

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ADC SOLUTIONS AUTO LLC
Petitioner

v.

THE NOCO COMPANY
Patent Owner

Patent No. 11,584,243
Issue Date: February 21, 2023

Title: JUMP STARTING DEVICE WITH USB

Inter Partes Review No. IPR2024-00671

**PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT NO. 11,584,243
UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. § 42**

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Ex #	Exhibit Description
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LISTING OF CLAIMS

U.S. Patent No. 11,584,243 (Claims 1, 2, 15, 17, 18, 51, 54, and 57)

Claim Designation	Claim Language
Claim 1 Preamble	A jump starting device for boosting or charging a depleted or discharged battery having a positive battery terminal and a negative battery terminal, the jump starting device comprising:
Limitation 1(a)	a power supply;
Limitation 1(b)	a positive battery connector for electrically connecting the jump starting device to the positive battery terminal of the depleted or discharged battery;
Limitation 1(c)	a negative battery connector for electrically connecting the jump starting device to the negative battery terminal of the depleted or discharged battery;
Limitation 1(d)	a power switch or switch circuit connected in circuit with the power supply and the positive and negative battery connectors,
Limitation 1(e)	the power switch or switch circuit configured to switch power on from the power supply to boost or charge the depleted or discharged battery when connected between the positive and negative battery connectors;
Limitation 1(f)	a USB input connector; and
Limitation 1(g)	a USB charge circuit electrically connecting the USB input connector to the power supply, the USB charge circuit comprising a DC-DC converter configured to upconvert voltage from the USB input connector to the power supply.
Claim 2	The device according to claim 1, wherein the power switch or switch circuit is controlled to turn on power to the depleted or discharged battery only when the jump starting device is connected with correct polarity to the depleted or discharged battery.
Claim 15	The device according to claim 1, further comprising a USB output connector for providing a power output from the power supply to a USB-chargeable device.

Claim Designation	Claim Language
Claim 17	The device according to claim 15, wherein the USB output connector is electrically connected to a USB output circuit, the USB output circuit connecting the power supply to the USB output connector.
Claim 18	The device according to claim 17, further comprising a microcontroller with a control circuit, the control circuit for the microcontroller allows the USB output circuit to be turned on and off by software control to prevent the power supply getting too low in capacity.
Claim 51	The device according to claim 1, wherein the power supply is a rechargeable lithium battery pack.
Claim 54	The device according to claim 51, further comprising a rechargeable lithium battery pack voltage measurement circuit configured to monitor the rechargeable lithium battery pack to prevent voltage potential from rising too high during a charging operation and from dropping too low during a discharge operation.
Claim 57 Preamble	A jump starting device for boosting or charging a depleted or discharged battery having a positive battery terminal and a negative battery terminal, the jump starting device comprising:
Limitation 57(a)	a power supply;
Limitation 57(b)	a positive battery connector for electrically connecting the jump starting starter device to the positive battery terminal of the depleted or discharged battery;
Limitation 57(c)	a negative battery connector for electrically connecting the jump starting starter device to the negative battery terminal of the depleted or discharged battery;
Limitation 57(d)	a power switch or switch circuit in circuit with the power supply and the positive and negative battery connectors,
Limitation 57(e)	the power switch or switch circuit configured to switch power on from the power supply to boost or charge the depleted or discharged battery when connected between the positive and negative battery connectors;

Claim Designation	Claim Language
Limitation 57(f)	a USB input connector;
Limitation 57(g)	a USB charge circuit electrically connecting the USB input connector to the power supply, the USB charge circuit configured to up-convert voltage from a USB charger power source connected to the USB input connector to the power supply using a DC-DC converter;
Limitation 57(h)	a USB output connector; and
Limitation 57(i)	a USB output circuit electrically connecting the power supply to the USB output connector.

I. FORMALITIES

A. Mandatory Notices (37 C.F.R. § 42.8(a)(1))

1. Real Party in Interest (37 C.F.R. § 42.8(b)(1))

Petitioner ADC Solutions Auto LLC (“ADC” or “Petitioner”) is a real party-in-interest in this Petition.

Winplus North America, Inc. and Winplus NA, LLC are also named as real parties-in-interest in this Petition. Winplus North America, Inc. and Winplus NA, LLC are co-defendants with ADC in the District Court Litigation identified in Section I.A.4. Petitioner does not believe Winplus North America, Inc. and Winplus NA, LLC rise to the level of real parties-in-interest as both entities are non-operational and have not exercised any control over this Petition or ADC’s decision to file this Petition. However, because Winplus North America, Inc. and Winplus NA, LLC agree to be bound by the estoppel provisions of 35 U.S.C. § 315(e), and in order to prevent a costly challenge by Patent Owner regarding whether these entities are real parties-in-interest, Winplus North America, Inc. and Winplus NA, LLC have been named as real parties-in-interest.

2. Designation of Lead and Backup Counsel (37 C.F.R. § 42.8(b)(3))

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3. Notice of Service (37 C.F.R. § 42.8(b)(4))

Please direct all correspondence to lead counsel at the above address.

Petitioner also consents to email service at the above email addresses for lead and back-up counsel and hand delivery at the above addresses for lead and backup counsel.

4. Related Proceedings (37 C.F.R. § 42.8(b)(2))

U.S. Patent No. 11,584,243 (“the ’243 patent”) is presently asserted in the litigation proceedings bulleted below.

- Actions in which ADC is a party:
 - *The NOCO Company v. Winplus North America Inc. et al.*,
Case No. 8:23-cv-00269 (C.D. Cal.) (“District Court Litigation”); and
 - *Certain Portable Battery Jump Starters and Components Thereof (II)*, Inv. No. 337-TA-1359 (U.S. International Trade Commission) (“ITC Action”).
- Actions in which ADC is not a party:
 - *The NOCO Company v. Shenzhen Carku Technology Co., Ltd.*,
Case No. 1:23-cv-00911 (N.D. Ill.);

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- *The NOCO Company v. Hulkman LLC et al.*, Case No. 3:23-cv-00642 (N.D. Cal.);
- *The NOCO Company v. Youxiangongsi*, Case No. 4:23-cv-00554 (S.D. Tex.); and
- *The NOCO Company v. Deltona Transformer Corporation et al.*, Case No. 6:23-cv-02194 (M.D. Fla.).

As noted above, ADC is a party to two of the pending proceedings in which the '243 patent is asserted. The earliest service of a complaint asserting the '243 patent against ADC occurred in the District Court Litigation in the Central District of California on March 13, 2023. EX1010; EX1011. Thus, this Petition is filed within one year after ADC was served with a complaint for infringement of the '243 patent.

ADC has not filed a separate civil action challenging the validity of the claims of the '243 patent, although ADC asserts invalidity defenses in connection with the pending ITC Action and will assert invalidity in the District Court Litigation (if, and when, the current stay of that action is lifted).

This Petition is one of two petitions that Petitioner has filed requesting *inter partes* review of patents assigned to The NOCO Company. On February 15, 2024, Petitioner filed a petition requesting *inter partes* review of U.S. Patent No. 11,447,023 (“the '023 patent”), which shares a patent family with the '243 patent.

Specifically, the '243 patent and '023 patent are continuations which claim priority back to U.S. Patent Application No. 14,325,938 (which issued as U.S. Patent No. 9,007,015). The docket number for the proceeding requesting *inter partes* review of the '023 patent is IPR2024-00577. This Petition could affect, or be affected by, a decision in IPR2024-00577.

B. Grounds for Standing (37 C.F.R. § 42.104(a))

Petitioner certifies the '243 Patent is available for *inter partes* review. Petitioner is not barred or estopped from requesting an *inter partes* review challenging the patent claims on the Grounds identified herein.

C. Procedural Statements

This Petition is filed in accordance with 37 C.F.R. § 42.106(a). A Power of Attorney (37 C.F.R. § 42.10(b)) and Exhibit List (37 C.F.R. § 42.63(e)) are filed concurrently with this Petition. The fee is being paid via Deposit Acct. No. 11-0160. The United States Patent and Trademark Office is authorized to charge any fee deficiency, or credit any overpayment, to Deposit Acct. No. 11-0160.

