

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

THE NOCO COMPANY, INC.,
Petitioner,

v.

PILOT, INC.,
Patent Owner.

IPR2022-01237
Patent 11,124,077 B2

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

AMUNDSON, *Administrative Patent Judge*.

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

I. INTRODUCTION

The NOCO Company, Inc. (“Petitioner”) filed a Petition requesting an *inter partes* review of claims 1–24 in U.S. Patent No. 11,124,077 B2 (Exhibit 1001, “the ’077 patent”) under 35 U.S.C. §§ 311–319. Paper 1 (“Pet.”). Pilot, Inc. (“Patent Owner”) did not file a Preliminary Response.

In the Institution Decision, we instituted review based on all challenged claims and all challenges included in the Petition. Paper 7 (“Inst. Dec.”). We have jurisdiction under 35 U.S.C. § 6. We issue this Final Written Decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons explained below, Petitioner has shown by a preponderance of the evidence that claims 1–24 in the ’077 patent are unpatentable. *See* 35 U.S.C. § 316(e) (2018).

II. BACKGROUND

A. *Real Parties in Interest*

Petitioner identifies itself as the real party in interest. Pet. 74. Patent Owner identifies itself as the real party in interest. Paper 3, 2. The parties do not raise any issue about real parties in interest.

B. *Related Matters*

Petitioner and Patent Owner identify the following civil action as a related matter involving the ’077 patent: *Pilot, Inc. v. The NOCO Company, Inc.*, No. 2:22-cv-00389-PHX-SRB (D. Ariz. filed Mar. 14, 2022). Pet. 74; Paper 3, 2.

C. *The ’077 Patent (Exhibit 1001)*

The ’077 patent, titled “Automobile Charger,” issued on September 21, 2021, from an application filed on April 21, 2021. Ex. 1001, codes (22), (45), (54). The patent identifies that application as the latest in a

series of continuation applications that began with an application filed on December 12, 2014. *Id.* at 1:5–15, code (63). The patent claims priority to an application filed in China on April 28, 2014. *Id.* at 1:14–16. The patent states that the disclosure “relates to an automobile charging device,” in particular, “a novel automobile charger with a safe power supply charging quickly.” *Id.* at 1:21–23; *see id.* at code (57).

The ’077 patent describes problems with conventional automobile chargers. *See* Ex. 1001, 1:24–34. For instance, the patent states that “current automobile chargers have common problems” because they cannot “automatically detect” the following:

- (1) “whether a load is connected”;
- (2) “whether an electrode is connected with an automobile storage battery reversely”;
- (3) “whether an automobile engine or the storage battery has a reverse current”; and
- (4) “whether the battery state is suitable for heavy current power generation.”

Id. at 1:28–34. The patent purports to address those problems with “a novel automobile charger with the safe power supply charging quickly.” *Id.* at 1:34–38, 1:42–45; *see id.* at 2:31–58.

The '077 patent's Figure 1 (reproduced below) depicts a block diagram for an automobile charger:

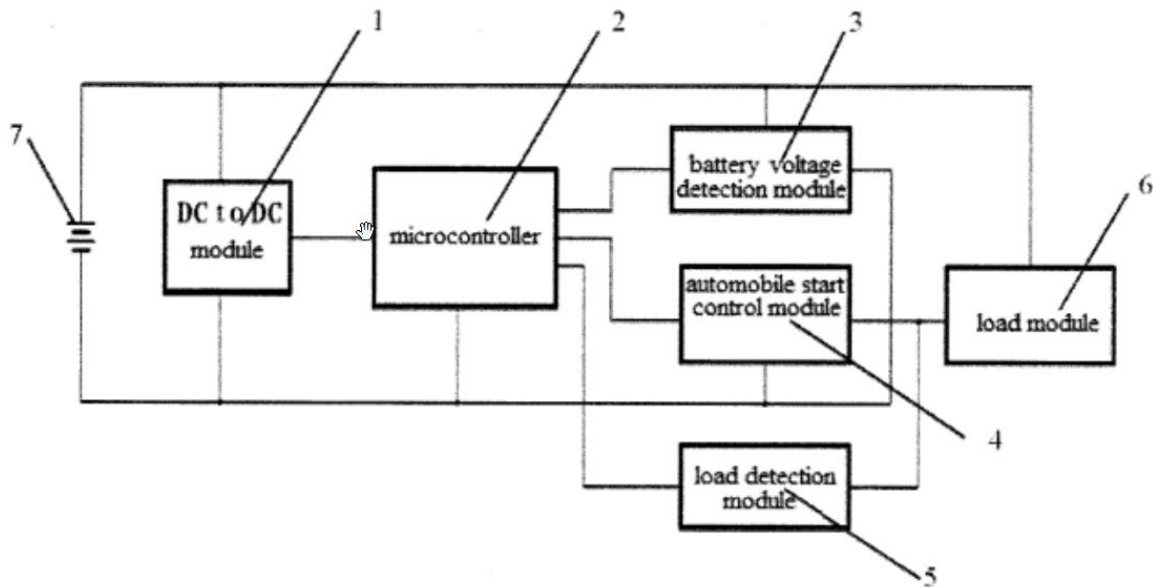


Figure 1

Figure 1 illustrates an automobile charger including the following components:

- (1) DC-to-DC module 1;
- (2) microcontroller 2;
- (3) battery voltage detection module 3;
- (4) automobile start control module 4;
- (5) load detection module 5;
- (6) load module 6; and
- (7) direct current power supply 7.

Ex. 1001, 2:62–63, 2:66–3:2, 3:15–35, Fig. 1.

The DC-to-DC module “provides a stable voltage for the microcontroller.” Ex. 1001, 2:1–3, 4:13–14. The microcontroller “collects relevant data to conduct the corresponding control.” *Id.* at 2:2–4, 4:14–15.

The battery voltage detection module “conducts the measurement of” the power-supply battery’s voltage and “provides protection” for the power-supply battery to “prevent damages caused by the discharging of the direct current power supply.” *Id.* at 2:4–5, 2:16–19, 4:15–17. The automobile start control module “conducts the power supply or the power outage for the load module” and corresponds to an electronic switch controlled by the microcontroller. *Id.* at 2:5–8, 2:29–30, 4:18–20, 4:42. The load detection module “detects whether the load module is correctly connected” and “prevents improper operations of the user,” such as “reversed polarity.” *Id.* at 2:8–10, 2:20–22, 2:40–43, 4:20–25. The load module “comprises the automobile storage battery and the automobile engine.” *Id.* at 3:32–34.

Additionally, the microcontroller “determines whether the automobile storage battery is connected with the automobile engine through the load detection module.” Ex. 1001, 4:23–25. The automobile start control module is “automatically activated and the battery starts to supply power to the load module when the load is correctly connected.” *Id.* at 4:26–28. The automobile start control module is “automatically deactivated and the battery stops supplying power to the load module when assuming that the load is not connected or the positive and negative polarities are reversely connected.” *Id.* at 4:28–32.

The automobile charger includes a standby mode where “the microcontroller closes all outputs when the battery voltage is lower than 9V.” Ex. 1001, 4:32–34; *see id.* at 2:23–26. The automobile charger “recovers the normal operation only when the battery voltage is larger than 10V.” *Id.* at 4:34–35; *see id.* at 2:23–28.

An automobile engine “will generate the normal voltage to recharge the battery after the automobile starts.” Ex. 1001, 4:36–37. But the automobile start control module is “deactivated immediately once the recharging voltage is larger than the voltage before that battery starts the power supply, to protect the battery from damages caused by charging with the normal voltage.” *Id.* at 4:37–41.

The '077 patent's Figure 2 (reproduced below) depicts a circuit diagram for an automobile charger:

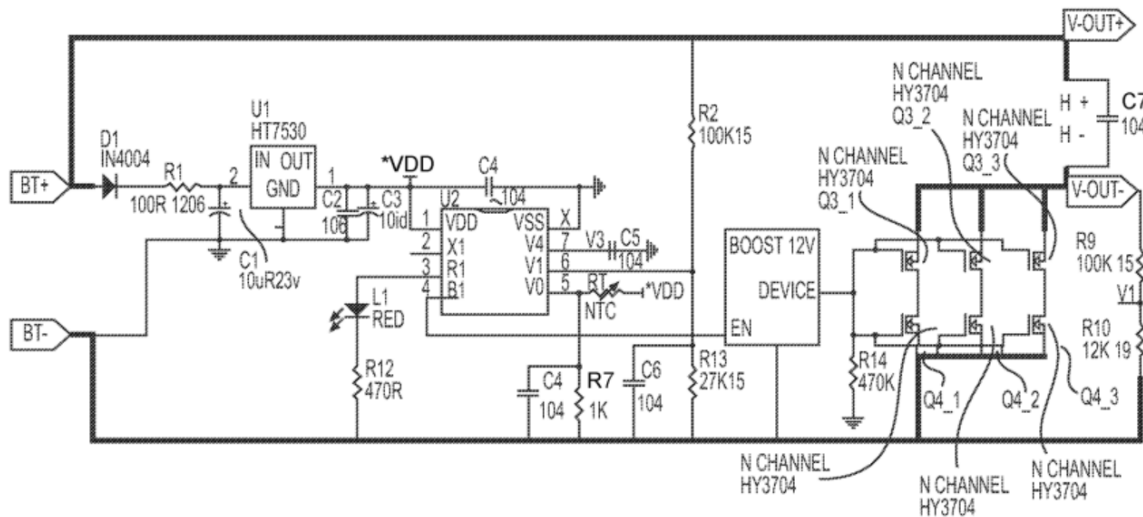


Figure 2

Figure 2 illustrates an automobile charger including microcontroller U2 and the modules illustrated in Figure 1 except the load module (the automobile storage battery and the automobile engine). *See* Ex. 1001, 2:64–65, 3:36–4:12, Figs. 1–2.

As an example, the DC-to-DC module in Figure 2 comprises “a diode D1, a resistor R1, capacitor C1, a HT7530 voltage stabilizing tube, [and] capacitors C2 and C3.” Ex. 1001, 3:36–38, Fig. 2. As another example, the battery voltage detection module in Figure 2 comprises

“resistors R2, R13 and capacitor C6.” *Id.* at 4:7–8, Fig. 2. As yet another example, the load detection module in Figure 2 comprises “resistors R9, 10, a capacitor C6 and a resistor R13.” *Id.* at 4:1–2, Fig. 2.

Additionally, Figure 2 depicts electronic switching circuitry comprising a plurality of n-channel transistors identified as Q3_1, Q3_2, Q3_3, Q4_1, Q4_2, and Q4_3. Ex. 1001, Fig. 2; *see id.* at 2:12–14, 2:29–30, 4:42. Further, Figure 2 shows Q3_1, Q3_2, and Q3_3 connected to a negative terminal (V-OUT-) of a depleted battery and Q4_1, Q4_2, and Q4_3 connected to a negative terminal (BT-) of a power-supply battery. *Id.* at Fig. 2.

D. The Challenged Claims

Petitioner challenges independent apparatus claim 1 and claims 2–24 that depend directly or indirectly from claim 1. Pet. 6, 21–73.

Claim 1 exemplifies the challenged claims and reads as follows (with formatting added for clarity and with bracketed numbers and letters added for reference purposes):¹

1. [1p] A jumpstarter comprising:
 - [1(a)(i)] a battery connected to a voltage regulator,
 - [1(a)(ii)] the battery capable of supplying power, via the voltage regulator, to at least a microcontroller,
 - [1(a)(iii)] the battery also capable of supplying power to an automobile battery when the battery has at least a predetermined voltage;
- [1(b)] a load detector circuit, connected to the microcontroller, to detect when the jumpstarter is correctly connected to the automobile battery;

¹ We use the same numbers and letters that Petitioner uses to identify the claim language. *See* Pet. 21–29.

[1(c)] the microcontroller generating, when the jumpstarter is correctly connected to the automobile battery, an output signal; and

[1(d)] switching circuitry, including at least one switch, to operatively connect the battery to the automobile battery when the microcontroller generates the output signal to supply a charging current to the automobile battery.

Ex. 1001, 5:11–27.

E. The Asserted References

For its challenges, Petitioner relies on the following references:

Name	Reference	Exhibit
Richardson	US 2013/0154543 A1, published June 20, 2013 (based on an application filed February 15, 2013)	1004
Krieger	US 2004/0130298 A1, published July 8, 2004 (based on an application filed December 10, 2002)	1005
Baxter	US 2010/0173182 A1, published July 8, 2010 (based on an application filed March 24, 2010)	1006
Tracey	WO 2012/080996 A1, published June 21, 2012 (based on an application filed December 14, 2011)	1007
Lai	US 8,232,772 B2, issued July 31, 2012 (based on an application filed May 27, 2008)	1008

Pet. 6, 21–73.

Petitioner asserts that each reference qualifies as prior art for the '077 patent “under at least 35 U.S.C. § 102(a)(1) (AIA).” Pet. 7, 10, 16–17, 19.

Patent Owner does not dispute that each reference qualifies as prior art.

F. The Asserted Challenges to Patentability

Petitioner asserts the following challenges to patentability:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–7, 9–11, 18–20	103	Krieger
8	103	Krieger, Baxter
22, 23	103	Krieger, Tracey
1–7, 9–16, 18–21, 24	103	Richardson
17	103	Richardson, Lai
3–7, 19, 20	103	Richardson, Krieger
8	103	Richardson, Krieger, Baxter
22, 23	103	Richardson, Tracey

Pet. 6, 21–73.

G. Testimonial Evidence

To support its challenges, Petitioner relies on the declaration of Jonathan R. Wood, Ph.D. (Exhibit 1003). Dr. Wood states, “I have 54 years of experience in power electronics and analog circuits, including battery systems.” Ex. 1003 ¶ 5. Dr. Wood also states, “I hold a Ph.D in Electrical Engineering from the Massachusetts Institute of Technology (1973), an M.E. in Electrical Engineering from the University of Auckland (1969), and a B.E. in Electrical Engineering from the University of Auckland (1968).” *Id.*

Patent Owner does not introduce testimonial evidence.

H. Burden

In an *inter partes* review, a petitioner bears the burden of persuasion to prove “unpatentability by a preponderance of the evidence.” *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (quoting 35 U.S.C. § 316(e)); *see* 37 C.F.R. § 42.1(d) (2023).

I. Order to Show Cause

The Scheduling Order set April 17, 2023, as the date for Patent Owner to file a response to the Petition. Paper 7, 11. The Scheduling Order instructed Patent Owner to arrange a conference call with the parties and the Board if Patent Owner elected not to file a response to the Petition. *Id.* at 9.

Patent Owner did not file a response to the Petition or arrange a conference call with the parties and the Board.

On October 5, 2023, we issued an Order to Show Cause directing Patent Owner to “show cause why adverse judgment should not be entered against it.” Paper 10, 2.

On October 20, 2023, Patent Owner responded to the Order to Show Cause. Paper 13 (“Order Resp.”). In its response, Patent Owner stated as follows:

Patent Owner and Petitioner each maintain open applications, and the Board’s analysis of the prior art and arguments may be instructive in allowing the USPTO to, in the future, examine claims in these pending applications. Accordingly, Patent Owner does not request adverse judgment against itself. Instead, Patent Owner requests that the Board issue a Final Written Decision finding all claims remain valid.

Id. at 2–3.

Further, Patent Owner argued that “Petitioner has failed to present competent evidence of unpatentability, including failing to present viable reasons to read the prior art references as supporting the proffered obviousness grounds.” Order Resp. 3. Patent Owner also argued that “there is a lack of proof” that the asserted references teach the following limitation in claim 1 (limitation 1(b)): “a load detector circuit, connected to the microcontroller, to detect when the jumpstarter is correctly connected to the

automobile battery.” *Id.*; *see id.* at 3–4. Patent Owner did not dispute that the asserted references teach every other limitation in claim 1 and every limitation in dependent claims 2–24. *Id.* at 2–4.

In response, Petitioner argued that “Patent Owner has effectively abandoned the contest in this IPR proceeding by electing not to file a response to the Petition and by failing to abide by the instructions of the Scheduling Order to arrange a conference call with the parties and the Board if electing not to file a response.” Paper 14, 2. Petitioner also argued as follows:

Should the Board deem it appropriate to proceed to a final written decision, despite the Patent Owner’s purposeful failure to comply with the Scheduling Order, the substantive arguments included in the Patent Owner’s Response to Order to Show Cause should be wholly disregarded. Patent Owner’s inclusion of a substantive response to the Petition in its Response to Order to Show Cause is yet another attempt to sidestep the rules of this tribunal and the Board’s Scheduling Order. Patent Owner’s substantive arguments are clearly untimely, and should therefore be disregarded by the Board in preparing its final written decision.

