* (citing *In re Kahn*, 441 F.3d 977, 990–91 (Fed. Cir. 2006)).

Putting aside the issue of nexus, we agree that Patent Owner does not present sufficient objective evidence of commercial success or long-felt but unmet need. Patent Owner does not offer objective evidence of commercial success aside from the lighting product packaging (*see* Exs. 2012–2017). Patent Owner does not offer objective evidence of long-felt but unmet need aside from its interrogatory answer (*see* Ex. 2011, 19).

Accordingly, we give no weight to Patent Owner’s showings for commercial success and long-felt but unmet need.

K. Challenge to Claims 1, 2, 10, and 15 as Anticipated by Yu

1. Overview of Yu (Ex. 1010)

Yu is directed to “a LED light string that uses parallel connected resistors that are connected across the leads of the LEDs in a light string,” which “greatly enhances the reliability of the light string.” Ex. 1010, code (57).

Figure 3 of Yu is reproduced below:

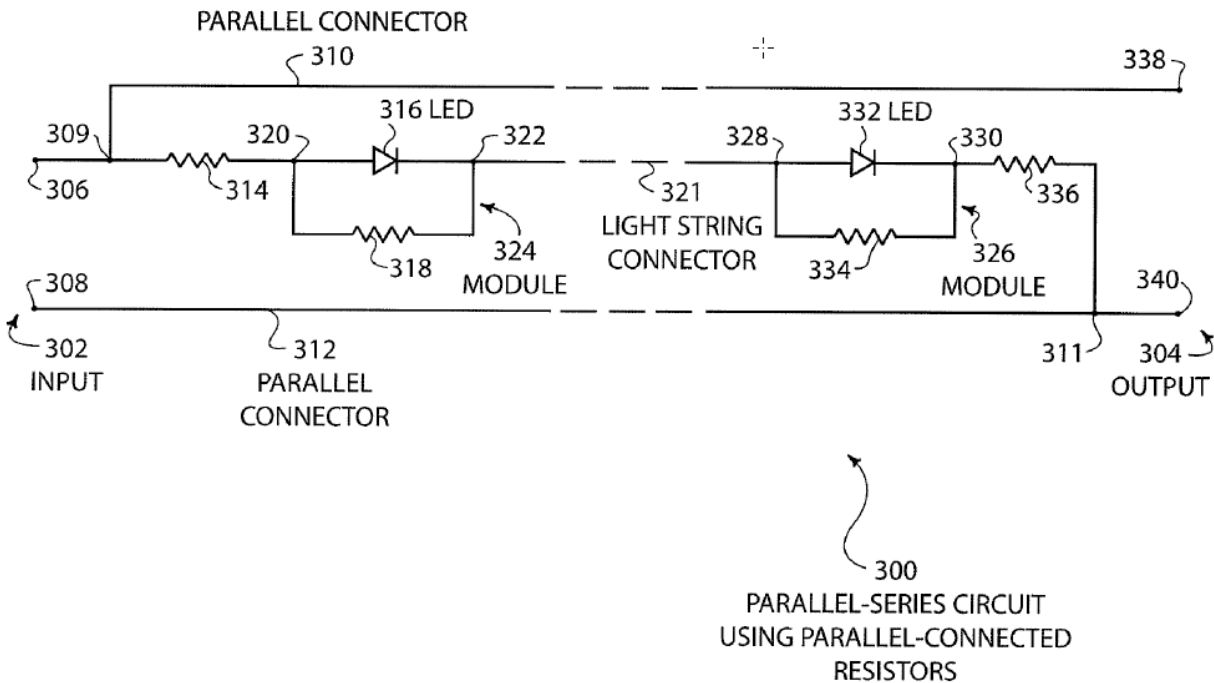


Figure 3 of Yu depicts a schematic circuit diagram of a parallel-series circuit 300 using parallel connected resistors. *See id.* ¶¶ 11, 14. Circuit 300 has input 302 at nodes 306, 308 and output 304 at nodes 338, 340. *See id.* ¶ 14. A plurality of modules 324, 326 are connected in series in parallel connector 310. *See id.* ¶¶ 14–16. Each module 324, 326 contains a LED (316, 332) and a resistor (318, 334) connected in parallel. *See id.* Yu discloses that “if any of the LEDs in the light string, such as LEDs 316, 332 go out, the continuity in light string connector 321 is maintained by the parallel connected resistors.” *Id.* ¶ 16.

