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Paper 38
Entered: May 22, 2023

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HOME DEPOT U.S.A., INC.,
Petitioner,

v.

LYNK LABS, INC.,
Patent Owner.

PGR2022-00009
Patent 10,932,341 B2

Before JON B. TORNQUIST, MONICA S. ULLAGADDI, and SCOTT RAEVSKY, *Administrative Patent Judges*.

ULLAGADDI, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable

I. INTRODUCTION

Home Depot U.S.A., Inc. ("Petitioner") filed a Petition (Paper 1, "Petition" or "Pet.") requesting post-grant review of claims 1–5, 7–12, and 14–19 ("the challenged claims") of U.S. Patent No. 10,932,341 B2 (Ex. 1001, "the '341 patent"), accompanied by the supporting Declaration of Dr. Dean Neikirk (Ex. 1002). Lynk Labs, Inc. ("Patent Owner") filed a Preliminary Response (Paper 5, "Preliminary Response" or "Prelim. Resp.").

Upon review of these papers, we instituted post-grant review, pursuant to 35 U.S.C. § 324, as to the challenged claims based on the challenges set forth in the Petition. Paper 10 ("Institution Decision" or "Inst. Dec.").

Subsequent to institution, Patent Owner filed a Patent Owner Response (Paper 20, "PO Resp."), Petitioner filed a Reply to Patent Owner's Response (Paper 29, "Pet. Reply"), and Patent Owner filed a Sur-Reply (Paper 30, "Sur-Reply"). On February 28, 2023, we held an oral hearing. A transcript of the hearing is of record. Paper 37 ("Tr.").

For the reasons that follow, we conclude that Petitioner has proven by a preponderance of the evidence that the challenged claims of the '341 patent are unpatentable.

II. BACKGROUND

A. Real Parties in Interest

Petitioner (i) identifies Home Depot Product Authority, LLC as a real party-in-interest, (ii) identifies The Home Depot, Inc. as a potential real party-in-interest because it is also a named defendant in a related litigation (discussed *infra*), and (iii) "[i]n an abundance of caution," identifies as potential real parties-in-interest suppliers of certain products that have been

accused in the litigation and from whom Petitioner has requested indemnification, including Bel Air Lighting, Inc., New Bright Technology, Cordelia Lighting, Elec-Tech Solid State Lighting (HK) Ltd., Globe Electric, King of Fans, Inc., Leedarson Lighting/Green Intelligence Co., and Year Young Industrial Co. Pet. 1. Petitioner notes that "[t]hese suppliers have not yet controlled or participated in the drafting of this Petition, and none has consented to being named an RPI." *Id.*

Patent Owner identifies itself as the real party-in-interest. Paper 3, 1.

B. Related Matters

The parties identify: *Lynk Labs, Inc. v. The Home Depot USA, Inc., et al.*, No. 6:21-cv-00097 (W.D. Tex.) as a related matter involving the '341 patent. Pet. 2; Paper 3, 1. Patent Owner also identifies *Lynk Labs, Inc. v. Home Depot USA, Inc. et al.*, No. 1:21-cv-05021 (N.D. Ga.) ("the Related Litigation") and notes that the Georgia Litigation "was transferred from the Western District of Texas." Paper 28, 1.

Patent Owner also identifies U.S. Patent Application Nos. 17/001,074, 17/157,264, 17/216,032, 17/266,505, and 17/306,450 as "pending applications [that] may affect, or be affected by, a decision in this proceeding." Paper 3, 1.

Petitioner also challenges the '341 patent, specifically, claims 1–3, 5, 7–10, 12, 14–17, and 19, in IPR2022-00143 and institution was denied on May 27, 2022.

Petitioner also challenges U.S. Patent No. 10,537,001, a parent of the '341 patent, in IPR2021-01541, *inter partes* review was instituted on May 16, 2022, and a Final Written Decision finding all challenged claims unpatentable issued on April 26, 2023.

C. The '341 Patent

The '341 patent issued from U.S. Application No. 16/740,295, filed on January 10, 2020 ("the '295 application"). Ex. 1001, codes (21), (22). The '295 application was filed as (i) a continuation of U.S. Application No. 16/274,164, filed on February 12, 2019, now U.S. Patent No. 10,537,001 (Ex. 1020, "the '001 patent"), and in turn is (ii) a continuation of U.S. Application No. 15/685,429, filed on August 24, 2017, now U.S. Patent No. 10,271,393, and in turn is (iii) a continuation of U.S. Application No. 14/172,644, filed on February 4, 2014, now U.S. Patent No. 9,750,098, and is in turn (iv) a continuation of U.S. Application No. 13/322,796, filed as Application No. PCT/US2010/001597 (Ex. 1018, "the '597 PCT") on May 28, 2010, now U.S. Patent No. 8,648,539. Ex. 1001, code (63).

U.S. Patent No. 8,648,539 claims priority as a continuation-in-part of U.S. Application No. 12/287,267, filed on October 6, 2008, now U.S. Patent No. 8,179,055. *Id.* The '341 patent also claims the benefit of U.S. Provisional Application No. 61/217,215, filed on May 28, 2009, and U.S. Provisional Application No. 60/997,771, filed on October 6, 2007. *Id.* at code (60).

The '341 patent is titled "Multi-Voltage and Multi-Brightness LED Lighting Devices and Methods of Using Same" and "relates to light emitting diodes ('LEDs') for AC operation . . . [and] to multiple voltage level and multiple brightness level LED devices, packages and lamps." *Id.* at code (54) (Title), 1:25–28.

The '341 patent explains that existing LED packages do not provide "a multi-voltage and/or multi-current circuit monolithically integrated on a

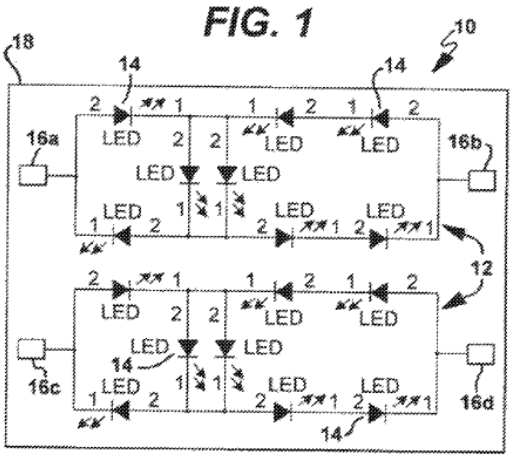
single substrate." *Id.* at 2:65–67. The '341 patent provides that it would be advantageous to (i) have a multi-voltage and/or multi-brightness circuit that can "provide options in voltage level, brightness level and/or AC or DC powering input power preference," and (ii) provide multiple voltage level and/or multiple brightness level light emitting LED circuits, chips, packages, and lamps "that can easily be electrically configured for at least two forward voltage drive levels with direct AC voltage coupling, bridge rectified AC voltage coupling or constant voltage DC power source coupling." *Id.* at 3:1–12. To this end, the '341 patent discloses an

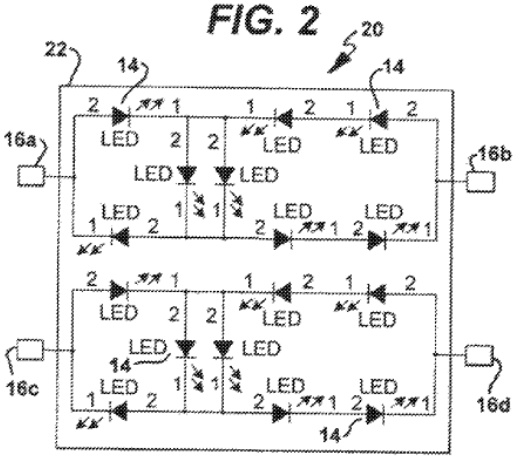
> invention [that] comprises circuits and devices that can be driven with more than one AC or DC forward voltage "multi-voltage" at 6V or greater based on a selectable desired operating voltage level that is achieved by electrically connecting the LED circuits in a series or parallel circuit configuration and/or more than one level of brightness "multi-brightness" based on a switching means that connects and/or disconnects at least one additional LED circuit to and/or from a first LED circuit. The desired operating voltage level and/or the desired brightness level electrical connection may be achieved and/or completed at the LED packaging level when the multi-voltage and/or multi-brightness circuits and/or single chips are integrated into the LED package, or the LED package may have external electrical contacts that match the integrated multi-voltage and/or multi-brightness circuits and/or single chips within, thus allowing the drive voltage level and/or the brightness level selectability to be passed on through to the exterior of the LED package and allowing the voltage level or brightness level to be selected at the LED package user, or the PCB assembly facility, or the end product manufacturer. . . .
>
> According to another aspect of the invention, each multi-voltage AC LED device would be able to be driven with at least two different AC forward voltages resulting in a first forward voltage drive level by electrically connecting the two single voltage AC LED circuits in parallel and a second forward voltage drive level

by electrically connecting the at least two single voltage level AC LED circuits in series.

Id. at 3:12–32, 4:12–19.

Figures 1 and 2 of the '341 patent, illustrating schematic diagrams of multi-voltage and/or multi-brightness LED lighting devices, are reproduced below. *Id.* at 9:56–57, 10:12–13.





Figures 1 and 2 illustrate schematic diagrams of multi-voltage and/or multi-brightness LED lighting devices. *Id.* at 9:56–57, 10:12–13.

The multi-voltage and/or multi-brightness LED lighting device 10 illustrated in Figure 1 includes at least two AC LED circuits 12 configured in an imbalanced bridge circuit, each of which have at least two LEDs 14. *Id.* at 9:56–10:11. The at least two AC LED circuits have electrical contacts 16a, 16b, 16c, and 16d at opposing ends to provide connectivity options for an AC voltage source input. *Id.* For example, if 16a and 16c are electrically connected together and 16b and 16d are electrically connected together and one side of the AC voltage input is applied to 16a and 16c and the other side of the AC voltage input is applied to 16b and 16d, the circuit becomes a parallel circuit with a first operating forward voltage. *Id.* If, however, only 16a and 16e are electrically connected and the AC voltage inputs are applied

to electrical contacts 16b and 16d, a second operating forward voltage is required to drive the single chip 18. *Id.* The '341 patent further explains that single chip 18 may also be configured to operate at more than one brightness level, i.e., "multi-brightness," by "electrically connecting for example 16a and 16b and applying one side of the line of an AC voltage source to 16a a[n]d 16b and individually applying the other side of the line from the AC voltage source a second voltage to 26b and 26c." *Id.*

In the multi-voltage and/or multi-brightness LED lighting device 20 illustrated in Figure 2, the at least two AC LED circuits 12 are integrated onto substrate 22. *Id.* at 10:12–23. The at least two AC LED circuits 12 are configured in an imbalanced bridge circuit, each of which have at least two LEDs 14. *Id.* The at least two AC LED circuits have electrical contacts 16a, 16b, 16c, and 16d on the exterior of the substrate 22 and can be used "to electrically configure and/or control the operating voltage and/or brightness level of the multi-voltage and/or multi-brightness LED lighting device." *Id.*

Figures 6 and 7 of the '341 patent, illustrating more schematic diagrams of multi-voltage and/or multi-brightness LED lighting devices, are reproduced below. *Id.* at 10:65–66, 11:18–19.

FIG. 6

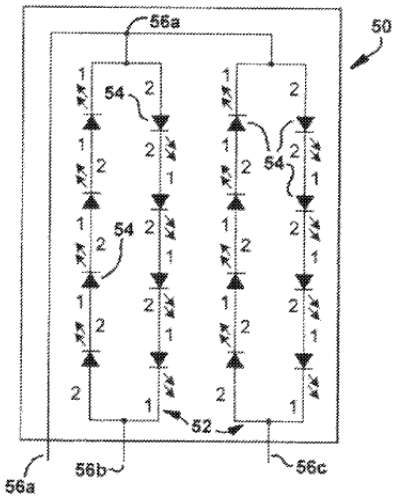
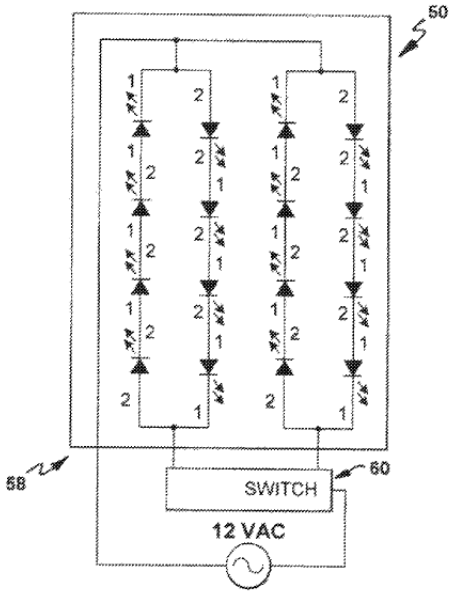


FIG. 7



Figures 6 and 7 illustrate schematic diagrams of multi-voltage and/or multi-brightness LED lighting devices. *Id.* at 10:65–66, 11:18–19.

The multi-voltage and/or multi-brightness LED lighting device 50 illustrated in Figure 6 includes at least two AC LED circuits 52, each of which have at least two LEDs 54 in series and anti-parallel relation. *Id.* at 10:65–11:17. The at least two AC LED circuits 52 have at least three electrical contacts 56a, 56b and 56c, and are electrically connected together in parallel at one end 56a and left unconnected at the opposing ends of the electrical contacts 56b and 56c. *Id.* One side of an AC voltage source line is electrically connected to 56a and the other side of an AC voltage source line is individually electrically connected to 56b and 56c "with either a fixed connection or a switched connection thereby providing a first brightness when AC voltage is applied to 56a and 56b and a second brightness when an AC voltage is applied to 56a, 56b and 56c." *Id.* The multi-voltage and/or multi-brightness LED device shown in Figure 7, which is similar to the device shown in Figure 6, is further integrated within a lamp 58 and

connected to a switch 60 to control the brightness level of the multi-voltage and/or multi-brightness LED lighting device. *Id.* at 11:18–22.

Figure 9 of the '341 patent, reproduced below, illustrates another schematic diagram of a multi-brightness LED lighting device. *Id.* at 11:40–43.

FIG. 9

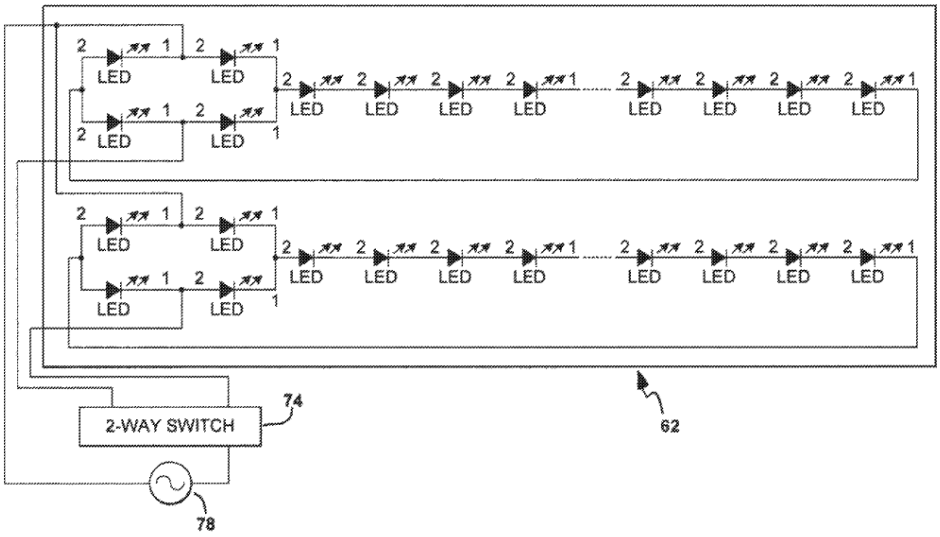


Figure 9 illustrates another schematic diagram of a multi-voltage and/or multi-brightness LED device including at least two single voltage LED circuits integrated with a single chip or within a substrate. *Id.* at 11:36–42.