II. INTRODUCTION

Petitioner respectfully requests the Board institute *inter partes* review of U.S. Patent No. 11,584,243 (“the '243 patent”), assigned to The NOCO Company (“Patent Owner”).

The '243 patent is directed to a jump starter that can boost, charge, or “jump start” a vehicle battery. While the '243 patent purports to provide improvements to safety features for detecting battery presence and reverse polarity, these features are entirely absent from the independent claims of the '243 patent. Instead, after years of litigation and prosecution of continuation applications, and alongside *inter partes* review proceedings finding the safety features unpatentable (recently affirmed on appeal), Patent Owner amended the independent claims of the '243 patent to claim a standard jump starter with standard (and obvious) USB input and output technology.

Even the '243 patent admits the claimed USB features are based on ***standard*** USB technology and conventional power conversion techniques. Since its inception, a primary goal of USB—and one of the most desirable features for users and producers of USB-capable devices—is enabling the use of standard cables, connectors, and power supplies for battery-powered electronics. Through standardization, professionals and consumers alike could reduce the need to haul multiple proprietary cables and power supplies with their growing set of battery-powered devices. And a person of ordinary skill in the art was well-equipped to implement standard USB technology and components with published reference circuits for commercially-available DC-DC converter chips to implement the claimed USB features in a jump starter.

A petition for *inter partes* review must demonstrate “a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a). The Petition meets this threshold.

III. STATEMENT OF THE PRECISE RELIEF REQUESTED AND THE REASONS THEREFOR (37 C.F.R. § 42.22(a))

Petitioner requests *inter partes* review of the '243 patent based on the following patents and patent publications, all of which were filed, issued, or published prior to the earliest claimed priority date of the '243 patent, which is no earlier than July 3, 2014. The prior art relevant to this Petition includes: U.S. Publication No. 2013/0154543 A1 (“Richardson”), published on June 20, 2013 (EX1005); U.S. Patent No. 9,391,467 B2 (“Zhao”), filed on January 17, 2014 (EX1006); U.S. Publication No. 2013/0241488 A1 (“Dao”), published on September 19, 2013 (EX1031); Chinese Utility Model Patent No. CN 202311234 U (“Yu”), issued on September 25, 2013 (EX1007; EX1008); and U.S. Patent No. 9,219,372 B2 (“Paparrizos”), filed January 22, 2013 (EX1009).

Richardson and Dao qualify as prior art under 35 U.S.C. §§ 102(a)(1) and 102(a)(2). Zhao and Paparrizos qualify as prior art under 35 U.S.C. § 102(a)(2). Yu qualifies as prior art under 35 U.S.C. § 102(a)(1).

This Petition further relies upon the Declaration of C. Arthur MacCarley, Ph.D. PE. (“MacCarley Decl.”) (EX1003), and the MacCarley curriculum vitae

(EX1004)), which is relevant to the skill, knowledge, and experience of a person having ordinary skill in the art (“PHOSITA”) at the time of the alleged invention and how that person would have understood and applied the prior art. *See* EX1003, ¶¶ 1-17, 60-67. The statutory grounds on which the challenge is based are:

- 1) Claims 1 and 2 are unpatentable under 35 U.S.C. § 103(a) over Richardson in view of Zhao.
- 2) Claims 15, 17, 18, 51, 54, and 57 are unpatentable under 35 U.S.C. § 103(a) over Richardson in view of Zhao and Dao.
- 3) Claims 1, 2, 15, 17, 18, and 57 are unpatentable under 35 U.S.C. § 103(a) over Yu in view of Paparrizos.
- 4) Claims 15, 17, 18, 51, 54, and 57 are unpatentable under 35 U.S.C. § 103(a) over Yu in view of Paparrizos and Dao.

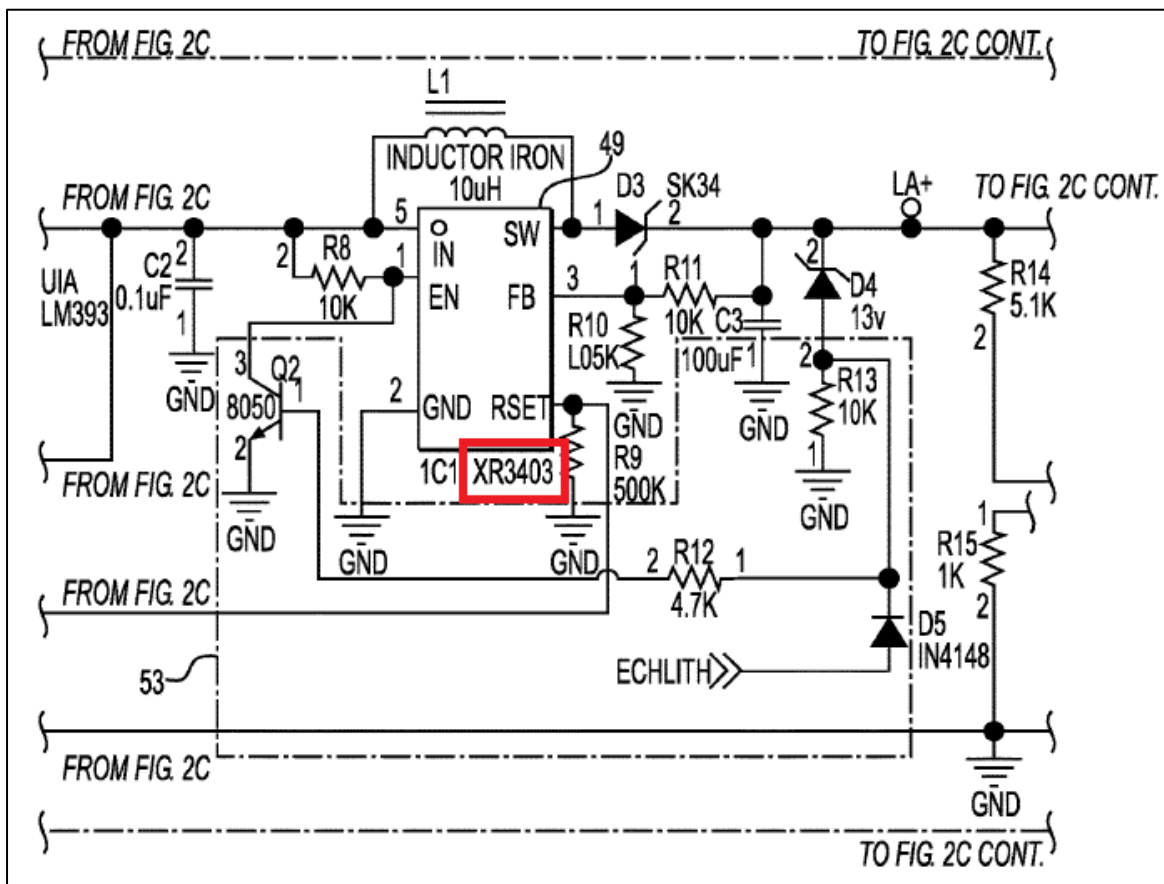
IV. U.S. PATENT NO. 11,584,243 (“THE ’243 PATENT”) (EX1001)

A. Specification and Claims

The ’243 patent relates to a device that can boost, charge, or jump start batteries such as the starter battery of a vehicle, i.e., a jump starter. EX1001, Abstract, 1:5-7; EX1003, ¶¶ 18-27. The claims of the ’243 patent merely add standard Universal Serial Bus (“USB”) technology to a conventional jump starter to allow charging of the device’s battery via a standard USB connector and power supply. EX1001, Limitations 1(f)-(g), 57(f)-(g). Indeed, the primary discussion of

USB charging consists of three sentences that admit the claimed functionality can be achieved through a “standard” USB charger, connector, and cables. EX1001, 7:32-38; EX1003, ¶ 25. The ’243 patent also discloses the “USB charge circuit 52 converts power from any USB charger power source, charge voltage and current for charging the lithium battery pack 32.” EX1001, 5:24-26.

