

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SHENZHEN CHIC ELECTRICS CO., LTD.,
Petitioner,

v.

PILOT, INC.,
Patent Owner.

IPR2021-01232
Patent 10,046,653 B2

Before JEFFREY W. ABRAHAM, JULIA HEANEY, and
STEVEN M. AMUNDSON, *Administrative Patent Judges*.

ABRAHAM, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. *Background and Summary*

Shenzen Chic Electrics Co., Ltd. (“Petitioner”) filed a petition for an *inter partes* review (Paper 2 (“Pet.”)) challenging claims 1 and 3–20 of U.S. Patent No. 10,046,653 B2 (Ex. 1001 (“the ’653 patent”). Pilot Inc. (“Patent Owner”) did not file a Preliminary Response.

On January 14, 2022, we instituted an *inter partes* review of claims 1 and 3–20. Paper 6 (“Institution Decision” or “Inst. Dec.”). After institution, Patent Owner filed a Response to the Petition (Paper 8, “PO Resp.”), Petitioner filed a Reply to Patent Owner’s Response (Paper 12, “Reply”), and Patent Owner filed a Corrected Sur-reply (Paper 21, “Sur-reply”).¹

On October 12, 2022, the parties presented arguments at an oral hearing for this proceeding. We have entered a transcript of the hearing into the record. Paper 26 (“Tr.”). After the hearing, we authorized additional briefing regarding the patentability of claim 3. Paper 24 (Order authorizing additional briefing); Paper 25 (Pet. Suppl. Brief); Paper 27 (PO Suppl. Brief).

We have jurisdiction under 35 U.S.C. § 6. We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a). Based on the record before us, we conclude that Petitioner has shown, by a preponderance of the evidence, that claims 1 and 4–20 of the ’653 patent are unpatentable, but has not shown that claim 3 is unpatentable.

¹ Patent Owner’s original Sur-reply (Paper 13) was expunged, and Patent Owner filed its Corrected Sur-reply pursuant to our Order Granting-in-Part Petitioner’s Motion to Strike (Paper 20).

B. Real Parties-in-Interest

Each party identifies itself as the real party-in-interest. Pet. 1; Paper 4, 2.

C. Related Matters

The parties indicate that the '653 patent is at issue in one currently pending district court litigation: *Pilot Inc. v. The NOCO Company, Inc.*, No. 2:20-cv-01452 (D. Ariz.), as well as IPR2021-00777 (“the 777 IPR”).² Pet. 2; Paper 4, 2. The parties also indicate that the '653 patent was at issue in other district court litigations that have been dismissed without prejudice. Pet. 2; Paper 4, 2–3.

D. The '653 Patent (Ex. 1001)

The '653 patent, titled “Automobile Charger,” issued August 14, 2018, and is directed to “a novel automobile charger with a safe power supply charging quickly.” Ex. 1001, codes (45), (54), 1:11–13. The '653 patent explains that prior-art automobile charging devices, i.e., devices for jump starting vehicles, suffered from various problems, including an inability to automatically detect whether a load (e.g., an automobile storage battery) is connected, whether an automobile engine or storage battery has a reverse current, and whether the battery state is suitable for heavy power generation. Ex. 1001, 1:18–24. The '653 patent aims to solve these problems, and depicts one solution in Figure 1, reproduced below.

² The Board issued a Final Written Decision in the 777 IPR on October 3, 2022. IPR2021-00777, Paper 22.

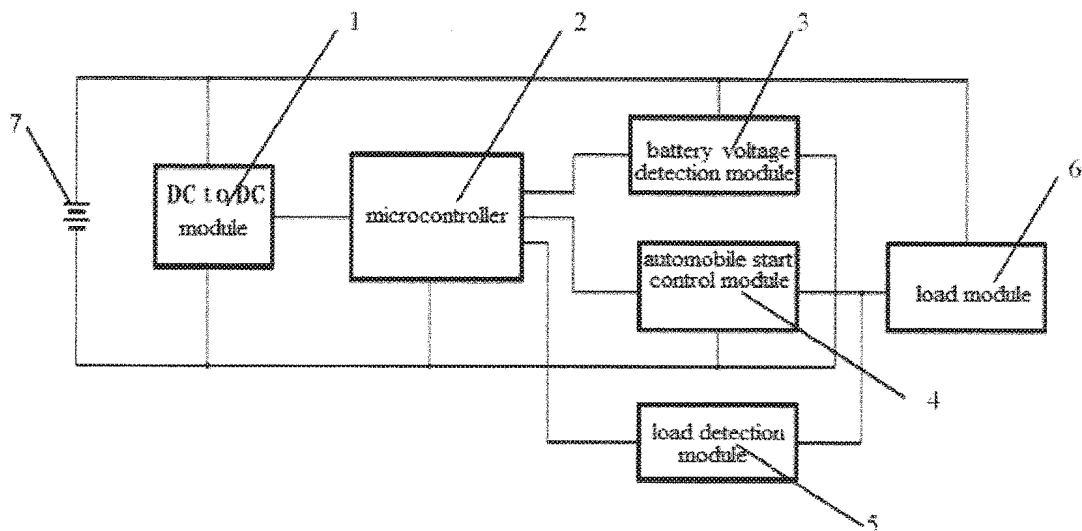


Figure 1 is a block diagram showing one embodiment of an automobile charger that includes DC to DC module 1, microcontroller 2, battery voltage detection module 3, automobile start control module 4, load detection module 5, load module 6, and direct current power supply 7 (the jump starter battery). Ex. 1001, 2:55–58. Although not shown in Figure 1, the '653 patent states that load module 6 “comprises the automobile storage battery and the automobile engine is located on the end of the load module.” Ex. 1001, 3:23–25.

The '653 patent explains that the DC to DC module provides “the stable voltage for the microcontroller which collects relevant data” and “determines whether the automobile storage battery is connected with the automobile engine through the load detection module.” Ex. 1001, 4:4–16. When the load is correctly connected, the automobile start control module (an electronic switch) is automatically activated, and the battery starts to supply power to the load module. Ex. 1001, 2:18–19, 4:16–18. If the load is

not connected, or positive and negative polarities are reversed, the automobile start control module is automatically deactivated, and the battery stops supplying power to the load module. Ex. 1001, 4:19–23.

The '653 patent explains that its automobile charger provides benefits over prior-art devices, including, *inter alia*, (1) controlling the supply power for the load, which protects the product and reduces the product size and material cost, (2) providing low voltage protection to prevent damage caused by over-discharging the battery, (3) preventing improper operations by the user, such as reversed polarity, which can cause damage to the automobile or direct current power supply, and (4) employing voltage backflow protection for an abnormal load, wherein the automobile start line is closed to protect the battery when an abnormal voltage is detected. Ex. 1001, 2:20–36.

E. Illustrative Claims

Of the challenged claims, claims 1, 7, and 17 are independent claims. Claims 1 and 7 are illustrative, and are reproduced below.

1. An automobile charger, comprising:

a first pole of a first battery connected with a first lead of a power converter, a first lead of a battery level detector, and a first lead of a load;

a second pole of the first battery connected with a second lead of the power converter, a first lead of a microcontroller, a first lead of a switching circuit and a second lead of the battery level detector;

a third lead of the power converter connected with a second lead of the microcontroller; and

three additional leads of the microcontroller connected with a third lead of the battery level detector, a second lead of the switching circuit and a first lead of a load detector, respectively,

wherein a second lead of the load detector is connected with a third lead of the switching circuit and a second lead of the load, and

wherein the load includes a second battery and a motor.

Ex. 1001, 5:2–20.

7. A charging device, comprising:

a battery level detector to detect a level of a first battery;

a load detector to detect a type of connection of a load;

a microcontroller to generate an output signal based on the level of the first battery and the type of connection of the load; and

switching circuitry to selectively connect the first battery to the load based on the output signal.

Ex. 1001, 6:28–35. Independent claim 17 is a method claim containing limitations similar to those in claim 7. Ex. 1001, 7:6–13.

F. Reviewed Unpatentability Challenges

We review the following challenges from the Petition:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1, 3, 6	103	Yu, ³ Klang, ⁴ Koebler ⁵
4, 7–12, 14–20	103	Yu, Klang, Koebler, Thomason ⁶
5, 13	103	Yu, Klang, Koebler, Richardson ⁷

³ CN 203211234 U, issued Sept. 25, 2013 (Ex. 1005).