The device illustrated in Figure 9 includes: two sets of four LEDs, each set configured in a bridge circuit; two bridge-rectified series LED circuits having plural LEDs connected in series; and a switch 74 electrically connected between the multi-brightness LED lighting device 62 and an AC voltage source 78, to enable a change in the brightness level of the multi-brightness LED lighting device. *Id.* at 11:23–43.[1]

[1] We refer to the description of Figure 8 with respect to Figure 9 because the description of Figure 9 references the description of Figure 8.

D. Illustrative Claims

Petitioner challenges claims 1–5, 7–12, and 14–19 of the '341 patent. Pet. 1. Claims 1, 8, and 15 are independent. Claim 1 is illustrative and reproduced below.

> 1. [1.pre] An LED lighting device comprising:
> [1.a] a first operating LED circuit and at least one additional LED circuit,
> [1.b] at least one of the first operating LED circuit or the at least one additional LED circuit including at least two LEDs connected in either series or parallel, and
> [1.c] the at least one additional LED circuit being configured to emit a different color light compared to the first operating LED circuit; and
> [1.d] a switch capable of at least one of:
> (a) switching a voltage level input to at least one of the first operating LED circuit or the at least one additional LED circuit, or
> (b) switching the at least one additional LED circuit on or off,
> [1.e] wherein (a) or (b) is selectable by a user switching the switch, and
> [1.f] wherein the LED lighting device is configured to connect to an AC voltage power source.

Ex. 1001, 12:9–27.[2]

E. Asserted Grounds

Petitioner presents the following challenges as summarized in the chart below. Pet. 5.

Ground	Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1	3, 10, 17	112(a), 112(b)[3]	Lack of Written Description; Lack of Enablement;

[2] Bracketed reference numbering/lettering reflects Petitioner's annotations.

Ground	Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
			Indefiniteness
2	4, 11, 18	112(a), 112(b)	Lack of Written Description; Lack of Enablement; Indefiniteness
3	1, 3, 5, 7, 8, 10, 12, 14, 15, 17, 19	102[4]	Bruning[5]
4	1–3, 5, 7–10, 12, 14–17, 19	103[4]	Bruning, Kabel[6]
5	1, 2, 5, 7–9, 12, 14–	103	Dowling,[7] Mueller[8]

[4] Per the Manual of Patent Examining Procedure (MPEP) § 2159.02, America Invents Act ("AIA") 35 U.S.C. §§ 102, 103 took effect on March 16, 2013. AIA 35 U.S.C. §§ 102, 103 apply to any patent application that contains or contained at any time a claim to a claimed invention that has an effective filing date that is on or after March 16, 2013. If a patent application (1) contains or contained at any time a claim to a claimed invention having an effective filing date as defined in 35 U.S.C. § 100(i) that is on or after March 16, 2013 or (2) claims or ever claimed the benefit of an earlier filing date under 35 U.S.C. §§ 120, 121, or 365 based upon an earlier application that ever contained such a claim, then AIA 35 U.S.C. §§ 102, 103 apply to the application, (i.e., the application is an AIA application). If there is ever even a single claim to a claimed invention in the application having an effective filing date on or after March 16, 2013, AIA 35 U.S.C. §§ 102, 103 apply in determining the patentability of every claimed invention in the application. This is the situation even if the remaining claimed inventions all have an effective filing date before March 16, 2013, and even if a claim to a claimed invention having an effective filing date on or after March 16, 2013, is canceled. *Infra* §§ III.A.2–3 (determining that at least one claim in the '341 patent has an effective filing date after March 16, 2013 ***and implicating AIA versions of the statues for each challenged ground***).

[5] U.S. Patent Application Publication No. 2002/0070914 A1, published June 13, 2002 (Ex. 1004, "Bruning").

[6] U.S. Patent Application Publication No. 2004/0164948 A1, published August 26, 2004 (Ex. 1005, "Kabel").

[7] U.S. Patent Application Publication No. 2002/0048169 A1, published April 25, 2002 (Ex. 1006, "Dowling").

[8] U.S. Patent No. 6,016,038, issued January 18, 2000 (Ex. 1007, "Mueller").

Ground	Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
	16, 19		

III. ANALYSIS

A. Legal Standards

"The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same." 35 U.S.C. § 112(a). The Federal Circuit "has consistently held that § 112, first paragraph[9], contains a written description requirement separate from enablement." *Ariad Pharm. v. Eli Lilly and Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). "[T]he test for sufficiency [of the written description] is whether the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date." *Id.*

"To prove that a claim is invalid for lack of enablement, a challenger must show . . . that a person of ordinary skill in the art would not be able to practice the claimed invention without undue experimentation." *Enzo Life Sciences, Inc. v. Roche Molecular Systems, Inc.*, 928 F.3d 1340, 1345 (Fed. Cir. 2019). Factors to be considered in determining whether a disclosure would require undue experimentation include:

> (1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of

[9] The AIA recodified 35 U.S.C. § 112, first paragraph, as 35 U.S.C. § 112(a). Pub. L. No. 112-29, 125 Stat. at 296–97.

the claims.

In re Wands, 858 F.2d 731, 737 (Fed. Cir. 1988).

In this post-grant review proceeding, we apply the test for indefiniteness approved by the Supreme Court in *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898 (2014). *See* Memorandum on Approach to Indefiniteness Under 35 U.S.C. § 112 in AIA Post-Grant Proceedings (Jan. 6, 2021), 5 ("The office now clarifies that the Board shall follow *Nautilus* in AIA post-grant proceedings").[10] Under *Nautilus*, a claim of a patent challenged for indefiniteness is unpatentable if the claim, read in light of the patent specification and the prosecution history, fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention. *Nautilus*, 572 U.S. at 901.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros., Inc. v. Union Oil Co. of*, 814 F.2d 628, 631 (Fed. Cir. 1987).

A patent 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 said 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;

[10] Available at https://www.uspto.gov/sites/default/files/documents/IndefinitenessMemo.pdf.

(3) the level of ordinary skill in the art; and (4) when in evidence, objective evidence of nonobviousness.[11] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

In a post-grant review, as in an *inter partes* review, "the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *See Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016). This burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware*, 800 F.3d at 1378.

We analyze the challenges presented in the Petition in accordance with the above-stated principles.

B. Level of Ordinary Skill in the Art

Petitioner contends that:

> A person of ordinary skill in the art ("POSITA") as of October 6, 2007 (earliest listed priority date) or January 10, 2020 (actual filing date), would have had a bachelor's degree in electrical engineering, or similar technical filed, with two years of relevant experience in the field of design and/or development of LEDs and circuits in the context of lighting control systems. An increase in experience could compensate for less education.

Pet. 24 (citing Ex. 1002 ¶ 46).

Patent Owner contends that

> the '341 Patent is directed toward lighting devices. Thus, the proper field is "the field of design and/or development of LEDs and circuits in the context of ***lighting devices***," not "***lighting control systems.***" Indeed, as seen in '341 Patent, Figs. 1-12, the disclosure is directed to devices such as LED packages and lamps, not the control systems that can be used to control LEDs. So, for example, the '341 Patent is directed to devices like LED

[11] Patent Owner does not present objective evidence of nonobviousness.

> chips, bulbs, or lamps, not multicomponent lighting control systems.

PO Resp. 4–5 (citing PO Resp. § II.A; Ex. 1001, 1:26–29 ("The present invention specifically relates to multiple voltage level and multiple brightness level LED devices, packages and lamps."), 1:41–46 ("The present invention specifically relates to multiple voltage level and multiple brightness level light emitting diode circuits, single chips, packages and lamps 'devices.'"); Ex. 2008 ¶ 40 (Bretschneider Decl.)).

Each of the challenged claims of the '341 patent recites an "LED lighting device." Accordingly, we determine that the level of ordinary skill in the art is "a bachelor's degree in electrical engineering, or similar technical field, with two years of relevant experience in the field of design and/or development of LEDs and circuits," as Petitioner proposes and that "the field of design and/or development" would be "in the context of lighting devices" as Patent Owner proposes, in which "[a]n increase in experience could compensate for less education." *Id.*; Pet. 24 (citing Ex. 1002 ¶ 46).

Our definition is consistent with the specification of the '341 patent and the cited references. The findings and conclusions rendered in this Decision would not change had we adopted Petitioner's definition in its entirety.

C. Claim Construction

In this post-grant review, filed on November 12, 2021, we construe the claims of the '341 patent using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b) (2021), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of

ordinary skill in the art and the prosecution history pertaining to the patent. 37 C.F.R. § 42.200(b); *see Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–1314 (Fed. Cir. 2005) (en banc). In construing claims in accordance with their ordinary and customary meaning, we take into account the specification and prosecution history. *Phillips*, 415 F.3d at 1315–17.

Petitioner sets forth proposed constructions for the terms "forward voltage," "switch," "selectable by a user switching the switch," and "driver." Pet. 24–29. According to Petitioner, "[b]ecause the prior art asserted herein discloses the preferred embodiment within the indisputable scope of the claims, the Board need not construe the outer bounds of the claims as part of these proceedings." *Id.* at 24.

In the present proceeding, we need only construe "forward voltage" in order to decide Petitioner's challenges. We do not need to expressly construe any of the other claim terms. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) ("[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.")).

1. Petitioner's Proposed Constructions of "Forward Voltage"

Petitioner asserts "'[f]orward voltage' should be construed as 'the minimum voltage difference required between the anode and cathode of the LEDs in the claimed circuit to allow current to flow through the LEDs' based on the [Patent Owner's] express definition in the intrinsic record." Pet. 25. Petitioner represents that Patent Owner, in the Related Litigation, asserted that this "express definition" should not be applied. *Id.* at 26 (citing

Ex. 1022, 35–38).[12] Petitioner urges that, "[i]n the alternative, 'forward voltage' should be construed as 'a voltage in a diode's forward direction.'" *Id.* at 25–26.

2. Petitioner's Initial Claim Construction Contentions

Petitioner contends that during prosecution of U.S. Application No. 16/274,164 (the application underlying the parent of the '341 patent, the '001 patent, "the '164 application"), Patent Owner expressly defined "forward voltage." Pet. 25 (citing Ex. 1023, 9 (Amendment)). During prosecution of the '164 application, Applicant asserted that:

> Colby[13] fails to disclose that the first operating LED circuit and the at least one additional LED circuit both have a forward voltage of 6V or greater [as amended]. Stating that "US plugs operate on 120V 60Hz," the Office Action essentially relies on the disclosure of 'AC voltage' in Colby having a 'frequency of 60 Hz' as disclosing the forward voltage required by claim 1. *Office Action*, p. 4; *Colby*, 4:26–31. However, Applicant respectfully submits that the disclosure of an AC voltage supplied from a wall outlet does not disclose the forward voltage of an LED.
>
> "the forward voltage" of an LED circuit, as recited in claim 1, is the minimum voltage difference required between the anode and cathode of the LEDs in the claimed circuit to allow current to flow through the LEDs." *(See, e.g., LED Tutorial - Learn the basics*, https://www.baldengineer.com/led-basics.html.) Thus; the recited forward voltage is different from the AC voltage provided by a typical wall outlet.

[12] In the Related Litigation, we note that Patent Owner states that "[t]he passage from the prosecution history referencing the 'Bald Engineer' [webpage] is generally consistent with the plain and ordinary meaning in the context of the claims under the discussion in the '001 patent" and "[t]hus, the term requires no further construction." Ex. 1022, 36 (referring to definition at https://www.baldengineer.com/led-basics.html).

[13] U.S. Patent No. 7,748,877 B1 to Colby (Ex. 1037, "Colby").

Ex. 1023, 9 (citing Ex. 2014, "Bald Engineer LED Tutorial").

3. Patent Owner's Response and Sur-reply

First, Patent Owner argues that limiting "forward voltage" to a single minimum voltage would be inconsistent with the two forward voltages recited in dependent claims 3, 10, and 17, is "contrary to the central purpose of the '341 Patent, which is to provide multiple voltage levels and multiple brightness levels to LED circuits," and "would exclude numerous embodiments of the '341 Patent discussed above, including the embodiment covering the stated purpose of the patent." PO Resp. 11–13; *see* Sur-reply 11–12, 22.

Second, Patent Owner further argues that "[t]he Petition does not attempt to argue that the statement in the prosecution history for the '001 Patent is a clear and unmistakable disavowal of the explicit teachings of the claims and specification of the '341 Patent," and the "Petition cannot do so because the statement is from the file history for another patent discussing different claim language in a context that is different than the construction proposed here." PO Resp. 19; *see* Sur-reply 6–7, 9–10 (Patent Owner characterizing Applicant as arguing, during prosecution, that "one could not simply use AC mains . . . as the forward voltage for LEDs because the forward voltage is a function of the operating characteristics of the LED circuits," and "[t]hus, the applicant did not define forward voltage as one specific minimum voltage"). According to Patent Owner,

> the claim language being addressed in the '001 Application ("forward voltage of 6V or greater") is different, the application under review ('164 Application) is different, and the prior art being addressed (the Colby reference) is not at issue here. Taken together, it is very ***unclear*** how the statement applies in the context of the '341 Patent. What is clear is that Petitioner's

> position is expressly and repeatedly contradicted by the plain language of the claims and specification of the '341 Patent. Thus, adopting Petitioner's proposed construction would be clear legal error.

PO Resp. 19–20.

> *Third*, Patent Owner contends that
>
> "[t]he minimum voltage difference required" does not rule out, and in fact implies the potential use of voltages in excess of that minimum. This interpretation is supported by the language of the claim being discussed ("a forward voltage of 6V or greater"), which clarifies that a forward voltage can have values equal to or greater than the minimum voltage (there, 6V) to allow current to flow.
>
> This interpretation is also supported by the website that the Applicant cited (www.baldengineer.com/led-basics.html) in support of its statement. Ex. 2014 [Bald Engineer]. The website states that "[t]he 'Forward Voltage' rating of a diode will determine the minimum voltage difference between the anode and cathode to allow current to flow." Read carefully, the website is drawing a distinction between forward voltage and minimum voltage—the forward voltage rating determines the minimum voltage, but is not necessarily limited to that minimum voltage. Further in the discussion, the website cites to data sheets showing that yellow LEDs have a forward voltage operating range, including a minimum and maximum voltage.

Id. at 22 (citing Ex. 2008 ¶¶ 69, 71) (alteration in original); *see* Sur-reply 2 (citing PO Resp. 16–17; Pet. Reply 6, 9), 10. Patent Owner presents a portion of the Bald Engineer LED Tutorial, reproduced below, that shows a minimum and maximum value of a forward voltage for a particular LED.

Items	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V_F	I_F=20mA	1.8	---	2.2	V

Table Reproduced from Bald Engineer Tutorial
Describing Forward Voltage of an LED. Ex. 2014.

Patent Owner also argues that "Petitioner's second proposed construction ('a voltage in a diode's forward direction') is also incorrect because it allows for forward voltages that could be less than the minimum operating voltage and greater than the maximum operating voltage." PO Resp. 23.

4. Patent Owner's Proposed Construction of "Forward Voltage"

Disputing Petitioner's proposed constructions, Patent Owner contends that "a POSITA would understand that the term 'forward voltage' in the '341 Patent should be construed as the operating voltage for the claimed LED circuit." PO Resp. 11. Patent Owner further contends its

> construction uses the term "operating" voltage for the LED circuit to clarify that the claim requires voltage in a range that will actually cause the LED circuit to "operat[e]"—that is, illuminate in the manner intended. If the forward voltage were zero, below the minimum turn on voltage the LED circuit would not provide light and would not be an "operating LED circuit."

Id. at 7 (alteration in original). According to Patent Owner,

> [i]f the forward voltage were above the maximum operating voltage for that particular LED circuit, a number of undesirable effects would occur, including possible LED failure, a shorter LED life, a shift away from the intended color or intensity, and/or excessive heat generation. Under any of these conditions, the LED circuit would not operate as intended.

Id. at 7–8 (citing Ex. 2008 ¶ 46).