Id. at 2–3.

Having considered the parties’ respective arguments as to whether adverse judgment should be entered against Patent Owner under 37 C.F.R. § 42.73(b) based on an abandonment of the contest by Patent Owner, we have decided not to enter adverse judgment against Patent Owner. In light of Patent Owner’s statement regarding the Petition’s merits and Patent Owner’s statement that it does not request adverse judgment, we do not view Patent Owner’s actions as an abandonment of the contest. *See Apple Inc. v. Zipit Wireless, Inc.*, IPR2021-01124, Paper 14 (Dec. 21, 2022) (vacating

entry of adverse judgment after determining that it was not sufficiently clear that the patent owner intended to abandon the contest) (precedential); Order Resp. 2–4.

III. PATENTABILITY ANALYSIS

A. Legal Principles: Obviousness

A patent may not be obtained “if the differences between the claimed invention and the prior art are such that the claimed 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. An obviousness analysis involves underlying factual inquiries including (1) the scope and content of the prior art; (2) differences between the claimed invention and the prior art; (3) the level of ordinary skill in the art; and (4) where in evidence, objective indicia of nonobviousness, such as commercial success, long-felt but unsolved needs, and failure of others.² *Graham v. John Deere Co.*, 383 U.S. 1, 17–18, 35–36 (1966); *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1047–48 (Fed. Cir. 2016) (en banc). When evaluating a combination of references, an obviousness analysis should address “whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

We analyze the obviousness issues according to these principles.

B. Level of Ordinary Skill in the Art

Factors pertinent to determining the level of ordinary skill in the art include (1) the educational level of the inventor; (2) the type of problems

² The record does not include evidence or argument regarding objective indicia of nonobviousness.

encountered in the art; (3) prior-art solutions to those problems; (4) the rapidity with which innovations are made; (5) the sophistication of the technology; and (6) the educational level of workers active in the field. *Envtl. Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 696–97 (Fed. Cir. 1983). Not all factors may exist in every case, and one or more of these or other factors may predominate in a particular case. *Id.* These factors are not exhaustive, but merely a guide to determining the level of ordinary skill in the art. *Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007). Moreover, the prior art itself may reflect an appropriate skill level. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

Petitioner asserts that a person of ordinary skill in the art at the time of the alleged invention would have had “at least a Bachelor’s Degree in a relevant engineering discipline such as electrical engineering and at least two years of relevant experience in the design and/or development of automotive electrical systems, or a Masters or more advanced degree in a relevant engineering discipline such as electrical engineering.” Pet. 5. Dr. Wood’s testimony supports Petitioner’s assertion. *See* Ex. 1003 ¶ 45.

We adopt Petitioner’s description of an ordinarily skilled artisan as consistent with the ’077 patent and the asserted prior art.

C. Claim Construction

We construe claim terms “using the same claim construction standard” that district courts use to construe claim terms in civil actions under 35 U.S.C. § 282(b). *See* 37 C.F.R. § 42.100(b). Under that standard, claim terms “are given their ordinary and customary meaning, which is the meaning the term would have to a person of ordinary skill in the art at the time of the invention.” *Power Integrations, Inc. v. Fairchild Semiconductor*

Int'l, Inc., 904 F.3d 965, 971 (Fed. Cir. 2018) (citing *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc)). The meaning of claim terms may be determined by “look[ing] principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17).

Petitioner does not propose an explicit construction for any claim term. *See, e.g.*, Pet. 7.

Patent Owner does not propose an explicit construction for any claim term. *See* Order Resp. 2–4.

“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.” *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999); *see Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). We determine that no claim term requires an explicit construction to decide whether Petitioner satisfies the “preponderance of the evidence” standard for proving unpatentability.

D. Alleged Obviousness over Krieger: Claims 1–7, 9–11, and 18–20

Petitioner contends that claims 1–7, 9–11, and 18–20 are unpatentable under § 103 as obvious over Krieger. *See* Pet. 6, 21–39. Below, we provide an overview of Krieger. Then, we consider the obviousness issues. For the reasons explained below, we agree with Petitioner that claims 1–7, 9–11, and 18–20 are unpatentable under § 103 as obvious over Krieger.

1. OVERVIEW OF KRIEGER (EXHIBIT 1005)

Krieger is a U.S. patent application publication titled “Microprocessor Controlled Booster Apparatus with Polarity Protection,” filed on December 10, 2002, and published on July 8, 2004. Ex. 1005, codes (12), (22), (43), (54). Krieger states that the invention relates “to a booster device used for boosting a depleted battery,” and more particularly “to microprocessor control of the booster apparatus and a polarity protection circuit.” *Id.* ¶ 2; *see id.* at code (57). The polarity-protection circuit prevents current flow to a depleted battery “unless proper polarity is achieved.” *Id.* ¶ 10, code (57); *see id.* ¶ 29.

Krieger describes problems with conventional booster devices. *See* Ex. 1005 ¶¶ 4–9. For example, Krieger explains that connecting a boosting battery’s terminals to a depleted battery’s terminals “can be very dangerous if the batteries are connected incorrectly.” *Id.* ¶ 5. A “large current passes through the electric wires” even when “the two batteries are connected correctly.” *Id.* But when “the two batteries are connected erroneously, a current which passes through the electric wires is 10 to 20 times larger than the current existing on the electric wires when the batteries are correctly connected.” *Id.* Further, an “incorrect connection may result in one or both of the batteries being short-circuited,” and “in some cases, an explosion, fire and damage to the vehicle or to a person may result.” *Id.*

To address those issues, Krieger discloses a booster device that “can be used to ensure that the connection of the two batteries is made correctly and in a safe manner.” Ex. 1005 ¶¶ 6, 10.

Krieger's Figure 1 (reproduced below) depicts a booster device including a polarity-protection circuit:

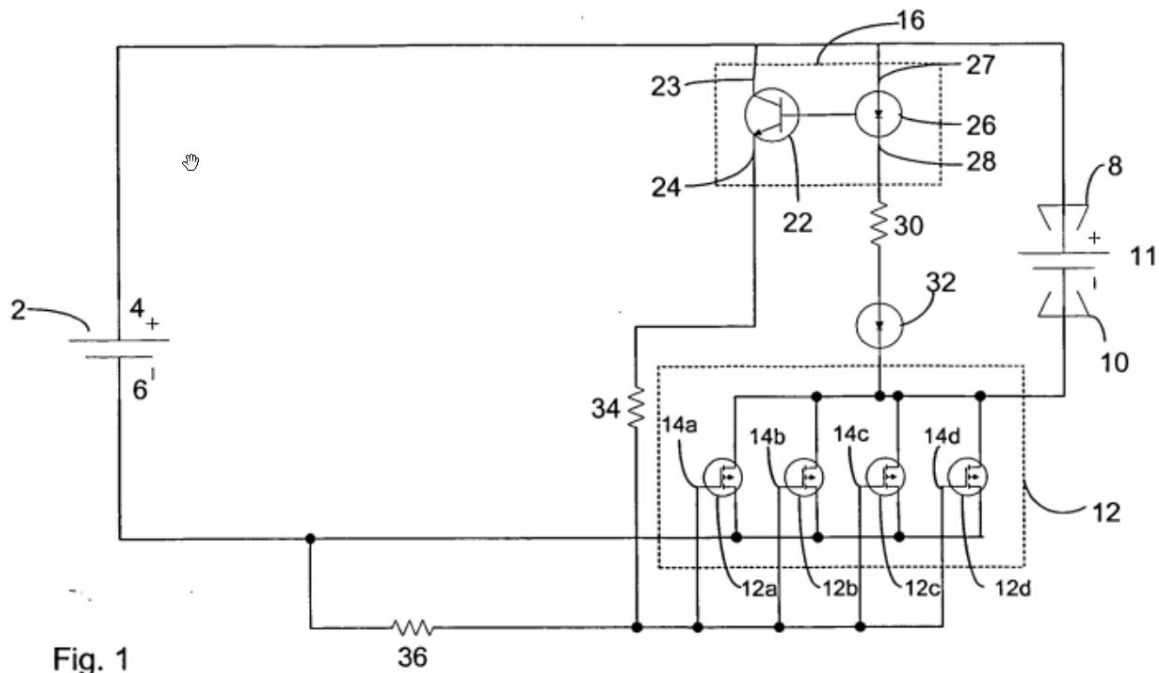


Figure 1 illustrates a booster device including boosting battery 2 with positive terminal 4 and negative terminal 6, switch 12 comprising field-effect transistors 12a–12d, and polarity-sensing circuit (opto-isolator) 16 coupled to boosting battery 2 and depleted battery 11. Ex. 1005 ¶¶ 22, 28–31, Fig. 1.

“The positive terminal 4 of the boosting battery 2 is coupled to one of a pair of alligator clamps 8, 10 to be connected to” depleted battery 11 “via a wire or battery cable.” Ex. 1005 ¶ 28, Fig. 1. “The negative terminal 6 of the boosting battery 2 is connected to the other of the alligator clamps 8, 10 to be connected to” depleted battery 11 “via a wire or battery cable.” *Id.* ¶ 28, Fig. 1.

Switch 12 is “activated to complete a boosting circuit between the boosting battery 2 and the depleted battery 11” by polarity-sensing circuit

(opto-isolator) 16 “only when a correct polarity connection between the batteries is attained.” Ex. 1005 ¶¶ 29, 31. Polarity-sensing circuit (opto-isolator) 16 “senses the polarity of the connection between the boosting battery 2 and the depleted battery 11 and provides a signal indicating the state of the connection” to switch 12. *Id.* ¶ 31.

Preferably, switch 12 is “a solid state device, such as a transistor, diode, field effect transistor(FET), etc.” Ex. 1005 ¶ 30. Figure 1 depicts switch 12 as “a number [of] FETs 12a–12d connected in parallel with each other.” *Id.* ¶ 30, Fig. 1.

Polarity-sensing circuit (opto-isolator) 16 includes phototransistor 22 and light emitting diode (LED) 26. Ex. 1005 ¶ 32, Fig. 1. “The opto-isolator 16 only turns on when it is properly biased as a result of a correct polarity connection being made between the boosting battery 2 and the depleted battery 11.” *Id.* ¶ 33.

Krieger’s Figure 5 (reproduced below) depicts a microprocessor-controlled jump-starter system:

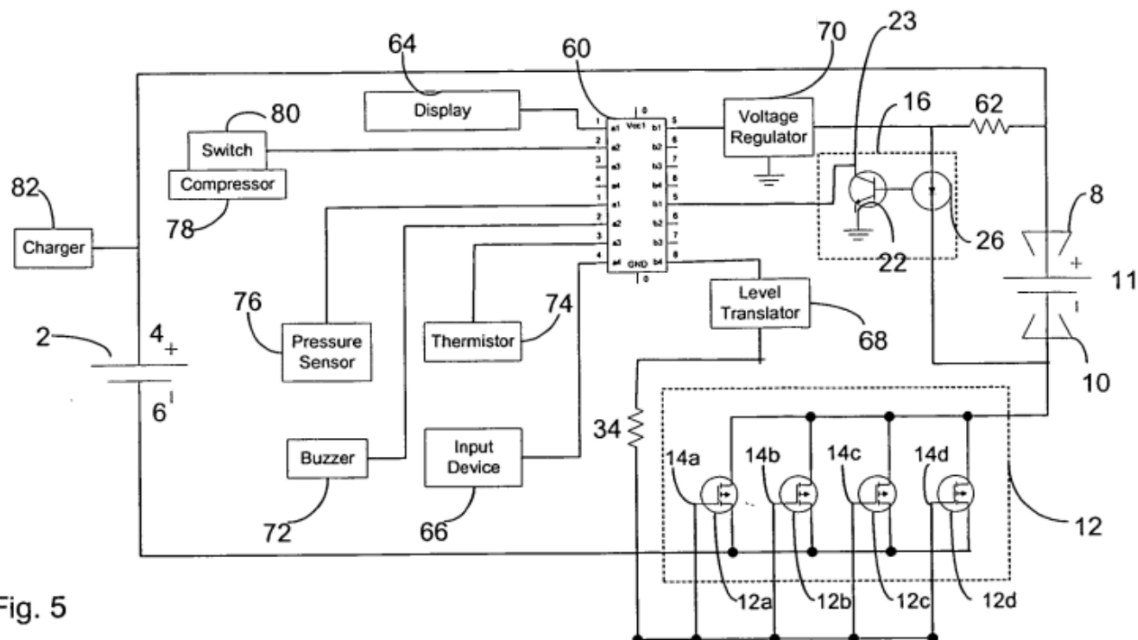


Fig. 5

Figure 5 illustrates a jump-starter system including boosting battery 2 with positive terminal 4 and negative terminal 6, switch 12 comprising field-effect transistors 12a–12d, opto-isolator 16, microprocessor 60, display 64, and voltage regulator 70. Ex. 1005 ¶¶ 26, 28, 43–46, Fig. 5.

Microprocessor 60 may “perform essentially all of the control functions needed for operation of the jump starter.” Ex. 1005 ¶ 43. With “a feedback circuit or other means,” microprocessor 60 may monitor (1) “the voltage and/or current being supplied to the depleted battery 11 from the booster battery 2” and (2) “the voltage and/or current of the battery 11.” *Id.* ¶ 44. By doing so, microprocessor 60 may detect “short circuits or other faults.” *Id.* “A resistive divider may be used to provide the voltage and current measurements to the microprocessor’s A/D input.” *Id.* Further, microprocessor 60 receives a “low voltage power supply,” e.g., 5 volts, from boosting battery 2 via voltage regulator 70. *Id.* ¶ 46, Fig. 5.

Voltage regulator 70 is “coupled to the boosting battery 2 and the depleted battery 11 for detecting their charge levels.” Ex. 1005 ¶ 52, Fig. 5. Voltage regulator 70 “produces a voltage proportional to the voltage of the boosting battery 2.” *Id.* ¶ 53. Microprocessor 60 detects “when the voltage of the boosting battery 2 falls below a predetermined level, for example, about 80% of its rated value.” *Id.* Voltage regulator 70 also “produces a voltage proportional to the voltage of the depleted battery 11.” *Id.* ¶ 54. Microprocessor 60 “receives this signal from” voltage regulator 70 and “determines and displays the voltage of the depleted battery 11 on display 64.” *Id.*

2. INDEPENDENT CLAIM 1

(a) Preamble

Claim 1 recites “[a] jumpstarter.” Ex. 1001, 5:11.

Petitioner contends that Krieger teaches claim 1’s preamble because Krieger discloses a microprocessor-controlled jump-starter system and Krieger’s Figure 5 depicts that system. Pet. 21 (quoting Ex. 1005 ¶ 43).

Generally, a preamble does not limit a claim. *Allen Eng’g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1346 (Fed. Cir. 2002). We need not decide whether claim 1’s preamble limits the claim because we agree with Petitioner that Krieger teaches claim 1’s preamble. *See* Pet. 21; Ex. 1003 ¶¶ 49, 74. Specifically, Krieger discloses a microprocessor-controlled jump-starter system. Ex. 1005 ¶ 43, Fig. 5; *see* Ex. 1003 ¶¶ 49, 74. Krieger explains that the microprocessor may “perform essentially all of the control functions needed for operation of the jump starter.” Ex. 1005 ¶ 43; *see* Ex. 1003 ¶ 50.

(b) Limitation 1(a)(i)

Claim 1 recites “a battery connected to a voltage regulator.” Ex. 1001, 5:12 (limitation 1(a)(i)).

Petitioner contends that Krieger teaches limitation 1(a)(i) because Krieger’s microprocessor-controlled jump-starter system includes voltage regulator 70 coupled to boosting battery 2 through resistor 62. Pet. 22 (citing Ex. 1005 ¶ 52, Fig. 5).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Krieger teaches limitation 1(a)(i). *See* Pet. 22; Ex. 1003 ¶ 75.

(c) Limitation 1(a)(ii)

Claim 1 recites “the battery capable of supplying power, via the voltage regulator, to at least a microcontroller.” Ex. 1001, 5:12–14 (limitation 1(a)(ii)).

Petitioner contends that Krieger teaches limitation 1(a)(ii) because the voltage regulator in Krieger’s microprocessor-controlled jump-starter system supplies the microprocessor with a “low voltage power supply (e.g., 5 volts) from battery 2.” Pet. 22–23 (emphasis omitted) (citing Ex. 1005 ¶ 46, Fig. 5).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Krieger teaches limitation 1(a)(ii). *See* Pet. 22–23; Ex. 1003 ¶ 76.