The “USB charge circuit 52” is also depicted in Figure 2C. EX1001, Fig. 2C. The component labeled “XR3403” is central to the USB charge circuit. *See id.* (annotated).



The XR3403 chip is a commercial, off-the-shelf integrated circuit that can accept a 5V input and boost such voltage to 12V via conventional techniques. *See* EX1012 at 6 (“Normal application... Input 5V to Output 9V 12V 24V”); EX1003, ¶¶ 26-27. In other words, USB charge circuit 52 utilizes a conventional power conversion technique whereby a “boost converter” (*e.g.*, the XR3403 chip) boosts 5V input from a standard USB charging source to a higher voltage level, such as the approximate 12V the ’243 patent explains would be capable of charging the lithium-ion battery pack of the disclosed jump starter. EX1001, 7:35-38; EX1003, ¶¶ 26-27.

Aside from standard USB technology and conventional power conversion, the remaining limitations of the independent claims are similarly directed to conventional components or features, including:

- A power supply (*e.g.*, a jump starter’s battery). EX1001, Limitations 1(a) and 57(a).
 - The ’243 patent admits it was known for portable booster devices to have a battery. EX1001, 1:11-17.
- Battery connectors (*e.g.*, cable clamps). EX1001, Limitations 1(b)-(c) and 57(b)-(c).
 - The ’243 patent discusses prior art uses of “jumper terminals or clamps.” EX1001, 1:18-25, 1:11-17.

- A controllable switch for connecting power from the jump starter’s battery to the vehicle battery. EX1001, Limitations 1(d)-(e) and 57(d)-(e).
 - The ’243 patent discusses the prior art’s use of circuit-controlled switches in jump starting devices. EX1001, 1:26-36, 2:35-39.
- A USB output connector and circuit for charging portable electronic devices. EX1001, Limitations 57(h)-(i)¹.
 - The ’243 patent admits the USB output feature relies upon “standard” USB technology. EX1001, 7:22-31.

The challenged dependent claims recite the following additional conventional features:

- (1) controlling the ON/OFF status of the USB output (claim 18). EX1001, 7:25-28.
- (2) using lithium cells in the battery pack (claim 51). EX1001, 4:15-27.
- (3) monitoring battery pack voltage for overcharge and overdischarge protections (claim 54). EX1001, 7:43-48.

B. Prosecution History of the ’243 Patent

The ’243 patent stems from a line of continuation applications claiming priority back to U.S. Patent Application No. 14/325,938, which was filed on July 3,

¹ Independent claim 1 does not require the USB output feature.

2014, and issued as U.S. Patent No. 9,007,015 (EX1013). EX1001, [60]; EX1003, ¶ 28. All claims of the '015 patent were challenged in *inter partes* review, IPR2020-00944, which resulted in a Final Written Decision (“the '015-FWD”) finding all claims, except claim 11, unpatentable. EX1014; EX1003, ¶ 29. The Federal Circuit affirmed the '015-FWD. EX1015.

Many arguments and findings in IPR2020-00944 are germane to this Petition. The '015 patent and '243 patent share a common (or substantially indistinguishable) specification, and have claims with similar subject matter. *Compare* EX1001 *with* EX1013. The Board found the Richardson reference—asserted in Grounds 1 and 2 of this Petition—anticipated the only independent claim and several dependent claims of the '015 patent.

The following are non-limiting examples of the Board’s findings in IPR2020-00944 particularly pertinent here:

- Richardson discloses an apparatus for jump starting a vehicle engine. EX1014 at 50.
- Richardson’s batteries constitute a power supply. EX1014 at 50-51.
- Richardson’s “reverse voltage sensor 24” constitutes a “reverse polarity sensor.” EX1014 at 53-54.
- Richardson’s “contact relay 34” constitutes a “power switch.” EX1014 at 54-55.

- Richardson’s “system microcontroller 12” constitutes a “microcontroller.” EX1014 at 55-67.
- Richardson anticipates claim 1 of the ’015 patent. EX1014 at 47-67.
- In connection with claim 11 of the ’015 patent—which involves a limitation similar to the USB charging limitations present in both independent claims of the ’243 patent—the Board found Petitioner: (1) only asserted secondary references with USB outputs to charge other devices (as opposed to USB inputs) (EX1014 at 92); (2) failed to demonstrate obviousness of claim 11 due to “conclusory” positions and inadequate evidence (EX1014 at 92-94); (3) asserted new arguments and evidence in its reply that would not be considered by the Board (EX1014 at 94).
- With regard to claim 10 of the ’015 patent—which required a “USB output port” similar to independent claim 57 and dependent claims 15, 17, and 18 of the ’243 patent—the Board agreed with petitioner that a person of skill in the art would have been motivated to “incorporate USB output ports in Richardson as a convenience feature allowing users to also charge electronic devices.” EX1014 at 88.

During IPR2020-00944, Patent Owner was prosecuting the ’243 patent.

Patent Owner originally presented substantially similar claims as the ’015 patent and submitted a preliminary amendment with the only independent claim requiring

a “USB charging input.” *Compare* EX1002, 37-40 with EX1013, 8:4-10:22; EX1002, 79-89; EX1003, ¶ 30. The Examiner issued a non-final rejection finding most claims obvious over Richardson and Tinaphong. EX1002, 440-468; EX1003, ¶ 31.

In response, Patent Owner amended independent claim 24 to recite two limitations directed to USB charging—a “USB input charge circuit” configured to “increase charge voltage” from a USB charger to a power supply, and a “USB charging input.” EX1002, 485-495; EX1003, ¶ 32. Patent Owner argued Richardson does not disclose the USB limitations but did not contest Richardson taught the remaining limitations. EX1002, 473-476; EX1003, ¶ 33. Patent Owner also argued “[d]ropping down the voltage as taught by Tinaphong is the exact opposite and wrong direction to the requirement of stepping up or increasing the charging voltage to charge the internal lithium polymer battery 18 of Tinaphong to at least 12 V...” EX1002, 476; EX1003, ¶ 34.

The Examiner issued a final rejection finding most claims obvious over Richardson and Balmefrezol. EX1002, 601-635; EX1003, ¶ 35. In response, Patent Owner amended the claims, including a slight modification of the language of the USB charging limitations and the addition of independent claim 80. EX1002, 1777-1790; EX1003, ¶ 35. Patent Owner reiterated that Richardson does not disclose the USB charging limitations and argued “Balmefrezol does not teach or

suggest up-converting (i.e. increasing or boosting) the voltage from the USB interface to the internal battery, but instead teaches away from the claimed USB charging feature by disclosing down-converting (i.e. decreasing or bucking) the voltage from the USB interface to the internal battery of the electronic device.”

EX1002, 1794, 1797-1798 (emphasis in original); EX1003, ¶ 36.

The Examiner issued a non-final rejection, finding most claims obvious over Richardson and Butler. EX1002, 1914-1951; EX1003, ¶ 37. In response, Patent Owner argued Butler does not qualify as prior art. EX1002, 2045-56; EX1003, ¶ 38. The Examiner then issued a final rejection but indicated claims 24-80 would be allowable subject to a terminal disclaimer over claims 1-54 of the '023 patent. EX1002, 2130-35. Patent Owner subsequently filed a terminal disclaimer to overcome this rejection and a Notice of Allowability issued on December 23, 2022. EX1002, 2155-2161, 2233-2240; *see also id.* at 2277-79; EX1003, ¶ 39.

V. BACKGROUND OF THE PRIOR ART REPLIED UPON IN THIS PETITION

A. Prior Art Patents and Printed Publications Relied Upon

This challenge is based on five prior art references: Richardson, Zhao, Dao, Yu, and Paparrizos.