Patent Owner cites numerous portions of the specification in support of its position. *Id.* at 8 (citing Ex. 1001, code (54) (Title), code (57) (Abstract), 1:25–28, 1:41–46, 3:12–14, 4:33–35, 4:38–41, 5:27–34); *see id.* at 9 (citing Ex. 2008 ¶ 48). The cited portions of the specification disclose "multi-voltage and multi-brightness LED lighting devices" as well as that "the forward voltage 'drives' the LED circuit." *Id.*

Patent Owner also cites extrinsic evidence. *Id.* at 8–10 (citing Ex. 2011 ("All About Circuits"); Ex. 2008 ¶¶ 49, 50), 14 (citing Ex. 2012 ("Samsung Datasheet")), 16 (citing Ex. 2013 ("Cree Datasheet")). In particular, Patent Owner cites manufacturer specification sheets for particular makes of diodes and argues that within "even a single diode, the forward voltage will vary depending on the current applied." *Id.* at 10. Patent Owner explains that

> [a] basic property of diodes is that they have a range of forward voltages that may be applied for the diode to operate and are not limited to a single minimum voltage. For example, one electrical engineering textbook discloses that "[t]he voltage dropped across a conducting, forward-biased diode is called the forward voltage." Ex. 2011 [All About Circuits] explains that forward voltage "varies only slightly for changes in forward current and temperature" and provides a graph showing the relationship. As can be seen in the graph below, the forward voltage (labelled "Forward Bias") for this particular diode varies from a minimum of about .5V to a maximum of about .9V depending on the current applied.

Id. at 9 (citing Ex. 2008 ¶ 49) (second alteration in original).

5. Petitioner's Reply

With respect to Patent Owner's *first* argument, Petitioner responds that "the fact that the 'operating' LED circuit limitation may further limit the voltages required to practice the claim as a whole does not mean that it should be read into other limitations" particularly when "the 'forward voltage' limitation is applied in the alternative to the 'additional' LED circuit, which lacks the 'operating' limitation." Pet. Reply 3–4.

With respect to Patent Owner's *second* argument, Petitioner characterizes Patent Owner as "assert[ing] a definition or disclaimer related to a claim term in a parent patent cannot be used against the child patent."

Id. at 7 (citing PO Resp. 18–19). Petitioner argues that Patent Owner "again attempts to distance its definition of 'forward voltage' in the parent's prosecution history from the use of the exact same term in the claims of the 341 patent" and argues that "there is no basis in fact or law to ignore the definition." *Id.* at 8 (citing PO Resp. 21–22); *see id.* at 7 (citing *Cordis Corp. v. Boston Scientific Corp.*, 658 F.3d 1347, 1356 n.5 (Fed. Cir. 2011).

With respect to Patent Owner's *third* argument, Petitioner contends that the Bald Engineer LED Tutorial "is explicit that the 'forward voltage' is a single, minimum voltage." *Id.* at 8 (citing Ex. 2014, 2 ("minimum voltage difference," "The forward voltage defines the amount of voltage required for the current to flow through the diode junction. Any voltages below this level cause the LED to remain 'open' or non-conductive.")). Petitioner contends that the Bald Engineer LED Tutorial "does mention an LED datasheet as an example, but that datasheet . . . , merely shows minor variances in the single forward voltage that is possible based on either manufacturing tolerances or operating conductions[14]." *Id.* at 9 (citing Ex. 1034 ¶¶ 16–17).

Petitioner similarly contends that Exhibits 2011, 2012, and 2013 are LED data sheets "which show relatively minor variations in purported 'forward voltages' based on manufacturing tolerances and operating conditions." *Id.* at 6 (citing PO Resp. 13–18). Petitioner persuasively points out that, "[o]n cross examination, [Patent Owner's] expert admitted that those minor variations were based on operating conditions, *and that at constant temperature and current there would be single forward voltage*."

[14] In its Petitioner's Reply, Petitioner uses the term "operating conductions." We presume the Petitioner intends to refer to "operating conditions" as set forth in Dr. Neikirk's Reply Declaration (Ex. 1034 ¶ 16).

Id. (citing Ex. 1035, 61:1–9, 61:21–62:3) (emphasis added). Petitioner further persuasively contends that "these minor variations are inconsistent with [Patent Owner's] theories regarding the disclosure of multiple forward voltages in the specification" because "[Patent Owner's] (incorrect) theory is that the switch could change the forward voltage by *cutting it in half or doubling it, by changing the parallel/serial configuration of the LED circuits*." *Id.* (emphasis added). According to Petitioner,

> with respect to EX2012, a particular Samsung LED device would have a forward operating voltage somewhere between 5.9V and 6.1V. PO's expert admitted that for such a device, neither [halving the voltage to] 3V nor [doubling the voltage to] 12V would be a forward voltage because the LED would not operate at 3V and would be destroyed at 12V. Thus, this extrinsic evidence exposes an additional flaw in PO's analysis of the intrinsic record.

Id. at 6–7 (citing Ex. 1035, 63:1–64:5, 65:5–21, 62:9–17).

6. Analysis

Having reviewed the entire record developed during trial, we are persuaded that Petitioner's claim construction position is supported by evidence, and we maintain our preliminary construction of "forward voltage." Patent Owner's arguments are unavailing as they urge us to ignore the intrinsic evidence (e.g., prosecution history disclaimer) in favor of extrinsic evidence (e.g., diode manufacturing specification data sheets).

The intrinsic record—including the disclosures in the '341 patent and the disclaimer made during prosecution of the application underlying the '001 parent patent—persuades us that Petitioner's first construction, "the minimum voltage difference required between the anode and cathode of the LEDs in the claimed circuit to allow current to flow through the LEDs" is supported by the record.

As we explained in our Institution Decision, one exception to the general rule that claim terms are given their ordinary and customary meaning is "when the patentee disavows the full scope of a claim term either in the specification or during prosecution." *Uship Intellectual Props., LLC v. United States*, 714 F.3d 1311, 1313 (Fed. Cir. 2013) (quoting *Thorner v. Sony Computer Entm't Am., LLC*, 669 F.3d 136s2, 1365 (Fed. Cir. 2012)). During prosecution, Applicant "ma[de] clear that the invention does not include a particular feature"—that is, made clear that the claimed "forward voltage of 6V *or greater*" excludes a 120V AC voltage from a wall outlet. *GE Lighting Solutions, LLC v. AgiLight, Inc.*, 750 F.3d 1304, 1309 (Fed. Cir. 2014) (quoting *SciMed Life Sys. Inc. v. Advanced Cardiovascular Sys., Inc.*, 242 F.3d 1337, 1341 (Fed. Cir. 2001)) (disavowal requires that "the specification [or prosecution history] make[] clear that the invention does not include a particular feature").

As the '001 patent is the parent to the '341 patent, we consider arguments made during the prosecution of the application underlying the '001 patent relevant to determining how "forward voltage" should be construed in the child patent, the '341 patent. Patent Owner cites no authority that would support disregarding the statements in the '001 patent for any reason, including because the '001 patent is a parent patent, the claim term "forward voltage" is used differently in the claim (i.e., claim 1 of the '001 patent recites "forward voltage *of 6V or greater*"), or that the statements made during prosecution were used to distinguish a different reference, Colby.

We agree with Petitioner that "there is no basis in fact or law to ignore the definition." Pet. Reply 8 (citing PO Resp. 21–22); *see id.* at 7 (citing

Cordis Corp. v. Boston Scientific Corp., 658 F.3d 1347, 1356 n.5 (Fed. Cir. 2011) ("Arguments made in the course of prosecuting the [parent] application are relevant, however, because a disclaimer in the parent application carries forward into the construction of the same claim term in the child."). Patent Owner's "recharacteriz[ation] [of] its disclaimer over Colby as merely related to wall outlets" is unavailing. *Id.* (citing PO Resp. 19–21). When a claim is not ambiguous, we do not read limitations into the claim to preserve its validity. *See Bennett Regul. Guards, Inc. v. Atlanta Gas Light Co.*, 825 F. App'x 773, 777 (Fed. Cir. 2020) ("Claims are construed to preserve validity only if, 'after applying all the available tools of claim construction . . . the claim is still ambiguous.'").

Even though, when read in isolation, 120V AC voltage might theoretically fall under the "or greater" portion of the amended claim limitation "forward voltage of 6V or greater," Applicant distinguished Colby on the basis that the 120V AC voltage from a wall outlet is not "*the minimum voltage* difference required between the anode and cathode of the LEDs in the claimed circuit to allow current to flow through the LEDs." *See* Ex. 1023, 9 (emphasis added). Applicant's argument specifically identifies the claim language at issue—"forward voltage of 6V or greater"—and specifically states that it is not disclosed because Colby does not disclose *the minimum voltage* and *instead*, discloses something else, something larger—120V AC voltage. Accordingly, we conclude that Applicant disclaimed any voltage that is more than "the minimum voltage difference required between the anode and cathode of the LEDs in the claimed circuit to allow current to flow through the LEDs" from the scope of "forward voltage."

We also agree with Petitioner that the '341 patent repeatedly uses the term "forward voltage" in connection with "single voltage series LED circuits." *See* Pet. 25 (citing Ex. 1001, 4:5–7:8; Ex. 1021, 28–30; Ex. 1002 ¶ 47). These disclosures support Petitioner's position that there is only one "forward voltage" for an *individual* circuit (i.e., a single voltage series LED circuit). In contrast, the forward voltage may differ based on the connection type, i.e., parallel or series, between at least *two* circuits. *See*, *e.g.*, Ex. 1001, 4:12–27. It is not apparent from the disclosure of the '341 patent that brightness or light output levels of an LED device are changed based on driving an individual circuit (i.e., the single voltage series LED circuit) with different forward voltages. *See generally id.* Instead, it appears that brightness levels or light output levels change based on adding or removing one or more individual circuits connected in series or parallel to a "first operating LED circuit." *Id.* at 3:45–49 ("It would further be advantageous to provide multi-brightness LED devices that can be switched to different levels of brightness by simply switching *additional circuits on or off in addition* to a first operating circuit within a single chip and or LED package." (emphasis added)).

D. Challenge 1—Lack of Written Description and Enablement, and Indefiniteness of Claims 3, 10, and 17

Petitioner contends claims 3, 10, and 17 are invalid because they lack written description and enablement under 35 U.S.C. § 112(a) and because they are indefinite under 35 U.S.C. § 112(b). Pet. 29–32.

1. Petitioner's Initial Contentions

First, Petitioner contends that, "[u]nder any construction of 'forward voltage,' such as the alternative construction, claims 3, 10 and 17 are not supported by the specification as filed." Pet. 31 (citing Ex. 1002 ¶ 59).

Petitioner contends that this is because, "none of these embodiments includes a switch, wherein switching the switch provides two different DC forward voltages to an LED circuit." *Id.* at 32 (citing Ex. 1002 ¶ 64); *see id.* at 31–32 (citing Pet. §§ V.A, V.C.1.a; Ex. 1002 ¶¶ 59–64).

Second, Petitioner contends that "[u]nder the correct construction of 'forward voltage,' each of the 'first operating LED circuit' and the 'one additional LED circuit' has a single 'forward voltage' because each has a single 'minimum.'" *Id.* at 30 (citing Pet. § V.E.2). According to Petitioner, "[b]ecause each circuit has only a single 'forward voltage,' no switch can provide 'at least two different' forward voltages to either circuit" and "[t]hus, under the correct construction of 'forward voltage,' these claims are to impossible subject matter that is not disclosed in the specification." *Id.* (citing Ex. 1002 ¶ 57). We refer to these arguments as Petitioner's "impossibility of multiple minimum voltages" arguments.

Petitioner contends that, "because the specification does not describe or enable this impossible subject matter, the claims are invalid for lack of written description and lack of enablement." *Id.* at 30–31. Petitioner also contends that "[a] claim to impossible subject matter is invalid as indefinite." *Id.* Petitioner also takes the position that "[n]one of these embodiments disclose or enable the full breadth of these claims" because the claims encompass a situation in which the two different voltages are applied to only one of the LED circuits—under any construction of "forward

voltage" as it appears in the claim term "two different DC forward voltages." *Id.* at 19–20.

2. Patent Owner's Response and Sur-reply

First, Patent Owner points to paragraphs 28 and 30 of the '597 PCT, which disclose an LED device that is "driven with at least two different DC forward voltages," including "a first forward voltage drive level when the two single voltage LED circuits *are connected in parallel* and a second forward voltage drive level that is twice the level of the first forward voltage drive level when the at least two LED circuits *are connected in series*." Ex. 1018 ¶¶ 28 (emphases added), 30. Patent Owner takes the position that, "[b]ecause the claims provide different voltages to 'at least one of' the two circuits, they clearly allow for different voltages to one *or* both of the LED circuits." PO Resp. 27 (emphasis added). According to Patent Owner, "the '597 Application repeatedly and expressly discloses single multi-voltage LED circuits (that is, LED circuits that operate using more than one forward voltage)." *Id.* (citing Ex. 1018 ¶¶ 13 ("The art is deficient in that it does not provide a multi-voltage . . . circuit monolithically integrated on a single substrate"), 14 ("It would further be advantageous to have a multi-voltage . . . circuit that can provide options in voltage level, brightness level and/or AC or DC powering input power preference."). Patent Owner also contends that "[t]wo different forward voltages can clearly be applied to the two different LED circuits—that is, one forward voltage for the 'first operating LED circuit' and a different forward voltage for the 'one additional LED circuit.'" *Id.* at 39–40; *see* Sur-reply 14 (citing PO Resp. 26–27) (Patent Owner arguing that Petitioner "ignores the fact that the two LED

circuits connected together create a combined circuit that uses two different forward voltages depending on whether it operates in parallel or series").

Second, Patent Owner further contends that, "just because the circuit resides within a device does not mean it is no longer a circuit," "[n]or does the fact that a multi-voltage circuit is composed of two or more single voltage circuits mean that each of the single circuits cannot be driven with more than one voltage, or that the multi-voltage circuit is no longer a circuit." PO Resp. 29; *see id.* at 28 (citing Ex. 1018, Fig. 9, ¶ 60); Sur-reply 4. Patent Owner contends that the term "'LED circuit' is a common term that a POSITA would understand covers numerous possible circuit configurations, not just single voltage LED circuits." PO Resp. 30 (citing Ex. 2008 ¶ 84). Patent Owner further contends that "an LED circuit may be two LEDs and a switch that switches the LEDs between a parallel and a series configuration," and that "[w]hether in the parallel or series configuration, it is still the same circuit, yet the two configurations would have different forward voltages." *Id.* (citing Ex. 2008 ¶ 86). Patent Owner states that Figure 12 of the '341 patent shows LED circuits that are connected in series and characterizes the LED circuits as "form[ing] ***an*** LED circuit with one forward voltage." *Id.* at 41 (citing Ex. 2008 ¶ 99) (emphasis added). Patent Owner further states that "when the LED circuits are connected in parallel, the resulting LED circuit would have a second (different) forward voltage." *Id.* at 41–42 (citing Ex. 2008 ¶ 99); *see* Sur-reply 15 (citing-in-part PO Resp. 13).

Patent Owner also contends that "different LED circuits are not limited to the same number of LEDs" and accordingly, "[a] POSITA would understand that LED circuits with various scalable or flexible configurations

may need to be driven with multiple different forward voltages." *Id.* at 24 (citing Ex. 1001, 10:17–18 ("LED circuits 12 configured in a[n] imbalanced bridge circuit.")).

Patent Owner further contends "claim 1 (from which claim 3 depends) recites a switch capable of 'switching a voltage level input' to the LED circuits" and "[t]hus, the claim itself requires an LED circuit to have more than one voltage level options that can be delivered to the LED circuit and are selectable by a switch." PO Resp. 40. According to Patent Owner, "the specification clearly and repeatedly teaches that LED circuits may have more than one voltage level." *Id.* (citing Ex. 1001, 3:5–12 ("It would further be advantageous to provide multiple voltage level LED circuits . . . that can easily be electrically configured for at least two forward voltage drive levels"), 3:12–19). According to Patent Owner, these disclosures support a finding that "the '341 Patent teaches connecting LED circuits in series and parallel configurations *to form new circuits*" and that "[*e*]*ach of these new circuits* may (depending on the configuration) have a different forward voltage." *Id.* at 41 (citing Ex. 2008 ¶ 98) (emphases added); *see also* Sur-reply 22 ("[a] POSITA would understand that voltage can be increased across an LED to increase brightness" and "[i]ndeed, the dimmer aspect of the '341 Patent is essentially disclosing one way to increase LED brightness"), 24 ("The '341 Patent is also clear that forward voltage can be changed to increase brightness." (citing Ex. 1001, 3:11–19; 7:3–8; 9:17–24; 11:31–35)).