Yu further discloses:

If one of the LEDs 316, 332 of FIG. 3 is shorted, that particular module will become shorted. Series connected resistors 318, 336 limit the current sufficiently that an overload condition does not occur on light string connector 321 even if several modules are shorted. Hence, series connected resistors 318, 334 are sized to accommodate the shorting of one, several, or all of the LEDs, such as LEDs 316, 332.

Id.

2. Prior Art Status of Yu

Yu has a filing date of July 31, 2006. Ex. 1010, code (22). Petitioner directs attention to an affidavit filed under 37 C.F.R. § 1.131 by Steven Altamura during prosecution of the application that issued as the '794 Patent. *See* Pet. 73; Ex. 1002, 122–23. Petitioner asserts that the Examiner would not have considered the Declaration because there was no prior art under consideration at the time of its submission. *See* Pet. 73. Petitioner further asserts that the Declaration also lacked the associated exhibits, and therefore did not meet the requirements of 37 C.F.R. § 1.131(b) for a proper showing of facts. *See id.* Petitioner contends that the Yu reference is applicable prior art under pre-AIA 35 U.S.C. § 102(e).

Patent Owner asserts that Yu does not qualify as prior art under pre-AIA 35 U.S.C. § 102(e) because the date of invention for the '794 Patent predates the July 31, 2006, filing date of Yu. PO Resp. 31. Patent Owner contends that inventor Steven Altamura's Declarations establish diligence in the filing of the application following conception, and actual reduction to practice before Yu's filing date. *See id.* Patent Owner asserts that Mr. Altamura's Declaration describes how he built a functioning prototype of the invention as early as January 15, 2006, and includes Exhibits A, B, C, and D that provide documentation of the invention and further refinements to the invention prior to the filing date of Yu. *See id.* at 33–34. Patent Owner asserts that "Mr. Altamura's declaration testimony regarding reduction to practice is sufficiently corroborated under the rule of reason standard." *Id.* at 34.

We observe that, aside from Declaration testimony of Mr. Altamura and accompanying exhibits, Patent Owner does not offer any additional evidence to establish reduction to practice. An inventor's testimonial assertion of inventive facts requires corroboration by independent evidence. *Brown v. Barbacid*, 276

F.3d 1327, 1335 (Fed. Cir. 2002). The purpose of the corroboration requirement is to prevent fraud, by providing independent confirmation of the inventor's testimony. *Kridl v. McCormick*, 105 F.3d 1446, 1450 (Fed. Cir. 1997). Without the requirement of independent corroboration, there would be a great temptation to commit perjury and the adverse party would be effectively precluded from a successful rebuttal. *Price v. Symsek*, 988 F.2d 1187, 1194–95 (Fed. Cir. 1993). A rule of reason applies to determining whether the inventor's testimony has been corroborated. *See id.* at 1195. “The rule of reason, however, does not dispense with the requirement for some evidence of independent corroboration.” *Coleman v. Dines*, 754 F.2d 353, 360 (Fed. Cir. 1985).

Accordingly, based on the entire record, we find that Mr. Altamura's Declaration testimony is uncorroborated. Yu is prior art to the '794 Patent because Patent Owner is unable to establish actual reduction to practice earlier than the July 31, 2006, filing date of Yu.