(d) Limitation 1(a)(iii)

Claim 1 recites “the battery also capable of supplying power to an automobile battery when the battery has at least a predetermined voltage.” Ex. 1001, 5:14–16 (limitation 1(a)(iii)).

Petitioner contends that Krieger teaches limitation 1(a)(iii) because the boosting battery in Krieger’s microprocessor-controlled jump-starter system is “coupled to a pair of alligator clamps 8, 10 to be connected to” an automobile battery requiring charging. Pet. 23–24 (citing Ex. 1005 ¶ 28, Fig. 5). Petitioner also contends that Krieger discloses:

- (1) monitoring the boosting battery “to detect when the battery falls below a predetermined voltage needed for supplying power to” the automobile battery; and
- (2) notifying the operator when the boosting battery “is low and needs to be recharged,” e.g., when the microprocessor detects that “the boosting battery

has fallen below ‘a predetermined level, for example, about 80% of its rated value.’”

Id. at 24 (quoting Ex. 1005 ¶ 53) (citing Ex. 1005 ¶ 44).

According to Petitioner, “the boosting battery is ‘capable’ of supplying power to an automobile battery when the [boosting] battery has at least a predetermined voltage, i.e., the boosting battery is above the ‘predetermined level.’” Pet. 24 (emphasis omitted).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Krieger teaches limitation 1(a)(iii). *See* Pet. 23–25; Ex. 1003 ¶¶ 77–80.

(e) Limitation 1(b)

Claim 1 recites “a load detector circuit, connected to the microcontroller, to detect when the jumpstarter is correctly connected to the automobile battery.” Ex. 1001, 5:17–19 (limitation 1(b)).

Petitioner contends that Krieger teaches limitation 1(b) because Krieger’s microprocessor-controlled jump-starter system includes “a feedback circuit or other means” for permitting the microprocessor to monitor “the voltage and/or current” of the automobile battery (load). Pet. 26 (quoting Ex. 1005 ¶ 44). Petitioner contends that Krieger discloses using “[a] resistive divider” to “provide the voltage and current measurements to the microprocessor’s A/D input.” *Id.* (alteration by Petitioner) (quoting Ex. 1005 ¶ 44).

Petitioner also contends that the microprocessor uses “the monitored voltage and/or current” to (1) detect that the jumpstarter “is connected” to the automobile battery (load) and (2) detect that the positive and negative

polarities of the automobile battery (load) “are not reversely connected.”

Pet. 26. As support, Petitioner identifies Krieger’s disclosures as follows:

- (1) microprocessor 60 controls switch 12 to “supply power from the boosting battery 2 to the depleted automobile battery 11”;
- (2) if “the polarity connections of clamps 8, 10 to the depleted battery 11 are not correct, the switch 12 remains off”;
- (3) microprocessor 60 may “detect if clamps 8, 10 are connected to a battery or have been disconnected”;
- (4) if “no battery is present, the switch 12 is placed in a non-conducting state”; and
- (5) if “a battery is present, the jump starting process continues.”

Id. at 26–27 (quoting Ex. 1005 ¶¶ 47–48) (citing Ex. 1005 ¶¶ 45, 56).

Further, Petitioner asserts that detecting “when the jumpstarter is correctly connected to the automobile battery” according to limitation 1(b) involves (1) detecting that the jumpstarter “is connected” to the automobile battery (load) and (2) detecting that the positive and negative polarities of the automobile battery (load) “are not reversely connected.” *See* Pet. 25–26.

Patent Owner disputes that Krieger teaches limitation 1(b). *See* Order Resp. 3–4. Specifically, Patent Owner asserts that “the ‘load detector circuit’ of Kreiger [sic] cannot properly be found to meet the claimed ‘feedback circuit’ of” the ’077 patent. *Id.* at 3. Patent Owner asserts that “[a] ‘feedback circuit’ is commonly understood by artisans as a circuit that supplies some portion of the circuit output back to the input of the involved system.” *Id.* Patent Owner also asserts that Krieger’s circuit “measures

electrical load being drawn from a power source” and “has nothing to do with supplying some portion of its output to the involved system.” *Id.*

We agree with Petitioner that Krieger teaches limitation 1(b). *See* Pet. 25–27; Ex. 1003 ¶¶ 81–83. The ’077 patent’s specification indicates that detecting “when the jumpstarter is correctly connected to the automobile battery” according to limitation 1(b) involves (1) detecting that the jumpstarter “is connected” to the automobile battery (load) and (2) detecting that the positive and negative polarities of the automobile battery (load) “are not reversely connected.” *See* Ex. 1001, 2:8–10, 2:20–22, 2:40–43, 2:51–54, 4:20–32; *see also* Ex. 1003 ¶ 81. As an example, the specification explains that the “load detection of the present disclosure can prevent improper operations by the user, such as reversed polarity, which causes damages to the automobile or the direct current power supply.” Ex. 1001, 2:40–43. As another example, the specification explains that the “microcontroller in the present disclosure determines whether the automobile storage battery is connected with the automobile engine through the load detection module.” *Id.* at 4:23–25.

As Petitioner contends, the microprocessor in Krieger’s microprocessor-controlled jump-starter system uses “the monitored voltage and/or current” to (1) detect that the jumpstarter “is connected” to the automobile battery (load) and (2) detect that the positive and negative polarities of the automobile battery (load) “are not reversely connected.” Ex. 1005 ¶¶ 44–48, Fig. 5; *see* Ex. 1003 ¶¶ 82–83; Pet. 26. Specifically, microprocessor 60 may monitor (1) “the voltage and/or current being supplied to the depleted battery 11 from the booster battery 2” and (2) “the voltage and/or current of the battery 11” with “a feedback circuit or other

means.” Ex. 1005 ¶ 44; *see id.* ¶ 48; Ex. 1003 ¶¶ 50, 82. Additionally, microprocessor 60 provides output signals that (1) control switch 12 by activating or deactivating switch 12 and (2) “terminate the jump starting process when a fault is detected.” Ex. 1005 ¶¶ 45–46; *see* Ex. 1003 ¶¶ 50–51, 83.

In Krieger’s Figure 5, for example, “a correct polarity connection between the boosting battery 2 and the depleted battery 11” forward biases LED 26 to turn on phototransistor 22 and cause phototransistor 22 to supply “a first signal of a first voltage” to microprocessor 60. Ex. 1005 ¶ 45, Fig. 5; *see* Ex. 1003 ¶ 51. In contrast, an incorrect polarity connection reverse biases LED 26 to turn off phototransistor 22 and cause phototransistor 22 to supply “a second signal of a second voltage” to microprocessor 60. Ex. 1005 ¶ 45, Fig. 5; *see id.* ¶ 47; Ex. 1003 ¶¶ 51, 83. Microprocessor 60 “activate[s] the switch 12 into a conducting state when it receives the first signal” and “deactivate[s] the switch 12 into a non-conducting state when it receives the second signal.” Ex. 1005 ¶ 45; *see* Ex. 1003 ¶ 51.

Further, the ’077 patent’s Figure 2 depicts a load detection module comprising “resistors R9, 10, a capacitor C6 and a resistor R13.” Ex. 1001, 4:1–2, Fig. 2. Resistor R9 (100K) and resistor R10 (12K) form a resistive divider that provides a voltage measurement to the microcontroller’s V1 port. *See id.* at 3:59–66, Fig. 2. Similarly, Krieger discloses using “[a] resistive divider” to “provide the voltage and current measurements to the microprocessor’s A/D input” and permit the microprocessor to “detect short circuits or other faults.” Ex. 1005 ¶ 44.

As for Patent Owner’s assertion that “the ‘load detector circuit’ of Kreiger [sic] cannot properly be found to meet the claimed ‘feedback circuit’

of” the ’077 patent, we agree with Petitioner that “Patent Owner’s substantive arguments are clearly untimely” and should be “disregarded by the Board.” *See* Order Resp. 3; Paper 14, 3. But even if considered, they lack merit. No claim includes the word “feedback.” Ex. 1001, 5:11–6:41. Indeed, the word “feedback” does not appear in the ’077 patent’s written description. *See, e.g., id.* at 1:40–5:9.

(f) Limitation 1(c)

Claim 1 recites “the microcontroller generating, when the jumpstarter is correctly connected to the automobile battery, an output signal.” Ex. 1001, 5:20–22 (limitation 1(c)).

Petitioner contends that Krieger teaches limitation 1(c) because the microprocessor in Krieger’s microprocessor-controlled jump-starter system:

- (1) controls switch 12 “to supply power from the boosting battery 2 to the depleted automobile battery 11 when the microprocessor determines that the automobile battery is ‘correctly connected’”;
- (2) “provides output signals to activate the switch 12 into a conducting state”; and
- (3) “can deactivate switch 12 to terminate the jump starting process when a fault is detected.”

Pet. 27 (quoting Ex. 1005 ¶ 45).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, and the reasons discussed above for limitation 1(b), we agree with Petitioner that Krieger teaches limitation 1(c). *See* Pet. 27–28; Ex. 1003 ¶ 84; *supra* § III.D.2(e). As discussed above for limitation 1(b), microprocessor 60 provides output signals that (1) control switch 12 by activating or deactivating switch 12 and (2) “terminate the jump starting process when a fault is detected,” e.g., when the jumpstarter is incorrectly

connected. Ex. 1005 ¶¶ 45–46; *see* Ex. 1003 ¶¶ 50–51, 83; *supra* § III.D.2(e).

(g) Limitation 1(d)

Claim 1 recites “switching circuitry, including at least one switch, to operatively connect the battery to the automobile battery when the microcontroller generates the output signal to supply a charging current to the automobile battery.” Ex. 1001, 5:23–27 (limitation 1(d)).

Petitioner contends that Krieger teaches limitation 1(d) because Krieger’s microprocessor-controlled jump-starter system includes FET-based switch 12 that the microprocessor activates “to complete a boosting circuit between the boosting battery 2 and the depleted battery 11.” Pet. 28–29 (quoting Ex. 1005 ¶ 29). Further, Petitioner asserts that “the switch may include ‘a number [of] FETs 12a–12d connected in parallel with each other.’” *Id.* at 28 (alteration by Petitioner) (quoting Ex. 1005 ¶ 30).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, and the reasons discussed above for limitation 1(b), we agree with Petitioner that Krieger teaches limitation 1(d). *See* Pet. 28–29; Ex. 1003 ¶ 85; *supra* § III.D.2(e). As discussed above for limitation 1(b), “a correct polarity connection between the boosting battery 2 and the depleted battery 11” forward biases LED 26 to turn on phototransistor 22 and cause phototransistor 22 to supply “a first signal of a first voltage” to microprocessor 60. Ex. 1005 ¶ 45, Fig. 5; *see* Ex. 1003 ¶ 51; *supra* § III.D.2(e). In contrast, an incorrect polarity connection reverse biases LED 26 to turn off phototransistor 22 and cause phototransistor 22 to supply “a second signal of a second voltage” to microprocessor 60. Ex. 1005 ¶ 45, Fig. 5; *see id.* ¶ 47; Ex. 1003 ¶¶ 51, 83. Microprocessor 60 “activate[s] the

switch 12 into a conducting state when it receives the first signal” and “deactivate[s] the switch 12 into a non-conducting state when it receives the second signal.” Ex. 1005 ¶ 45; *see* Ex. 1003 ¶ 51.

(h) Conclusion About Obviousness for Claim 1

For the reasons discussed above, Krieger teaches the invention covered by claim 1. *See supra* §§ III.D.2(a)–(g). Hence, Petitioner has shown by a preponderance of the evidence that claim 1 is unpatentable under § 103 as obvious over Krieger.

3. DEPENDENT CLAIMS 2–7, 9–11, AND 18–20

(a) Claim 2

Claim 2 depends directly from claim 1 and further requires “a battery voltage detector circuit to detect a battery voltage of the battery.” Ex. 1001, 5:28–30.

Petitioner contends that Krieger teaches the invention covered by claim 2 because Krieger’s microprocessor-controlled jump-starter system includes “a feedback circuit or other means” for permitting the microprocessor to monitor “the voltage and/or current being supplied to the depleted battery 11 from the booster battery 2.” Pet. 29–30 (quoting Ex. 1005 ¶ 44). Petitioner contends that Krieger discloses using “[a] resistive divider” to “provide the voltage and current measurements to the microprocessor’s A/D input.” *Id.* at 30 (alteration by Petitioner) (quoting Ex. 1005 ¶ 44). Petitioner also contends that Krieger discloses programming the microprocessor to “detect when the voltage of the boosting battery 2 falls below a predetermined level.” *Id.* (citing Ex. 1005 ¶ 53).

For the reasons stated by Petitioner and supported by Dr. Wood's testimony, we agree with Petitioner that Krieger teaches the invention covered by claim 2. *See* Pet. 29–30; Ex. 1003 ¶ 86.

(b) Claims 3–7

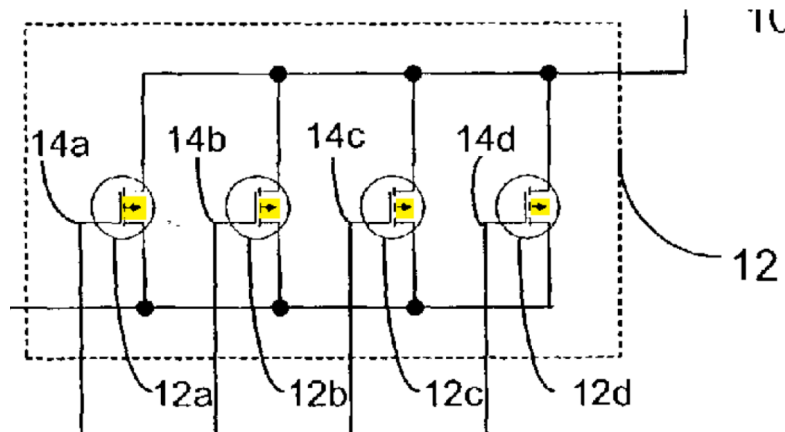
Claim 3–7 relate to the “at least one switch” recited in claim 1 and read as follows:

3. The jumpstarter of claim 1, wherein the at least one switch is one or more MOSFETs.
4. The jumpstarter of claim 3, wherein the one or more MOSFETs are n-channel MOSFETs.
5. The jumpstarter of claim 1, wherein there are a plurality of switches.
6. The jumpstarter of claim 1, wherein the at least one switch is a plurality of MOSFETs.
7. The jumpstarter of claim 6, wherein the plurality of MOSFETs are connected in parallel.

Ex. 1001, 5:31–40.

Petitioner contends that Krieger teaches or renders obvious the inventions covered by claims 3–7 because Krieger discloses that switch 12 includes “a number [of] FETs 12a–12d connected in parallel with each other,” e.g., as shown in Krieger's Figure 5. Pet. 30–31, 33–34. Petitioner also contends that Figure 5 depicts MOSFETs because the arrows in FETs 12a–12d in Figure 5 denote MOSFETs. *Id.* at 31–32.

To support its contentions, Petitioner provides a highlighted excerpt from Figure 5 as reproduced below (Pet. 32):



The above highlighted excerpt from Figure 5 illustrates switch 12 including “FETs 12a–12d connected in parallel with each other” with yellow highlighting over an outwardly pointing arrow in each FET. *See* Pet. 32; Ex. 1003 ¶ 89; Ex. 1005 ¶ 30, Fig. 5.

Further, Petitioner asserts that an ordinarily skilled artisan would have understood that:

- (1) “MOSFETs were, and continue to be, the most common choice for switches in power circuitry, such as the jump starter device described in Krieger”;
- (2) “n-channel MOSFETs are more commonly used in power switching applications because of the ease of manufacture of n-channel MOSFETs compared to p-channel MOSFETs”; and
- (3) Krieger’s disclosure that “FETs 12a–12d are preferably high power, very low on-resistance types” identifies “characteristics of n-channel MOSFETs.”

Pet. 32–33 (emphasis omitted).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Krieger teaches or renders obvious the inventions covered by claims 3–7. *See* Pet. 30–34; Ex. 1003 ¶¶ 87–96.

(c) Claim 9

Claim 9 depends directly from claim 1 and further requires “a load detector to detect a reverse polarity connection to the automobile battery.” Ex. 1001, 6:1–3.