Third, citing column 3, lines 12 through 19 of the '341 patent, Patent Owner contends that

> [t]his disclosure alone discloses "a switch" (e.g., switching means) "wherein switching the switch" (e.g., connecting or

> disconnecting the at least one additional LED circuit to and/or from a first LED circuit) "provides two different DC forward voltages" (e.g., more than one AC or DC forward voltage) to an LED circuit (one additional LED circuit or the first LED circuit or the combination of the one additional LED circuit with the first LED circuit). There are numerous other embodiments of the '341 Patent disclosing similar configurations. To the extent there are minor differences between an embodiment and the specific claim language (e.g., the term "switch" is not explicitly mentioned in a particular embodiment or the embodiment does not specify whether it uses AC or DC), *a POSITA would easily understand how to implement those differences and would understand that they can look to other embodiments for the differences*.

PO Resp. 43–44 (citing Ex. 1001, 4:33–45, 5:35–51, 5:52– 6:3; Figs. 8, 9, 11, 12; Ex. 2008 ¶ 102) (emphasis added); *see* Sur-reply 14 (Patent Owner arguing that "[a] POSITA would understand how to use a switch to change between two forward voltage levels"), 22–23 (Patent Owner arguing that "[t]he circuits in Fig. 12 are provided as an exemplary 'LED package 100' that can be integrated into larger circuits and modified" which "would include, for example, 'wiring' the package to be switchable between series and parallel configurations" because "the '341 Patent is meant to improve on the type of fixed prior art configuration Petitioner seeks to limit Fig. 12 to").

3. Petitioner's Reply

Petitioner responds to Patent Owner's *first* argument by arguing that "providing a single forward voltage to one of the circuits and a different single forward voltage to the other circuit would not practice the claims, much less disclose and enable its full breadth." Pet. Reply 17.

Petitioner responds to Patent Owner's *second* argument by arguing that Patent Owner's "attempt to characterize the entirety of LED device 100 as a single claimed LED circuit fails because the claims require multiple

LED circuits," that is, the claimed "first operating LED circuit" and the claimed "at least one additional LED circuit." *Id.*

Petitioner responds to Patent Owner's *third* argument by arguing that Patent Owner "fails to address that the claims require that the switching of the switch provide the at least two different forward voltages, which is not disclosed." *Id.* (citing PO Resp. 39–40). Petitioner characterizes Patent Owner as "argu[ing] that claim 1 requires the switch provide multiple 'voltage level options,'" and argues that this "does not address whether a switch can provide two different 'forward voltages' as required by claim 3, i.e., two different minimums, under Petitioner's construction." *Id.* (citing PO Resp. 40). Petitioner also contends that "no switch is disclosed that would provide multiple 'DC forward voltages' to the LED device 100 as a whole." *Id.* at 18 (citing Pet. 17–20).

Petitioner also argues that Patent Owner's "conclusion with respect to claim 3 and Figure 12 . . . is incorrect." *Id.* (citing PO Resp. 41–42). According to Petitioner, "LED device 100 can be wired into either a parallel or a serial configuration *during manufacture*, and the resulting LED device 100 will then have *one* of two different possible forward voltages and will be coupled to the appropriate voltage source." *Id.* (citing Pet. 11–12; Ex. 1002 ¶ 22) (emphasis added). Petitioner contends that "[t]he forward voltage *provided to the two LED circuits 92 within* LED device 100 will be the same regardless of the configuration." *Id.* (citing Pet. 11–12; Ex. 1002 ¶ 22) (emphasis added).

4. 35 U.S.C. § 112(a)

With respect to the *written description requirement*, we are persuaded that under the construction of "forward voltage" adopted in Section III.C,

written description support is lacking in the '295 application underlying the '341 patent.[15]

Claims 3, 10, and 17 recite "wherein the switching of the switch provides at least two different DC forward voltages to *at least one of* the first operating LED circuit or the at least one additional LED circuit."

With regard to Patent Owner's *first* argument, encompassed within the scope of each of claims 3, 10, and 17 are three situations: (1) when two different DC forward voltages are provided to *only* the first operating LED circuit; (2) when two different DC forward voltages are provided to *only* the at least one additional LED circuit; and (3) when two different DC forward voltages are provided to the first operating LED circuit *and* the at least one additional LED circuit. We agree with Petitioner's position—that it is necessary to support the full breadth of these claims (i.e., all three situations)—and not merely one of the three situations, as Patent Owner contends. *See* Pet. 19; PO Resp. 27, 39–40; *see also LizardTech, Inc. v. Earth Resource Mapping, Inc.*, 424 F.3d 1336, 1345 (Fed. Cir. 2005) ("Whether the flaw in the specification is regarded as a failure to demonstrate that the patentee possessed the full scope of the invention recited in [a] claim . . . or a failure to enable the full breadth of that claim, the specification provides inadequate support for the claim under section 112, paragraph one.").

The '295 application does not provide sufficient written description support for situations (1) and (2) under our adopted construction of "forward

[15] Here and below, we consider the parties' citations to and discussion of '597 PCT relevant to our analysis of the '295 application because the '597 PCT and the '295 application have substantially similar disclosures.

voltage" as it appears in the claim term "two different DC forward voltages" recited in claims 3, 10, and 17. *Supra* § III.C (forward voltage is construed as "the minimum voltage difference required between the anode and cathode of the LEDs in the claimed circuit to allow current to flow through the LEDs"). The cited portions of the '597 PCT disclose "a first forward voltage drive level when the two single voltage LED *circuits are connected in parallel* and a second forward voltage drive level that is twice the level of the first forward voltage drive level when the at least two LED *circuits are connected in series*." Ex. 1018 ¶¶ 28 (emphasis added), 30; *supra* n.14 (considering citations to the '597 PCT relevant to the analysis of the '295 application because the '597 PCT and '295 application have substantially similar disclosures). That is, the forward voltage drive level in the '597 PCT depends on whether the (at least) two single voltage LED circuits are connected together in parallel or in series. This is distinguishable from situations (1) and (2) because the cited portions do not disclose that the two different forward voltage drive levels are applied to *only* one single voltage LED circuit—the cited portions describe only a situation in which at least *two* LED circuits are required.

Patent Owner's *first* argument is unpersuasive because the configuration changes that Patent Owner references in the '295 application and the '341 patent are disclosed as being based on the type of wiring connection, parallel or serial, between *two* LED circuits, i.e., the "at least one of the first operating LED circuit" and the "the at least one additional

LED circuit."[16] The disclosures of the '295 application and the '341 patent do not address the situation in which (1) the two different DC forward voltages are provided to *only* the first operating LED circuit, nor the situation in which (2) two different DC forward voltages are provided to *only* the at least one additional LED circuit.

We are persuaded by Petitioner that Patent Owner's *second* argument that draws the LED circuit "box" around two single voltage LED circuits is unavailing as the independent claims from which dependent claims 3, 10, and 17 require both a "first operating LED circuit" and "at least one additional circuit." *See* Pet. Reply 17. For this reason, Patent Owner's argument that Petitioner's challenge "ignores the fact that the two LED circuits connected together create a combined circuit that uses two different forward voltages depending on whether it operates in parallel or series" is unavailing. Sur-reply 14 (citing PO Resp. 26–27). The claims require multiple LED circuits—that is, the claimed "first operating LED circuit" and the claimed "at least one additional LED circuit." Pet. Reply 18.

We further agree that "[t]he forward voltage provided to the two LED circuits 92 *within* LED device 100 will be the same regardless of the configuration." Pet. Reply 18 (citing Pet. 11–12; Ex. 1002 ¶ 22) (emphasis added). Petitioner's counsel clarified, during the hearing, that there is no disclosure that would support a finding that the switch provides two different forward voltages, for example, by switching the wiring configuration (e.g., from serial to parallel or vice versa) *between* two LED circuits.

[16] Patent Owner cites to portions of the '341 patent. We cite the corresponding portions of the '295 application as is relevant to our determinations regarding challenges based on 35 U.S.C. §§ 112(a)–(b).

> JUDGE ULLAGADDI: [C]ouldn't it be argued that there's one DC forward voltage applied when it's in a first configuration between these two single voltage LED circuits and a second DC forward voltage when it's in the other configuration?
>
> MR. ERICKSON: No, it cannot, Your Honor, for two reasons. First, the claim requires that a switch provide the different DC-forward voltages, and nowhere is there disclosure of a switch that switches between the serial and parallel embodiments. So that's the first reason why that argument would fail.
>
> The second reason why that argument would fail is that the claim at issue requires the different DC voltages be applied to at least one of the first or the one additional circuit. And when you switch those between parallel and serial, you're always providing 6 volts. In this example, if the individual LED circuits are 6 volt LED circuits. if they're in parallel, the driver applies 6 volts. You're always getting 6 volts to each LED. If they're in series, the driver provides 12 volts to the series, but that results in 6 volts being applied to each LED circuit.

Tr. 9:17–10:8. We credit the testimony of Dr. Neikirk, who testifies that, when "the two 6V LED circuits are wired in parallel, the LED device will have a 6V forward voltage" and "the two 6V LED circuits are wired in series, the LED device will have a 12V forward voltage." Ex. 1002 ¶ 22 (citing Ex. 1001, Fig. 4, Fig. 5, 10:49–64). That is, in either case, the voltage drop across one LED circuit is the same as the voltage drop across the other LED circuit. Accordingly, Patent Owner's argument that "[t]wo different forward voltages can clearly be applied to the two different LED circuits—that is, one forward voltage for the 'first operating LED circuit' and a different forward voltage for the 'one additional LED circuit'" is unavailing. PO Resp. 39–40.

In response to Patent Owner's argument that "different LED circuits are not limited to the same number of LEDs" and accordingly, "[a] POSITA

would understand that LED circuits with various scalable or flexible configurations may need to be driven with multiple different forward voltages," this may be relevant to situation (3), but does not address situations (1) or (2) set forth above. *See* Sur-reply 24 (citing Ex. 1001, 10:17–18 ("LED circuits 12 configured in a[n] imbalanced bridge circuit.")).

Patent Owner's arguments that "[a] POSITA would understand that voltage can be increased across an LED to increase brightness," that "the dimmer aspect of the '341 Patent is essentially disclosing one way to increase LED brightness," and that "[t]he '341 Patent is also clear that forward voltage can be changed to increase brightness" are inapposite. Sur-reply 22, 24 (citing Ex. 1001, 3:11–19; 7:3–8; 9:17–24; 11:31–35)). The voltage used to drive an LED or circuit, which can be increased or decreased, is not the same as or equivalent to the claimed "forward voltage," which is "*the minimum* voltage difference required between the anode and cathode of the LEDs in the claimed circuit *to allow current to flow* through the LEDs" as construed in Section III.C. Patent Owner's Sur-reply arguments are unavailing for similar reasons:

> Petitioner argues that a switch could not change the forward voltage by cutting it in half or doubling it. Petitioner confuses the difference between providing forward voltages to several LED circuits (as required by the claims) and providing forward voltages to a single LED. If a switch is switching between different LED circuits (for example, an LED circuit in parallel and an LED circuit in series), then the forward voltage might easily be doubled or halved. *On the other hand, if a switch is increasing current to a single LED, then the voltage would increase gradually*. PO's expert testimony is fully consistent with this understanding.

Sur-reply 8 (citing Pet. Reply 6) (emphasis added).

With regard to Patent Owner's *third* argument, the cited portion in column 3, lines 12 through 19 of the '341 patent discloses that

> [the] invention comprises circuits and devices that can be driven with more than one AC or DC forward voltage "multi-voltage" at 6V or greater based on a selectable desired operating voltage level that is achieved by electrically connecting the LED circuits in a series or parallel circuit configuration and/or more than one level of brightness "multi-brightness" based on a switching means that connects and/or disconnects at least one additional LED circuit to and/or from a first LED circuit.

Ex. 1001, 3:12–19. At best, the cited portion of the '341 patent (and the corresponding portion of the '295 application) indicates that the "switching means" connects and disconnects LED circuits. *Id.* The cited portion does not indicate that the switch is capable of changing the configuration of the interconnection between LED circuits from series to parallel or vice versa. *Id.* Nor does it indicate that the switch is the electrical component that "provides at least two different DC forward voltages" to "the first operating LED circuit" or to "the at least one additional LED circuit," as encompassed by the scope of claims 3, 10, and 17.

Patent Owner takes the position that

> [t]o the extent there are minor differences between an embodiment and the specific claim language (e.g., the term 'switch' is not explicitly mentioned in a particular embodiment or the embodiment does not specify whether it uses AC or DC), a POSITA would easily understand how to implement those differences and would understand that they can look to other embodiments for the differences."

PO Resp. 43–44; *see* Sur-reply 14 (Patent Owner arguing that "[a] POSITA would understand how to use a switch to change between two forward voltage levels"). However, the claimed subject matter must be disclosed in

the specification—it is not sufficient for the claimed subject matter to be obvious in view of the specification's disclosure. *Ariad*, 598 F.3d at 1351 (holding that "the test for sufficiency is whether the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had *possession* of the claimed subject matter as of the filing date" and that "a description that merely renders the invention obvious does not satisfy the requirement" (emphasis added)); *Turbocare Div. of Demag Delaval Turbomachinery Corp. v. Gen. Elec. Co.*, 264 F.3d 1111, 1119 (Fed Cir. 2001) (affirming summary judgment for failing to satisfy the written description requirement where the "original disclosure is completely lacking in any description of an embodiment in which the spring is located" where claimed, and holding that, although "[s]uch an embodiment may have been obvious from" that disclosure, "that is not enough to satisfy the written description requirement"); *Rivera v. International Trade Commission*, 857 F.3d 1315, 1322 (Fed. Cir. 2017) (finding that "[t]he specification [] does not teach a container with an integrated filter, and so, does not provide written description support for such a container, even if that type of container might be rendered obvious by the specification"). Similarly, Patent Owner's argument that "[t]he circuits in Fig. 12 are provided as an exemplary 'LED package 100' that can be integrated into larger circuits and modified" which "would include, for example, 'wiring' the package to be switchable between series and parallel configurations" is unavailing because the "original disclosure is completely lacking in any description of an embodiment in which" the "'wiring'. . . [is] switchable between series and parallel configurations." Sur-reply 22–23; *see* Pet. Reply 18.

We further disagree that Petitioner is attempting to read any particular embodiment into claims 3, 10, and 17. None of the embodiments, considered individually or in combination, discloses or enables the full breadth of claims, as Petitioner contends. *See* Pet. 31–32.

Based on the complete record developed during trial, Petitioner establishes, by a preponderance of the evidence, that claims 3, 10, and 17 lack sufficient written description support in the '295 application underlying the '341 patent as required by 35 U.S.C. § 112(a).

Separate from the written description requirement, 35 U.S.C. § 112(a) includes an *enablement* requirement. *Ariad Pharmaceuticals, Inc. v. Eli Lilly and Co.*, 598 F.3d 1336, 1344 (Fed. Cir. 2010) (*en banc*). Enablement requires the specification of a patent to "teach those skilled in the art how to make and use the full scope of the claimed invention without 'undue experimentation.'" *Genentech, Inc. v. Novo Nordisk, A/S*, 108 F.3d 1361, 1365 (Fed. Cir. 1997) (quoting *In re Wright*, 999 F.2d 1557, 1561 (Fed. Cir. 1993)); *see also Amgen v. Sanofi*, No. 21-757, 598 U.S. __, slip op. at 13 (2023) ("[T]he specification must enable the full scope of the invention as defined by its claims.").