1. Richardson

Richardson discloses a portable power source that can jump start vehicle batteries. EX1005, ¶¶ [0002], [0006]-[0007]. The disclosed system is controlled by a microcontroller. EX1005, ¶ [0014]; EX1003, ¶ 49.

Richardson acknowledges various problems can occur when jump starting a vehicle battery. *See* EX1005, ¶ [0005]. Richardson teaches safety features to mitigate these problems, including reverse polarity protection. EX1005, ¶ [0016]; EX1003, ¶ 50.

Richardson is in the same field of endeavor and addresses subject matter reasonably pertinent to problems facing the '243 patent's named inventors. *Compare* EX1001, Abstract, 1:17-24 *with* EX1005, Abstract; EX1003, ¶ 51.

2. Zhao

Zhao discloses a battery charging system that includes a step-up converter for boosting a DC input voltage. EX1006, Abstract. Zhao's battery charging system can charge a multicell, series-connected lithium-ion battery pack from a 5V input provided by a USB power source. EX1006, 1:22-27, 2:63-3:11; EX1003, ¶ 52.

Zhao is in the same field of endeavor and addresses subject matter that was reasonably pertinent to problems facing the '243 patent's named inventors.

Compare EX1001, 1:42-44, 4:4-16, 7:25-28 *with* EX1006, 1:19-30, 3:6-11;
EX1003, ¶ 53.

3. Dao

Dao discloses a portable power supply that jump starts vehicle batteries using one or more lithium cells in a battery pack and overcharge and overdischarge protections for the lithium battery pack. EX1031, Abstract, ¶¶ [0001], [0002], [0020], [0024], [0031]; EX1003, ¶ 54.

Dao is in the same field of endeavor and addresses subject matter that was reasonably pertinent to problems facing the '243 patent's named inventors.

Compare EX1001, Abstract, 7:41-48 *with* EX1031, Abstract, ¶¶ [0001], [0020], [0024], [0031]; EX1003, ¶ 55.

4. Yu

Yu discloses an automotive starting device (*e.g.*, jump starter). EX1007; EX1008², Abstract. Yu's device comprises various components including a microprocessor-controlled relay which connects power from the internal battery to a vehicle battery. EX1008, ¶ [0004]. Before initiating a jump start, Yu's device detects whether a vehicle battery is connected with correct polarity. EX1008, ¶ [0009]; EX1003, ¶ 56.

² EX1007 is the original Chinese language patent for the Yu reference. EX1008 is the certified English translation thereof. Petitioner's citations to this reference herein will be to the English translation, EX1008.

Yu is in the same field of endeavor and addresses subject matter that was reasonably pertinent to problems facing the '243 patent's named inventors.

Compare EX1001, Abstract, 1:17-24 *with* EX1008, Abstract; EX1003, ¶ 57.

5. Paparrizos

Paparrizos discloses a battery charging circuit that boosts a lower input voltage to a sufficient voltage to charge higher voltage batteries. EX1009, Abstract, 3:31-35, 8:17-31. Paparrizos's circuit charges multicell, series-connected lithium-ion battery packs from a 5V USB power source. EX1009, 2:30-40, 8:17-31; EX1003, ¶ 58.

Paparrizos is in the same field of endeavor and addresses subject matter that was reasonably pertinent to problems facing the '243 patent's named inventors.

Compare EX1001, 1:42-44, 4:4-16, 7:25-28 *with* EX1009, 1:18-39, 2:30-40, 8:17-31; EX1003, ¶ 59.

VI. A PERSON HAVING ORDINARY SKILL IN THE ART

The prior art and MacCarley Declaration demonstrate a person having ordinary skill in the art, as of the claimed July 3, 2014 priority date, would have at least a bachelor's degree in electrical engineering or its equivalent and at least two years of experience in the field of electrical engineering including some experience with DC power supply or battery charger design. EX1003, ¶¶ 41-44; EX1014 at

10-11. Less work experience could be compensated for by a higher level of education, such as a master's degree, and vice versa. EX1003, ¶ 44.

VII. CLAIM CONSTRUCTION UNDER 37 C.F.R. § 42.104(b)(3)

Unless otherwise addressed herein, the terms of the unexpired '243 patent's claims are to be given their plain and ordinary meaning, as understood by one of ordinary skill in the art, in view of the specification. *See* 37 C.F.R. § 42.100(b); 83 FR 51340; *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc); EX1003, ¶¶ 43-45.

Petitioner does not believe any construction would have an impact on the invalidity analyses set forth herein. *HTC Corp. v. Cellular Communications Equip., LLC*, 877 F.3d 1361, 1367–68 (Fed. Cir. 2017) (affirming the Board absent an express construction of a term). Based on the evidence below and the similarities between the prior art and the specification and claims of the '243 patent, Petitioner submits there are no formal claim constructions necessary in this proceeding because “claim terms need only be construed to the extent necessary to resolve the controversy.” *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) (internal quotations omitted); EX1003, ¶¶ 46-47.

VIII. DISCRETION UNDER § 325(D)

The Board uses a two-part framework to evaluate arguments under 35 U.S.C. § 325(d): “(1) whether the same or substantially the same art previously

was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office; and (2) if either condition of the first part of the framework is satisfied, whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims.” *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 8 (PTAB Feb. 13, 2020) (precedential). This framework is assessed under the *Becton, Dickinson* factors. *Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 (PTAB Dec. 15, 2017) (precedential as to § III.C.5, first paragraph).

Under *Becton, Dickinson*, the Board considers:

- (a) the similarities and material differences between the asserted art and the prior art involved during examination;
- (b) the cumulative nature of the asserted art and the prior art evaluated during examination;
- (c) the extent to which the asserted art was evaluated during examination, including whether the prior art was the basis for rejection;
- (d) the extent of the overlap between the arguments made during examination and the manner in which petitioner relies on the prior art;
- (e) whether petitioner has pointed out sufficiently how the examiner erred in its evaluation of the asserted prior art; and
- (f) the extent to which additional evidence and facts presented in the petition warrant reconsideration of the prior art or arguments.

See Becton, Dickinson, Paper 8 at 17–18.

A. Petitioner does not rely on the same or substantially the same prior art and arguments

Becton, Dickinson factors (a), (b), and (d) each weigh against discretionary denial under the first part of the *Advanced Bionics* framework. Although Richardson was used by the Examiner to reject the claims of the '243 patent, the Examiner failed to consider *any* prior art teaching USB charging via a DC-DC *boosting* technique, which is the exact feature Patent Owner argued was missing from Tinaphong and Balmefrezol in response to the Examiner's obviousness rejections. EX1002, 476, 1797-98. In other words, to overcome the Examiner's obviousness rejection based on Richardson and Tinaphong, Patent Owner amended the claims to require both a USB charging input and a USB charge circuit configured to "increase charge voltage." EX1002, 485-486. Patent Owner argued Tinaphong taught *buckling* (i.e., decreasing) an input voltage from a USB power source but did not teach *boosting* a USB input voltage. EX1002, 476. Patent Owner offered substantially similar arguments in response to the Examiner's combination of Richardson and Balmefrezol, arguing that Balmefrezol only disclosed bucking voltage rather than boosting. EX1002, 606-625, 1794, 1797-98.

Ground 1 of this Petition, however, proposes modifying Richardson in view of Zhao, which was not before the Examiner and teaches exactly what Patent Owner argued was missing from Tinaphong and Balmefrezol—increasing a USB

input voltage via a DC-DC boost converter. EX1001, [56] References Cited; EX1006, 1:25-27; 2:63-3:11. Zhao is therefore non-cumulative because it teaches the USB charging limitations missing from Tinaphong and Balmeffrezol which led to allowability of the claims. Accordingly, the prior art and arguments raised in Ground 1 are “substantially different” than those raised during prosecution. *See Peloton Interactive, Inc. v. NEC Corporation*, IPR2023-01241, Paper 17 at 14-15 (PTAB Feb. 7, 2024) (finding first part of *Advanced Bionics* not met where non-cumulative art not before examiner taught missing limitation); *see also Samsung Electronics Co. Ltd. v. Headwater Research LLC*, IPR2023-01157, Paper 9 at 6-7 (PTAB Jan. 22, 2024) (same).