⁴ US 6,424,158 B2, issued July 23, 2002 (Ex. 1006).

⁵ US 2013/0241498 A1, published Sept. 19, 2013 (Ex. 1007).

⁶ US 2005/0110467 A1, published May 26, 2005 (Ex. 1008).

⁷ US 2013/0154543 A1, published June 20, 2013 (Ex. 1009).

Petitioner relies on declarations from James L. Kirtley, Jr., Ph.D. Ex. 1004 (“Kirtley Declaration”); Ex. 1020 (“Kirtley Rebuttal Declaration”).⁸

Patent Owner relies on a declaration from Joseph McAlexander III. Ex. 2005. Petitioner deposed Mr. McAlexander, and filed the transcript of the deposition as Exhibit 1019. *See also* Ex. 2004 (executed signature page and errata pages from the McAlexander deposition).

II. ANALYSIS

A. *Legal Standards*

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden of persuasion never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review).

A claim is unpatentable under 35 U.S.C. § 103 if “the differences between the claimed invention and the prior art are such that the claimed

⁸ In its Patent Owner Response, Patent Owner argues that Dr. Kirtley’s Declaration is not admissible because Petitioner failed to show Dr. Kirtley is a person of ordinary skill in the art. PO Resp. 30–32. Petitioner challenged this assertion in its Reply, and Patent Owner did not respond in its Sur-reply. Reply 22–24; *see generally* Sur-reply. During the Oral Hearing, Patent Owner confirmed it was no longer pursuing this argument. Tr. 51:21–52:1.

invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains.” 35 U.S.C. § 103 (2018). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when present, objective evidence of nonobviousness.⁹ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

To show obviousness, it is not enough to merely show that the prior art includes separate references covering each separate limitation in a challenged claim. *Unigene Labs., Inc. v. Apotex, Inc.*, 655 F.3d 1352, 1360 (Fed. Cir. 2011). “This is so because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418–19 (2007). On the other hand, an obviousness analysis “need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.” *KSR*, 550 U.S. at 418; *accord In re Translogic Tech., Inc.*, 504 F.3d 1249, 1259 (Fed. Cir. 2007).

B. Level of Ordinary Skill in the Art

Petitioner asserts that a person of ordinary skill in the art would have had “a bachelor’s degree in electrical engineering or its equivalent and two years of experience in electrical engineering with some experience in design

⁹ The parties have not asserted or otherwise directed our attention to any objective evidence of nonobviousness.

of battery charging systems.” Pet. 8. Patent Owner states that it adopts this definition for purposes of its Response. PO Resp. 4.

In light of the record before us, we adopt Petitioner’s proposal regarding the level of ordinary skill in the art. Based on our review of the ’653 patent and the prior art of record, we determine that the definition offered by Petitioner comports with the qualifications a person would have needed to understand and implement the teachings of the ’653 patent and the prior art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (explaining that specific findings regarding ordinary skill level are not required “where the prior art itself reflects an appropriate level and a need for testimony is not shown”) (quoting *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 163 (Fed. Cir. 1985)). It is also consistent with the level of skill in the art adopted in the 777 IPR, which also involves the ’653 patent. IPR2021-00777, Paper 7 at 6–7.

C. Claim Construction

In an *inter partes* review, we construe claim terms according to the standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–17 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b) (2022). Under *Phillips*, claim terms are afforded “their ordinary and customary meaning.” *Phillips*, 415 F.3d at 1312. “[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention.” *Id.* at 1313. “Importantly, the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification.” *Id.*

Petitioner proposes constructions for the terms “battery level detector,” “load detector,” and “switching circuit”/“switching circuitry.” Pet. 9–12. Petitioner contends that “[a]ll other claim terms are to be understood according to their plain and ordinary meaning.” Pet. 9.

Patent Owner contends that Petitioner’s proposed constructions are not necessary because they do “nothing more than combine the words already present with words that do nothing to alter or clarify the meaning of the terms,” and because “none of Petitioner’s proposed constructions appear material to the issues to be determined by the Board.” PO Resp. 5. Petitioner did not respond to Patent Owner’s contention. *See generally* Reply.

Claim 3 of the ’653 patent depends from claim 1 and recites that “the switching circuit conducts power supply or power outage for the load through the microcontroller.” Ex. 1001, 6:13–14. As part of the Final Written Decision in the 777 IPR, we construed the phrase “conducts power supply or power outage for the load through the microcontroller” to mean “[t]he power for charging the load passes through the microcontroller.” IPR2021-00777, Paper 22, 11–12. After the oral hearing, we explained in an Order that “[f]or purposes of consistency, we intend to adopt the same construction of the phrase ‘conducts power supply or power outage for the load through the microcontroller’ for this proceeding as we did in the 777 IPR.” Paper 24, 3. Neither party, however, addressed the patentability of claim 3 under this construction in its papers or during the oral hearing. *See* Pet. 9–12, 47–49; PO Resp. 4–6; *see generally* Reply; Sur-reply; Tr. Therefore, we authorized supplemental briefing on the patentability of claim 3 under this proposed construction. Paper 24, 3.

In its supplemental brief, Petitioner contends that our proposed construction “contradicts the technical disclosure of the ’653 patent” and that “[t]he proper construction of this term is ‘switching circuit under control of the microcontroller that selectively conducts power supply or power outage for the load.’” Pet. Suppl. Br. 3.¹⁰ In particular, Petitioner contends that claim 3, through claim 1, only recites one connection between the microcontroller and the first battery, such that the connections in claim 3 do not allow the power supply from the first battery to pass through the microcontroller to the load. Pet. Suppl. Br. 4–5. Claim 1, however, recites “an automobile charger, comprising . . .” which is an open-ended term, meaning that claim 1 is not limited to only the connections expressly recited therein. Petitioner’s arguments do not address this open-ended aspect of the plain language of the claims.

Petitioner also argues that the language of claim 3 is consistent with its construction because claim 3 “places the switching circuit between the second pole of the first battery . . . and the second lead of the load.” Pet. Suppl. Br. 5. Although Petitioner’s interpretation may be consistent with the language in claim 3, we discern nothing in claim 3 that expressly limits the placement of the switching circuit, especially considering the open-ended “comprising” language used in claims 1 and 3.

¹⁰ We disagree with Petitioner’s assertion that its supplemental brief is “Petitioner’s first opportunity to address the construction” of this limitation “in this proceeding.” Pet. Suppl. Br. 3. Petitioner had the opportunity to construe any and all claim terms in its Petition. As noted above, Petitioner proposed constructions for only three claim terms and stated that “[a]ll other claim terms are to be understood according to their plain and ordinary meaning.” Pet. 9. Nevertheless, we address Petitioner’s arguments in its supplemental brief regarding the construction of this limitation in claim 3.

Nor are we persuaded by Petitioner's argument that the Specification "is consistent" with its proposed construction. Pet. Suppl. Br. 5–8. Once again, although Petitioner's interpretation may be consistent with language in the Specification describing an embodiment of the invention, the plain language of claims 1 and 3 does not suggest a clear intention to limit the scope of the claim, as proposed by Petitioner. *See Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 906 (Fed. Cir. 2004) ("Even when the specification describes only a single embodiment, the claims of the patent will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using 'words or expressions of manifest exclusion or restriction.'"). Indeed, in its Reply, Petitioner takes the position that the claims are not necessarily limited by the embodiment disclosed in the Specification. *See, e.g.*, Reply 4–5 (asserting that Mr. McAlexander's testimony that his conclusion was informed by the disclosure of only one embodiment in the specification reflects an "improper importation of specification limitations into the claim language"); *see also* Ex. 1001, 2:61–67 (stating "[t]he technical solutions of the present disclosure will be described more clearly and fully in conjunction with the drawings in the embodiments of the present disclosure, and obviously, the described embodiments are merely part of the present disclosure, not all the embodiments").