3. Analysis of Claims 1, 2, 10, and 15

Petitioner asserts that Yu discloses the preamble recitation and the limitation “a plurality of serially connected LED light sources and a bypass resistor being connected in parallel with at least one of the respective light sources,” as recited in claims 1, 10, and similarly recited in claim 15, based on Yu's disclosure of LEDs 316, 332 interconnected in series where each LED 316, 332 is connected in parallel with a bypass resistor 318, 334 respectively. *See* Pet. 67–68 (reproducing Ex. 1010, Fig. 3; citing Ex. 1013, 46 ¶ 2, Fig. 3), 72 (addressing claim 15). Petitioner contends that Yu discloses the limitation “said bypass resistor being in circuit and conducting current at all times across the light sources when current is flowing through the circuit regardless of whether the LED light sources are conducting current therethrough,” as recited in claims 1, 10, and similarly recited

in claim 15, based on Yu's explicit disclosure that if any of the LEDs in the light string go out, the continuity in light string connector 312 is maintained by the parallel connected resistors. *See* Pet. 69 (citing Ex. 1010 ¶ 15), 72–73 (addressing claim 15); *see also* Pet. 68–69 (addressing parallel circuit operation under Ohm's Law; citing Ex. 1013, 123 ¶ 1, 124 ¶¶ 2–4). Petitioner asserts that Yu discloses the “wherein the resistance of the bypass resistor is equal to or greater than the inherent resistance of the light source to which the resistor is attached,” as recited in claim 10, based on Petitioner's explanation that there is no inherent resistance of an LED, the resistance being determined by Ohm's Law, and Yu's disclosure that if the LED's are replaceable in a socket, the LEDs that burn out can be readily identified and new ones can be plugged in to the socket without affecting the overall operation of the circuit. *See* Pet. 70–71 (citing Ex. 1010 ¶ 16; Ex. 1013, 24–26, 27 ¶ 2, 28 ¶¶ 6–9, 131 ¶ 2), 72–73 (addressing claim 15). Petitioner contends that Yu discloses the limitation “the ability to operate at 100% duty cycle,” as recited in claim 15, because current continuously flows through the resistors during the operation of Yu. *See* Pet. 72 (citing Pet. 67–69). Petitioner further asserts that Yu discloses “the circuit is series-parallel connected,” as recited in dependent claim 2, based on Yu's series-parallel circuit 300 connecting the series circuit of LEDs 315, 332 with corresponding bypass resistors 318, 334 connected in series between parallel connectors 310, 312. *See* Pet. 69–70 (reproducing Ex. 1010, Fig 3; citing Ex. 1010 ¶ 14; Ex. 1013 118–119).

Patent Owner does not address the merits of Petitioner's unpatentability arguments based on Yu. *See* PO Resp. 31–35.

Based on the entire record, we determine Petitioner shows by a preponderance of the evidence that claims 1, 2, 10, and 15 are anticipated by Yu. *See* Pet. 67–73.

III. CONCLUSION

For the foregoing reasons, we determine that Petitioner demonstrates by a preponderance of the evidence that claims 1, 2, 4–7, and 9–15 are unpatentable.¹¹ Petitioner, however, does not demonstrate by a preponderance of the evidence that claims 3 and 8 are unpatentable. Our conclusions are summarized in the following table.

Claim(s)	35 U.S.C. §	Reference(s)/ Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
1	102(b)	Inoue	1	
1, 10	103(a)	Inoue, Holler	1, 10, 15	
1, 10, 11	103(a)	Holler, Smith	1, 10, 11, 15	
1, 5–7, 9	103(a)	Fisherman, Callahan	1, 5–7, 9	
2–6, 8, 9	103(a)	Inoue, Smith	4	2, 3, 5, 6, 8, 9
10–14	103(a)	Holler, Callahan	10–14	
1, 2, 10	102(e)	Yu	1, 2, 10, 15	
Overall Outcome			1, 2, 4–7, 9–15	3, 8

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).

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has demonstrated by a preponderance of the evidence that claims 1, 2, 4–7, 9–15 of the '794 patent are unpatentable;

FURTHER ORDERED that Petitioner has not demonstrated by a preponderance of the evidence that claims 3 and 8 of the '794 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.

IPR2024-01259
Patent 11,533,794 B2

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