Petitioner contends that Krieger teaches the invention covered by claim 9 for the reasons that Krieger teaches limitation 1(b) and because the microprocessor in Krieger’s microprocessor-controlled jump-starter system uses “the monitored voltage and/or current” to “detect that positive and negative polarities of the automobile battery are not reversed.” Pet. 34–35.

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Krieger teaches the invention covered by claim 9. *See* Pet. 34–35; Ex. 1003 ¶¶ 97–98; *supra* § III.D.2(e).

(d) Claim 10

Claim 10 depends directly from claim 1 and specifies that “the microprocessor includes a standby mode where all outputs are closed.” Ex. 1001, 6:4–5.

Petitioner asserts that the Board should interpret the phrase “all outputs are closed” in claim 10 to mean that “the jumpstarter is prevented from supplying a charging voltage to the automobile battery.” Pet. 36, 59. Petitioner explains that the ’077 patent “uses the term ‘closes’ or ‘closed’ to mean that the outputs are disconnected (in contrast to the more conventional use of the term ‘open’ to describe a disconnected circuit).” *Id.* at 35 & n.4 (citing Ex. 1001, 4:32–35; Ex. 1003 ¶ 100).

Petitioner contends that Krieger teaches the invention covered by claim 10 because Krieger discloses “standby modes during which the jump starter is prevented from supplying a charging voltage to the automobile battery” when (1) “a reverse polarity condition” exists or (2) “the automobile battery is disconnected from the jumpstarter.” Pet. 36 (citing Ex. 1003 ¶¶ 99–101; Ex. 1005 ¶¶ 47–48).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Krieger teaches the invention covered by claim 10. *See* Pet. 35–36; Ex. 1003 ¶¶ 99–101.

(e) Claim 11

Claim 11 depends directly from claim 10 and specifies that “the microcontroller closes all outputs when a voltage of the direct current power supply is lower than that of a state being able to supply power.” Ex. 1001, 6:6–9.

Petitioner contends that Krieger teaches the invention covered by claim 11 because the microprocessor in Krieger’s microprocessor-controlled jump-starter system “monitors and detects when the jump starter battery 2 falls below a predetermined level needed to supply power to the vehicle battery 11.” Pet. 36–37. As support, Petitioner quotes Krieger as follows:

The microprocessor 60 is programmed to detect when the voltage of the boosting battery 2 falls below a predetermined level, for example, about 80% of its rated value. The buzzer 72 or other device can then be activated to indicate to the operator that the charge of the boosting battery 2 is low and that it should be recharged.

Id. at 37 (quoting Ex. 1005 ¶ 53).

For the reasons stated by Petitioner and supported by Dr. Wood's testimony, we agree with Petitioner that Krieger teaches the invention covered by claim 11. *See* Pet. 36–37; Ex. 1003 ¶¶ 102–105.

(f) Claim 18

Claim 18 depends directly from claim 1 and further requires “a start control module to stop supplying battery power when there is no load.” Ex. 1001, 6:25–27.

Petitioner contends that Krieger teaches the invention covered by claim 18 for the reasons that Krieger teaches limitation 1(b) and because the microprocessor in Krieger's microprocessor-controlled jump-starter system “monitors the voltage and/or current being supplied to the automobile battery and controls the switch 12 to terminate the jump starting process upon detecting that the automobile has been disconnected,” i.e., when there is no load. Pet. 38 (citing Ex. 1003 ¶¶ 106–107; Ex. 1005 ¶¶ 48, 58).

For the reasons stated by Petitioner and supported by Dr. Wood's testimony, we agree with Petitioner that Krieger teaches the invention covered by claim 18. *See* Pet. 38; Ex. 1003 ¶¶ 106–107; *supra* § III.D.2(e).

(g) Claims 19 and 20

Claim 19 depends directly from claim 1 and specifies that “the at least one switch switches a negative voltage.” Ex. 1001, 6:28–29. Claim 20 also depends directly from claim 1 and specifies that “the at least one switch is connected to a negative battery terminal.” *Id.* at 6:30–31.

Petitioner contends that Krieger teaches the inventions covered by claims 19 and 20 because FETs 12a–12d in Krieger's Figure 5 are “electrically connected to the negative terminal 6 of the boosting battery 2.” Pet. 38–39 (citing Ex. 1003 ¶¶ 108–111; Ex. 1005 ¶ 32, Fig. 5).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Krieger teaches the inventions covered by claims 19 and 20. *See* Pet. 38–39; Ex. 1003 ¶¶ 108–111.

(h) Summary for Dependent Claims 2–7, 9–11, and 18–20

For the reasons discussed above, Krieger teaches or renders obvious the inventions covered by claims 2–7, 9–11, and 18–20. *See supra* §§ III.D.3(a)–(g). Hence, Petitioner has shown by a preponderance of the evidence that claims 2–7, 9–11, and 18–20 are unpatentable under § 103 as obvious over Krieger.

E. Alleged Obviousness over Krieger and Baxter: Claim 8

Petitioner contends that claim 8 is unpatentable under § 103 as obvious over Krieger and Baxter. *See* Pet. 6, 39–41. Above, we provided an overview of Krieger. *See supra* § III.D.1. Below, we provide an overview of Baxter. Then, we consider the obviousness issues. For the reasons explained below, we agree with Petitioner that claim 8 is unpatentable under § 103 as obvious over Krieger and Baxter.

1. OVERVIEW OF BAXTER (EXHIBIT 1006)

Baxter is a U.S. patent application publication titled “Low-Voltage Connection with Safety Circuit and Method for Determining Proper Connection Polarity,” filed on March 24, 2010, and published on July 8, 2010. Ex. 1006, codes (12), (22), (43), (54). Baxter states that the invention relates “to batteries providing certain safety features.” *Id.* ¶ 3; *see id.* at code (57).

Baxter explains that jumper cables “commonly used to connect two low-voltage (e.g. battery-powered) systems temporarily” may “result in personal injury and equipment damage.” Ex. 1006 ¶ 5. For example, when

“jump starting a car with” a depleted battery “using a car with a good battery,” a “spark may be created.” *Id.* If “the spark is in the vicinity of hydrogen gas commonly generated by car batteries, the spark can ignite the hydrogen gas to explosive effect.” *Id.* Further, “connecting a jumper cable set backward (i.e. with polarity of one of the battery connections reversed) can also cause injury or damage.” *Id.*

To address those issues, Baxter discloses “a safety circuit for use in low-voltage systems that improves safety.” Ex. 1006 ¶¶ 7, 25, code (57). The safety circuit “leaves the battery disconnected from the low-voltage system until it determines that it is safe to make a connection.” *Id.* ¶¶ 7, 25, code (57). The safety circuit may implement a method for detecting the “proper polarity of the connections between the battery and the low-voltage system.” *Id.* ¶¶ 7, 25, code (57).

The safety circuit may use “one or more high-current transistors as a switch to connect the two low-voltage systems.” Ex. 1006 ¶¶ 10, 28; *see id.* ¶ 36. The “one or more transistors are controlled by the safety circuit or control circuit that detects the condition at each end of the connection cable or cables.” *Id.* ¶¶ 10, 28; *see id.* ¶ 36.

Baxter's Figure 7 (reproduced below) depicts a circuit diagram for a safety circuit:

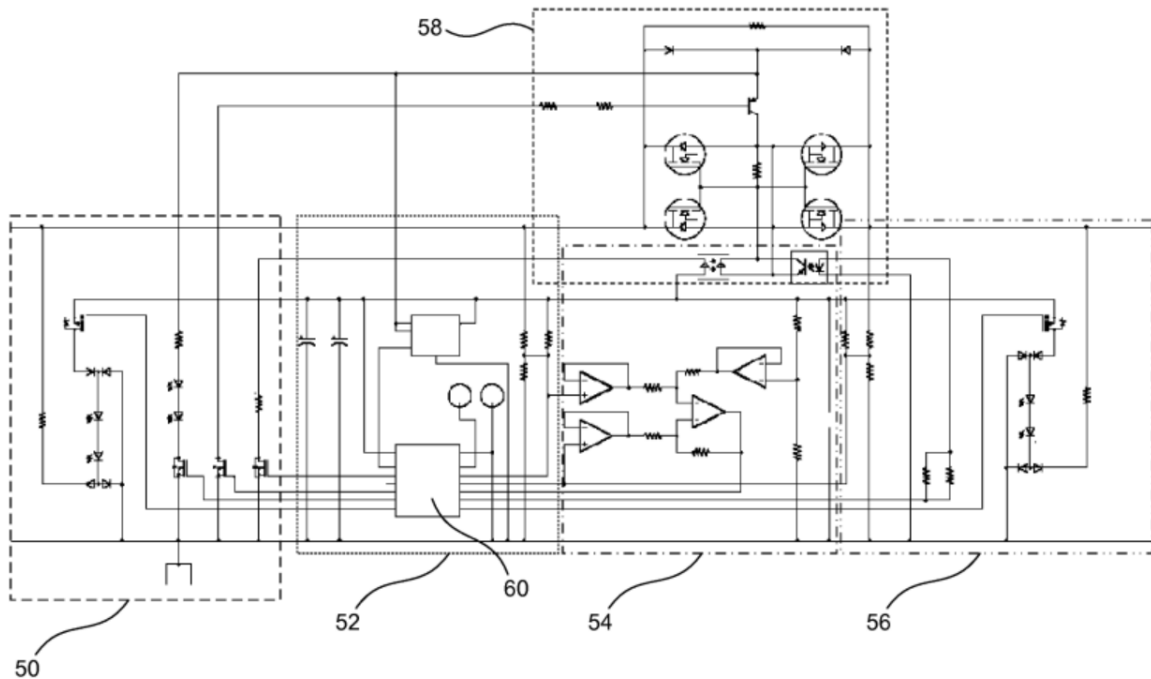


FIG. 7

Figure 7 illustrates a safety circuit comprising microcontroller 60 and other components arranged in various areas as follows:

- area 50 depicted in more detail in Figure 8;
- area 52 depicted in more detail in Figure 9;
- area 54 depicted in more detail in Figure 10;
- area 56 depicted in more detail in Figure 11; and
- area 58 depicted in more detail in Figure 12.

Ex. 1006 ¶¶ 18–19, 58, Figs. 7–12.

Baxter's Figure 12 (reproduced below) depicts in more detail area 58 in Figure 7's safety circuit:

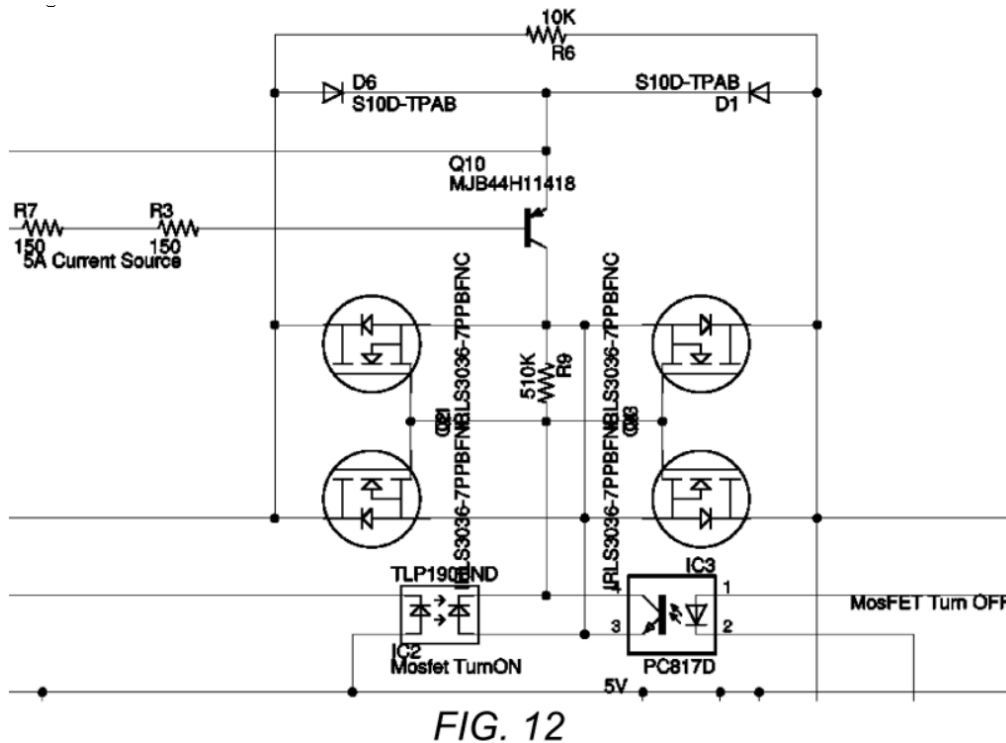


Figure 12 illustrates area 58 encompassing the following components: IC2, IC3, D1, D6, R3, R6, R7, R9, Q10, and four metal-oxide-semiconductor field-effect transistors (MOSFETs). Ex. 1006 ¶ 58, Fig. 12; *see* Ex. 1003 ¶ 113.

2. DIFFERENCES BETWEEN THE CLAIMED INVENTION AND THE PRIOR ART

Claim 8 depends indirectly from claim 1 and specifies that “the plurality of MOSFETs [comprising the switching circuitry] are connected in a series-parallel topology.” Ex. 1001, 5:41–42.

Petitioner contends that Krieger discloses “a MOSFET-based switch 12 that includes ‘a number [of] FETs 12a–12d connected in parallel with each other.’” Pet. 39 (alteration by Petitioner) (quoting Ex. 1005 ¶ 30). Petitioner contends that Baxter discloses:

- (1) “a safety circuit for jump starting a battery” that
 - (a) “detects when the battery is connected with a reversed polarity” and
 - (b) “leaves the battery disconnected until it determines that it is safe to make a connection”;
- (2) “using ‘one or more high-current transistors as a switch’”; and
- (3) “using MOSFETS connected in a series-parallel topology.”

Pet. 39–40 (quoting Ex. 1006 ¶28) (citing Ex. 1006 ¶¶7–10, 25–26, Fig. 7).

To support its contentions, Petitioner provides a highlighted version of Baxter's Figure 12 as reproduced below (Pet. 41):

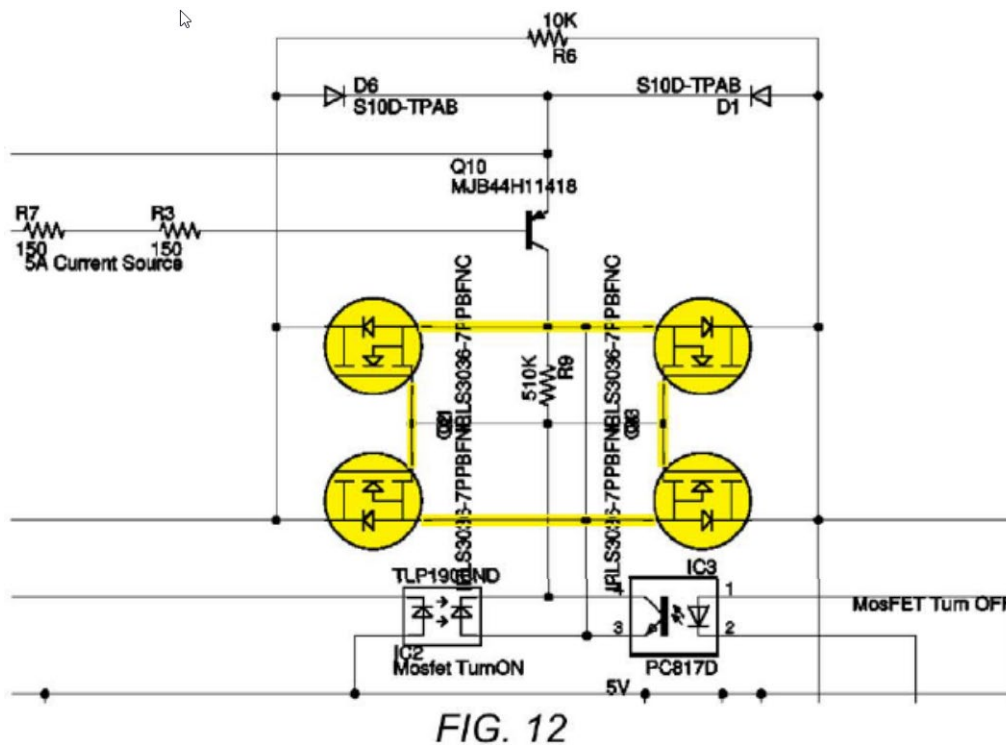


Figure 12 illustrates area 58 encompassing the following components: IC2, IC3, D1, D6, R3, R6, R7, R9, Q10, and four MOSFETs. Ex. 1006 ¶ 58, Fig. 12; *see* Ex. 1003 ¶ 113. The above highlighted version of Figure 12

includes yellow highlighting over the four MOSFETs and the connections between them. *See* Pet. 41; Ex. 1003 ¶ 113.