Petitioner also argues that we should not construe the term "conduct" in claim 3 to literally mean "conducts electrical conductivity or current transmission" because elsewhere the '653 patent uses the term "conduct" according to "another conventional meaning for the word," namely to mean "perform." Pet. Suppl. Br. 8–9. Petitioner makes a similar argument

regarding the term “through,” which, according to Petitioner, is used in some places in the Specification according to “its other conventional meaning” of “using” or “by means of.” Pet. Suppl. Br. 9. But implicit in this argument is the fact that the construction of this phrase we adopted in the 777 IPR is based on at least one of the conventional meanings of the terms “conduct” and “through.” This confirms that our construction is consistent with the plain language of the claim.

For all of the foregoing reasons,¹¹ we are not persuaded that we should deviate from the construction of this claim limitation that we adopted in the 777 IPR. *See* IPR2021-00777, Paper 22 at 11–12 (explaining that this construction is consistent with the plain language of the claim and comports with the Federal Circuit’s decision in *Chef Am., Inc. v. Lamb-Weston, Inc.*, 358 F.3d 1371, 1373 (Fed. Cir. 2004), which Petitioner does not address). As a result, we construe the phrase “conducts power supply or power outage for the load through the microcontroller” to mean “[t]he power for charging the load passes through the microcontroller.”

We determine that we do not need to expressly construe any other terms for purposes of this Decision. *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.”)).

¹¹ Patent Owner, in its supplemental brief, states that it agrees with Petitioner’s assertion that the disputed limitation does not require that the power for charging the load passes through the microcontroller. PO Suppl. Br. 1. Patent Owner, however, does not offer any additional arguments in support of its statement. PO Suppl. Br. 1.

D. Claims 1, 3, and 6 – Obviousness in View of Yu, Klang, and Koebler

Petitioner contends claims 1, 3, and 6 are unpatentable as obvious in view of Yu, Klang, and Koebler. Pet. 13–50; Reply 3–20. Patent Owner argues that Petitioner has failed to provide substantial evidence of obviousness. *See generally*, PO Resp.; Sur-reply.

1. Yu (Ex. 1005)

Yu discloses “an apparatus for the emergency starting of an automobile.” Ex. 1005 ¶ 1. Yu explains that when using an external lead-acid battery to start an automobile, a large current may be generated that can damage the original battery of the automobile or even cause an explosion. Ex. 1005 ¶ 2. According to Yu, its invention “can effectively prevent electric sparks from being generated when it is connected to or disconnected from the automobile, and thus safety can be improved.” Ex. 1005 ¶ 3. Yu provides a schematic diagram of its apparatus in Figure 1, reproduced below.

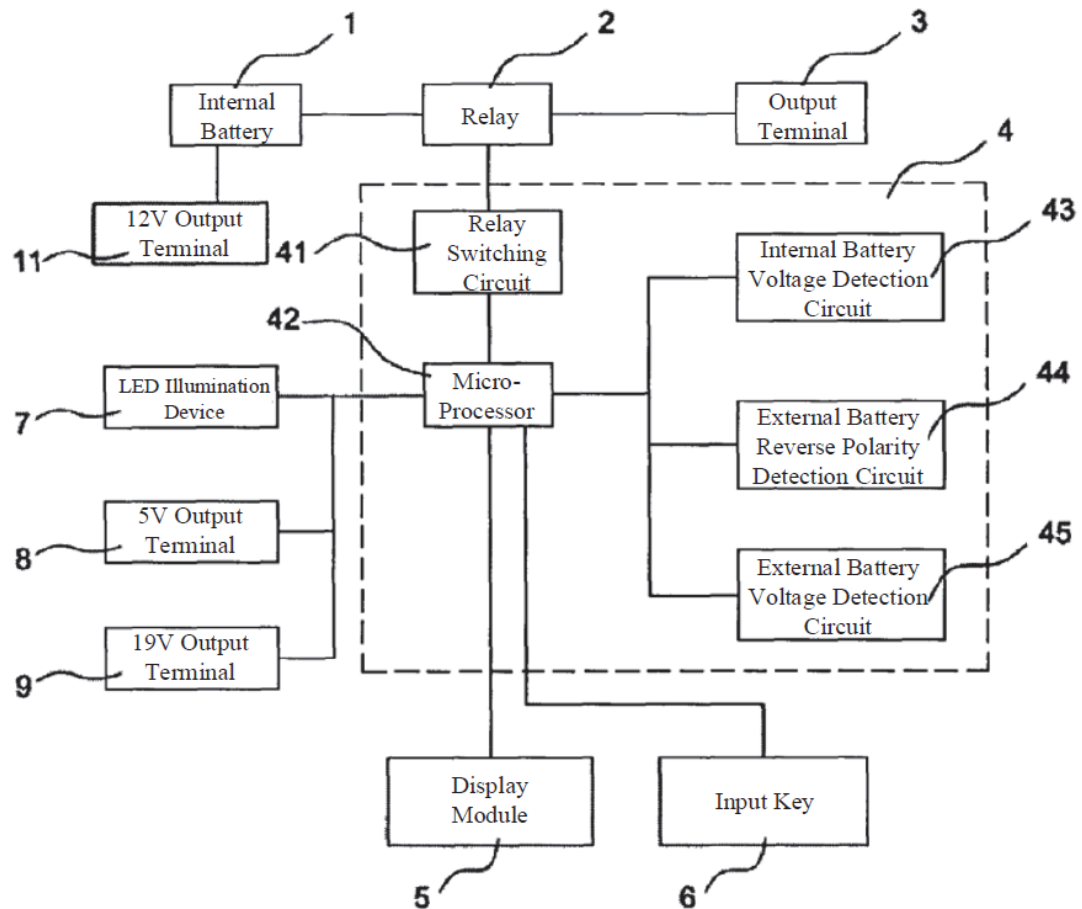


Figure 1 of Yu shows an apparatus for starting an automobile, including internal battery 1, relay 2, output terminal 3, and control module 4. Ex. 1005 ¶ 21. Control module 4 includes relay switching circuit 41, microprocessor 42, internal battery voltage detection circuit 43, external battery reverse polarity detection circuit 44, and external battery voltage detection circuit 45. Ex. 1005 ¶¶ 21–23. Yu explains that microprocessor 42 is configured to control the on/off state of relay 2 via relay switching circuit 4, and that external battery reverse polarity detection circuit 44 is “configured to provide a signal indicating correct or erroneous connection of an external battery.” Ex. 1005 ¶ 21. Yu further explains that internal battery voltage detection circuit 43 and external battery voltage detection circuit 45

provide signals to microprocessor 42 to facilitate monitoring of the condition of the internal and external batteries, respectively. Ex. 1005 ¶ 27.

2. Klang (Ex. 1006)

Klang is directed to a “method and system for performing automatic and rapid diagnostic testing and charging of a battery.” Ex. 1006, code (57). In one embodiment, Klang “utilizes a novel interactive stepping procedure which allows batteries determined to be good to be recharged in a minimum period of time without overheating the battery or spewing electrolyte.” Ex. 1006, 3:51–54.

3. Koebler (Ex. 1007)

Koebler is directed to an apparatus for starting the motor of an internal combustion engine, and includes “a solid state switching configuration for high powered battery systems for protecting against over-charging, over-discharging and short circuiting of batteries, especially starter batteries for internal combustion engines.” Ex. 1007 ¶ 2.

4. Analysis

a. Claim 1

Petitioner contends Yu teaches or suggests an automobile charger, as claim 1 recites,¹² based on Yu’s description of its invention as “an apparatus for starting of an automobile, and specifically, . . . an apparatus for emergency starting of an automobile.” Pet. 18 (quoting Ex. 1005 ¶ 1; citing Ex. 1005 ¶¶ 2–4, 21, Fig. 1).

¹² Neither party affirmatively argues that the preamble is limiting. Although we find that the evidence supports that Yu discloses the preamble, we make no determination that the preamble is limiting.