Petitioner's "impossibility of multiple minimum voltages" arguments with respect to the inventions recited in claims 3, 10, and 17 are persuasive to show a lack of written description as discussed above, as well as to show a lack of enablement, indefiniteness, and PGR eligibility, as discussed below. We agree that, "[b]ecause each circuit has only one such minimum, there is only one 'forward voltage' for each circuit, and no switch can

provide 'at least two different DC forward voltages' to either [individual] circuit." Pet. 18.

As we discussed above, the '295 application (and the '341 patent) addresses two different forward voltages based on the type of wiring connection, parallel or serial, between *two* circuits, i.e., the "at least one of the first operating LED circuit" and "the at least one additional LED circuit." Similar to what we discussed above, the disclosures of the '295 application and the '341 patent do not address or explain how it would even be possible to apply two different minimum voltages for the very same circuit as would be necessary in two of the three situations encompassed by the scope of claims 3, 10, and 17, i.e., the situations in which: (1) the two different DC forward voltages are provided to *only* the first operating LED circuit; and (2) two different DC forward voltages are provided to *only* the at least one additional LED circuit. We further note that the portions of the '295 application corresponding to the portions of the '341 patent cited by Petitioner refer to the disclosed LED circuits as "single voltage LED circuits." Ex. 1003, 17–19 ('295 application as filed, paragraphs 28 and 30). This disclosure further lends support to a finding that multiple minimum voltages are not applied to individual circuits, the single voltage LED circuits, unless at least two of these single voltage LED circuits are connected together.

Based on the complete record developed during trial, we are persuaded that Petitioner establishes, by a preponderance of the evidence, that the '295 application underlying the '341 patent lacks enabling disclosure supporting claims 3, 10, and 17 as required by 35 U.S.C. § 112(a).

For the purposes of the analysis of PGR eligibility in Section III.F *infra*, we also determine that neither the '597 PCT nor the applications intervening between the '597 PCT and the '295 application provide sufficient written description support or enabling disclosure for claims 3, 10, and 17 for the same reasons discussed above.

5. 35 U.S.C. § 112(b)

We are persuaded that it is more likely than not that the '295 application underlying the '341 patent "fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus*, 572 U.S. at 901. That is, it is unclear what the scope of claims 3, 10, and 17 is, given that a POSITA could not possibly apply two different DC forward voltages, under the construction of "forward voltage" that we adopted in Section III.C, to only one of the two single voltage LED circuits. That is, apply two different DC forward voltages to: (1) *only* the claimed the first operating LED circuit; or (2) *only* the at least one additional LED circuit, as is encompassed by the scope of claims 3, 10, and 17. We are persuaded that Petitioner establishes that claims 3, 10, and 17 are indefinite because it would have been impossible to apply two different minimum voltages (i.e., the claimed "two different DC forward voltages") to only one single voltage LED circuit (i.e., only one of the claimed first operating circuit and the at least one additional circuit). *Cf. Synchronoss Techs., Inc. v. Dropbox, Inc.*, 987 F.3d 1358, 1366–67 (Fed. Cir. 2021) (finding the challenged claims indefinite and therefore invalid because they "nonsensical and require an impossibility—that the digital media file contain a directory of digital media files").

Based on the complete record developed during trial, we are

persuaded that Petitioner establishes, by a preponderance of the evidence, that claims 3, 10, and 17 are indefinite under 35 U.S.C. § 112(b).

E. Challenge 2—Lack of Written Description and Enablement, and Indefiniteness of Claims 4, 11, and 18

Petitioner contends that claims 4, 11, and 18 are invalid (i) because the Specification does not describe or enable the allegedly impossible subject matter and thus, these claims lack written description and enabling support in the '295 application or the '341 patent; and (ii) because claims 4, 11, and 18 are drawn to impossible subject matter, they are also indefinite. Pet. 32–33.

1. Petitioner's Initial Contentions

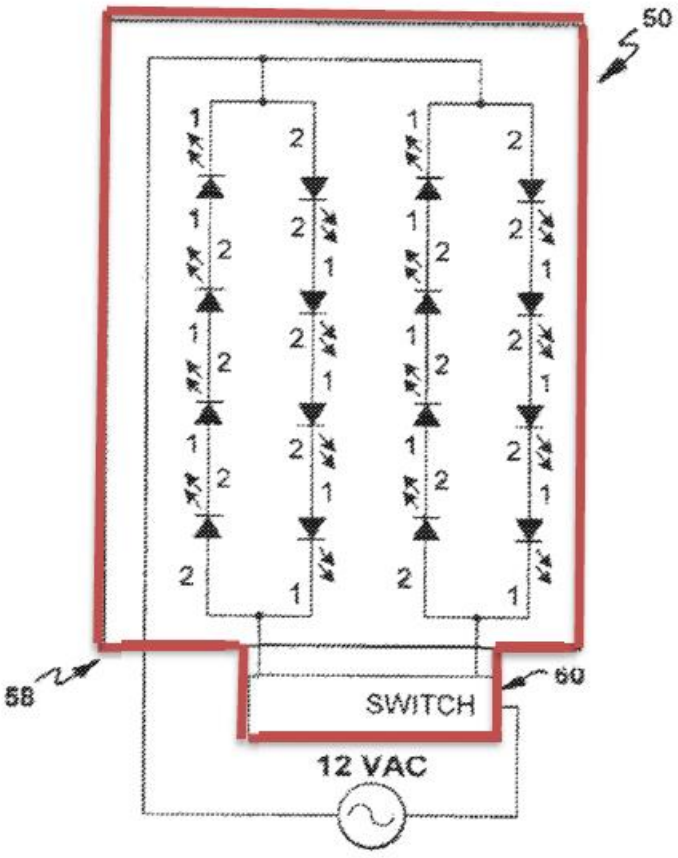
Petitioner argues that claims 4, 11, and 18 of the '341 patent claim "impossible subject matter [that] is not disclosed in the Pre-AIA Applications," particularly because "the independent claims define the 'LED lighting device' [as] compris[ing] the switch, but the dependent claims [4, 11, and 18] require that the switch be 'between' that same 'LED lighting device' and the power source." Pet. 20–21.

2. Patent Owner's Response and Sur-reply

Patent Owner disputes Petitioner's position and contends that "[t]hese features [of dependent claims 4, 11, and 18] are clearly supported and disclosed in the '597 [PCT] Application" because Figures 7 and 9 of the '597 Application "clearly disclose 2-way switch 60 connected between an AC power source and an LED lighting device" and because "the '597 Application discloses embodiments where the switch is part of the LED lighting device. PO Resp. 32–33 (citing Ex. 1018 ¶¶ 57, 58, Figs. 7, 9). Patent Owner argues that "[t]here does not appear to be any dispute that this claim is directed toward an arrangement similar to Fig. 7, except that the box

50 comprising the LED device is extended to encompass switch 60 as shown in the red box," reproduced below. *Id.* at 45.

FIG. 7



Patent Owner's annotated version of Figure 7 of the '341 patent. *Id.* at 46.

Patent Owner alternatively contends that the claimed switch acts as an interface:

> While the independent claims characterize the LED device as "comprising" the switch, a POSITA would understand that Claims 4, 11 and 18 are simply specifying where in the LED device the switch would be connected relative to the power source. In other words, the claims are directed to a switch that acts as the interface between the AC voltage power source and the LED lighting device. By acting as the interface, this switch is

> both *a part of* the LED lighting device (as the independent claims require) and *between* the AC voltage power source and the LED lighting device (as the dependent claims require).

Id. at 46–47 (citing Ex. 1001, Figs. 7, 9 (Patent Owner arguing that the cited figures show a switch located between a voltage source and the rest of a LED device)); *see* Sur-reply 16–17, 25–26.

3. Petitioner's Reply

Petitioner's responds that claims 4, 11, and 18 "are nonsensical because they require the switch, which is part of the LED lighting device, to be connected to itself." Pet. Reply 14 (citing *Becton, Dickinson and Co. v. Tyco Healthcare Group, LP*, 616 F.3d 1249, 1254–56 (Fed. Cir. 2010)).

Petitioner contends that "[Patent Owner's] assertion that these claims are disclosed in Figures 7 and 9 and [0057]-[0058] of the '597 PCT is wrong for multiple reasons." *Id.* (citing PO Resp. 32–33). Petitioner contends that "[e]ach of Figures 7 and 9 and the accompanying text discloses a switch that is external to the LED device." *Id.* (citing Ex. 1018 ¶ 59 ("switch 74 is electrically connected between the multi-brightness LED device 62 and the AC voltage source 78")). According to Petitioner, "[n]othing in those disclosures describe how the switch can be both a part of the LED lighting device and between that device and the AC voltage source." *Id.* (citing Ex. 1034 ¶¶ 25–27).

4. 35 U.S.C. § 112(a)

Patent Owner's arguments are unavailing. As to Patent Owner's initial contention, Patent Owner cites portions in Figures 7 and 9 of the '597 PCT and the '341 patent that depict switch 60 as being external to multi-voltage and/or multi-brightness LED lighting device 50 and lamp 58 in Figure 7 and depict two-way switch 74 as external to multi-brightness LED lighting

device 62 in Figure 9. *See* PO Resp. 32–33 (citing Ex. 1018 ¶¶ 57, 58, Figs. 7, 9). Patent Owner also cites paragraphs 57 and 58 of the '597 PCT in support of its argument. *Id.*; *supra* n.14. Paragraph 57 of the '597 PCT describes Figure 7 and does not disclose how switch 60 is part of LED lighting device 50 and/or lamp 58. Ex. 1018 ¶ 57. Paragraph 58 of the '597 PCT describes Figure 8, which depicts "at least two bridge rectified 68 series LED circuits 69," but does not depict a switch, let alone one included within multi-brightness LED lighting device 62. *Id.* ¶ 58. The cited figures of the '597 PCT do not depict and the cited portions do not describe how the claimed "switch" can be a constituent part of the LED lighting device of independent claims 1, 9, and 15 *and* be between the LED lighting device and AC voltage power source as required by claims 4, 11, and 18. Even assuming, *arguendo*, Patent Owner could cite to any support for re-drawing the box corresponding to multi-voltage and/or multi-brightness LED lighting device 50 in its annotated version of Figure 7 to *include* switch 60, Patent Owner's annotated version of Figure 7 still would not support a finding that switch 60 is *between* LED lighting device 50 and the AC voltage source.

As to Patent Owner's alternative "interface" contention, even assuming, *arguendo*, that Patent Owner cited to sufficient underlying evidence or support for characterizing the switch as an "interface," such evidence would still not support a finding that the claimed "switch" could be *part* of the LED lighting device of independent claims 1, 8, and 15 *and* also be "connected between the AC voltage power source and the LED lighting

device," as recited in claims 4, 11, and 18, which depend directly from claims 1, 8, and 15.

We agree that the portions of the '295 application corresponding to the portions of the '341 patent and the '597 PCT cited by Patent Owner do not and cannot show the claimed switch as being part of the claimed LED lighting device and at the same time being disposed between the voltage source and the claimed LED lighting device.

We are persuaded that the Petition shows by a preponderance of the evidence that claims 4, 11, and 18 lack sufficient written description support in the '295 application underlying '341 patent as required by 35 U.S.C. § 112(a).

With regard to the *enablement* requirement, we are persuaded that the '295 application does not "teach those skilled in the art how to make and use the full scope of the claimed invention without 'undue experimentation'" because it is "impossible" for the switch to be both part of the LED lighting device and between the LED lighting device and the voltage source, as discussed above in this section.

We are persuaded that the Petition shows by a preponderance of the evidence that claims 4, 11, and 18 lack sufficient enabling disclosure in the '295 application underlying '341 patent as required by 35 U.S.C. § 112(a).

For the purposes of the analysis of PGR eligibility in Section III.F *infra*, we also determine that neither the '597 PCT nor the applications intervening between the '597 PCT and the '295 application provide

sufficient written description support or enabling disclosure for claims 4, 11, and 18 for the reasons discussed above.

5. 35 U.S.C. § 112(b)

We are persuaded that the '295 application underlying the '341 patent "fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention" for reasons similar to those discussed above. *Nautilus*, 572 U.S. at 901. That is, it is unclear what the scope of claims 4, 11, and 18 is, given that a POSITA could not possibly make the claimed switch both a constituent part of the claimed LED lighting device (as required by claims 1, 8, and 15 from which claims 4, 11, and 18 directly depend) *and* dispose it between the claimed LED lighting device and the claimed AC voltage power source (as required by claims 4, 11, and 18).

In view of the above, the Petition establishes by a preponderance of the evidence that claims 4, 11, and 18 are indefinite under 35 U.S.C. § 112(b).

F. Eligibility for Post-Grant Review

The post-grant review provisions set forth in section 6(d) of the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (September, 2011) ("AIA"), apply only to patents subject to the first-inventor-to-file provisions of the AIA. *See* AIA § 6(f)(2)(A) (stating that the provisions of Section 6(d) "shall apply only to patents described in section 3(n)(1)"). Patents subject to the first-inventor-to-file provisions are those that issue from applications "that contain[] or contained at any time . . . a claim to a claimed invention that has an effective filing date as defined in section 100(i) of title 35, United States Code, that is on or after" March 16, 2013. AIA § 3(n)(1); *see supra* n.4. "A petition for a post-grant review may

only be filed not later than the date that is 9 months after the date of the grant of the patent or of the issuance of a reissue patent (as the case may be)." 35 U.S.C. § 321(c).

Petitioner contends that the '341 patent is eligible for post-grant review because, even if some of the claims are entitled to the benefit of a filing date before March 16, 2013 by virtue of the parent application(s), (i) challenged claims 3, 4, 10, 11, 17, and 18 have an earliest effective filing date that is on or after March 16, 2013, and (ii) one of the parent applications of the '341 patent that issued as a patent contains claims having earliest effective filing dates on or after March 16, 2013. Pet. 16–23. Petitioner further contends that the Petition was filed within nine months of the issue date of the '341 patent. *Id.* at 3.

Patent Owner argues that, "[t]o the extent the Board determines claims 3, 4, 10, 11, 17, or 18 are not supported by Pre-AIA Applications because it determines that the claims are impossible, the claims are still ineligible for post-grant review because new matter added during prosecution cannot convert pre-AIA claims to post-AIA claims." PO Resp. 36. According to Patent Owner,

> [t]he Final Guidelines for Implementing the Fist Inventor To File Provisions of the AIA provide that "an amendment (other than a preliminary amendment filed on the same day as [the] application) seeking to add a claim to a claimed invention that is directed to new matter in an application filed on or after March 16, 2013, that, as originally filed, discloses and claims only subject matter also disclosed in a previously filed pre-AIA application to which the application filed on or after March 16, 2013, is entitled to priority or benefit under 35 U.S.C. 119, 120, 121, or 365, would not change the application from a pre-AIA application into an AIA application."

Id. at 37 (citing 78 Fed. Reg. 11,083 (Feb. 14, 2013) (Ex. 2015)); *see* Sur-reply 20–21 (Patent Owner arguing, in part, that "the Guidelines clarify that a claim to new matter does not have a filing date and therefore does not impact the other claims in the patent, not contradicting the AIA").

AIA § 3(n)(1) reads as follows:

> (n) EFFECTIVE DATE. —
>
> > (1) IN GENERAL. — Except as otherwise provided in this section, the amendments made by this section shall take effect upon the expiration of the 18-month period beginning on the date of the enactment of this Act, and shall apply to any application for patent, and to any patent issuing thereon, that contains or contained at any time—
> >
> > > (A) a claim to a claimed invention that has an effective filing date as defined in section 100(i) of title 35, United States Code, that is [after March 15, 2013]; or
> > >
> > > (B) a specific reference under section 120, 121, or 365(c) of title 35, United States Code, to any patent or application that contains or contained at any time such a claim.

We are persuaded by Petitioner's response that "[t]he statute's [AIA § (3)(n)(1)] explicit [language] 'contains or contained at any time' limitation on 'a claim' does not provide for, nor permit, an exception for claims added by amendment during prosecution." Pet. Reply 10. Petitioner also persuasively argues that the "'Examination Guidelines' cited by Patent Owner do not conflict with the statute defining *PGR eligibility of issued patents*." *Id.* (emphasis added).