Dr. Wood testifies that Baxter's Figures 7 and 12 show "MOSFETS connected in a series-parallel topology." Ex. 1003 ¶ 113.

For the reasons stated by Petitioner and supported by Dr. Wood's testimony, we agree with Petitioner that Baxter teaches claim 8's "series-parallel topology" for a plurality of MOSFETs. *See* Pet. 39–41; Ex. 1003 ¶¶ 112–113.

3. ALLEGED REASON TO COMBINE THE TEACHINGS OF THE REFERENCES

Petitioner identifies a reason that would have prompted an ordinarily skilled artisan to combine Baxter's teachings with Krieger's teachings. *See* Pet. 41. Additionally, Petitioner explains that combining those teachings would have yielded a predictable result. *Id.* Dr. Wood's testimony supports Petitioner's positions. *See* Ex. 1003 ¶ 114.

For instance, Dr. Wood testifies that an ordinarily skilled artisan "would have been motivated to utilize a series-parallel MOSFET switch" as shown in Baxter's Figures 7 and 12 in Krieger's MOSFET-based switch 12 because the skilled artisan would have understood that Baxter's series-parallel arrangement "blocks reverse current flow when the FETs are turned off" in contrast to "a single FET which always allows current flow in one direction, even when the FET is turned off." Ex. 1003 ¶ 114. Dr. Wood also testifies that an ordinarily skilled artisan would have been motivated "to utilize a pair of series connected MOSFETs, as disclosed by Baxter, for each of the parallel-connected FETs 12a–12d in Krieger's switch 12" to yield "the desirable and predictable result of preventing reverse current flow from the

automobile battery 11 to the boosting battery 2 in Krieger’s jump starter.”
Id. (emphases omitted).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that an ordinarily skilled artisan would have been motivated to combine Baxter’s teachings with Krieger’s teachings and would have obtained a predictable result. *See* Pet. 41; Ex. 1003 ¶ 114.

4. CONCLUSION ABOUT OBVIOUSNESS

For the reasons discussed above, the combined disclosures in Krieger and Baxter teach the invention covered by claim 8. *See supra* §§ III.D.2(h), III.D.3(b), III.E.2. Moreover, an ordinarily skilled artisan would have been motivated to combine Baxter’s teachings with Krieger’s teachings and would have obtained a predictable result. *See supra* § III.E.3. Hence, Petitioner has shown by a preponderance of the evidence that claim 8 is unpatentable under § 103 as obvious over Krieger and Baxter.

F. Alleged Obviousness over Krieger and Tracey: Claims 22 and 23

Petitioner contends that claims 22 and 23 are unpatentable under § 103 as obvious over Krieger and Tracey. *See* Pet. 6, 42–44. Above, we provided an overview of Krieger. *See supra* § III.D.1. Below, we provide an overview of Tracey. Then, we consider the obviousness issues. For the reasons explained below, we agree with Petitioner that claims 22 and 23 are unpatentable under § 103 as obvious over Krieger and Tracey.

1. OVERVIEW OF TRACEY (EXHIBIT 1007)

Tracey is an international patent application publication titled “A Jump Starter,” filed on December 14, 2011, and published on June 21, 2012. Ex. 1007, codes (12), (22), (43), (54). Tracey states that the invention

relates “to a jump starter system for a battery, especially a vehicle battery.”
Id. at 1:7.³

Tracey describes problems with jump starters “comprising a lead acid battery within a battery housing and leads for extending from the battery housing to the terminal of” a depleted battery. Ex. 1007, 1:21–22. Specifically, “[s]uch units are costly, bulky, and heavy, and can generally only be used for large scale commercial applications.” *Id.* at 1:22–23. Further, if “the unit is not used for some time,” the “battery charge diminishes so that it is not effective when required.” *Id.* at 1:24–25. Hence, Tracey endeavors to provide a jump starter that “will address these issues.” *Id.* at 1:30–31; *see id.* at code (57).

More specifically, Tracey discloses a jump-starter control circuit that “protects from voltage mismatch, reverse polarity, short circuit, over-discharge, and over-use.” Ex. 1007, 6:28–29, Fig. 10. The control circuit includes “power-switching and over-discharge elements” as well as reverse-blocking elements. *Id.* at 7:9–11, 7:22–24, Fig. 10. The control circuit “prevent[s] damage from events such as accidental shorting of the clips.” *Id.* at code (57); *see id.* at 4:9–11, 8:10–14, 8:26–29.

According to Tracey, the “following are advantageous aspects of the invention”:

- “Jump starter product protection from misuse”;
- “Battery protection”;
- “Passive safety”;

³ For Exhibit 1007 (Tracey), we follow Petitioner’s practice and cite to the page numbers appearing in the published application.

- “No possibility of damage through operator error such as short circuit etc.”; and
- “Solid state switching.”

Ex. 1007, 9:8–19.

Tracey’s Figure 10 (reproduced below) depicts a circuit diagram for a jump-starter control circuit:

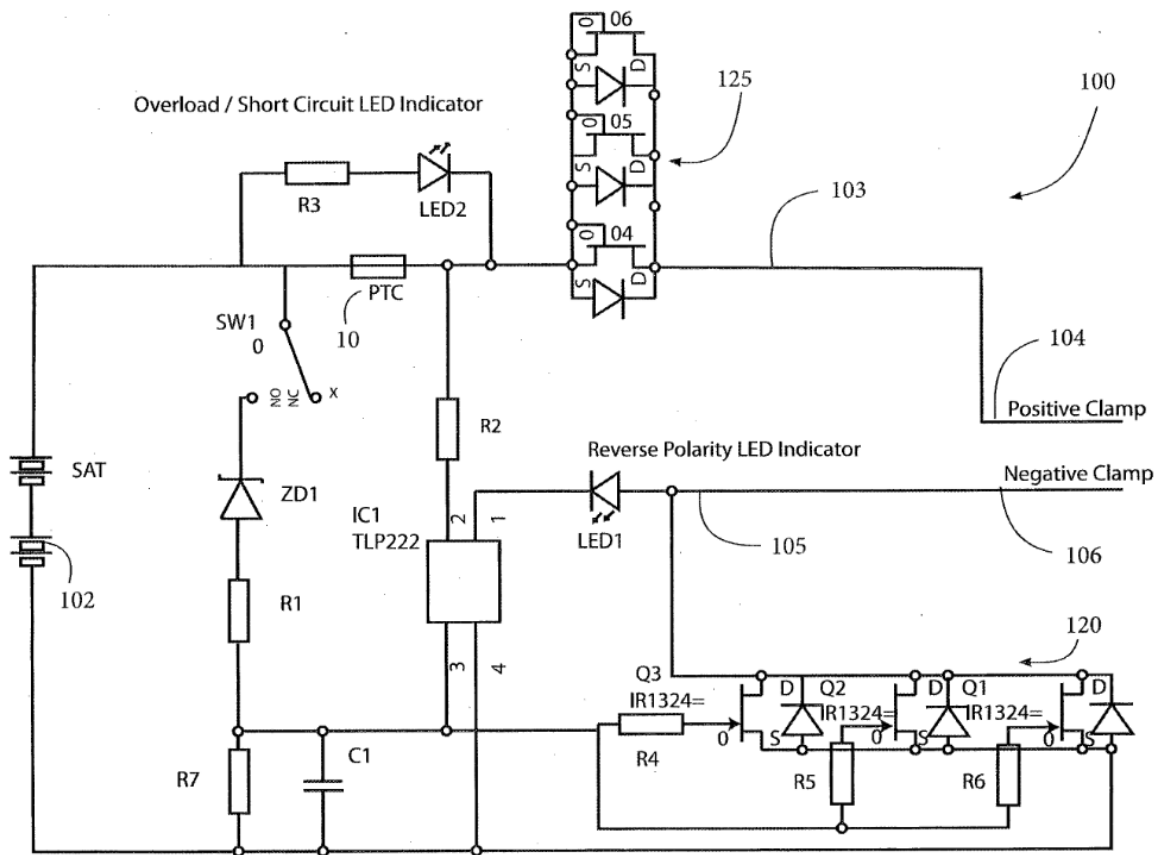


Fig.10

Figure 10 illustrates control circuit 100 comprising “batteries 102, a positive lead 103 with a clamp conductor 104, and a negative lead 105 with a clamp conductor 106.” Ex. 1007, 6:18–19, Fig. 10.

Control circuit 100 includes switch SW1, Zener diode ZD1, resistor R1, and “MOSFETS (or alternates) Q1, Q2 and Q3” that comprise the “power-switching and over-discharge elements.” Ex. 1007, 7:8–11, Fig. 10.

Control circuit 100 also includes “MOSFETS (or alternates) Q4, Q5 and Q6” connected to “the positive supply lead 103.” *Id.* at 7:22–23, Fig. 10 (items 04, 05, and 06 identified by reference numeral 125).

Devices Q4, Q5, and Q6 “are connected in such a way as to utilise [sic] their intrinsic diodes for the purposes of reverse blocking of current.” Ex. 1007, 7:23–24. Specifically, the “gate to source is short circuited, thus holding the devices in a permanent OFF state.” *Id.* at 7:24–25. If the jump starter connects to “a vehicle with a greater voltage than the unit is intended for” or the vehicle alternator attempts to return charge, “the intrinsic diodes in Q4, Q5 and Q6 will become reverse biased” and “no current may flow.” *Id.* at 7:25–27, 7:30–33. Hence, control circuit 100 “protects the jump-starter’s internal battery 102 from potentially dangerous overcharge conditions.” *Id.* at 7:27–28.

2. DIFFERENCES BETWEEN THE CLAIMED INVENTION AND THE PRIOR ART

Claim 22 depends directly from claim 1 and further requires “a voltage back-flow protection.” Ex. 1001, 6:35–36. Claim 23 depends from claim 22 and recites “wherein the voltage back-flow protection [is] for an abnormal load.” *Id.* at 6:37–38.

Petitioner contends that Tracey discloses “a voltage back-flow protection” circuit comprising “a trio of ‘MOSFETS (or alternatives) Q4, Q5 and Q6’” that “are connected in such a way as to utilise [sic] their intrinsic diodes for the purposes of reverse blocking of current.” Pet. 42–43 (quoting Ex. 1007, 7:22–24). Then, Petitioner quotes Tracey as follows: “Should the jump starter circuit 100 be connected to a vehicle with a greater voltage than the unit is intended for, the diodes become reverse biased and no current

may flow. This feature protects the jump-starter’s internal battery 102 from potentially dangerous overcharge conditions.” *Id.* at 43 (quoting Ex. 1007, 7:25–28).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Tracey teaches the limitations in claims 22 and 23. *See* Pet. 42–43; Ex. 1003 ¶¶ 115–117.

3. ALLEGED REASON TO COMBINE THE TEACHINGS OF THE REFERENCES

Petitioner identifies a reason that would have prompted an ordinarily skilled artisan to combine Tracey’s teachings with Krieger’s teachings. *See* Pet. 43–44. Additionally, Petitioner explains that combining those teachings would have yielded a predictable result. *Id.* at 44. Dr. Wood’s testimony supports Petitioner’s positions. *See* Ex. 1003 ¶ 118.

For instance, Dr. Wood testifies that an ordinarily skilled artisan “would have been motivated to combine” Tracey’s back-flow protection circuit with Krieger’s jump-starter circuit to yield “the predictable result of protecting against unsafe conditions caused by connecting the jump starter to a vehicle with an abnormally high voltage load.” Ex. 1003 ¶ 118.

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that an ordinarily skilled artisan would have been motivated to combine Tracey’s teachings with Krieger’s teachings and would have obtained a predictable result. *See* Pet. 43–44; Ex. 1003 ¶ 118.

4. CONCLUSION ABOUT OBVIOUSNESS

For the reasons discussed above, the combined disclosures in Krieger and Tracey teach the inventions covered by claims 22 and 23. *See supra*

§§ III.D.2(h), III.F.2. Moreover, an ordinarily skilled artisan would have been motivated to combine Tracey’s teachings with Krieger’s teachings and would have obtained a predictable result. *See supra* § III.F.3. Hence, Petitioner has shown by a preponderance of the evidence that claims 22 and 23 are unpatentable under § 103 as obvious over Krieger and Tracey.

*G. Alleged Obviousness over Richardson:
Claims 1–7, 9–16, 18–21, and 24*

Petitioner contends that claims 1–7, 9–16, 18–21, and 24 are unpatentable under § 103 as obvious over Richardson. *See* Pet. 6, 44–65. Below, we provide an overview of Richardson. Then, we consider the obviousness issues. For the reasons explained below, we agree with Petitioner that claims 1–7, 9–16, 18–21, and 24 are unpatentable under § 103 as obvious over Richardson.

1. OVERVIEW OF RICHARDSON (EXHIBIT 1004)

Richardson is a U.S. patent application publication titled “Method and Apparatus for Providing Supplemental Power to an Engine,” filed on February 15, 2013, and published on June 20, 2013. Ex. 1004, codes (12), (22), (43), (54). Richardson states that the invention relates “to a portable power source for a motor vehicle,” and more particularly “to a method and apparatus to provide supplemental power to start internal combustion and turbine engines.” *Id.* ¶ 2; *see id.* at code (57).

Richardson describes potential problems due to “the use of conventional jumper cables.” *See* Ex. 1004 ¶ 5. For instance, if “the batteries are cross-connected or the clamps inadvertently contact each other when one end of the jumper cables is connected to a battery, sparking can occur resulting in damage to the battery, the electrical system of the vehicle,

and injury to the user of the jumper cables.” *Id.* Further, if “the jumper cables are not properly connected, there is a potential for the batteries exploding and fire, which may result in injury to those in proximity to the vehicle being jumped.” *Id.*

To address those issues, Richardson discloses a portable supplemental power source or jump starter that:

- (1) includes “one or more internal batteries and capacitors to provide the power to” a depleted battery; and
- (2) monitors (a) the voltage of the depleted battery and (b) “the current delivered by the jump starter batteries and capacitors” to “determine if a proper connection has been established and to provide fault monitoring.”

Ex. 1004 ¶ 7; *see id.* ¶¶ 8, 14, code (57), Fig. 1. “For safety purposes, only if the proper polarity is detected can the system operate.” *Id.* ¶ 7; *see id.* at code (57).

“Once the vehicle is started, the vehicle’s electrical system may recharge the batteries and capacitors before the unit automatically electrically disconnects from the vehicle’s battery.” Ex. 1004 ¶ 7; *see id.* ¶ 55, Fig. 1. Recharging permits the batteries and capacitors “to be fully recharged in about 1 to 5 minutes and can therefore start many vehicles in a row without becoming discharged.” *Id.* ¶ 55.