Claim 1 recites that its automobile charger comprises “a first pole of a first battery connected with a first lead of a power converter, a first lead of a battery level detector, and a first lead of a load” and “a second pole of the first battery connected with a second lead of the power converter, a first lead of a microcontroller, a first lead of a switching circuit and a second lead of the battery level detector.” Ex. 1001, 5:3–9. Petitioner contends that Yu discloses a first battery (“internal battery 1”), a power converter (e.g., power supply chip “IC9” in Figure 4), a battery level detector (“internal battery voltage detection circuit 43”), a switching circuit (that includes relay 2 and the switching control circuit 41 in Figures 1 and 2), a microcontroller (microprocessor 42), and a load (e.g. an automobile engine, storage battery, or external battery connected to “output terminal 3”). Pet. 19–23 (citing Ex. 1005 ¶¶ 2, 21–23, 26–27, Figs. 1, 2, 4; Ex. 1004 ¶¶ 83–92, 107–108).

Petitioner further contends that “negative and positive internal battery terminals ‘B-’ and ‘B+’ are mapped to claimed first pole and second pole of the first battery, respectively.” Pet. 27. Petitioner argues that the negative terminal B- (the first pole of the first battery) is grounded and connected with the ground “PGND” at Pin 1 of the power converter chip IC9 as the first lead of the power converter, connected with the ground on the bottom terminal of the resistor R71 within the internal battery voltage detection circuit 43 as the first lead of the battery level detector, and connected with a grounded output terminal of output terminal 3 as the first lead of the load, as claim 1 requires. Pet. 27–29 (citing Ex. 1005, Figs. 2 and 4).

Petitioner contends that the positive terminal B+ (second pole of the first battery) is connected with the top terminal of R69 of internal battery voltage detection circuit 43, as the second lead of the battery level detector,

is connected with microprocessor 42, and connected to contact 1 on the left-hand side of switch component K1, as the first lead of the switching circuit, as claim 1 requires. Pet. 30–32.

Petitioner also argues that it would have been obvious to place the switch between the load and the negative pole. According to Petitioner,

Moving the switch in this manner is simply a modification of known and routine circuit elements (a battery, a switch, and a load) in a known, routine and predictable manner: the switch controls when the circuit between the battery and the load is closed—regardless of whether the switch is locate[d] between the load and the positive pole of the battery or the load and the negative pole. At a minimum, it would have been obvious to try this modification given the limited number of solutions (i.e., two) for connecting a switch between a power supply and the load—i.e., either connecting it to the positive terminal or the negative terminal of the power supply.

Pet. 32–33; *see also* Reply 9–10 (arguing that “[b]ecause each of Yu, Klang and Koebler, were trying to solve the same safety problem of selectively connecting a power source to a load only when it is safe to do so, there is ‘good reason’ under the KSR analysis to try the finite number of topologies and combinations presented in the art”).

Petitioner further contends that Klang and Koebler teach placing a switch on the negative side of the load. Pet. 33–34 (citing Ex. 1006, 7:8–14, Fig. 2; Ex. 1007, Figs. 16, 18, 20, and 22). Moreover, Petitioner contends that:

Koebler teaches that its MOSFET solid-state switch apparatus can be used in “any battery system that requires charging and discharging in order to extend the battery life, and for safety” ([Ex. 1007 ¶ 94]) and this teaching would have guided and motivated a [person of ordinary skill in the art] to apply choices of Koebler’s MOSFET switching designs on positive and

negative sides of the load to implement the switches in the jump start devices or battery charging devices in Yu and Klang.

Pet. 34.

Claim 1 additionally requires various connections (i) between the power converter and microcontroller; (ii) between the microcontroller and the battery level detector, the switching circuit, and a load detector, and (iii) between the load detector and the switching circuit and the load. Ex. 1001, 5:10–19. Petitioner directs us to portions of Yu that teach or suggest these components and connections recited in claim 1. Pet. 21–22, 36–46.

Lastly, claim 1 requires that “the load includes a second battery and a motor.” Ex. 1001, 5:20. Petitioner contends that Yu discloses that the load includes the storage battery of a vehicle and an engine of a car. Pet. 46–47 (citing Ex. 1005 ¶ 2).

Patent Owner argues Petitioner has failed to demonstrate sufficiently that a person of ordinary skill in the art would have been motivated to modify Yu to arrive at the claimed invention. PO Resp. 8. In particular, Patent Owner contends that Petitioner fails to point to any evidence in the asserted prior-art references themselves that provide a reason to combine their teachings, and therefore Petitioner relies on statements in the Kirtley Declaration. Pet. 8–9. Patent Owner states that Dr. Kirtley provides several rationales for combining Yu with the secondary references that are all based on the similarities of the references, which do not constitute substantial evidence of a motivation to combine. PO Resp. 9–15 (addressing paragraphs 120–134 of the Kirtley Declaration). Patent Owner also argues Dr. Kirtley’s opinions suffer from hindsight bias. PO Resp. 15–16.

Patent Owner next criticizes Petitioner's arguments based on the advantages of solid-state switches, such as MOSFET, to replace other electronic switches. PO Resp. 17–20. Patent Owner contends that the challenged claims of the '653 patent simply require an electronic switch, not solid-state switches, and, therefore, “a motivation to use such switches would not itself support any other alterations to the circuitry.” PO Resp. 18–19. As a result, Patent Owner contends that Petitioner's evidence supports only the “direct substitution between different types of electronic switches,” and does not support “substituting *the entire* switching solution of secondary references into Yu.” PO Resp. 19. According to Patent Owner, “[a] motivation to use solid state switches, even if correct, is not a ‘reason to combine the known elements in the fashion claimed by the patent at issue.’” PO Resp. 20 (quoting *KSR*, 550 U.S. at 418).

Patent Owner also argues that “Claim 1 requires negative pole switching,” such that the final connection between the jump starter and the car battery is on the negative pole. PO Resp. 20. Patent Owner explains that the preferred embodiment shown in Figure 2 of the '653 patent includes a direct connection between the positive pole of the first battery and the positive pole of the load, and a direct connection between the negative pole of the first battery and the switching circuit. Pet. 21–22. According to Mr. McAlexander, “[a]ny attempt to identify ‘a first pole of a first battery’ as the negative terminal of a first battery creates a configuration conflict that fails to satisfy all the remaining elements of Claim 1.” Ex. 2001 ¶ 34; PO Resp. 20–22.

Patent Owner asserts that Yu discloses the opposite of negative pole switching by inserting a normally open relay between the first (positive) pole

of the first battery and the first lead of the load. PO Resp. 22–23. Patent Owner further asserts that Petitioner fails to provide “any basis that would motivate the extensive rearrangement of connections necessary to implement the required negative pole switching” in Yu. PO Resp. 24–25. Additionally, Patent Owner contends Petitioner fails to show that combining Yu with the teachings of the secondary references (such as Koebler) to replace the Yu positive switching circuit with a negative switching circuit would have been technically feasible and would predictably work. PO Resp. 25–26.

According to Patent Owner, Petitioner and Dr. Kirtley provide nothing beyond conclusory assertions that a redesign is possible. PO Resp. 26–27. Patent Owner further contends that Yu and Koebler have “totally different connection solution[s],” such that moving the switch to the negative pole in Yu would render Yu inoperable. PO Resp. 28–29 (arguing that “[i]f the required structure of ‘a first pole of a first battery connected with . . . a first lead of a load’ is deployed in the device of Yu, the device will not work or, at least, would not work without complex further modification unconsidered by Petitioner”).

In its Reply, Petitioner challenges Patent Owner’s argument that claim 1 requires negative pole switching, i.e., that the first pole of the first battery is a positive terminal, the second pole of the first battery is a negative terminal, and the switching circuit is between the negative pole of the battery and the load. Reply 4. Petitioner argues that claim 1 does not include express language imposing these requirements, and Patent Owner is attempting to import limitations into the claim from a preferred embodiment in the Specification. Reply 4–5. Petitioner further asserts that Patent Owner did not otherwise address Petitioner’s arguments that Yu discloses all of the

limitations in claim 1 “where the claimed ‘first pole’ of the first battery of Claim 1 is mapped to the negative terminal B- of Yu’s battery, and the claimed ‘second pole’ of the first battery of Claim 1 is mapped to the positive terminal B+ of Yu’s battery.” Reply 5–6.