To determine whether any of claims 3, 4, 10, 11, 17, and 18 of the '341 patent is entitled to a right of priority and effective filing date based on the '597 PCT (i.e., the first application in the priority chain filed before 2013), we determine whether the earlier-filed application satisfies the following two requirements set forth in 35 U.S.C. § 112(a)—"(1) a written

description of the subject matter of the claim(s) at issue in the later filed nonprovisional application, and (2) an enabling disclosure to permit one of ordinary skill in the art to make and use the claimed invention in the later filed nonprovisional application without undue experimentation." *See* MPEP § 211.05.

We are persuaded that the '597 PCT lacks sufficient written description support for the inventions recited in claims 3, 10, and 17 of the '341 patent. *Supra* § III.D. Dependent claims 3, 10, and 17 of the '341 patent are therefore not entitled to an effective filing date as early as that of the '597 PCT (i.e., 2010). *Id.* Independently, the '597 PCT lacks an enabling disclosure for the inventions recited in claims 3, 10, and 17 of the '341 patent—for this additional reason, these claims do not receive an effective filing date corresponding to the '597 PCT.

Our determinations of lack of written description support and lack of enabling disclosure for claims 4, 11, and 18 and '597 provide two additional, independent bases for PGR eligibility. *See* AIA § 3(n)(1).

We further do not agree with Patent Owner that Petitioner is arguing that "the claims are not entitled to any priority date at all," nor do we agree that the claims are not entitled to any priority date. PO Resp. 32. In this case, the effective filing date is, at best, only as early as the filing date of the '295 application from which the '341 patent matured. Patent Owner has not demonstrated that any of the applications intervening between the '597 PCT and the '295 application—U.S. Patent Application Nos. 16/274,164, 15/685,429, and 14/172,644—provide sufficient support (i.e., enablement or written description) for claims 3, 4, 10, 11, 17, and 18 of the '341 patent. The '295 application was filed on January 10, 2020, which is after March

16, 2013, and thus the first-inventor-to-file provisions of the AIA apply to our analysis of *all* of the challenged claims. *See supra* n.4.

We further determine that Petitioner filed the Petition within the 9-month statutory period for requesting post-grant review in accordance with 35 U.S.C. § 321(c). The '341 patent issued on February 23, 2021 (*see* Ex. 1001, code (45)), and the Petition in this proceeding was accorded a filing date of November 12, 2021 (*see* Paper 4). Thus, the Petition was filed less than 9 months after the date of issuance of the '341 patent.

In view of the above, we are persuaded that PGR eligibility of the '341 patent is conferred by the effective filing date of claims 3, 4, 10, 11, 17, and 18.

Petitioner additionally argues that claims 1–15 of the '001 patent have an effective filing date on or after March 16, 2013 because none of the pre-AIA applications in the priority chain of the '001 patent disclose the subject matter of independent claims 1 and 11 and dependent claims 9 and 15 of the '001 patent. Pet. 21–23. Patent Owner disputes Petitioner's contentions. PO Resp. 15–16. As we determine that the '341 patent is PGR eligible on the basis of the effective filing date of claims 3, 4, 10, 11, 17, and 18, we need not determine whether any of claims 1–15 of the '001 patent have an effective filing date on or after March 16, 2013.

G. Challenge 3—Anticipation by Bruning

Petitioner contends that claims 1, 3, 5, 7, 8, 10, 12, 14, 15, 17, and 19 are unpatentable as anticipated under 35 U.S.C. § 102 over Bruning. Pet. 33–53. For the reasons that follow, we are persuaded that Petitioner demonstrates anticipation of claims 1, 5, 7, 8, 12, 14, 15, 17, and 19 by Bruning by a preponderance of the evidence.

1. Overview of Bruning

Bruning is titled "Control and Drive Circuit Arrangement for Illumination Performance Enhancement with LED Light Sources." Ex. 1004, code (54) (Title). Bruning "relates to backlighting of display panels, including the backlighting in LCD panels." *Id.* ¶ 1. More particularly, Bruning discloses a backlight for an LCD display comprised of an array of LEDs, the backlight driven and controlled by a fast pulse power converter to provide a response time for the backlight on the order of microseconds. *Id.* at code (57) (Abstract).

Bruning's Figure 4, reproduced below, illustrates an LED backlight. *Id.* ¶ 31.

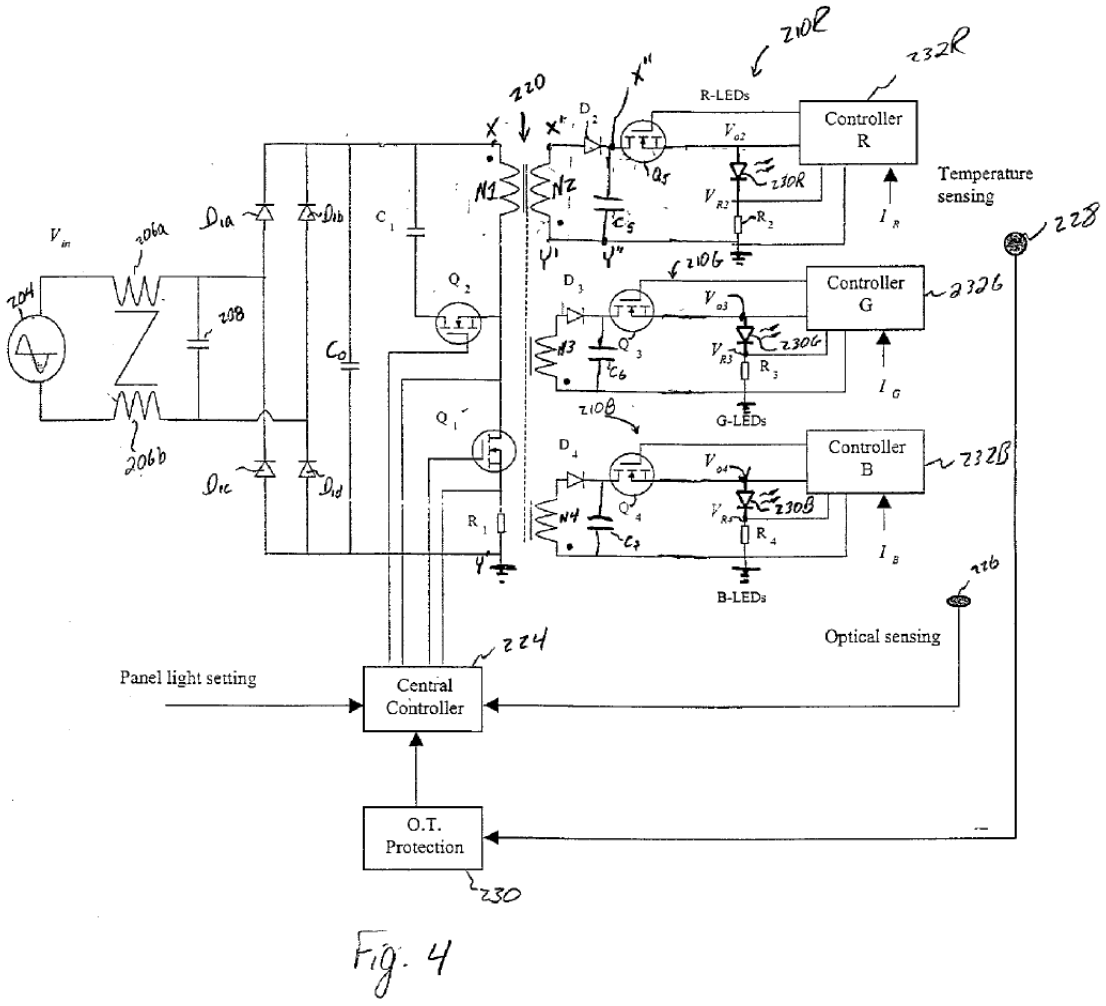


Fig. 4

Figure 4 illustrates an LED backlight. *Id.* ¶ 31.

Figure 4 illustrates drive circuitry for an LED backlight. *Id.* The drive circuitry includes: an AC voltage source 204 connected to inductors 206a, 206b and capacitor 208; diodes D_{1a}, D_{1b}, D_{1c}, D_{1d} comprising a full wave rectification bridge circuit which provides full wave rectification of the AC input of AC source 204; capacitor C_o for smoothing the rectified AC signal further into a first order DC voltage that is provided across points X–Y in Figure 4; and converter circuitry between points X and Y. *Id.* ¶¶ 31–32. The converter circuitry between points X and Y in Figure 4 includes a multiple output transformer 220, a switch Q_1, and a resistor R_1. *Id.* ¶ 32. Multiple

output transformer 220 has a primary winding N1 and three secondary windings N2, N3, and N4 each magnetically coupled to the primary winding. *Id.* Secondary windings N2, N3, and N4 are included in LED sub-array circuits 210R, 210G, and 210B of an RGB LED array. *Id.*

Switch Q_1 is cycled on and off by a central controller 224. *Id.* ¶ 33. When Q_1 is on (closed), the rectified voltage applied across X–Y drops across primary winding N1; and when Q_1 is off (open), the rectified voltage drops across switch Q_1. *Id.* When switch Q_1 is "off," the circuit between points X and Y is open. *Id.* ¶ 34. In addition, a negative voltage appears across primary winding N1, induced by secondary windings N2–N4, when Q_1 is off. *Id.* During the "on" portions of a switching cycle of switch Q_1, a voltage $V_{X'-Y'}$ is created across points X' and Y' in LED sub-array 210R due to the induced voltage in secondary winding N2 created by current i_{N1}, in primary winding N1. *Id.* ¶ 35. Similar voltages are created in the other secondary windings (N3 and N4). *Id.*

LED sub-arrays 210R, 210G, and 210B generate the light output of the LED backlight 200 using applied voltages V_{R0}, V_{G0}, and V_{B0}, respectively. *Id.* ¶ 40. Since turns ratios between primary winding N1 and secondary windings N2, N3, and N4 of transformer 220 are fixed, voltages V_{R0}, V_{G0}, V_{B0} applied to LED sub-arrays 210R, 210G, and 210B, respectively, are controlled by controller 224 by controlling the duty cycle of switch Q_1. *Id.* ¶ 38. And, since voltages V_{R0}, V_{G0}, V_{B0} establish the maximum level of light output of LED sub-arrays 210R, 210G, and 210B, respectively, the maximum level of light output by LED sub-arrays 210R, 210G, and 210B, respectively, are likewise controlled by controller 224, by controlling the duty cycle of switch Q_1. *Id.* In addition, a "panel light

setting" input to central controller 224 (controlled by a user or by other input, including video input) adjusts the duty cycle of Q_1 and thus the maximum light output of LED sub-arrays 210R, 210G, and 210B. *Id.*

The drive circuitry in Figure 4 further includes a switch Q_5 and controllers 232R, 232G, and 232B. *See* Fig. 4. Switching Q_5 on and off in a cyclical manner causes the current through red LED 230R to rise and fall in a cyclical manner, thus resulting in a cyclical rise and fall in the light output of red LED 230. *Id.* ¶ 42. Controller 232R independently controls the switching of switch Q_5. *Id.* The duty cycle set by controller 232R controls the amount of time that Q_5 is turned on and off in a switching cycle. *Id.* Controller 232R and switch Q_5 have response times on the order of microseconds; thus, the duty cycle may be on the order of microseconds. *Id.* Similarly, the light output of green and blue LED sub-arrays 210G and 210B are independently controlled by the independent controllers 232G and 232B. *Id.* ¶ 44. Thus, independent controllers 232R, 232G, and 232B determine the relative output of red, green, and blue light, respectively, output by LED sub-arrays 210R, 210G, and 210B, respectively. *Id.* Since the duty cycle of each controller (and the resulting cyclical change of light output) is on the order of microseconds, the eye integrates the separate color outputs into a resulting color composite. *Id.* Thus, controllers 232R, 232G, and 232B may be used to regulate the color point and/or color content of the generated white light. *Id.*

2. Independent Claim 1

[1.pre] "An LED lighting device comprising:"

Petitioner contends that "Bruning discloses an LED lighting device (Figs. 2, 4) comprising an LED backlight for a mobile device, including the

claimed elements as shown below." Pet. 34 (citing Ex. 1004, codes (54) (Title), (57) (Abstract), Figs. 1–5, ¶¶ 4, 7, 9–15, 24–29, 31–51; Pet. § VIII.A (Bruning overview); Ex. 1002 ¶ 67). Patent Owner does not contest Petitioner's evidence and arguments with respect to the preamble. *See* PO Resp. Based our review of the complete record developed during trial, we are persuaded that Petitioner demonstrates sufficiently that Bruning discloses the preamble of claim 1.[17]

[1.a] "a first operating LED circuit and at least one additional LED circuit"

Petitioner contends "Bruning discloses a first operating LED circuit (LED sub-array circuit 210R) and at least one additional LED circuit (e.g., LED sub-array circuits 210G and 210B)." Pet. 34–35 (citing Ex. 1004 ¶¶ 31–44 (paragraph 40 disclosing "LED sub-array circuits 210R, 210G, 210B")). Patent Owner does not contest Petitioner's evidence and arguments with respect to this limitation. *See* PO Resp. Based our review of the complete record developed during trial, we are persuaded that Petitioner demonstrates sufficiently that Bruning discloses limitation 1.a.

[1.b] "at least one of the first operating LED circuit or the at least one additional LED circuit including at least two LEDs connected in either series or parallel"

Petitioner contends that "Bruning discloses at least one of the first operating LED circuit (LED subarray circuit 210R) or the at least one additional LED circuit (e.g., LED sub-array circuits 210G and 210B)

[17] We need not determine whether the preambles of any of claims 1, 8, and 15 are limiting because Petitioner persuasively shows that Bruning discloses the subject matter of the preambles in this third challenge and also persuasively shows that the combination of Bruning and Kabel teaches the subject matter of the preambles in the following, fourth challenge.

including at least two LEDs connected in either series or parallel ('One LED 230R is used in FIG. 4b to represent all of the LEDs in the sub-array 210R.')." Pet. 36 (citing Ex. 1004 ¶¶ 24, 25, 31–44; Ex. 1002 ¶ 69). Petitioner further contends that "Bruning discloses that each of the sub-arrays includes at least two LEDs connected in either series or parallel, and preferably includes redundant connections to minimize the impact of a failure or short of an LED." *Id.* (citing Ex. 1004 ¶¶ 24, 25, 40; Ex. 1002 ¶ 70). Patent Owner does not contest Petitioner's evidence and arguments with respect to this specific limitation. *See* PO Resp. Based our review of the complete record developed during trial, we are persuaded that Petitioner demonstrates sufficiently that Bruning discloses limitation 1.b.

[1.c] "the at least one additional LED circuit being configured to emit a different color light compared to the first operating LED circuit"

Petitioner contends that Bruning discloses "the at least one additional LED circuit (e.g., sub-array circuits 210G and 210B emitting green and blue light, respectively) being configured to emit a different color light compared to the first operating LED circuit (LED sub-array circuit 210R emitting red light)." Pet. 36 (citing Ex. 1004 ¶¶ 4, 7, 9, 11, 12, 14, 15, 24–29, 37, 40, 48–50, Fig. 4; Ex. 1002 ¶ 71). Patent Owner does not contest Petitioner's evidence and arguments with respect to this limitation. *See* PO Resp. Based our review of the complete record developed during trial, we are persuaded that Petitioner demonstrates sufficiently that Bruning discloses limitation 1.c.

[1.d] "a switch capable of at least one of: (a) switching a voltage level input to at least one of the first operating LED circuit or the at least one additional LED circuit, or (b) switching the at least one additional LED circuit on or off" and

[1.e] "wherein (a) or (b) is selectable by a user switching the switch, and"

Petitioner contends:

> Each of the "panel light setting" and "switch Q_1" individually satisfies this limitation under the proper construction of "switch." . . .
>
> Bruning discloses a switch ("switch Q_1") capable of switching a voltage level input to at least one of the first operating LED circuit (LED sub-array circuit 210R) or the at least one additional LED circuit (e.g., LED sub-array circuits 210G and 210B). Switch Q_1 controls the voltages VR0, VG0, VB0 that are applied to the red, green, and blue LED sub-arrays 210R, 210G and 210B, respectively. Specifically, switch Q_1's duty cycle (controlled by the user via controller 224) controls the voltage applied to the LED circuits . . .
>
> Additionally, Bruning discloses that "the duty cycle of Q_1 . . . may be used to adjust the overall intensity of the LED backlight." This is because Q_1's duty cycle controls the applied voltages VR0, VG0, VB0, and the applied voltages VR0, VG0, VB0 determine their respective circuits' maximum current and maximum brightness level.