Similarly, Ground 3 presents an obviousness challenge based on new art and arguments that were not previously presented to the Examiner—Yu in view of Paparrizos. Yu was cited in an Information Disclosure Statement but not substantively considered by the Examiner. EX1002, 776, 647-680. “The Board frequently holds that a reference that ‘was neither applied against the claims nor discussed by the Examiner’ does not weigh in favor of exercising the Board’s discretion under § 325(d) to deny a petition.” *Amazon.com, Inc. v. M2M Sols. LLC*, IPR2019-01204, Paper 14 at 16 (PTAB. Jan. 23, 2020); *see also Apotex Inc. v. UCB Biopharma SPRL*, IPR2019-00400, Paper 17 at 25 (PTAB July 15, 2019). And, like Zhao, Paparrizos was not before the Examiner and teaches precisely

what Patent Owner argued was missing from the prior art of record—increasing a USB input voltage via a DC-DC boost converter. EX1009, 3:2-6, 3:31-35; 8:10-31. Accordingly, the prior art and arguments raised in Ground 3 are “substantially different” than those raised during prosecution. *See Peloton*, IPR2023-01241, Paper 17 at 14-15; *Samsung*, IPR2023-01157, Paper 9 at 6-7.

Similarly, Grounds 2 and 4 present substantially different prior art and arguments from prosecution through further reliance on Dao, which was cited in an IDS but not substantively considered by the Examiner. EX1002, 408 (identifying Dao).

B. The patent office materially erred in allowing the claims of the '243 patent

Allowance of the challenged claims was also material error warranting against exercise of discretion under part two of the *Advanced Bionics* framework and *Becton, Dickinson* factors (c), (e), and (f). The prosecution history demonstrates the Examiner did not sufficiently locate, evaluate, or appreciate prior art teaching boosting a USB input voltage to charge a higher voltage battery via a DC-DC converter. As discussed above, Zhao and Paparrizos—which were not before the Examiner—each differ from Tinaphong and Balmefrezol by teaching up-converting (i.e., boosting or increasing) the USB input voltage to charge higher voltage batteries. *See Samsung*, IPR2023-01157, slip op. at 6-7 (Paper 9).

The Examiner was also not presented with the substantial evidence accompanying this Petition, or anything similar, which demonstrates the known desirability and predictability of boosting a USB input voltage to charge a higher voltage battery pack via a DC-DC boost converter. For example, evidence of motivation to combine and reasonable expectation of success relied upon herein—specifically Zhou (EX1016), Amemiya (EX1017), CN 202512152 U (EX1018; EX1019), CN 201226449Y (EX1020; EX1021), CN 203788026 U (EX1022; EX1023), the expert declaration of Mr. MacCarley, and the deposition of Mr. Bryan Legates (EX1026)—were not of record during prosecution. EX1001, [56] References Cited.

Finally, with respect to Yu and Dao, there is no evidence in the prosecution history of the extent to which the Examiner considered Yu or Dao, that the Examiner applied the references against the claims, or that the Examiner considered the particular disclosures of these references. *See, e.g., Vizio, Inc. v. Nichia Corp.*, IPR2017-00551, Paper 9 at 7–8 (PTAB July 7, 2017). Yu and Dao were among hundreds of references before the Examiner during prosecution and appear to have been overlooked. EX1002, 408, 776; *see, e.g., Samsung*, Paper 9 at 7-8 (finding material error under part two of *Advanced Bionics* because references among 1800 cited in IDS); *see also, e.g., Hum Industrial Technology, Inc. v. Amsted Rail Company, Inc.*, IPR2023-00540, Paper 10 at 44-45 (PTAB Aug. 11,

2023) (finding examiner did not sufficiently evaluate or appreciate reference where it was listed with “almost 37” references in an IDS and not used in a rejection).

Accordingly, Petitioner respectfully submits the Board should decline to exercise discretionary denial under § 325(d).

IX. DISCRETION UNDER § 314(A)

Under the Office’s June 21, 2022 Memorandum³ (“Guidance Memo”), the parallel ITC Action does not provide a basis for discretionary denial under 35 U.S.C. § 314(a). Guidance Memo at 2-3. Additionally, ADC has offered Patent Owner a stipulation that, if IPR is instituted, it will not pursue in the District Court Litigation any ground raised or that could have been reasonably raised in this Petition with respect to claims 1, 2, 15, 17, 18, 51, 54, and 57 of the ’243 patent. EX1028; Guidance Memo at 7 (PTAB will not discretionarily deny institution in view of parallel district court litigation if a *Sotera* stipulation is served).

X. GROUND FOR UNPATENTABILITY

Petitioner requests cancellation of the challenged claims on the following Grounds:

A. Ground 1: Claims 1 and 2 are unpatentable under 35 U.S.C. § 103(a) over Richardson in view of Zhao

³ *Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation*, available at www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621.pdf.

1. Combination Overview

A PHOSITA would have found it obvious to combine Richardson's and Zhao's teachings. EX1003, ¶ 68. Both references relate to systems utilizing a multicell battery pack, and a PHOSITA would have been motivated to modify Richardson in view of Zhao to include a USB charging input and circuit to achieve the predictable result of effectively charging the batteries of Richardson's jump starter. *Id.*

Richardson teaches a battery-powered device having a pack of series-connected 12V batteries. EX1005, FIG 2A (depicting "batteries 23"), ¶ [0034]; EX1003, ¶ 69. To reach a 12V rating, a PHOSITA would understand Richardson's batteries require multiple cells connected in series, such as a series of lithium-ion cells or lead-acid cells. *Id.* Zhao discloses a system for charging battery-powered devices that have a multicell pack of series-connected cells. *Id.*; EX1006, 2:63-3:11. Zhao teaches its system can use low voltage charging systems like 5V USB to charge batteries with a voltage rating above that of the voltage received from the USB power source. EX1006, 1:22-27; 2:51-54; 3:6-11; EX1003, ¶ 69.

Zhao is directed to the known technique of charging a multicell battery pack of series-connected cells—which is the same battery architecture in Richardson's jump starter—by using a DC-DC booster converter in accordance with its established function of converting a lower voltage input to a higher voltage output.

EX1003, ¶ 70. Zhao teaches charging a pack rated above 5V with a 5V USB input—a known technique that a PHOSITA would have been motivated to implement in a predictable manner to charge 12V batteries like those disclosed by Richardson. EX1003, ¶¶ 70-71.

2. Independent Claim 1

a. Preamble⁴

Richardson discloses a jump starting device. EX1005, Abstract, claim 26. Richardson’s device provide power to jump start vehicle batteries. EX1005, ¶¶ [0002], [0006]-[0007]; EX1003, ¶ 72. Richardson describes “[j]ump starter 10” includes “microprocessor 12” to control the system, thereby allowing the jump starter to boost or charge a battery by connecting the internal batteries of the jump starter to the positive and negative terminals of a vehicle battery. EX1005, ¶¶ [0004], [0007], [0014], [0016], [0021], [0035]; FIG. 1, FIG. 2C, FIGS. 3-8; EX1003, ¶ 72.