In its Sur-reply, Patent Owner clarifies that “[f]or avoidance of doubt, Patent Owner does *not* argue that Claim 1 is limited by the specification’s disclosure to negative side switching, as a matter of claim construction or otherwise.” Sur-reply 2. Instead, Patent Owner contends that the specific connections recited in claim 1 require a circuit with a switch on the negative pole “as a matter of practical engineering and patent claim utility.” Sur-reply 2–3. Patent Owner explains that according to claim 1, the first pole of the battery is connected to the first lead of the power converter, and the power converter is connected with second lead of the microcontroller, providing power to the microcontroller. Sur-reply 4–5 (citing Ex. 1001, Fig. 1). Patent Owner further explains that according to claim 1, the second pole of the battery is connected to the power converter, microcontroller, and switching circuit. Sur-reply 5. According to Patent Owner, “[f]or practical electrical engineering reasons, it necessarily follows, from the required connection between the second pole of the battery and the microcontroller, that the second pole *is* the negative pole, i.e., the ground, in this context, because the microcontroller is receiving power from the first pole via the power converter.” Sur-reply 6–7 (citing Ex. 2001 ¶¶ 34, 39–40; Ex. 1019, 156:3–6). Patent Owner also asserts that “[m]icrocontrollers are expected to be grounded, rather than connected to various ‘hot’ wires at different levels.” Sur-reply 7 (citing Ex. 1019, 152:24–153:1).

After considering the parties' arguments and evidence, we find Petitioner has demonstrated by a preponderance of evidence that Yu teaches or suggests all of the limitations claim 1 requires. It is undisputed that the claimed first pole and second pole of the first battery are the two poles of a conventional battery, that one of the poles is the positive terminal, and the other pole is the negative terminal. Sur-reply 3. It is also undisputed that claim 1 does not expressly require (1) the first pole of the first battery to be the positive terminal, (2) the second pole of the first battery to be the negative terminal, or (3) the switch being placed between the negative pole of the battery and the load—i.e., negative pole switching. *See* Reply 4; Sur-reply 2–3; Ex. 1020 ¶¶ 58, 82; Ex. 1019, 76:24–77:18, 78:15–19:15.

Rather, claim 1 only expressly requires a connection between the first pole of the first battery and a first lead of a power converter, a first lead of a battery level detector, and a first lead of a load. Ex. 1001, 5:3–5. Consistent with the express language of claim 1, Petitioner directs us to portions of Yu that disclose a first pole of a battery (B-), a power converter, a battery level detector, and a load, as well as connections between the first pole of the first battery and these components. Pet. 19–29.

Claim 1 also expressly requires connections between the second pole of the first battery and a second lead of the power converter, a first lead of a microcontroller, a first lead of a switching circuit, and a second lead of the battery level detector. Ex. 1001, 5:6–9. Again, consistent with the express language of claim 1, Petitioner directs us to portions of Yu that disclose a second pole of a battery (B+), a microcontroller, and a switching circuit, as well as connections between the second pole of the first battery and a second lead of the power converter, a first lead of a microcontroller, a first lead of a

switching circuit, and a second lead of the battery level detector. Pet. 19–23, 30–32.

Patent Owner does not dispute that Yu discloses the specific components or the connections between them that Petitioner directs us to. *See generally* PO Resp; Sur-reply. Instead, Patent Owner’s argument that Petitioner fails to demonstrate sufficient evidence of obviousness is based on its assertion that claim 1 requires *different* connections than those Yu discloses or suggests. PO Resp. 21–23 (arguing claim 1 requires negative pole switching, which Yu does not disclose).

We, however, disagree with Patent Owner’s contention that the Petition is deficient because claim 1 requires negative pole switching and Yu does not teach negative pole switching. PO Resp. 21–23; Sur-reply 1–15. Although Patent Owner contends that claim 1 requires a circuit with the switch between the negative pole and the load “as a *matter of practical engineering* and patent claim utility,” Patent Owner fails to direct us to any authority supporting its argument that these considerations frame the interpretation of claim language that is otherwise clear on its face. Sur-reply 2–3. Nor does Patent Owner direct us to any authority supporting its assertion that we should “reject” Petitioner’s arguments and evidence demonstrating Yu discloses the express limitations recited in the claim “as not fitting the claim language based on engineering design principles.” Tr. 47:10–12.

We also disagree with Patent Owner’s argument that the “structural context” of claim 1, “i.e., the specific claimed *connections* between various components enumerated in [c]laim 1,” requires that the first pole of a first battery be the positive terminal and the second pole be the negative terminal.

Sur-reply 3. Petitioner has demonstrated persuasively that Yu discloses the specific connections between the various components expressly enumerated in claim 1 without the first pole of the first battery being the positive terminal of the battery or the second pole of the first battery being the negative terminal. Moreover, Patent Owner acknowledges that systems with positive side switches, i.e., having the switching circuit connected to the positive terminal of the battery, were known in the art. Sur-reply 9 (stating that “a positive side switch arrangement is known in the prior art”).

Patent Owner directs us to paragraphs 34, 39, and 40 of Mr. McAlexander’s Declaration to support its assertion that claim 1 requires negative side switching. Mr. McAlexander’s testimony in paragraph 34 is based on Figure 2 of the ’653 patent. But the ’653 patent is explicit that its description of the invention, made in conjunction with the figures, represents only “part of the embodiments of the present disclosure, not all the embodiments.” Ex. 1001 2:62–67. Likewise, Patent Owner admits that claim 1 is not limited “by the specification’s disclosure to negative side switching.” Sur-reply 2. Additionally, Petitioner’s demonstration that Yu discloses the express limitations of claim 1 undermines Mr. McAlexander’s statement that “[a]ny attempt to identify ‘a first pole of a first battery’ as the negative terminal of a first battery creates a configuration conflict that fails to satisfy remaining elements of Claim 1.” Ex. 2001 ¶ 34. We reach the same conclusion regarding Mr. McAlexander’s complementary statement in paragraph 40 that “[a]ny attempt to identify ‘a second pole of a first battery’ as the positive terminal of a first battery creates a configuration conflict that fails to satisfy all the elements of Claim 1.” Ex. 2001 ¶ 40.

Paragraph 39 of Mr. McAlexander's Declaration suffers from similar problems, as it also relies on Figure 2 of the '653 patent. Moreover, Patent Owner's arguments that the second pole of the first battery must be the negative terminal because the first pole of the first battery is the positive terminal, and vice versa, are conclusory, unsupported, and rely on circular reasoning. Sur-reply 6–7.

Patent Owner's arguments based on specific required connections to the microcontroller are likewise unavailing. Sur-reply 6–8. Patent Owner relies on annotations made to Figure 1 of the '653 patent (Sur-reply 8), but, as explained above, Patent Owner acknowledges that the claims are not limited to the preferred embodiments and related discussion of the figures in the Specification. Sur-reply 2; Ex. 1001 2:62–67. Furthermore, with regard to Patent Owner's argument that persons of skill in the art would have known that microcontrollers must be grounded, we note that claim 1 uses the term comprising, which means the claimed automobile charger can include additional components or connections not expressly recited in the claim. Ex. 1001, 5:2. This open-ended nature of claim 1 undermines Patent Owner's argument that the second pole of the battery *must* be the negative terminal in order to account for the microcontroller being grounded. Notably, Patent Owner acknowledges that alternative types of circuits with multiple grounds and additional components may exist, consistent with testimony from Dr. Kirtley. Sur-reply 10; Ex. 1020 ¶ 84.

Specifically, Dr. Kirtley testifies that a person of ordinary skill in the art would have understood that connections between components depicted as single lines in Yu's figures “may comprise multiple connections, such as multiple signal connections, and common power and ground connections for

sensors and microprocessors.” Ex. 1020 ¶ 84 (citing Ex. 1021 (US 7,973,534 B2)). We credit Dr. Kirtley’s testimony, as Patent Owner does not dispute the substance of Dr. Kirtley’s testimony or the supporting exhibit. Instead, Patent Owner argues that Petitioner is attempting to “sneak in new evidence that is improper in a reply” and create a new ground. Sur-reply 13–15. We disagree, as Petitioner and Dr. Kirtley offer this evidence to demonstrate what a person of ordinary skill in the art would have understood in considering Yu—not as a new ground. Moreover, Petitioner properly offered this exhibit and Dr. Kirtley’s testimony in response to Patent Owner’s arguments that claim 1 requires negative side switching, which Yu does not disclose. In its Reply, Petitioner is entitled to “respond to arguments raised in the corresponding . . . patent owner response.”