Pet. 38–39 (citing Ex. 1004 ¶¶ 26, 36–38, 45, Fig. 4a; Ex. 1002 ¶¶ 72–75) (third alteration in original).

Petitioner alternatively contends that

> Bruning also discloses a switch ("panel light setting") capable of switching a voltage level input to at least one of the first operating LED circuit (LED sub-array circuit 210R) or the at least one additional LED circuit (e.g., LED sub-array circuits 210G and 210B). Bruning discloses that the user directly controls the "panel light setting" switch to adjust Q1's duty cycle. The setting of the panel light setting switch controls the voltages (VR0, VG0, VB0) that are applied to the red, green, and blue LED sub-arrays 210R, 210G and 210B, respectively, via controller 224 and switch Q1 as discussed above.

Id. at 39–40 (citing Ex. 1004 ¶ 38; Ex. 1002 ¶ 76). Petitioner also contends that Bruning discloses that

> each of voltages (VR0, VG0, VB0) is selectable by a user switching the switch (panel light setting switch and switch Q1). The voltages are selectable by a user directly operating the panel light setting switch, which effects the change in the voltages via controller 224 and switch Q1 as discussed above. The voltages are selectable by a user indirectly operating switch Q1, which the user indirectly operates via the panel light setting switch and controller 224.

Id. at 40 (citing Ex. 1002 ¶ 78); *see* Ex. 1002 ¶ 77.

Patent Owner's Arguments

Patent Owner argues the Bruning does not explicitly describe how its "panel light setting" works, nor does it describe the panel light setting as a switch. PO Resp. 56–57.

Rather, Patent Owner contends that the panel light setting is merely an input to central controller 224, which is the component that actually 'adjusts the duty cycle of [transistor] Q1.'" *Id.* at 57 (citing Ex. 1004 ¶ 38). Patent Owner further argues that "switch Q1 is a transistor 'controlled by controller 224,' which sets the 'duty cycle of switch Q1'" "and is therefore not capable of being switched by a user." *Id.* at 53 (citing Ex. 1004 ¶¶ 37, 38); *see* Sur-reply 26. According to Patent Owner, "it would be 'impossible' for a user to perform the switching function of transistor Q1, which has cycles 'each having a period on the order of **10 microseconds**.'" PO Resp. 54 (citing Ex. 1004 ¶ 33; Ex. 2010, 81:20–24). Patent Owner contends that "[a] user cannot possibly switch that fast, nor could a user reasonably switch that many times" and that "[u]ser input may influence the controller to set a different rate of switching for Q1, but Q1 still switches regardless of user input." *Id.* at 54 (citing Ex. 2008 ¶ 117).

Patent Owner also argues that "the claims require that the switch individually switch a single LED circuit." *Id.* at 55 (citing Ex. 1001, claim 1); *see* Sur-reply 26–27. According to Patent Owner, "in Bruning['s] Fig. 4, Q1, through primary winding N1, affects voltage to each of secondary windings N2-N4—and therefore LED circuits 210R, 210G and 210B—simultaneously," but "does [not] individually switch any of these circuits." PO Resp. 55–56 (citing Ex. 1004 ¶¶ 33, 34).

Analysis of Parties' Arguments

With regard to Patent Owner's argument about the Bruning's "panel light setting," Petitioner acknowledges, in its fourth challenge applying Bruning in view of Kabel, that Bruning does not explicitly describe how its "panel light setting" is implemented. Pet. 54. We do not view Petitioner's acknowledgment as a deficiency of Petitioner's third challenge because independent claim 1 does not include any limitations specifying how the switch should be implemented—rather, claim 1 includes limitations specifying the function(s) that the switch must perform. Patent Owner's argument that Bruning does not explicitly describe the "panel light setting" as a switch is unavailing because the relevant inquiry is whether a POSITA would have understood Bruning's "panel light setting" to disclose a switch that performs the claimed function(s) recited in independent claim 1.

We are persuaded by Petitioner's argument that the user in Bruning "controls the 'panel light setting' switch to adjust Q1's duty cycle." *Id.* at 39 (citing Ex. 1004 ¶ 38); *see* Ex. 1004 ¶¶ 36, 37. Petitioner also persuasively points to Bruning's disclosure of adjusting Q_1's duty cycle to affect "the voltages (VR0, VG0, VB0) that are applied to," and "establish the maximum

level of light output" by, "the red, green, and blue LED sub-arrays 210R, 210G and 210B." Pet. 39–40 (citing Ex. 1002 ¶ 76); Ex. 1004 ¶ 38.

Patent Owner's second argument again implicitly construes the claimed "switch" to be *directly* controlled by the claimed user, although Patent Owner apparently withdraws its construction, requiring the same, that was initially set forth in its Preliminary Response. *See generally* PO Resp. We discern no argument or evidence in the record in support of requiring the claimed "switch" to be directly controlled by the claimed "user." Merely because "switch Q1 is a transistor 'controlled by controller 224'" does not mean that the switch is "not capable of being switched by a user." *See* PO Resp. 53, 56 (citing Ex. 1004 ¶¶ 37, 38). Having reviewed the entire record developed during trial, we maintain our preliminary determination that the claims do not exclude controlling the claimed "switch" *indirectly*, for example, by a user through a controller. As such, we agree with Petitioner that switch Q_1 also teaches the claimed "switch" because switch Q_1 is indirectly controlled by the claimed "user" via controller 224 and/or via Bruning's panel light setting. Because we determine that a user can *indirectly* control Bruning's panel light setting, for example by using controller 224, the period length of the transistor's cycles (i.e., on the order of microseconds) does not undermine the user's ability to control the switching. *See id.* at 22 (citing Ex. 1004 ¶ 33).

We further discern no argument or evidentiary support in the record to support a finding that "the claims require that the switch individually switch a single LED circuit." PO Resp. 55. Instead, we agree with Petitioner that "[t]he claims require a switch that switches a voltage level input to 'at least one of' the LED circuits, which literally encompasses switching a voltage

level input to all of the LED circuits." Pet. Reply 22 (citing Ex. 1035, 77:7–14).

Based upon our review of complete record developed during trial, we are persuaded that Petitioner demonstrates sufficiently that Bruning discloses limitations 1.d and 1.e.

[1.f] "wherein the LED lighting device is configured to connect to an AC voltage power source"

Petitioner points to Bruning's disclosure of an "ac input of ac source 204" as disclosing this limitation. Pet. 40 (citing Ex. 1004 ¶¶ 13, 26, 31–44, Figs. 3, 4). Patent Owner does not contest Petitioner's evidence and arguments with respect to this limitation. *See* PO Resp. Based our review of the complete record developed during trial, we are persuaded that Petitioner demonstrates sufficiently that Bruning discloses limitation 1.f.

For the foregoing reasons, we determine that Petitioner establishes by a preponderance of the evidence that claim 1 is anticipated by Bruning.

3. Dependent Claims 3, 10, and 17

Claims 3, 10, and 17 recite "wherein the switching of the switch provides at least two different DC forward voltages to at least one of the first operating LED circuit or the at least one additional LED circuit." As discussed above in Section III.C, we adopt one of Petitioner's proposals for construing "forward voltage"—"the minimum voltage difference required between the anode and cathode of the LEDs in the claimed circuit to allow current to flow through the LEDs." In Section III.D.5, under the adopted definition, we determine that claims 3, 10, and 17 were indefinite under 35 U.S.C. § 112(b). As we are unable to ascertain the scope of these claims, we cannot reach the merits of Petitioner's prior art-based challenges to claims 3, 10, and 17. *Cf. Samsung Elecs. Am., Inc. v. Prisua Eng'g Corp.*, 948 F.3d

1342, 1353 (Fed. Cir. 2020) ("[T]he proper course for the Board to follow, if it cannot ascertain the scope of a claim with reasonable certainty for purposes of assessing patentability, is to decline to institute the IPR or, if the indefiniteness issue affects only certain claims, to conclude that it could not reach a decision on the merits with respect to whether petitioner had established the unpatentability of those claims under sections 102 or 103.").

4. Dependent Claims 5 and 7

Claim 5 recites in part, "wherein the switching of the switch changes light output of the LED lighting device." Patent Owner does not specifically address Petitioner's challenge to dependent claim 5. *See generally* PO Resp. Petitioner persuasively cites Bruning's disclosure of voltages VR0, VG0, VB0 that "establish the maximum level of light output of LED sub-arrays 210R, 210G and 210B, respectively." Pet. 43 (citing Pet. VIII.B.1 (showing for claim 1); Ex. 1002 ¶ 83; Ex. 1004 ¶¶ 37, 40). Petitioner persuasively contends Bruning additionally "discloses that 'the duty cycle of Q1 … may be used to adjust the overall intensity of the LED backlight." *Id.* (citing Ex. 1004 ¶¶ 26, 45) (alteration in original). Petitioner contends, and we agree, "[a] POSITA would understand that the adjustment of the light output of the LED backlight is an adjustment to the perceived brightness of the laptop screen by a user." *Id.* (citing Ex. 1002 ¶ 84).

Claim 7 recites in part, "a driver electrically coupled to the switch and at least one of the first operating LED circuit or the at least one additional LED circuit." Patent Owner does not specifically address Petitioner's challenge to dependent claim 7. *See generally* PO Resp. Petitioner persuasively contends that "Bruning discloses the LED lighting device of claim 1, further comprising a driver ('drive circuitry') electrically coupled to

the switch ('panel light setting' switch) and at least one of the first operating LED circuit (LED sub-array circuit 210R) or the at least one additional LED circuit (e.g., LED sub-array circuits 210G and 210B)." Pet. 44 (citing Ex. 1004 ¶¶ 13, 31–44, code (57) (Abstract)).

According to Petitioner, "[t]he labeled driver in Figure 4 is circuitry that converts or conditions the power input—ac source 204—and supplies a power output to an LED circuit—the other sides of the transformer N1." *Id.* at 46 (citing Ex. 1004 ¶ 31, Figs. 3–4; Ex. 1002 ¶ 86). Petitioner contends, and we agree, that "Bruning discloses that the driver is electrically coupled to the user-controlled panel light setting switch via central controller 224" and that Bruning's "driver is electrically coupled to each of the LED circuits 210R, 210G, 210B, via secondary windings, diodes, transistors, and resistors, as shown in Figure 4." *Id.* (citing Ex. 1004 ¶¶ 32, 33, 38, Fig. 4; Ex. 1002 ¶¶ 87, 88).

For the foregoing reasons, we determine that Petitioner establishes, by a preponderance of the evidence, that claims 5 and 7 are anticipated by Bruning.

5. Independent Claim 8

Independent claim 8 is substantially similar to independent claim 1 except that the claimed "switch" switches a "brightness level" instead of a "voltage level." Claim 8 recites in part, "switching *a brightness level* of at least one of the first operating LED circuit or the at least one additional LED circuit." Petitioner substantially refers to its analysis of independent claim 1 in support of independent claim 8. Pet. 46–48. Petitioner contends that "[e]ach of the 'panel light setting' switch and 'switch Q1' individually satisfies [the "brightness"] limitation under the proper construction of

'switch.'" *Id.* at 47 (citing Petitioner's analysis of limitation 1.d (switches the voltage level) and claim 5 (switches the brightness level); Ex. 1002 ¶ 93).

As set forth above with respect to dependent claim 5 in Section III.G.3, Petitioner persuasively contends Bruning "discloses that 'the duty cycle of Q1 . . . may be used to adjust the overall intensity of the LED backlight" and that "[a] POSITA would understand that the adjustment of the light output of the LED backlight is an adjustment to the perceived brightness of the laptop screen by a user." *Id.* at 43 (citing Ex. 1004 ¶¶ 26, 45; Ex. 1002 ¶ 84). According to Petitioner, the duty cycle of Q_1 affects the applied voltages VR0, VG0, and VB0 and "[t]he maximum brightness of each circuit is determined by the voltages VR0, VG0, VB0 [which] are selectable by a user directly operating the panel light setting switch, which effects the change in the voltages via controller 224 and switch Q1." *Id.* at 48 (citing Petitioner's analysis of limitation 1.d; Ex. 1002 ¶¶ 94–95).

Patent Owner addresses independent claims 1, 8, and 15 together, and does not appear to make any arguments that are only applicable to independent claim 8. PO Resp. 20–23. As such, in finding Patent Owner's arguments unavailing, we rely on our analysis set forth in Section III.G.2.

For the foregoing reasons, we determine that Petitioner demonstrates by a preponderance of the evidence that independent claim 8 is anticipated by Bruning.

6. Dependent Claims 12 and 14

Dependent claims 12 and 14 recite features substantially similar to dependent claims 5 and 7, respectively. Petitioner refers to its showing for dependent claims 5 and 7 in support of its showing for dependent claims 12

and 14. Pet. 48. We adopt our analysis with respect to claims 5 and 7 set forth above. *Supra* § III.G.4. For the foregoing reasons, we determine that Petitioner demonstrates by a preponderance of the evidence that claims 12 and 14 are anticipated by Bruning.

7. Independent Claim 15

Independent claim 15 is substantially similar to independent claim 1 except that it does not a require a user to interact with the claimed switch. Instead, claim 15, recites in part, "wherein (a) or (b) is selectable by switching the switch." Petitioner cites its showing for independent claim 1 in support of its showing for most limitations. Pet. 49, 53. Petitioner cites additional portions of Bruning to disclose limitations 15.d and 15.e. *Id.*

Petitioner contends that "claim 15 is broader than claim 1 because claim 15 omits 'user'" and "[t]hus, Bruning *additionally* discloses this limitation by disclosing a switch (color specific switches (Q4, Q5)) capable of (b) switching the at least one additional LED circuit (e.g., LED sub-array circuits 210G and 210B, respectively) on or off." *Id.* at 49 (citing Ex. 1004 ¶¶ 41–46, Figs. 4, 4b–4d[18]; Ex. 1002 ¶ 105) (emphasis added). Petitioner further contends that "Bruning discloses the LED circuits can be turned on and off independently." *Id.* at 50 (citing Ex. 1004 ¶¶ 11, 12, 25, 26, 42, 44, 46, Figs. 4, 4b–4d).

Patent Owner addresses independent claims 1, 8, and 15 together, and does not appear to make any arguments that are applicable to only independent claim 15. *See generally* PO Resp. We rely on our analysis set forth in Section III.G.2.

[18] Bruning includes a Figure 4 as well as Figures 4a, 4b, 4c, and 4d.

For the foregoing reasons, Petitioner demonstrates by a preponderance of the evidence that claim 15 is anticipated by Bruning.

8. Dependent Claim 19

Dependent claim 19 recites features substantially similar to claim 5. Petitioner refers to its showing for dependent claim 5 in support of its showing for dependent 19. We adopt our analysis with respect to claim 5 set forth above. *Supra* § III.G.4. For the foregoing reasons, Petitioner demonstrates by a preponderance of the evidence that claim 19 is anticipated by Bruning.

H. Challenge 4—Obviousness over Bruning and Kabel

Petitioner contends that claims 1–3, 5, 7–10, 12, 14–17, and 19 are unpatentable as obvious under 35 U.S.C. § 103 over Bruning and Kabel. Pet. 53–61. For the reasons that follow, we are persuaded that Petitioner demonstrates obviousness of claims 1, 2, 5, 7–9, 12, 14–16, and 19 over Bruning in view of Kabel by a preponderance of the evidence.