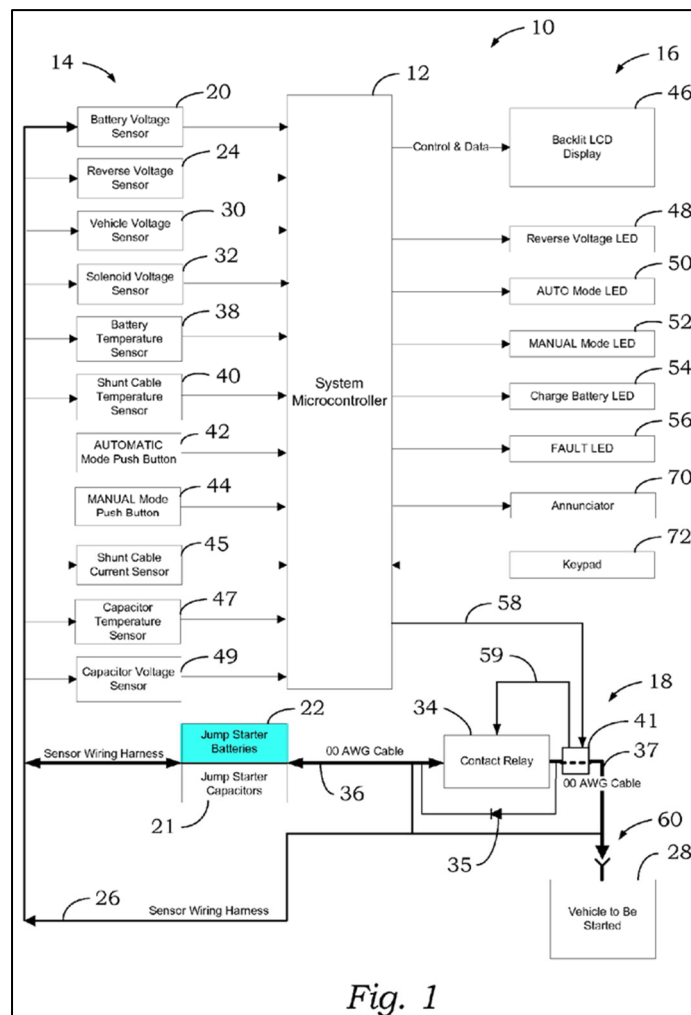
The Board made similar factual findings regarding Richardson in the ’015-FWD, which was affirmed on appeal. EX1014 at 50; EX1015 at 2; EX1003, ¶ 73.

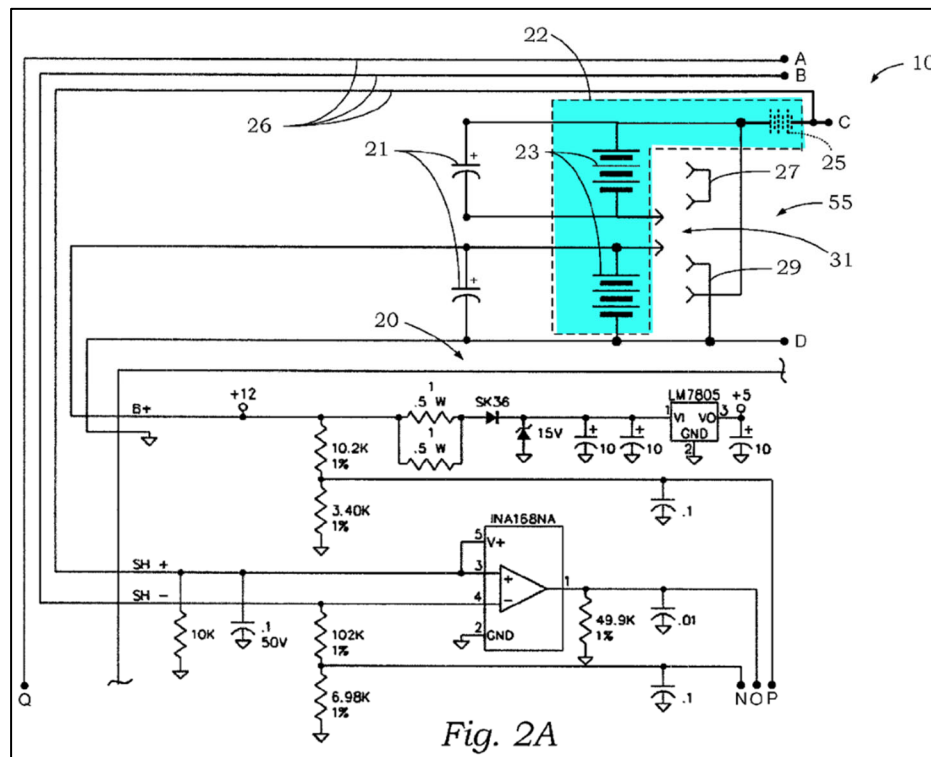
b. Limitation 1(a)

⁴ Because Petitioner includes the full claim language of the ’243 patent in the Listing of Challenged Claims, it does not reproduce the full claim language here. The Board is encouraged to reference the Listing of Challenged Claims at p. x to see the full claim language.

Richardson teaches its jump starting device has “one or more batteries.”

EX1005, Abstract, ¶ [0007], claim 1. “Jump starter batteries 22” supply power to jump start a vehicle’s battery. *See* EX1005, ¶¶ [0016], [0021], [0035]; EX1003, ¶ 74. This is further shown by Figures 1 and 2A, annotated below to indicate the batteries which operate as a power supply. EX1005, Figs. 1 and 2A (annotated).





EX1003, ¶ 74.

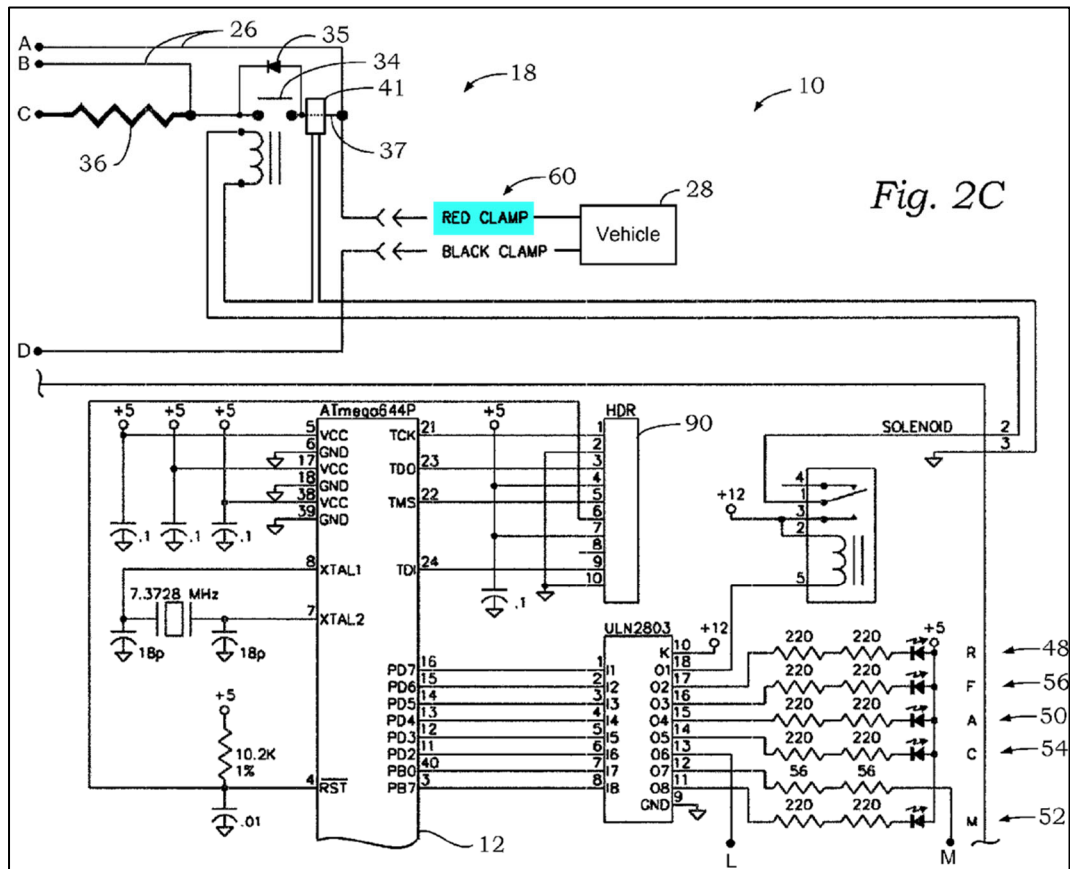
The Board made similar factual findings regarding Richardson in the '015-FWD, which was affirmed on appeal. *See* EX1014 at 50-51; EX1015 at 2; EX1003, ¶ 75.

c. Limitation 1(b)

Richardson discloses a “pair of conductive leads” which include a positive battery connector as claimed. EX1005, Abstract, claim 26; EX1003, ¶ 76.