37 C.F.R. § 42.23(b). A party also may submit rebuttal evidence in support of its reply. *See Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1077–78 (Fed. Cir. 2015).

Patent Owner also contends that Yu does not disclose a connection between the first pole of the first battery and the first lead of the load because Yu discloses a switch between the positive battery terminal and the load. Sur-reply 10–12 (citing PO Resp. 22–23; Ex. 2001 ¶ 37; Ex. 1005, Figure 4). This argument is based on Mr. McAlexander’s assessment of Figure 2 of Yu, showing open relay K1 between the positive pole of the battery in Yu (B+) and the first lead of the load (OUT+). Sur-reply 12–13; Ex. 2001 ¶ 37; Tr. 65:12–66:11. As noted above, however, Petitioner argues that the *negative pole (B-)* in Yu’s battery, not the positive pole of the battery, corresponds to the first pole of the first battery recited in claim 1. As such, Patent Owner’s argument and Mr. McAlexander’s assessment are

misguided, as they do not address Petitioner’s actual argument. Moreover, Patent Owner does not dispute that there is a connection between the negative pole of Yu’s battery and the load, as claim 1 expressly requires. Tr. 70:10–15.

For all of the foregoing reasons, we find Petitioner has demonstrated persuasively that Yu discloses “a first pole of a first battery connected with a first lead of a power converter, a first lead of a battery level detector, and a first lead of a load” and “a second pole of the first battery connected with a second lead of the power converter, a first lead of a microcontroller, a first lead of a switching circuit and a second lead of the battery level detector.” Ex. 1001, 5:3–9; Pet. 19–32; Reply 3–6; Ex. 1005 ¶¶ 2, 21–23, 26–27, Figs. 1, 2, 4; Ex. 1004 ¶¶ 83–92, 107–108; Ex. 1020 ¶¶ 58, 82, 84. Petitioner also directs us to evidence demonstrating Yu discloses or suggests the remaining limitations in claim 1, which Patent Owner does not dispute. Pet. 21–22, 36–46.

Based on the information presented in the Petition, including the relevant portions of the Kirtley Declaration and Kirtley Rebuttal Declaration, we are persuaded that Petitioner has demonstrated by a preponderance of the evidence that Yu discloses or suggests all of the limitations in claim 1.¹³

¹³ Although Petitioner refers to the disclosures of Klang and Koebler when discussing certain limitations of claim 1, Petitioner presents these arguments as alternative disclosures to the teaching in Yu to address the possible construction of claim terms under 35 U.S.C. § 112(f) and/or arguments potentially made by Patent Owner. *See, e.g.*, Pet. 24 (referring to the disclosure of switches in Klang and Koebler “[t]o the extent it is argued that that a relay disclosed in Yu is not an electronic switch”); 36 (stating “[t]o the extent that ‘switching circuit’ may [be] construed under 112(f), Koebler

We have considered Patent Owner’s arguments that Petitioner failed to show any motivation to alter Yu to use negative pole switching, failed to show that Yu can be reliably combined with Koebler, and that Yu would be inoperable by moving the switch to the negative pole. PO Resp. 24–29. These arguments, however, are based on Patent Owner’s contention that negative pole switching is a required feature of claim 1 and Yu does not teach negative pole switching. *See, e.g.*, Reply 6 (addressing Patent Owner’s arguments regarding a motivation to combine references “[i]f it is determined that Claim 1 requires negative pole switching”); Tr. 8:13–17, 55:23–56:1, 62:10–21 (all referring to Petitioner’s arguments that Yu discloses or suggests each and every limitation of claim 1). For the reasons stated above, we disagree with Patent Owner’s contention that negative pole switching is a required feature of claim 1, and find that Petitioner has demonstrated persuasively that Yu discloses or suggests each limitation of claim 1. As a result, the outcome here does not depend on modifying Yu to use negative pole switching or combining Yu with Koebler. We, therefore, decline to address Patent Owner’s arguments directed towards modifying Yu or combining Yu with additional prior-art references.

In view of the foregoing, we find Petitioner has demonstrated, by a preponderance of the evidence, that claim 1 is unpatentable as obvious in view of Yu.

discloses using a plurality of MOSFETs”); Tr. 8:13–17, 55:23–56:1, 62:10–21. For purposes of this challenge, we do not rely on these disclosures in Klang and Koebler because we do not construe the claims under § 112(f) and they concern arguments Patent Owner did not raise.

b. Claim 3

As discussed above, we construe the phrase “the switching circuit conducts power supply or power outage for the load through the microcontroller” in claim 3 to mean “[t]he power for charging the load passes through the microcontroller.” Petitioner admits that under this construction of claim 3, it has not presented evidence that claim 3 is unpatentable in view of Yu, Koebler, and Klang. Pet. Suppl. Br. 10. As a result, we determine that Petitioner has not demonstrated by a preponderance of the evidence that claim 3 is unpatentable as obvious in view of Yu, Koebler, and Klang.

c. Claim 6

Claim 6 depends from claim 1 and requires that the switching circuit is an electronic switch. Ex. 1001, 6:26–27. Petitioner argues Yu discloses relay 2 as an electronic switching device. Pet. 49 (citing Ex. 1005 ¶ 21, Figs. 1 and 2). Petitioner also relies on its arguments regarding Yu discussed above with regard to claim 1.

Patent Owner does not separately challenge the arguments and evidence Petitioner presents for claim 6. *See, e.g.*, PO Resp. 7. Instead, Patent Owner relies on the same arguments for claim 6 as it does for claim 1. *See generally* PO Resp.; Sur-reply.

After reviewing the evidence and arguments Petitioner presents in the Petition regarding claim 6, including the relevant portions of the supporting Kirtley Declaration, we agree, for the reasons explained in the Petition, that Yu discloses or suggests all of the limitations in claim 6. Pet. 49. As a result, we determine Petitioner has established by a preponderance of the evidence that claim 6 is unpatentable as obvious in view of Yu.

E. Claims 4, 7–12, and 14–20 – Alleged Obviousness in View of Yu, Klang, Koebler, and Thomason

Petitioner contends claims 4, 7–12, and 14–20 are unpatentable as obvious in view of Yu, Klang, Koebler, and Thomason. Pet. 50–68.

1. Thomason (Ex. 1008)

Thomason discloses a battery charger “having a polarity detection mechanism, automated current routing circuitry and excessive voltage protection” that is “configured to provide safe, spark free jump starting.” Ex. 1008, code (57). Thomason teaches that its jump-starter includes a first switch that activates the flow of electricity out of the device and a second switch that activates lights on the clamps that connect with the terminals of the battery intended to be recharged. Ex. 1008 ¶ 14. Thomason further teaches that “a variety of other lights and switches are also utilized to designate various functions such as the charge status of the battery being charged as well as the level of the battery in the jump-starting unit.” Ex. 1008 ¶ 14. In one preferred embodiment, Thomason discloses the use of metal-oxide-semiconductor field-effect transistors (MOSFETs) to provide the various switching and signaling functions. Ex. 1008 ¶ 17.

2. Analysis

a. Claim 4

Claim 4 depends from claim 1, and recites that the “the battery level detector is further configured to provide a protection for the first battery.” Ex. 1001, 6:17–19.

Petitioner contends that Yu discloses a connection between microprocessor 42 and internal battery voltage detection circuit 43 to provide signaling between these components that enables display module 5

to display the voltage of the internal battery 1 (“a battery level detector”) and for “monitoring of the use status of the internal battery.” Pet. 52–53 (citing Ex. 1005 ¶¶ 21–22, 27).

Petitioner also contends that Thomason discloses a battery level detector and a “a protection mechanism for protecting [an] internal battery by limiting [the] amount of power that is allowed to flow out of [the] internal battery to prevent it from being fully discharged and to prevent the jump starter from self-destructing when jumper cables are connected together.” Pet. 53 (citing Ex. 1008 ¶ 36). According to Petitioner, a person of ordinary skill in the art would have known from Yu how to use sensor inputs to a microcontroller to control a relay/switch, and would have had reason to “consider the level of the internal battery when determining when to turn on the relay, as taught in Thomason, because that would further protect the internal battery from being connected to a load when it is severely discharged, avoiding damage to the battery.” Pet. 53–54.