Richardson's Figure 1 (reproduced below) depicts a jump starter:

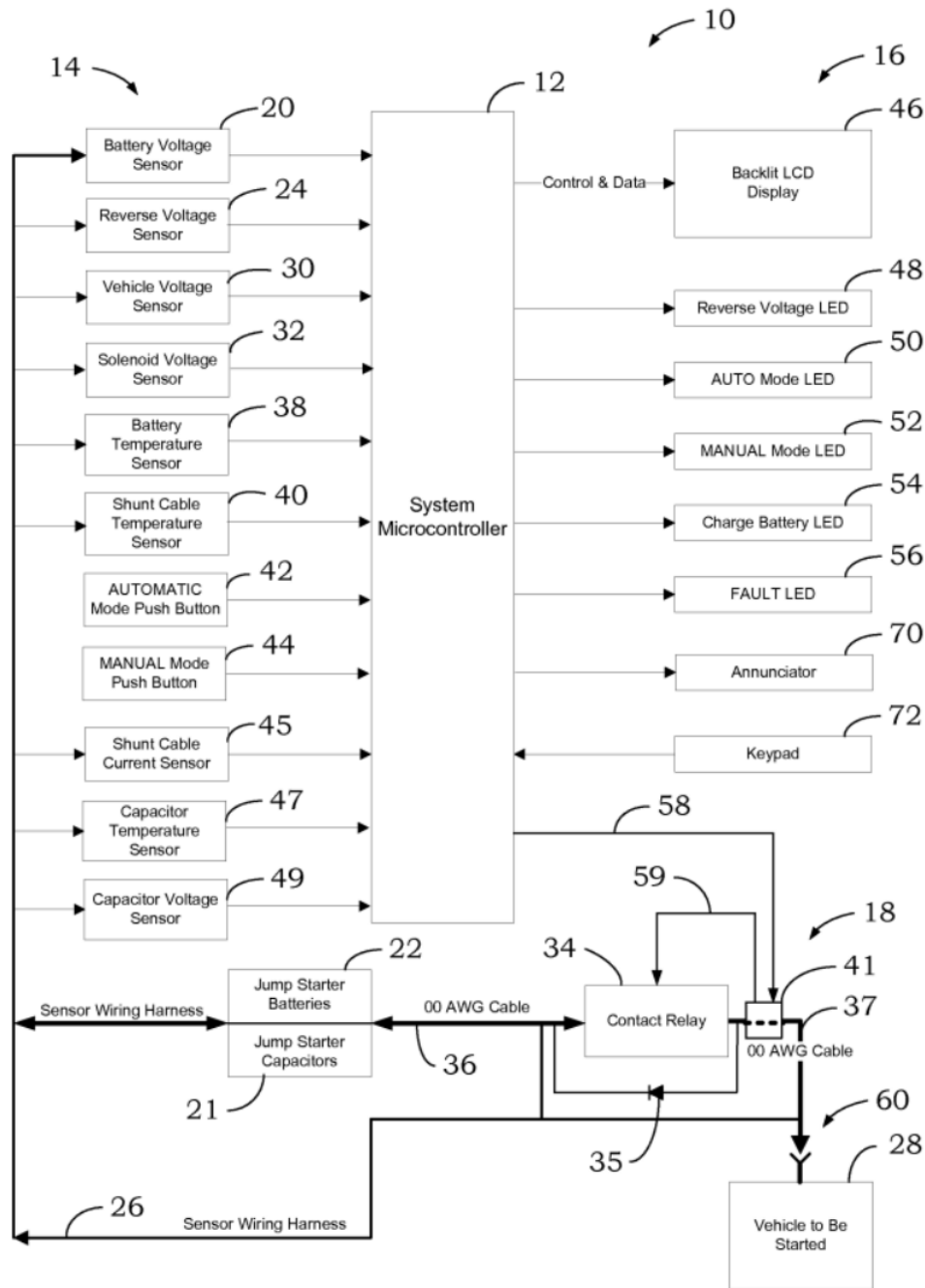


Fig. 1

Figure 1 illustrates jump starter 10 including microprocessor 12, jump starter capacitors 21, jump starter batteries 22, contact relay 34, jumper cables 60, various sensors, and various mechanisms for providing information to a

user. Ex. 1004 ¶¶ 14–16, 20, 27, Fig. 1. For example, LCD display 46 may “display user instructions, error messages, and real-time sensor data during operation of the jump starter 10.” *Id.* ¶ 20, Fig. 1.

Microprocessor 12 “receives inputs 14 and produces informational outputs 16 and control outputs 18.” Ex. 1004 ¶ 14, Fig. 1; *see id.* ¶¶ 20–21. Microprocessor 12 receives inputs from, among other things, the following sensors:

- (1) “battery voltage sensor 20” that “monitors the voltage level of one or more jump starter batteries 22”;
- (2) “reverse voltage sensor 24” that “monitors the polarity of the jumper cables on line 26 which are connected to the vehicle’s electrical system” to “determine if the cables have been properly connected to the vehicle”; and
- (3) “vehicle voltage sensor 30” that “monitors the voltage on line 37 (voltage of the vehicle).”

Id. ¶¶ 14, 16, 27, Fig. 1.

Microprocessor 12 includes contact relay control output 58 that “operates the contact relay 34 through temperature sensor 41.” Ex. 1004 ¶ 21, Fig. 1. “When the jump starter operation has been successfully initiated, the contact relay 34 is closed and the jump starter capacitors 21 and batteries 22 are connected to the starter system or batteries of the vehicle to be started 28.” *Id.* ¶ 21. “The contact relay 34 is opened when a successful start cycle has been completed, a start fault has occurred or the operator interrupts the jump starter cycle.” *Id.*

2. INDEPENDENT CLAIM 1

(a) Preamble

Claim 1 recites “[a] jumpstarter.” Ex. 1001, 5:11.

Petitioner contends that Richardson teaches claim 1's preamble because Richardson discloses a "portable supplemental power source (jump starter) of the present invention [that] is generally indicated by reference numeral 10." Pet. 44 (alteration by Petitioner) (quoting Ex. 1004 ¶ 14).

Generally, a preamble does not limit a claim. *Allen Eng'g*, 299 F.3d at 1346. We need not decide whether claim 1's preamble limits the claim because we agree with Petitioner that Richardson teaches claim 1's preamble. See Pet. 44; Ex. 1003 ¶¶ 56–58, 120. Specifically, Richardson discloses jump starter 10 including microprocessor 12 that "receives inputs 14 and produces informational outputs 16 and control outputs 18." Ex. 1004 ¶ 14, Fig. 1; see Ex. 1003 ¶¶ 56–58, 120.

(b) Limitation 1(a)(i)

Claim 1 recites "a battery connected to a voltage regulator." Ex. 1001, 5:12 (limitation 1(a)(i)).

Petitioner contends that Richardson teaches limitation 1(a)(i) because Richardson's microprocessor-controlled jump starter includes the following:

- (1) "one or more jump starter batteries 22" as well as "one or more capacitor[s] 21 . . . to provide additional energy storage"; and
- (2) a voltage regulator (LM7805) connected to the "one or more jump starter batteries 22."

Pet. 45–46 (alterations by Petitioner) (quoting Ex. 1004 ¶¶ 15–16).

To support its contentions, Petitioner provides a highlighted version of Richardson's Figure 2A as reproduced below (Pet. 46):

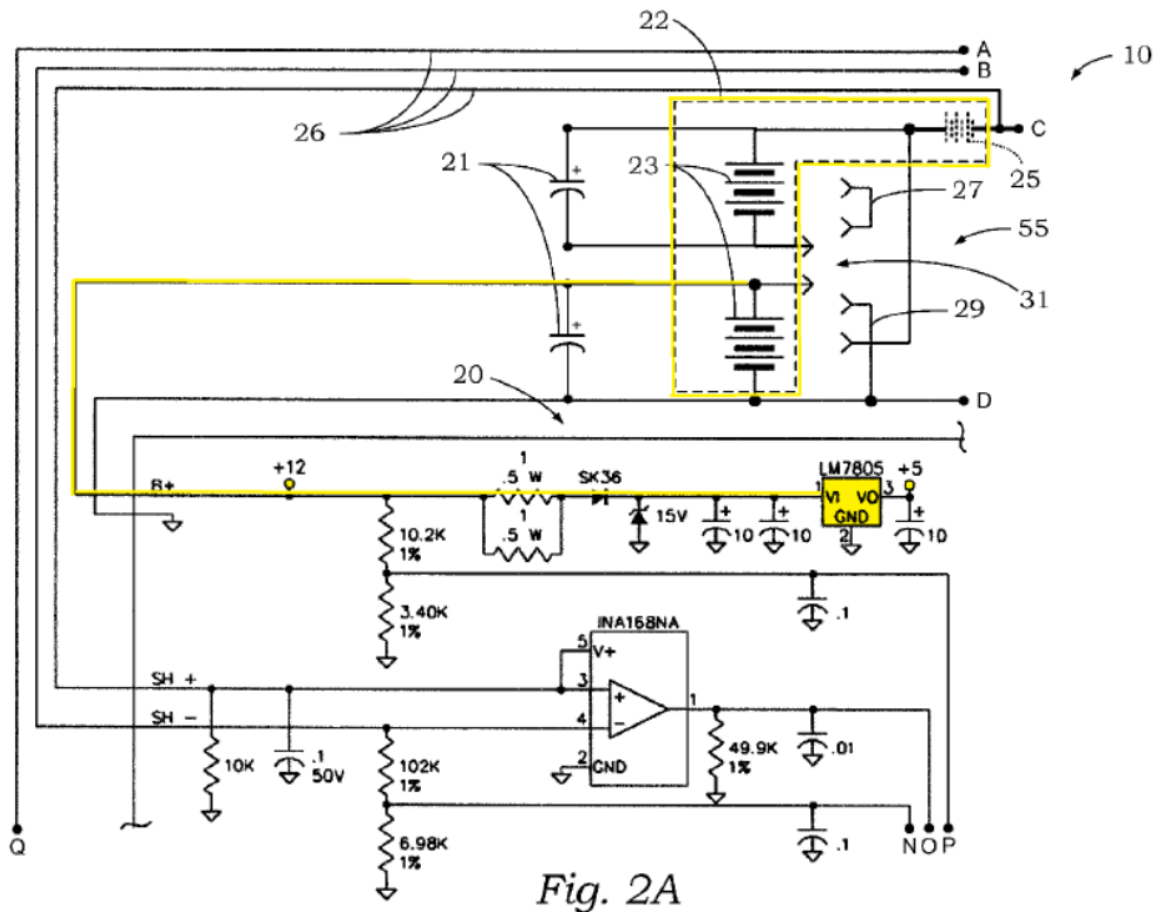


Fig. 2A

Figure 2A is part of a schematic diagram for jump starter 10 together with Figures 2B–2D. Ex. 1004 ¶¶ 9, 22, Fig. 2A. The above highlighted version of Figure 2A includes yellow highlighting over the following parts of the diagram: (1) the dashed lines denoting jump starter batteries 22, i.e., the batteries identified by reference numerals 23 and 25; (2) the component identified as LM7805; and (3) the conductor connecting jump starter batteries 22 to the component identified as LM7805. See Pet. 46; Ex. 1003 ¶ 121.

Further, Dr. Wood testifies that an ordinarily skilled artisan would have “recognized that LM7805 is a standard part number for a voltage

regulator.” Ex. 1003 ¶ 122 (citing Ex. 1012 (U.S. Patent No. 7,363,129 B1), 9:51–53).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Richardson teaches limitation 1(a)(i). *See* Pet. 45–46; Ex. 1003 ¶¶ 121–122.

(c) Limitation 1(a)(ii)

Claim 1 recites “the battery capable of supplying power, via the voltage regulator, to at least a microcontroller.” Ex. 1001, 5:12–14 (limitation 1(a)(ii)).

Petitioner contends that Richardson teaches limitation 1(a)(ii) because microprocessor 12 in Richardson’s microprocessor-controlled jump starter “is supplied with power (+5V) from the one or more batteries 22 via the voltage regulator (LM7805).” Pet. 47 (quoting Ex. 1004 ¶ 14).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Richardson teaches limitation 1(a)(ii). *See* Pet. 47; Ex. 1003 ¶ 123.

(d) Limitation 1(a)(iii)

Claim 1 recites “the battery also capable of supplying power to an automobile battery when the battery has at least a predetermined voltage.” Ex. 1001, 5:14–16 (limitation 1(a)(iii)).

Petitioner contends that Richardson teaches limitation 1(a)(iii) because Richardson’s microprocessor-controlled jump starter includes “one or more internal batteries [22] and capacitors [21] to provide the power to the battery of the vehicle to be jump started.” Pet. 47–48 (alterations by Petitioner) (quoting Ex. 1004 ¶ 7). Petitioner also contends that Richardson discloses the following:

- (1) “[w]hen the jump starter operation has been successfully initiated, the contact relay 34 is closed and the jump starter capacitors 21 and batteries 22 are connected to the starter system or batteries of the vehicle to be started 28”;
- (2) “[i]f the voltage level of the jump starter batteries 22 drop[s] below a value of twenty percent of the normal level, a charge battery LED 54 is illuminated”;
- (3) “[t]he charge battery LED 54 remains illuminated until the batteries 22 are charged to a minimum state of charge such as fifty percent, for example”; and
- (4) “[i]f the voltage level of the system batteries 22 measured by the voltage sensor 30 is equal to a state of charge of eighty percent or more below a fully charged voltage level 222, an error flag is set,” “the event [is] recorded in memory,” and the system “prohibits any further jump starter action by the operator until a charging voltage is detected.”

Id. at 48–49 (quoting Ex. 1004 ¶¶ 20–21, 28).

According to Petitioner, “the boosting battery is ‘capable’ of supplying power to an automobile battery when the [boosting] battery has at least a predetermined voltage, i.e., the jump starter batteries 22 are charged to a minimum state of charge such as fifty percent.” Pet. 48–49 (emphasis omitted).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Richardson teaches limitation 1(a)(iii). *See* Pet. 47–49; Ex. 1003 ¶¶ 124–126.

(e) Limitation 1(b)

Claim 1 recites “a load detector circuit, connected to the microcontroller, to detect when the jumpstarter is correctly connected to the automobile battery.” Ex. 1001, 5:17–19 (limitation 1(b)).

Petitioner contends that Richardson teaches limitation 1(b) because Richardson's microprocessor-controlled jump starter includes the following sensors:

- (1) "reverse voltage sensor 24 connected to microprocessor 12 that monitors the polarity of the jumper cables connected to the vehicle battery"; and
- (2) "vehicle voltage sensor 30 connected to microprocessor 12 that monitors the voltage of the vehicle battery to detect possible fault conditions such as a disconnected vehicle battery."

Pet. 50 (citing Ex. 1004 ¶¶ 16, 20, 27, 36, 41).

To support its contention, Petitioner provides a highlighted excerpt from Richardson's Figure 1 as reproduced below (Pet. 50):

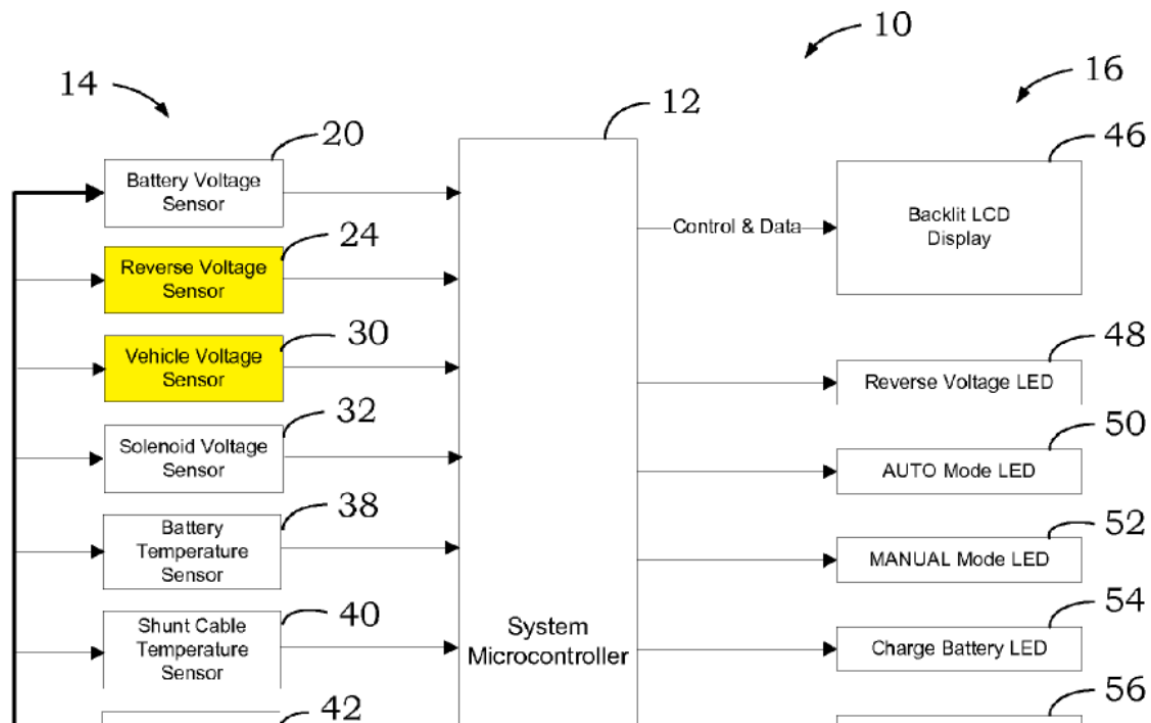


Figure 1 illustrates jump starter 10 including microprocessor 12 and various sensors. Ex. 1004 ¶¶ 14–16, 20, 27, Fig. 1. The above highlighted excerpt from Figure 1 has yellow highlighting over the following sensors:

- (1) reverse voltage sensor 24 that monitors the “polarity of the jumper cables” connected to the vehicle’s electrical system and supplies an input to microprocessor 12; and
- (2) vehicle voltage sensor 30 that monitors the “voltage of the vehicle” and supplies an input to microprocessor 12.