Richardson’s terminal connectors “may include conductive clamps” or other connectors. EX1005, ¶ [0016]. For example, “jumper cables 60” include the conventionally-colored red cable clamp for electrically connecting the positive

cable to the positive battery terminal. EX1005, ¶ [0027]; EX1003, ¶ 76; EX1005, FIG. 2C (annotated).

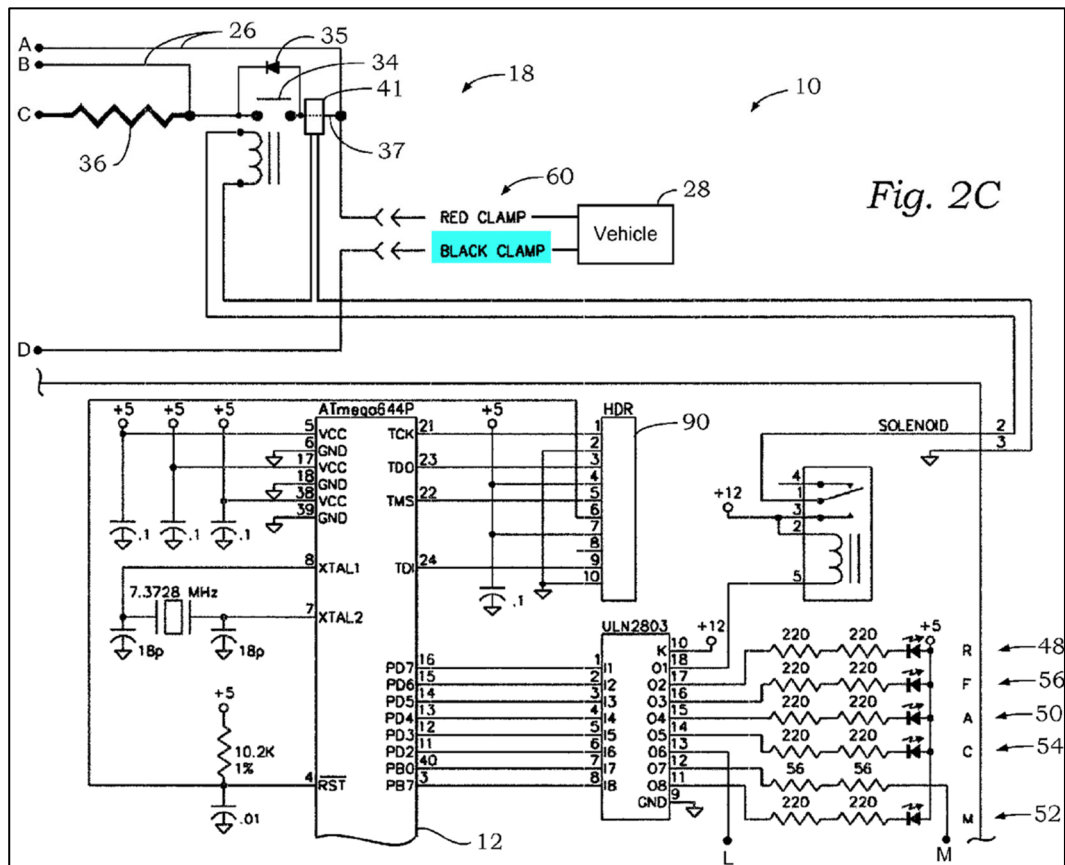


A PHOSITA would further understand Richardson discloses a positive battery connector as claimed as the cables are disclosed with different polarities. EX1005, ¶¶ [0016]; [0027]-[0028]; EX1003, ¶ 77. A PHOSITA would thus understand that the conductive leads include a positive cable clamp. *Id.*

d. Limitation 1(c)

Richardson's conductive leads (*see* Limitation 1(b), *supra*) also include a negative battery connector as claimed. EX1005, Abstract, claim 26; EX1003, ¶ 78.

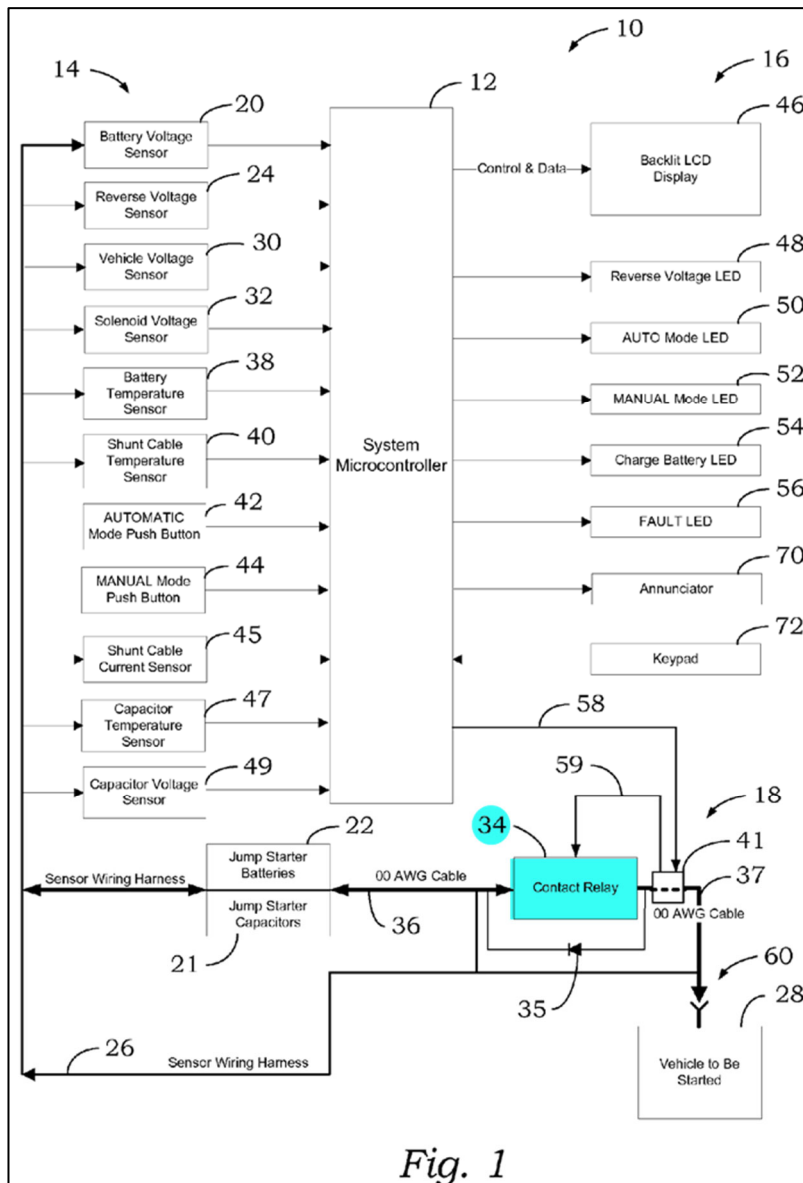
Richardson's terminal connectors "may include conductive clamps" or other types of connectors. EX1005, ¶ [0016]. For example, "jumper cables 60" include the conventionally-colored black cable clamp for connecting the negative cable to the negative battery terminal. EX1003, ¶ 78; EX1005, ¶ [0027], FIG. 2C (annotated).