Patent Owner does not separately address claim 4, or dispute that Yu and Thomason teach or suggest the additional limitations in claim 4. Rather, Patent Owner relies on its arguments presented for claim 1, including its argument that Petitioner fails to show a motivation to combine the asserted prior-art references and its arguments based on negative pole switching. PO Resp. 8–17, 20–29. Specifically, with regard to the proposed combination of Yu and Thomason, as discussed above in Section II.D.4.a, Patent Owner contends that Petitioner fails to point to any evidence in the asserted prior-art references themselves that provides a reason to combine their teachings, and therefore relies on statements in the Kirtley Declaration. Pet. 8–9. Patent Owner states that Dr. Kirtley provides several rationales for combining Yu

with the secondary references that are all based on the similarities of the references, which do not constitute substantial evidence of a motivation to combine. PO Resp. 9–15 (addressing paragraphs 120–134 of the Kirtley Declaration). Patent Owner also argues Dr. Kirtley’s opinions suffer from hindsight bias. PO Resp. 15–16.

After considering the parties’ arguments and evidence, we find Petitioner has established, by a preponderance of the evidence, that claim 4 is unpatentable as obvious in view of Yu and Thomason. As discussed above, we disagree with Patent Owner’s arguments regarding negative pole switching, and find that Petitioner presents persuasive evidence that Yu teaches or suggests the limitations of claim 1. Petitioner also presents undisputed evidence that Yu and Thomason teach or suggest the additional limitations in claim 4. Pet. 52–54. Additionally, Petitioner directs us to a disclosure in Thomason itself regarding a protection mechanism to prevent the jump starter from self-destructing, and presents testimony from Dr. Kirtley that a person of ordinary skill in the art would have considered Thomason’s teaching in order to avoid damage to Yu’s internal battery, and would have been able to implement Thomason’s teachings. Pet. 52–54; Reply 20–21; Ex. 1004 ¶¶ 189–192. Patent Owner and Mr. McAlexander do not challenge or otherwise refute this testimony. PO Resp. 9–10. Thus, contrary to Patent Owner’s assertions, Petitioner does direct us to evidence in the asserted prior-art references themselves that provide a reason to combine their teachings, and does not rely solely on conclusory statements regarding the similarities of Yu and Thomason to support its obviousness challenge.

In view of Petitioner’s persuasive evidence demonstrating where the prior-art references teach or suggest each limitation in the challenged claims, and explaining why a person of ordinary skill in the art would have had reason to combine the prior-art references with a reasonable expectation of success, we find Petitioner has established, by a preponderance of the evidence, that claim 4 is unpatentable as obvious in view of Yu and Thomason.

b. Claim 7

Claim 7 recites a “charging device.” Ex. 1001, 6:28. Petitioner contends Yu discloses¹⁴ an automobile charger based on Yu’s description of its invention as “an apparatus for starting of an automobile, and specifically, . . . an apparatus for emergency starting of an automobile.” Pet. 18 (quoting Ex. 1005 ¶ 1; citing Ex. 1005 ¶¶ 2–4, 21, Fig. 1), 54 (referring to its analysis of this limitation in claim 1).

Claim 7 next recites “a battery level detector to detect a level of a first battery.” Ex. 1001, 6:29. For this limitation, Petitioner directs us to Yu’s internal battery voltage detection circuit 43, “that is connected to enable signaling to the microprocessor 42 on the voltage of the internal battery 1.” Pet. 41 (addressing this limitation in connection with claim 1), 55 (addressing this limitation in connection with claim 7, referring to its analysis of this limitation in claim 1); *see also* Pet. 20 (asserting internal

¹⁴ Neither party affirmatively argues that the preamble is limiting. Although we find that the evidence supports that Yu discloses the preamble, we make no determination that the preamble is limiting.

battery voltage detection circuit 43 corresponds to the claimed battery level detector; citing Ex. 1005 ¶ 22, Fig. 2).

Claim 7 also requires “a load detector to detect a type of connection of a load.” Ex. 1001, 6:30. Petitioner contends that Yu teaches or suggests this limitation based on its disclosure of external battery reverse polarity detection circuit 44, which detects connection polarity, and/or external battery voltage detection circuit 45, which detects the voltage of the external battery and indicates whether the external battery is connected and if the “voltage of the external battery is in a normal range.” Pet. 57 (citing Ex. 1005 ¶¶ 21, 23, 26, 27, Figs. 1–2).

Claim 7 next requires “a microcontroller to generate an output signal based on the level of the first battery and the type of connection of the load.” Ex. 1001, 6:31–33. Similar to the discussion above for claim 4, for this limitation, Petitioner asserts that “Yu explains how microcontroller 42 receives and collects signals from reverse polarity detection circuit 44 and external battery voltage detection circuit 45, and, based on the received and collected signals, [provides] an output control to relay 2.” Pet. 59 (citing Ex. 1005 ¶¶ 21–27, Figs. 1–5). Petitioner also asserts that Thomason discloses measuring the internal battery voltage of a system, and considering the level of the internal battery when determining when to turn its switch on/off, which serves as “a protection mechanism for protecting [an] internal battery by limiting [the] amount of power that is allowed to flow out of [the] internal battery to prevent it from being fully discharged and to prevent the jump starter from self-destructing when jumper cables are connected together.” Pet. 53 (citing Ex. 1008 ¶ 36). According to Petitioner, a person of ordinary skill in the art would have known from Yu how to use sensor

inputs to a microcontroller to control a relay/switch, and would have had reason to “consider the level of the internal battery when determining when to turn on the relay, as taught in Thomason, because that would further protect the internal battery from being connected to a load when it is severely discharged, avoiding damage to the battery.” Pet. 53–54, 59–60.

Finally, claim 7 recites “switching circuitry to selectively connect the first battery to the load based on the output signal.” Ex. 1001, 6:34–35. According to Petitioner, Yu discloses a microcontroller (microprocessor 42) that controls the switching circuitry (relay 2) based on the output from the microprocessor to “selectively connect the internal battery to the external battery to be charged.” Pet. 60.

Patent Owner does not dispute that Yu and Thomason disclose the limitations in claim 7. As to the combination of the teachings of Yu and Thomason, Patent Owner relies on the same arguments discussed above in connection with claims 1 and 4.

After considering the parties’ arguments and evidence, we find Petitioner has established, by a preponderance of the evidence, that claim 7 is unpatentable as obvious in view of Yu and Thomason. Based on the evidence and arguments Petitioner presents in the Petition regarding claim 7, we agree that Yu discloses a charging device comprising a battery level detector (internal battery voltage detection circuit 43), load detector (external battery reverse polarity detection circuit 44 and/or external battery voltage detection circuit 45), microcontroller (microprocessor 42), and switching circuitry (relay 2), as claim 7 requires. Ex. 1005 ¶¶ 21–27; Pet. 53–60. Yu also discloses microprocessor 42 receives sensor input signals from internal battery voltage detection circuit 43, external battery reverse

polarity detection circuit 44, and external battery voltage detection circuit 45, and can use various signals to control relay 2. Ex. 1005 ¶¶ 26–27. We also agree that Thomason discloses considering the level of the internal battery when determining when to turn its switch on/off and that doing so avoids damaging the battery. Ex. 1008 ¶ 36; Pet. 53–60.

Thus, Petitioner directs us to a disclosure in Thomason itself regarding a protection mechanism to prevent the jump starter from self-destructing, and presents testimony from Dr. Kirtley that a person of ordinary skill in the art would have considered Thomason’s teaching in order to avoid damage to Yu’s internal battery, and would have been able to implement Thomason’s teachings. Pet. 52–54, 59–60; Reply 20–21; Ex. 1004 ¶¶ 189–192. Patent Owner and Mr. McAlexander do not challenge or otherwise refute this testimony. PO Resp. 9–10. Thus, contrary to Patent Owner’s assertions, Petitioner does direct us to evidence in the asserted prior-art references themselves that provide a reason to combine their teachings, and does not rely solely on conclusory statements regarding the similarities of Yu and Thomason to support its obviousness challenge.