See Pet. 50; Ex. 1003 ¶¶ 58, 128; Ex. 1004 ¶¶ 14, 16, Fig. 1.

Petitioner asserts that reverse voltage sensor 24 “monitors the polarity of the jumper cables on line 26 which are connected to the vehicle’s electrical system” and determines whether the jumper cables “have been properly connected to the vehicle.” Pet. 50–51 (quoting Ex. 1004 ¶¶ 16, 27). Petitioner asserts that vehicle voltage sensor 30 “monitors the voltage on line 37 (voltage of the vehicle)” and determines whether one of the jumper cables “has been disconnected” from “the vehicle’s battery or starter system.” *Id.* at 51 (quoting Ex. 1004 ¶¶ 16, 41).

According to Petitioner, an ordinarily skilled artisan would have understood that Richardson’s reverse voltage sensor 24 and vehicle voltage sensor 30 “are part of a ‘load detector circuit’ connected to” microprocessor 12 that detects “when the jump starter 10 is correctly connected to the automobile battery 28.” Pet. 52 (emphasis omitted) (citing Ex. 1003 ¶ 131).

Patent Owner disputes that Richardson teaches limitation 1(b). *See* Order Resp. 3–4. Specifically, Patent Owner asserts that Richardson “does not ‘feedback’ any portion of the circuit output signal into the involved system.” *Id.* at 3–4.

We agree with Petitioner that Richardson teaches limitation 1(b). *See* Pet. 49–52; Ex. 1003 ¶¶ 60–61, 63, 126–131. In Richardson’s microprocessor-controlled jump starter, microprocessor 12 employs various sensors to determine whether one of the jumper cables “has been

disconnected” from “the vehicle’s battery or starter system” and whether the jumper cables “have been properly connected to the vehicle.” Ex. 1004 ¶¶ 16, 20, 27–28, 41; *see* Ex. 1003 ¶¶ 60–61, 63, 126, 128–130.

As an example, if “the voltage measured is significantly less than the voltage of the jump starter capacitors 21 and batteries 22,” then (1) “a reverse polarity connection of the jumper cables to the vehicle is determined,” (2) “an error flag is set,” (3) “the event [is] saved in non-volatile memory,” (4) a “‘Reverse Polarity’ error message is displayed,” (5) “the reverse voltage LED 48 is illuminated,” and (6) “further jump starter action by the operator is ignored until the reverse polarity condition is corrected.” Ex. 1004 ¶ 27; *see id.* ¶ 20; Ex. 1003 ¶¶ 60, 129.

As another example, if “the system detects an increase in the difference between the measured jump starter battery voltage 20 and the voltage measured 30 across the contact relay 34 indicating that one of the jump starter cables has been disconnected” from “the vehicle’s battery or starter system,” then (1) “a jumper cable unplugged error count is incremented,” (2) a “‘Jumper Cable Unplugged’ error message is displayed,” (3) “the contact relay 34 is opened,” and (4) “the fault LED 56 is illuminated.” Ex. 1004 ¶ 41; *see id.* ¶ 36; Ex. 1003 ¶¶ 63, 130.

As yet another example, if “the voltage level of the system batteries 22 measured by the voltage sensor 30 is equal to a state of charge of eighty percent or more below a fully charged voltage level,” then (1) “an error flag is set,” (2) “the event [is] recorded in memory,” (3) the “charge battery LED 54 is illuminated,” and (4) “the LCD 46 displays a ‘Charge Battery’ message.” Ex. 1004 ¶ 28; *see id.* ¶ 20; Ex. 1003 ¶¶ 61, 126.

As for Patent Owner’s assertion that Richardson “does not ‘feedback’ any portion of the circuit output signal into the involved system,” we agree with Petitioner that “Patent Owner’s substantive arguments are clearly untimely” and should be “disregarded by the Board.” *See* Order Resp. 3–4; Paper 14, 3. But even if considered, they lack merit. No claim includes the word “feedback.” Ex. 1001, 5:11–6:41. Indeed, the word “feedback” does not appear in the ’077 patent’s written description. *See, e.g., id.* at 1:40–5:9.

(f) Limitation 1(c)

Claim 1 recites “the microcontroller generating, when the jumpstarter is correctly connected to the automobile battery, an output signal.” Ex. 1001, 5:20–22 (limitation 1(c)).

Petitioner contends that Richardson teaches limitation 1(c) because microprocessor 12 in Richardson’s microprocessor-controlled jump starter includes contact relay control output 58 that “operates the contact relay 34 through temperature sensor 41.” Pet. 52 (quoting Ex. 1004 ¶ 21). Petitioner quotes Richardson’s disclosure about how the jump starter functions as follows: “When the jump starter operation has been successfully initiated, the contact relay 34 is closed and the jump starter capacitors 21 and batteries 22 are connected to the starter system or batteries of the vehicle to be started 28.” *Id.* (quoting Ex. 1004 ¶ 21). According to Petitioner, “control of the contact relay 34 by the microprocessor 12 is conditioned on a determination that the automobile battery is correctly connected.” *Id.*

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Richardson teaches limitation 1(c). *See* Pet. 52–53; Ex. 1003 ¶ 132.

(g) Limitation 1(d)

Claim 1 recites “switching circuitry, including at least one switch, to operatively connect the battery to the automobile battery when the microcontroller generates the output signal to supply a charging current to the automobile battery.” Ex. 1001, 5:23–27 (limitation 1(d)).

Petitioner contends that Richardson teaches limitation 1(d) because contact relay 34 in Richardson’s microprocessor-controlled jump starter “connects the jump starter batteries 22 to the automobile battery 28 when the microprocessor 12 generates the contact relay control output signal 58 to supply charging current to the automobile battery 28.” Pet. 53–54 (citing Ex. 1004 ¶ 21).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Richardson teaches limitation 1(d). *See* Pet. 53–54; Ex. 1003 ¶¶ 133–134.

(h) Conclusion About Obviousness

For the reasons discussed above, Richardson teaches the invention covered by claim 1. *See supra* §§ III.G.2(a)–(g). Hence, Petitioner has shown by a preponderance of the evidence that claim 1 is unpatentable under § 103 as obvious over Richardson.

3. DEPENDENT CLAIMS 2–7, 9–16, 18–21, AND 24

(a) Claim 2

Claim 2 depends directly from claim 1 and further requires “a battery voltage detector circuit to detect a battery voltage of the battery.” Ex. 1001, 5:28–30.

Petitioner contends that Richardson teaches the invention covered by claim 2 because Richardson’s microprocessor-controlled jump starter

includes “[a] battery voltage sensor 20 [that] monitors the voltage level of one or more jump starter batteries 22.” Pet. 55 (alterations by Petitioner) (quoting Ex. 1004 ¶ 16) (citing Ex. 1003 ¶ 135; Ex. 1004, Fig. 1).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Richardson teaches the invention covered by claim 2. *See* Pet. 55; Ex. 1003 ¶ 135.

(b) Claims 3–7

Claim 3–7 relate to the “at least one switch” recited in claim 1 and read as follows:

3. The jumpstarter of claim 1, wherein the at least one switch is one or more MOSFETs.
4. The jumpstarter of claim 3, wherein the one or more MOSFETs are n-channel MOSFETs.
5. The jumpstarter of claim 1, wherein there are a plurality of switches.
6. The jumpstarter of claim 1, wherein the at least one switch is a plurality of MOSFETs.
7. The jumpstarter of claim 6, wherein the plurality of MOSFETs are connected in parallel.

Ex. 1001, 5:31–40.

Petitioner contends that Richardson in view of an ordinarily skilled artisan’s knowledge renders obvious the inventions covered by claims 3–7. *See* Pet. 56–58. Specifically, Petitioner asserts that an ordinarily skilled artisan would have understood that:

- (1) “a MOSFET-based power switch is advantageous over a relay at least because of a) smaller size, b) the ability to control the rate of increase of load current, and c) physical ruggedness and reliability”;

- (2) “compared to p-channel MOSFETs, n-channel MOSFETs are more commonly used in power switching applications because of the wider variety of available types resulting from the comparative ease of manufacture of n-channel MOSFETs”; and
- (3) “the use of a plurality of MOSFET switches connected in parallel is commonly used in power switching circuits to allow for higher current flow.”

Pet. 56–57 (citing Ex. 1003 ¶¶ 137, 139, 141).

Further, Petitioner asserts that an ordinarily skilled artisan would have been motivated to substitute a MOSFET-based power switch for Richardson’s contact relay 34 to “provide the predictable result of improving product reliability while providing the advantages of smaller size and control of load current.” Pet. 56 (citing Ex. 1003 ¶ 137); *see id.* at 56–57. Petitioner asserts that an ordinarily skilled artisan would have been motivated to use a plurality of n-channel MOSFETs when substituting for Richardson’s contact relay 34 due to the ubiquitous use of n-channel MOSFETs in power switching applications. *Id.* at 57 (citing Ex. 1003 ¶ 139). Petitioner asserts that an ordinarily skilled artisan would have been motivated to use a plurality of n-channel MOSFETs connected in parallel when substituting for Richardson’s contact relay 34 to allow for higher current flow. *Id.* (citing Ex. 1003 ¶ 141).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Richardson in view of an ordinarily skilled artisan’s knowledge renders obvious the inventions covered by claims 3–7. *See* Pet. 56–58; Ex. 1003 ¶¶ 136–143.

(c) Claim 9

Claim 9 depends directly from claim 1 and further requires “a load detector to detect a reverse polarity connection to the automobile battery.” Ex. 1001, 6:1–3.

Petitioner contends that Richardson teaches the invention covered by claim 9 for the reasons that Richardson teaches limitation 1(b) and because Richardson’s microprocessor-controlled jump starter includes reverse voltage sensor 24 that “monitors the polarity of the jumper cables connected to the vehicle battery, thereby enabling prevention of jump starting when a reverse polarity connection is detected.” Pet. 58 (citing Ex. 1003 ¶ 144; Ex. 1004 ¶¶ 16, 20, 27).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Richardson teaches the invention covered by claim 9. *See* Pet. 58; Ex. 1003 ¶ 144; *supra* § III.G.2(e).

(d) Claim 10

Claim 10 depends directly from claim 1 and specifies that “the microprocessor includes a standby mode where all outputs are closed.” Ex. 1001, 6:4–5.

Petitioner contends that Richardson teaches the invention covered by claim 10 because Richardson discloses a “Charge Battery” condition where “the jumpstarter is prevented from supplying a charging voltage to the automobile battery” that corresponds to the claimed “standby mode.”

Pet. 59. As support, Petitioner quotes Richardson as follows:

If the voltage level of the system batteries 22 measured by the voltage sensor 30 is equal to a state of charge of eighty percent or more below a fully charged voltage level 222, an error flag is set and the event recorded in memory 224. The charge battery

LED 54 is illuminated and the LCD 46 displays a “Charge Battery” message 225. The system stays in this condition, which prohibits any further jump starter action by the operator until a charging voltage is detected 226, which is great enough to indicate that a battery charger (not shown) has been connected to the batteries 22.

. . . The jump starter batteries 22 only need to reach a 50% charge in order for the system to attempt to start the vehicle.

Id. (quoting Ex. 1004 ¶¶ 28–29).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Richardson teaches the invention covered by claim 10. *See* Pet. 59; Ex. 1003 ¶¶ 145–147.

(e) Claim 11

Claim 11 depends directly from claim 10 and specifies that “the microcontroller closes all outputs when a voltage of the direct current power supply is lower than that of a state being able to supply power.” Ex. 1001, 6:6–9.

Petitioner contends that Richardson teaches the invention covered by claim 11 because microprocessor 12 in Richardson’s microprocessor-controlled jump starter “prevents jump starting (i.e., closes all outputs) when a voltage of the batteries 22 ‘is equal to a state of charge of eighty percent or more below a fully charged voltage level’ (i.e., when the battery voltage is lower than a state of being able to supply power).” Pet. 59–60 (emphases omitted) (quoting Ex. 1004 ¶ 28) (citing Ex. 1003 ¶¶ 148–149).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Richardson teaches the invention covered by claim 11. *See* Pet. 59–60; Ex. 1003 ¶¶ 148–149.

(f) Claims 12–14

Claim 12 depends directly from claim 10 and specifies that “the jumpstarter is in a standby mode when the battery has less than 9 volts.” Ex. 1001, 6:11–12. Claim 13 also depends directly from claim 10 and specifies that “the jumpstarter is not in a standby mode when the battery has more than 10 volts.” *Id.* at 6:13–15. Claim 14 also depends directly from claim 10 and specifies that “the jumpstarter is in a normal mode when the battery has more than 10 volts.” *Id.* at 6:16–17.

Petitioner contends that Richardson in view of an ordinarily skilled artisan’s knowledge renders obvious the inventions covered by claims 12–14. *See* Pet. 60–62. Specifically, Petitioner asserts that microprocessor 12 in Richardson’s microprocessor-controlled jump starter:

- (1) “prevents jump starting (i.e., enters a standby mode) when a voltage of the batteries 22 ‘is equal to a state of charge of eighty percent or more below a fully charged voltage level 222’”; and
- (2) “allows further jump starting (i.e., is not in standby mode) when the jump starter batteries 22 reach a 50% charge.”

Id. at 60–61 (emphases omitted) (quoting Ex. 1004 ¶ 28). According to Petitioner, Richardson’s jump starter 10 “may be configured to operate at different operating voltages, including for example, 12, 18, 24, 30, 36, 42, and 48 volts.” *Id.* at 60–61 (citing Ex. 1004 ¶ 34).

Further, Petitioner asserts that an ordinarily skilled artisan would have understood that the “exact value” for the “eighty percent or more” threshold and the “exact value” for the “50% charge” threshold would depend on “the type of battery being used and the operational voltage of the jump starter 10.” Pet. 60–61 (citing Ex. 1003 ¶¶ 151–152). Petitioner also asserts

that it “would have therefore been obvious” to an ordinarily skilled artisan based on Richardson’s disclosures and the skilled artisan’s knowledge that Richardson’s jump starter 10 would (1) enter a “standby mode” when “the battery has less than 9 volts and (2) exit a “standby mode” and enter a “normal mode” when “the battery has more than 10 volts” upon “selection of the appropriate type of battery and operational voltage.” *Id.* at 60–62 (citing Ex. 1003 ¶ 152).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Richardson in view of an ordinarily skilled artisan’s knowledge renders obvious the inventions covered by claims 12–14. *See* Pet. 60–62; Ex. 1003 ¶¶ 150–153.

(g) Claim 15

Claim 15 depends directly from claim 1 and specifies that “the supply power to the automobile battery is 12 volts.” Ex. 1001, 6:18–19.

Petitioner contends that Richardson teaches the invention covered by claim 15 because Richardson discloses that “[t]he jump starter 10 may be configured for 12, 18, 24, 30, 36, 42 or 48 volts, for example, using a selector jumper 55.” Pet. 62 (alteration by Petitioner) (quoting Ex. 1004 ¶ 34) (citing Ex. 1003 ¶ 154).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Richardson teaches the invention covered by claim 15. *See* Pet. 62; Ex. 1003 ¶ 154.

(h) Claim 16

Claim 16 depends directly from claim 1 and specifies that “the predetermined voltage is 10 volts.” Ex. 1001, 6:20–21.

Petitioner contends that Richardson in view of an ordinarily skilled artisan's knowledge renders obvious the invention covered by claim 16 for the reasons that Richardson in view of an ordinarily skilled artisan's knowledge renders obvious the invention covered by claim 13. Pet. 62.

For the reasons stated by Petitioner and supported by Dr. Wood's testimony, we agree with Petitioner that Richardson in view of an ordinarily skilled artisan's knowledge renders obvious the invention covered by claim 16. *See* Pet. 62; Ex. 1003 ¶ 155; *supra* § III.G.3(f).

(i) Claim 18

Claim 18 depends directly from claim 1 and further requires "a start control module to stop supplying battery power when there is no load." Ex. 1001, 6:25–27.

Petitioner contends that Richardson teaches the invention covered by claim 18 for the reasons that Richardson teaches limitation 1(b) and because Richardson's microprocessor-controlled jump starter includes "vehicle voltage sensor 30 connected to the microprocessor 12 (i.e., a start control module) that monitors the voltage of the vehicle battery to detect possible fault conditions such as a disconnected vehicle battery." Pet. 62–63 (emphasis omitted) (citing Ex. 1004 ¶¶ 16, 36, 41). Further, Petitioner asserts that "[i]f the vehicle voltage sensor 30 detects that the vehicle battery has been disconnected (i.e., there is no load), then the contact relay 34 is opened by the microprocessor to stop supplying battery power to the vehicle battery." *Id.* at 63 (citing Ex. 1003 ¶ 156; Ex. 1004 ¶¶ 16, 36, 41).