1. Overview of Kabel

Kabel is titled "Computer Program, Method, and Device for Controlling the Brightness of a Display." Ex. 1005, code (54) (Title). Kabel relates to "displays used in electronic devices such as laptop computers and avionics and marine equipment" and to "a computer program and method for controlling the brightness of a display by proportionally modifying the luminosity of each pixel in the display." *Id.* ¶ 3. More particularly, Kabel discloses a technique for controlling the brightness of a display by proportionally varying the voltage delivered to each pixel in the display after a back light for the display has been dimmed to its approximate lowest level. *Id.* at code (57) (Abstract).

Figure 1 of Kabel, reproduced below, shows an exploded isometric view of a display's components. *Id.* ¶ 14.

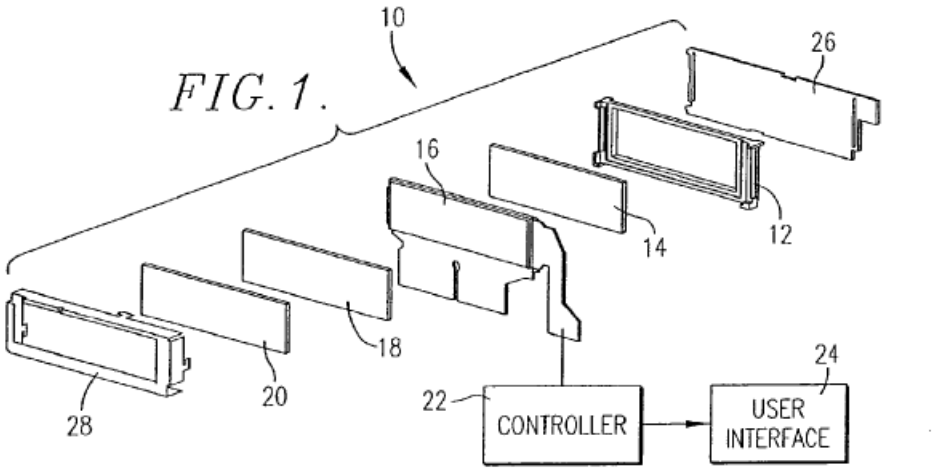


Figure 1 of Kabel, reproduced below, shows an exploded isometric view of the components of a display including a backlight. *Id.* ¶¶ 14, 17–18.

Display 10 illustrated in Kabel's Figure 1 includes: a backlight 12, which may include light-emitting diodes (LEDs), and is used to direct light through a display module 16 to form images on the face thereof; a diffuser panel 14 positioned between backlight 12 and display module 16 for diffusing and uniformly polarizing light emitted from backlight 12; display module 16; a color filter 18 which enables display 10 to display color images; an anti-reflective lens 20 positioned in front of display module 16 and color filter 18, for polarizing light passing through color filter 18 to sharpen images and eliminate glare; a brightness controller 22; and a user interface 24. *Id.* ¶¶ 17–21, 23, 25.

Backlight 12, diffuser panel 14, display module 16, color filter 18, and anti-reflective lens 20 may be sandwiched between a mounting board 26 and a frame 28, while controller 22 and user interface 24 may be integrally mounted with the other components of display 10, or may be mounted in a

separate enclosure attached to the other components of the display. *Id.* ¶ 18. Display module 16 may be a thin-film transistor (TFT) liquid crystal display (LCD) display module having an array of pixels arranged on a glass substrate, whereby active matrix technology is used to activate each pixel by a separate transistor. *Id.* ¶ 21. An image is then created on display module 16 by applying an electric charge to certain pixels to change the pixels' light absorption properties, to thereby vary the amount of light from backlight 12 that passes through the pixels. *Id.*

Brightness controller 22 and user interface 24 are electrically coupled to display module 16 and together control the brightness of display module 16. *Id.* ¶ 26. User interface 24 provides input to controller 22, and may be a touch-screen menu display having up/down arrows, or a manually-activatable slider bar. *Id.* Controller 22 and user interface 24 are operated to brighten or dim images created on display module 16. *Id.* ¶ 27. For example, an operator may press an up arrow or operate a slider bar on user interface 24 to increase the intensity of backlight 12. *Id.* Controller 22 and user interface 24 cooperate for dimming the display module 16 in two ways: first by dimming backlight 12, then by proportionally reducing the luminosity of the pixels of display module 16. *Id.* ¶ 28. More specifically, display module 16 is first dimmed by decreasing the brightness of backlight 12, and once backlight 12 has been dimmed to its lowest level before it turns off (or to a selected threshold level), the display may then be further dimmed by controlling the luminosity of each pixel of the display to limit the amount of light that passes through display module 16. *Id.*

2. Independent Claims 1, 8, and 15

Petitioner's challenge to independent claims 1, 8, and 15 are substantially similar to challenge 3 applying Bruning alone except that in its fourth challenge Petitioner cites Kabel for the switch limitations—limitations 1.d, 1.e, 8.d, 8.e, 15.d, and 15.e. Petitioner contends that "[u]nder [Patent Owner's] narrow construction of 'switch,' it would have been obvious to implement Bruning's 'panel light setting' switch as a 'manually-activatable slider bar' with at least two positions as taught by Kabel." Pet. 58 (citing Pet. § IX.C (Combination Rationale); Ex. 1002 ¶ 129).

Rationale for Combining

As rationale for combining, Petitioner contends that "a POSITA would have been motivated to investigate known implementation details for the 'panel light setting,' and been led to Kabel's teachings," which include "a 'user interface' for 'selectively adjusting brightness of the back light.'" Pet. 54 (citing Ex. 1004 ¶ 38, Fig. 4; Ex. 1005, code (57) (Abstract), ¶¶ 9, 26–28, 30; Ex. 1002 ¶ 118). Petitioner further contends that Bruning and Kabel concern analogous art because they both disclose backlit LCD displays having multiple LEDs in a laptop computer, they both disclose "mix[] . . . red, green, and blue light to form different shades and hues of light as perceived by the user," and they both disclose "ways for a user to control of the LCD display's brightness." *Id.* at 54–58.

Petitioner alleges that a POSITA would have "fill[ed] Bruning's gaps with Kabel's additional implementation details," specifically by implementing Bruning's panel light setting using Kabel's slider bar. Petitioner contends that Kabel discloses brightening or dimming images on a

display in a conventional manner—by using Kabel's slider bar. *Id.* at 56–57 (citing Ex. 1005 ¶¶ 27, 28, 30; Ex. 1002 ¶ 125).

Petitioner contends that the invention disclosed in Kabel includes "an 'entirely conventional' backlight that incorporates 'any conventional light source such as light-emitting diodes (LEDs),' a 'conventional' LCD display, and a 'conventional controller.'" *Id.* at 57 (citing Ex. 1005 ¶¶ 18, 19, 21, 26). Petitioner further contends that "Kabel also indicates that images on the display can be brightened or dimmed 'in a conventional manner' and gives as an example a slider bar." *Id.* (citing Ex. 1005 ¶¶ 27, 28; Ex. 1027 ¶ 30; Ex. 1002 ¶ 126).

Petitioner further contends that

> [a] POSITA would have found that Bruning and Kabel's teachings could have been predictably combined at least because of LED lighting art's predictability and the various elements' known interchangeability. A POSITA would have had a reasonable expectation of success in combining Kabel and Bruning, at least because the references use known variations of existing technology (physical switches like slider bars as user interfaces) to solve routine and well understood problems (adjust settings of a laptop's display, such as brightness) in predictable ways.

Id. at 58 (citing Ex. 1002 ¶ 127).

Patent Owner's Arguments

Patent Owner contends that "[n]othing cited in the Petition indicates that Kabel operates by switching voltage levels to LEDs, or by switching LED circuits on or off as required the claims," and instead, "Kabel uses the slider bar exclusively to provide a dimming function." PO Resp. 62 (citing Pet. 59–60; Ex. 1005 ¶ 28 (Patent Owner contending that the cited portion of Kabel "explain[s] low brightness settings are achieved by dimming the back

light 12 'to its lowest level before it turns off'")). Patent Owner further contends that "Kabel's purpose would be frustrated if the back light were completely shut off because vehicles like aircraft and boats would be at risk of accidents if the display lights were entirely shut off." *Id.* at 63 (citing Ex. 2008 ¶ 33).

Analysis of Patent Owner's Arguments and Rationale for Combining

Patent Owner apparently distinguishes Kabel's slider bar on the basis that it performs the function of dimming back light 12, as contrasted with the function of turning on or off back light 12. *See* PO Resp. 62–63 (Pet. 59–60; Ex. 1005 ¶ 28). Patent Owner takes the position that, because Kabel "explain[s] low brightness settings are achieved by dimming the back light 12 'to its lowest level **before it turns off**,'" this disclosure in Kabel precludes back light 12 from actually turning off. *Id.* at 62 (quoting Ex. 1005 ¶ 28). Even assuming, *arguendo*, that Kabel does not disclose turning *off* back light 12, the independent claims only require "a switch cable of *at least one of*: (a) switching a brightness level of at least one of the first operating LED circuit or the at least one additional LED circuit, *or* (b) switching the at least one additional LED circuit on or off, wherein (a) *or* (b) is selectable by a user switching the switch." That is, the switch need not be capable of both functions (a) and (b)—if the reference or combination of references teaches even one of the following three situations: a switch capable of function (a) only; a switch capable of function (b) only; or a switch capable of functions (a) and (b), then the cited reference(s) teach the subject matter of the claim. Accordingly, even if Kabel's slider bar is used exclusively for dimming, independent claims 1, 8, and 15 are met by the cited teachings of Bruning and Kabel because the combination teaches claimed function (a).

We have reviewed Petitioner's contentions and cited evidence as to claims 1, 8, and 15, summarized above. We are persuaded that the Petition's obviousness analysis articulates sufficiently how the teachings of Bruning and Kabel would have been combined, why such a combination would have been desirable to one of skill in the art, and that Petitioner's rationale is supported by sufficient rational underpinning and has a reasonable expectation of success as is set forth above. We are persuaded, having reviewed the cited portions of Bruning and Kabel, the limitations of independent claims 1, 8, and 15 are taught or suggested by the combination.

Based on the current record and for the foregoing reasons, we determine that Petitioner establishes, by a preponderance of the evidence, that independent claims 1, 8, and 15 are unpatentable as obvious in view of the combination of Bruning and Kabel.

3. Dependent Claims 2, 3, 5, 7, 9, 10, 12, 14, 16, 17, and 19

With respect to claims 3, 10, and 17, as we discussed above in Section III.G.3, claims 3, 10, and 17 were indefinite under 35 U.S.C. § 112(b) under our adopted definition of "forward voltage" recited in these claims. As we are unable to ascertain the scope of these claims, we cannot reach the merits of Petitioner's prior art-based challenges to claims 3, 10, and 17.

With respect to claims 2, 5, 7, 9, 12, 14, 16, and 19, we have reviewed Petitioner's contentions and the cited references, and we are persuaded that Petitioner's contentions are supported. *See* Pet. 58–61 (citing-in-part Ex. 1002 ¶¶ 134–142, 144–152). Patent Owner does not specifically contest any of claims 2, 5, 7, 9, 12, 14, 16, and 19. *See generally* PO Resp.

Claim 2 recites "[t]he LED lighting device of claim 1, wherein the

switch has at least two positions." Claim 9 depends from claim 8 and recites substantially similar features. Claim 16 depends from claim 15 and recites substantially similar features. Petitioner cites Kabel for these limitations and argues that "it would have been obvious to implement the 'panel light setting' switch as a 'manually-activatable slide bar' with at least two positions as taught by Kabel." Pet. 60–61. Having reviewed the cited portions of Kabel discussing its slider bar, we are persuaded that Kabel teaches that its "manually-activatable slider bar" has at least two positions.

Claim 5 recites "[t]he LED lighting device of claim 1, wherein the switching of the switch changes light output of the LED lighting device." Claim 12 depends from claim 8 and recites substantially similar features. Claim 19 depends from claim 15 and recites substantially similar features. Petitioner contends that "Bruning discloses the user can control a 'panel light setting' switch that allows adjustment of the brightness, or maximum light output of the LED backlight for a laptop's display." Pet. 58 (citing Ex. 1004 ¶¶ 17, 38, Figs. 2, 4). Petitioner alternatively contends that Kabel "discloses the user can control user interface 24 to adjust brightness of the laptop display's backlight." *Id.* at 59–60 (citing Ex. 1005 ¶¶ 9, 18, 26–32, code (57) (Abstract), Fig. 1; Ex. 1002 ¶ 131). Petitioner further contends that "Kabel discloses that the user interface 24 may be a 'manually-activatable slider bar'" and that user interface 24 may be "integrally mounted with the other components of the display 10." *Id.* at 60 (citing Ex. 1005 ¶¶ 18, 26, 30). We are persuaded that the cited portions support Petitioner's contentions.

Claim 7 recites, "[t]he LED lighting device of claim 1, further

comprising a driver electrically coupled to the switch and at least one of the first operating LED circuit or the at least one additional LED circuit." Claim 14 depends from claim 8 and recites substantially similar features. In its fourth challenge, Petitioner does not specifically point to Kabel as teaching the recited driver limitation. Pet. 58–59. We note, however, that with respect to its third challenge, Petitioner persuasively cites Bruning to disclose the recited driver limitation. *See id.* at 44–46 (citing Ex. 1004 ¶¶ 13, 31–44, code (57) (Abstract), Figs. 3–4; Pet. § V.E.5; Ex. 1002 ¶¶ 86–88); *supra* § III.G.4.

Based on the complete record developed during trial and for the foregoing reasons, that Petitioner establishes, by a preponderance of the evidence, that dependent claims 2, 5, 7, 9, 12, 14, 16, and 19 are unpatentable as obvious in view of Bruning and Kabel.

I. Challenge 5—Obviousness over Dowling and Mueller

Petitioner contends that claims 1, 2, 5, 7–9, 12, 14–16, and 19 are unpatentable as obvious under 35 U.S.C. § 103 over Dowling and Mueller. Pet. 61–83.

As we determine that claims 3, 4, 10, 11, 17, and 18 are unpatentable under 35 U.S.C. § 112, that claims 1, 5, 7, 8, 12, 14, 15, and 19 are anticipated under 35 U.S.C. § 102 by Bruning, and that claims 1, 2, 5, 7–9, 12, 14–16, and 19 are unpatentable under 35 U.S.C. § 103(a) over the combination of Bruning and Kabel (*supra* §§ II.D–E, G–H), we need not specifically determine the unpatentability of claims 1, 2, 5, 7–9, 12, 14–16, and 19 over the combination of Dowling and Mueller. *See Boston Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App'x 984 (Fed. Cir. 2020); *see also Beloit Corp. v. Valmet Oy*, 742 F.2d 1421, 1423 (Fed. Cir. 1984) (holding

that once a dispositive issue is decided, there is no need to decide other issues).

IV. CONCLUSION[19]

In summary:

Claims Challenged	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
3, 10, 17	112(a)	Lack of written description, Lack of enablement	3, 10, 17	
3, 10, 17	112(b)	Indefiniteness	3, 10, 17	
4, 11, 18	112(a)	Lack of written description, Lack of enablement	4, 11, 18	
4, 11, 18	112(b)	indefiniteness	4, 11, 18	
1, 3, 5, 7, 8, 10, 12, 14, 15, 17, 19	102	Bruning	1, 5, 7, 8, 12, 14, 15, 19[20]	
1–3, 5, 7–10, 12, 14–17, 19	103	Bruning, Kabel	1, 2, 5, 7–9, 12, 14–16, 19[20]	
1, 2, 5, 7–9, 12, 14–16, 19	103	Dowling,		

[19] 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).

[20] As we are unable to ascertain the scope of these claims, we cannot reach the merits of Petitioner's prior art-based challenges to claims 3, 10, and 17.

Claims Challenged	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
		Mueller[21]		
Overall Outcome			1–5, 7–12, 14–19	

V. ORDER

For the reasons given, it is:

ORDERED that Petitioner has established based on a preponderance of evidence that claims 1–5, 7–12, and 14–19 of the '341 patent are unpatentable; and

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

[21] Because we determined that the challenged claims are unpatentable under 35 U.S.C. § 112, unpatentable as anticipated under 35 U.S.C. § 102 by Bruning, or unpatentable under 35 U.S.C. § 103 as obvious over the combination of Bruning and Kabel, we decline to address this ground.

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