In view of Petitioner’s persuasive evidence demonstrating where the prior-art references teach or suggest each limitation in claim 7, and explaining why a person of ordinary skill in the art would have had reason to combine the prior-art references with a reasonable expectation of success, we find Petitioner has established, by a preponderance of the evidence, that claim 7 is unpatentable as obvious in view of Yu and Thomason.

c. Claims 8–12 and 14–20

Claims 8–12 and 14–16 depend directly or indirectly from claim 7. Petitioner directs us to portions of Yu and Thomason that disclose the additional limitations in these claims. Pet. 61–66.

Independent claim 17 contains limitations similar to those in claim 7, and Petitioner relies on the same arguments and evidence for claim 17 as it does for claim 7. Pet. 66–67. Claim 18 depends from claim 17, and claims 19 and 20 depend from claim 18. For these claims, Petitioner relies on the arguments and evidence it presents for claims 8–11. Pet. 67–68.

Once again, Patent Owner does not dispute that Yu and Thomason disclose the limitations in claims 8–12 and 14–20. As to the combination of the teachings of Yu and Thomason, Patent Owner relies on the same arguments discussed above in connection with claims 1, 4, and 7.

After considering the parties' arguments and evidence, we find Petitioner has established, by a preponderance of the evidence, that claims 8–12 and 14–20 are unpatentable as obvious in view of Yu and Thomason. Based on the evidence and arguments Petitioner presents in the Petition regarding claims 8–12 and 14–20, we find Petitioner has presented persuasive evidence demonstrating where the prior-art references teach or suggest each limitation in claims 8–12 and 14–20, and explaining why a person of ordinary skill in the art would have had reason to combine the prior-art references with a reasonable expectation of success. We disagree with Patent Owner's arguments to the contrary, for the reasons discussed above. Accordingly, we find Petitioner has established, by a preponderance of the evidence, that claims 8–12 and 14–20 are unpatentable as obvious in view of Yu and Thomason.

F. Claims 5 and 13 – Alleged Obviousness in View of Yu, Klang, Koebler, and Richardson

Petitioner contends claims 5 and 13 are unpatentable as obvious in view of Yu, Klang, Koebler, and Richardson. Pet. 69–75.

1. Richardson (Ex. 1009)

Richardson discloses a “portable power source for a motor vehicle,” (i.e., a jump starter), that “performs real-time monitoring of all system parameters to increase the safety and effectiveness of the unit’s operation while providing additional parametric and diagnostic information obtained before, during and after the vehicle starting operation.” Ex. 1009 ¶¶ 1, 5. Richardson explains that its method and apparatus include a programmable microprocessor that receives inputs and includes several outputs to provide information to the user and to control the application of power to the vehicle to be jump started. Ex. 1009 ¶¶ 11, 13. Richardson also discloses several sensors that monitor different parameters such as the voltage level of one or more jump starter batteries, the voltage of the vehicle battery, the polarity of the jumper cables, and the temperature of a shunt cable. Ex. 1009 ¶ 12. According to Richardson, “[t]he voltage is monitored to determine open circuit, disconnected conductive clamps, shunt cable fault, and solenoid fault conditions,” and the “current through the shunt cable is monitored to determine if there is a battery explosion risk, and for excessive current conditions presenting an overheating condition, which may result in fire.” Ex. 1009 ¶ 6.

2. Analysis

Claim 5 depends from claim 1, and requires that the microcontroller, “when placed in standby mode, closes all outputs when a voltage of the first

battery is lower than that of a state being able to supply power and then recovers when the voltage of the first battery is higher than that of the state being able to supply power.” Ex. 1001, 6:20–25. Claim 13 depends from claim 12 (which depends from claim 7), and requires that “the microcontroller generates the output signal to cause the switching circuitry to disconnect the first battery from the load if the recharging level of the first battery is greater than a threshold.” Ex. 1001, 6:59–63.

Petitioner directs us to portions of Yu and Richardson that disclose or suggest the limitations in claims 5 and 13. Pet. 72–75 (citing Ex. 1009 ¶¶ 22, 28–29, 55). Petitioner also argues that a person of ordinary skill in the art would have had reason to “modify Yu’s microcontroller to inhibit operation of the device and connecting the internal battery to the output when it is discharged, as taught by Richardson,” as a way to detect and avoid the drawbacks of using partially or severely discharged batteries. Pet. 71–72.

Patent Owner does not dispute that Yu and Richardson disclose the limitations in claims 5 and 13. As to the combination of the teachings of Yu and Richardson, Patent Owner relies on the same arguments discussed above in connection with claims 1, 4, and 7, including an argument that “Dr. Kirtley provides inapposite opinions regarding the superiority of solid-state switches.” PO Resp. 8.

After considering the parties’ arguments and evidence, we find Petitioner has established, by a preponderance of the evidence, that claims 5 and 13 are unpatentable as obvious in view of Yu and Richardson. Based on the evidence and arguments Petitioner presents in the Petition regarding claims 5 and 13, we find Petitioner has presented persuasive evidence

demonstrating where the prior-art references teach or suggest each limitation in claims 5 and 13. Pet. 72–75; Ex. 1009, ¶¶ 22, 28–29, 55, Figs. 3–8.

Additionally, Petitioner directs us to a disclosure in Richardson itself regarding safety features that inhibit the closing of a switch to connect the battery power source to a load for charging when the battery level is too low, and presents testimony from Dr. Kirtley that a person of ordinary skill in the art would have considered Richardson’s teaching to improve the safety features of Yu’s system. Pet. 71–75; Reply 21–22; Ex. 1009 ¶ 28, Figs. 3 and 5; Ex. 1004 ¶¶ 233–241. Patent Owner and Mr. McAlexander do not challenge or otherwise refute this testimony. PO Resp. 9–10. Thus, contrary to Patent Owner’s assertions, Petitioner does direct us to evidence in the asserted prior-art references themselves supporting a reason to combine their teachings, and does not rely solely on conclusory statements from Dr. Kirtley regarding the similarities of Yu and Richardson to support its obviousness challenge.

In view of Petitioner’s persuasive evidence demonstrating where the prior-art references teach or suggest each limitation in the challenged claims, and explaining why a person of ordinary skill in the art would have had reason to combine the prior-art references with a reasonable expectation of success, we find Petitioner has established, by a preponderance of the evidence, that claims 5 and 13 are unpatentable as obvious in view of Yu and Richardson.

III. CONCLUSION

After reviewing the complete record developed during the course of the trial, we conclude that Petitioner has satisfied its burden of demonstrating, by a preponderance of the evidence, that claims 1 and 4–20

of the '653 patent are unpatentable.¹⁵ Petitioner, however, has not demonstrated by a preponderance of the evidence that claim 3 of the '653 patent is unpatentable.

IV. ORDER

For the reasons given, it is:

ORDERED that Petitioner has established by a preponderance of the evidence that claims 1 and 4–20 of the '653 patent are unpatentable;

FURTHER ORDERED that Petitioner has not established by a preponderance of the evidence that claim 3 of the '653 patent is unpatentable; and

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

In summary:

¹⁵ 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).

Claim(s)	35 U.S.C. §	References/ Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
1, 3, 6	103	Yu, Klang, Koebler	1, 6	3
4, 7–12, 14–20	103	Yu, Klang, Koebler, Thomason	4, 7–12, 14– 20	
5, 13	103	Yu, Klang, Koebler, Richardson	5, 13	
Overall Outcome			1, 4–20	3

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For PETITIONER:

Kevin J. Patariu
Bing Ai
John D. Esterhay
John P. Schnurer
David C. Laney
PERKINS COIE LLP
patariu-ptab@perkinscoie.com
ai-ptab@perkinscoie.com
esterhay-ptab@perkinscoie.com
schnurer-ptab@perkinscoie.com
laney-ptab@perkinscoie.com
PerkinsService-SZChic-Pilot-IPRs@perkinscoie.com

For PATENT OWNER:

Alex W. Ruge
Robert R. Brunelli
Jason H. Vick
SHERIDAN ROSS P.C.
aruge@sheridanross.com
rbrunelli@sheridanross.com
jvick@sheridanross.com
Pilot-ShenzhenIPR-ServiceSR@sheridanross.com