For the reasons stated by Petitioner and supported by Dr. Wood's testimony, we agree with Petitioner that Richardson teaches the invention covered by claim 18. *See* Pet. 62–63; Ex. 1003 ¶ 156; *supra* § III.G.2(e).

(j) Claims 19 and 20

Claim 19 depends directly from claim 1 and specifies that “the at least one switch switches a negative voltage.” Ex. 1001, 6:28–29. Claim 20 also depends directly from claim 1 and specifies that “the at least one switch is connected to a negative battery terminal.” *Id.* at 6:30–31.

Petitioner contends that Richardson in view of an ordinarily skilled artisan’s knowledge renders obvious the inventions covered by claims 19 and 20. *See* Pet. 63–64. Petitioner concedes that Richardson’s contact relay 34 “is connected to the positive terminal (C) of the jump starter batteries 22.” *Id.* at 63 (citing Ex. 1004, Figs. 2A, 2C). But Petitioner asserts that an ordinarily skilled artisan would have known that “connection of the contact relay 34 to either the positive (C) or negative (D) battery terminals is an arbitrary design choice that would have no effect on the overall operation of” Richardson’s jump starter 10. *Id.* (citing Ex. 1003 ¶ 158). According to Petitioner, an ordinarily skilled artisan would have been “equally motivated to connect Richardson’s contact relay 34 to switch the negative battery voltage, instead of the positive battery voltage.” *Id.* (emphasis omitted).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Richardson in view of an ordinarily skilled artisan’s knowledge renders obvious the inventions covered by claims 19 and 20. *See* Pet. 63–64; Ex. 1003 ¶¶ 157–159.

(k) Claim 21

Claim 21 depends directly from claim 1 and specifies that “the jumpstarter has a fast charging function.” Ex. 1001, 6:33–34.

Petitioner contends that Richardson teaches the invention covered by claim 21 because Richardson discloses “a fast charging function for quickly recharging the jump starter batteries 22 using the vehicle battery.” Pet. 64. As support, Petitioner quotes Richardson as follows:

Referring to FIGS. 1 and 2, a diode 35 may be connected across the contact 34 to charge the capacitors 21 and jump starter batteries 22 from the vehicle charging system 28. The charging system of the vehicle may be used to charge the capacitors 21 and jump starter batteries 22. Whenever the vehicle has a working charging system this will occur as long as the cables are connected to the vehicle. This allows the capacitors 21 and jump starter batteries 22 to be fully recharged in about 1 to 5 minutes and can therefore start many vehicles in a row without becoming discharged. Even in situations in which the jump starter batteries 22 may be discharged to an extent that they alone may not be able to provide the necessary power to start a vehicle, the capacitors 21 may be rapidly recharged to start many vehicles in a row. This is very useful when starting fleets of vehicles with dead batteries.

Id. (quoting Ex. 1004 ¶ 55) (citing Ex. 1003 ¶ 161).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Richardson teaches the invention covered by claim 21. *See* Pet. 64; Ex. 1003 ¶¶ 160–161.

(l) Claim 24

Claim 24 depends directly from claim 1 and specifies that “the microcontroller determines whether a battery state is suitable for heavy current power generation.” Ex. 1001, 6:39–41.

Petitioner contends that Richardson in view of an ordinarily skilled artisan’s knowledge renders obvious the invention covered by claim 24. *See* Pet. 64–65. Specifically, Petitioner asserts that Richardson discloses that if “the voltage level of the system batteries 22 measured by the voltage

sensor 30 is equal to a state of charge of eighty percent or more below a fully charged voltage level 222, an error flag is set and the event recorded in memory 224.” *Id.* at 65 (quoting Ex. 1004 ¶ 28). Petitioner also asserts that an ordinarily skilled artisan would have understood that “Richardson’s process of detecting that the voltage level of the batteries 22 is ‘equal to a state of charge of eighty percent or more below a fully charged voltage level 222’ would operate to determine whether the battery state is suitable for heavy current power generation.” *Id.* (emphasis omitted) (quoting Ex. 1004 ¶ 28) (citing Ex. 1003 ¶ 163).

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Richardson in view of an ordinarily skilled artisan’s knowledge renders obvious the invention covered by claim 24. *See* Pet. 64–65; Ex. 1003 ¶¶ 162–163.

(m) Summary for Dependent Claims 2–7, 9–16, 18–21, and 24

For the reasons discussed above, Richardson teaches or renders obvious the inventions covered by claims 2–7, 9–16, 18–21, and 24. *See supra* §§ III.D.3(a)–(l). Hence, Petitioner has shown by a preponderance of the evidence that claims 2–7, 9–16, 18–21, and 24 are unpatentable under § 103 as obvious over Richardson.

H. Alleged Obviousness over Richardson and Lai: Claim 17

Petitioner contends that claim 17 is unpatentable under § 103 as obvious over Richardson and Lai. *See* Pet. 6, 65–68. Above, we provided an overview of Richardson. *See supra* § III.G.1. Below, we provide an overview of Lai. Then, we consider the obviousness issues. For the reasons explained below, we agree with Petitioner that claim 17 is unpatentable under § 103 as obvious over Richardson and Lai.

1. OVERVIEW OF LAI (EXHIBIT 1008)

Lai is a U.S. patent titled “Over Voltage and Over Current Protection Integrated Circuit,” filed on May 27, 2008, and issued on July 31, 2012. Ex. 1008, codes (12), (22), (45), (54). Lai states that the invention relates “to over voltage and over current protection circuits,” and more particularly “to a single integrated circuit containing both over current and over voltage protection for use in conjunction with other circuitry to provide redundant protection.” *Id.* at 1:18–22; *see id.* at code (57).

Lai explains that a “Li-ion rechargeable battery is very sensitive to over charge” and that over charging “may lead to explosion, flame or other hazardous situations.” Ex. 1008, 1:34–36. Thus, “it is very critical” from a “safety point of view” that the “Li-ion battery is properly protected against over charge.” *Id.* at 1:39–41. Lai also explains that providing separate chips for each type of protection “requires a great deal of space within an electronic device.” *Id.* at 1:54–56. According to Lai, “there is a need for a chip for providing an electronic device with multiple types of over voltage and over current protection in order to save space within the electronic device.” *Id.* at 1:57–59.

Lai's Figure 1 (reproduced below) depicts a block diagram for an integrated circuit (IC) that provides battery protection against over current, over voltage, and over charge:

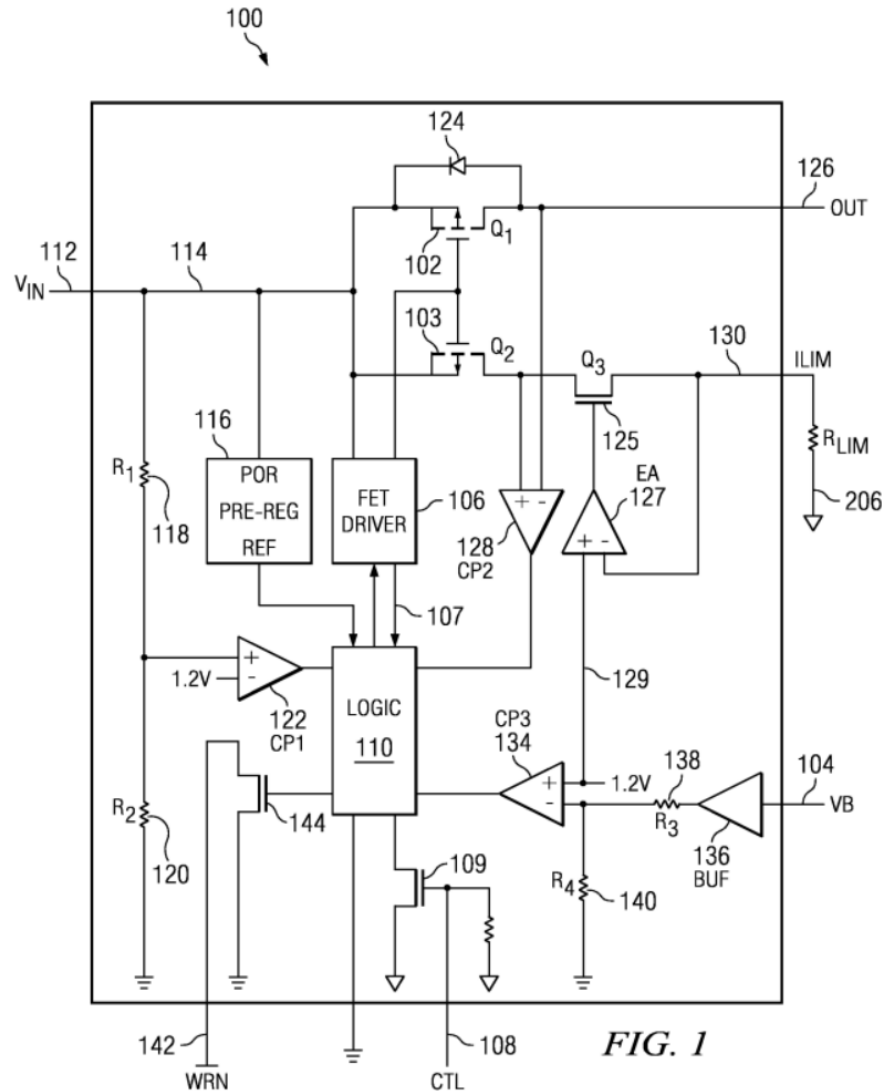


Figure 1 illustrates IC 100 that “protects three possible failure mechanisms in a charging system: input over voltage (the voltage input to the overall system), battery over voltage and charge current over current.” Ex. 1008, 2:17–18, 2:32–34, 2:39–42, Fig. 1. “When any of the above three failure mechanisms occur, the IC 100 turns off an internal p-channel MOSFET 102 to remove power from the charging system.” *Id.* at 2:42–45.

As an example, IC 100 provides over-voltage protection “through a battery voltage monitoring pin VB 104.” Ex. 1008, 2:59–60, Fig. 1; *see id.* at 4:65–66. “Comparator 134 monitors the VB pin 104 and issues an over voltage signal when the battery voltage” at the VB pin 104 exceeds a “battery over voltage protection (OVP) threshold.” *Id.* at 4:66–5:2.

2. DIFFERENCES BETWEEN THE CLAIMED INVENTION AND THE PRIOR ART

Claim 17 depends directly from claim 1 and further requires “a start control module to prevent recharging of a normal voltage of the battery.” Ex. 1001, 6:22–24.

According to Petitioner, “claim 17 requires that the ‘start control module’ prevents recharging of the internal jumpstarter battery (from the automobile battery) when the voltage of the jumpstarter battery is at ‘a normal voltage of the battery.’” Pet. 65–66 (citing Ex. 1001, 4:36–41; Ex. 1003 ¶ 164). To support its position, Petitioner quotes the ’077 patent as follows:

the automobile engine will generate the normal voltage to recharge the battery after the automobile starts, whereas the automobile start control module is deactivated immediately once the recharging voltage is larger than the voltage before that battery starts the power supply, to protect the battery from damages caused by charging with the normal voltage.

Id. at 65 (quoting Ex. 1001, 4:36–41).

Petitioner asserts that Richardson discloses “a fast charging function for quickly recharging the jump starter batteries 22 using the vehicle battery,” i.e., with diode 35 “connected across the contact 34 to charge the capacitors 21 and jump starter batteries 22 from the vehicle charging system.” Pet. 66 (quoting Ex. 1004 ¶ 55). Petitioner asserts that Lai

discloses an over-current, over-voltage, and over-charge “protection circuit for use with a battery charging system (e.g., such as the fast charging system in Richardson).” *Id.* (emphases omitted).

In particular, Petitioner contends that Lai provides over-voltage protection with comparator 134 that “issues an over voltage signal when the battery voltage” at the VB pin 104 exceeds a “battery over voltage protection (OVP) threshold” such that “IC 100 turns off an internal p-channel MOSFET 102 to remove power from the charging system.” Pet. 67–68 (quoting Ex. 1008, 2:43–45, 4:65–5:2). According to Petitioner, IC 100, p-channel MOSFET 102, and comparator 134 “prevent recharging of a normal voltage of a battery” and correspond to claim 17’s “start control module.” *Id.* at 68.

For the reasons stated by Petitioner and supported by Dr. Wood’s testimony, we agree with Petitioner that Lai teaches claim 17’s “start control module.” *See* Pet. 65–68; Ex. 1003 ¶¶ 164–167.

3. ALLEGED REASON TO COMBINE THE TEACHINGS OF THE REFERENCES

Petitioner identifies a reason that would have prompted an ordinarily skilled artisan to combine Lai’s teachings with Richardson’s teachings. *See* Pet. 68. Additionally, Petitioner explains that combining those teachings would have yielded a predictable result. *Id.* Dr. Wood’s testimony supports Petitioner’s positions. *See* Ex. 1003 ¶ 168.

For instance, Dr. Wood testifies that an ordinarily skilled artisan “would have been motivated to utilize” Lai’s battery-protection circuit to “protect against dangerous overcharging conditions in” Richardson’s jump starter 10. Ex. 1003 ¶ 168. Dr. Wood explains that incorporating Lai’s

battery-protection circuit into Richardson's jump starter 10 "could have been easily achieved by replacing the diode 35 shown in Fig. 1 of Richardson with" Lai's battery-protection circuit. *Id.* According to Dr. Wood, this "combination would have provided the predictable result of preventing recharging of the jump starter batteries 22 from the vehicle battery 28 once the charge on the jump starter batteries 22 reaches an over voltage protection threshold (i.e., to prevent recharging of a normal voltage of the battery)." *Id.* (emphasis omitted).

For the reasons stated by Petitioner and supported by Dr. Wood's testimony, we agree with Petitioner that an ordinarily skilled artisan would have been motivated to combine Lai's teachings with Richardson's teachings and would have obtained a predictable result. *See* Pet. 68; Ex. 1003 ¶ 168.

4. CONCLUSION ABOUT OBVIOUSNESS

For the reasons discussed above, the combined disclosures in Richardson and Lai teach the invention covered by claim 17. *See supra* §§ III.G.2(h), III.H.2. Moreover, an ordinarily skilled artisan would have been motivated to combine Lai's teachings with Richardson's teachings and would have obtained a predictable result. *See supra* § III.H.3. Hence, Petitioner has shown by a preponderance of the evidence that claim 17 is unpatentable under § 103 as obvious over Richardson and Lai.

IV. CONCLUSION

Based on the evidence presented with the Petition and the papers submitted after institution, Petitioner has shown by a preponderance of the evidence that:

- (1) claims 1–7, 9–11, and 18–20 are unpatentable under § 103 as obvious over Krieger;
- (2) claim 8 is unpatentable under § 103 as obvious over Krieger and Baxter;
- (3) claims 22 and 23 are unpatentable under § 103 as obvious over Krieger and Tracey;
- (4) claims 1–7, 9–16, 18–21, and 24 are unpatentable under § 103 as obvious over Richardson; and
- (5) claim 17 is unpatentable under § 103 as obvious over Richardson and Lai.⁴

In summary:

Claims	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–7, 9–11, 18–20	103	Krieger	1–7, 9–11, 18–20	
8	103	Krieger, Baxter	8	
22, 23	103	Krieger, Tracey	22, 23	
1–7, 9–16, 18–21, 24	103	Richardson	1–7, 9–16, 18–21, 24	

⁴ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding after the issuance of this Final Written 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 the 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).

Claims	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
17	103	Richardson, Lai	17	
3–7, 19, 20	103	Richardson, Krieger ⁵		
8	103	Richardson, Krieger, Baxter ⁶		
22, 23	103	Richardson, Tracey ⁷		
Overall Outcome			1–24	

V. ORDER

Accordingly, it is

ORDERED that claims 1–24 in the '077 patent are determined to be unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, the 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.

⁵ In view of our determinations that claims 3–7, 19, and 20 are unpatentable under § 103 as obvious over either Krieger or Richardson, we do not reach this challenge to patentability. *See supra* §§ III.D.3, III.G.3.

⁶ In view of our determination that claim 8 is unpatentable under § 103 as obvious over Krieger and Baxter, we do not reach this challenge to patentability. *See supra* § III.E.

⁷ In view of our determination that claims 22 and 23 are unpatentable under § 103 as obvious over Krieger and Tracey, we do not reach this challenge to patentability. *See supra* § III.F.

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