A PHOSITA would further understand Richardson discloses a negative battery connector as claimed as the cables are disclosed with different polarities. EX1005, ¶¶ [0016]; [0027]-[0028]; EX1003, ¶ 79. A PHOSITA would thus understand that the conductive leads include a negative cable clamp. *Id.*

e. Limitation 1(d)

Richardson discloses “contact relay 34” which functions as a power switch or switch circuit as claimed. EX1003, ¶ 80. For example, when a jump start is initiated, contact relay 34 is closed to connect the jump starter’s batteries to the vehicle battery, thereby transferring power for a jump start. *Id.*; EX1005, ¶¶ [0021], [0035]-[0036], [0054], Fig. 2C; EX1005, FIG. 1 (annotated).



EX1003, ¶ 76.

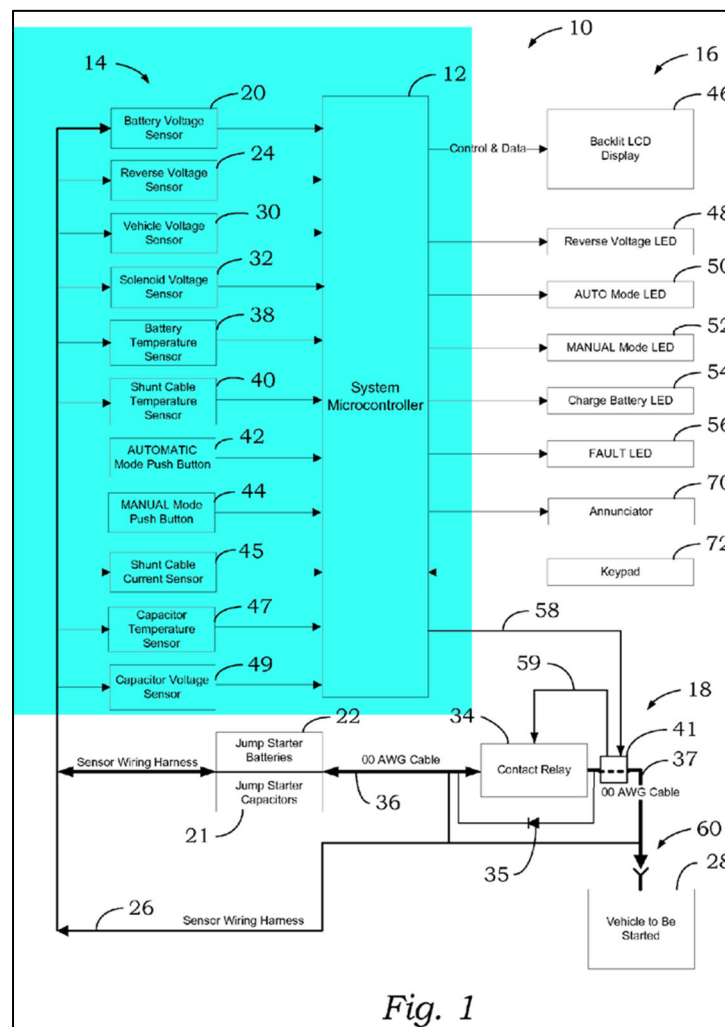
Richardson similarly discloses a jump starter with “a relay connected to said conductive leads” and “a processor for controlling said relay to selectively apply electrical power from said jump starter batteries and said jump starter capacitors to said electrical system of the engine.” EX1005, claim 26. Richardson’s flow charts of the processing steps further demonstrate the relay operates as a power switch or switch circuit as claimed. EX1005, FIG. 6 (Step 268: “Close Starter Contact Relay”); EX1003, ¶ 81.

The Board made similar factual findings regarding Richardson in the ’015-FWD, which was affirmed on appeal. EX1014 at 54-55; EX1015 at 2; EX1003, ¶ 82.

f. Limitation 1(e)

Richardson discloses that contact relay 34 is configured to switch power on as claimed. EX1003, ¶ 83. Contact relay 34 is configured to be controlled by a system comprised of microprocessor⁵ 12 and associated sensors and circuitry. EX1005, FIG. 1 (annotated).

⁵ Richardson also refers to “microprocessor 12” as “microcontroller 12.” EX1005, ¶ [0018], FIG. 1.



EX1003, ¶ 83.

For example, Richardson's jump starter has a processor for controlling the relay to selectively apply electrical power to the engine electrical system. EX1005, Abstract, ¶¶ [0018], [0036], claim 26. This microprocessor produces outputs which control the jump start function. EX1005, ¶¶ [0014], [0020], Fig. 2A, Fig. 2B, Fig. 2C. Richardson teaches that contact relay is configured to be closed (thereby switching power on) "[w]hen the jump starter operation has been successfully

initiated.” EX1005, ¶ [0021]. One of the earliest steps in this process is manually connecting the jumper cables to the vehicle battery. EX1005, ¶ [0026]. The device then proceeds through various processing steps and, if the appropriate conditions have been satisfied, can ultimately reach step 268 where the relay is closed for a jump start. EX1005, ¶¶ [0027]-[0035]; Figs. 3-6. If the jumper cables are disconnected or unplugged at any point, Richardson’s device will open contact relay 34 so that power is no longer switched on. EX1005, ¶¶ [0036], [0041]. Accordingly, Richardson teaches contact relay 34 is configured to switch power on during the time that the device is connected to the vehicle battery via the jumper cables. EX1003, ¶¶ 84-85.

g. Limitation 1(f)

Richardson is not explicit regarding the type of input connector utilized for charging its jump starter batteries. EX1005, ¶ [0029]. However, a PHOSITA would have been familiar with the relevant USB standards and been motivated to implement USB technology when designing a portable battery-powered device at the time of the ’243 patent. EX1003, ¶ 86. A PHOSITA would have been motivated to modify Richardson to implement a USB input connector (and associated circuit) as taught by Zhao. EX1006, 1:22-27; 3:1-11; EX1003, ¶ 86. A PHOSITA would have necessarily relied upon their knowledge regarding implementation of commercially-available USB receptacles (such as a micro-USB

receptacle) when designing a USB charging feature by adding a USB input connector and USB charge circuit to Richardson's device. EX1003, ¶ 87.

For example, Zhao teaches the input voltage of the system is provided by a "universal serial bus (USB) charger" (EX1006, 3:6-11), and a PHOSITA would have known Zhao's system implements a design requiring the remaining portions of a USB charging system, especially a USB-compliant receptacle (such as a micro-USB connector). EX1003, ¶ 88. A PHOSITA's knowledge of these USB input connectors—which the '243 patent admits are "standard" (EX1001, 7:23-25)—is further corroborated by the USB standards and other prior art discussing these standard connectors. EX1009, 1:20-23 (discussing USB, mini-USB, and micro-USB connectors); EX1018; EX1019, ¶ [0004] (discussing "Mini-USB interface"); EX1003, ¶ 88. This USB receptacle (which is a USB input connector as claimed) can receive the corresponding plug of a USB cable of a USB charger, thereby enabling the receipt and transmission of the power input from the USB power source to the USB input circuit and ultimately the jump starter's batteries. EX1003, ¶¶ 88-89.

A PHOSITA would understand Zhao's system is suitable for use with a variety of pack configurations and battery chemistries, such as a 3S pack of lithium-ion cells rated at 11.1V or a 4S pack of lithium-ion cells rated at 14.8V (both of which would be well-suited for starting a traditional lead-acid vehicle

starter battery rated at 12V). EX1006, 3:6-11; EX1003, ¶ 90. Thus, the disclosure of Zhao provides an explicit teaching, suggestion, or motivation to implement Zhao's USB input feature with a system like Richardson's jump starter. *Id.* A PHOSITA would have been motivated to modify Richardson's jump starter to either (1) replace the existing charging connector (and circuitry) with Zhao's step-up charging system and connect the output to Richardson's jump starter batteries, or (2) add Zhao's step-up charging system and connect the output to Richardson's jump starter batteries as an additional and alternative pathway for charging the jump starter batteries. EX1003, ¶ 91. Either option would have provided desirable features or improvements to Richardson's jump starter. For example, although option 1 may result in longer charging times, it allows the supplier to avoid the need to supply a proprietary charger or other type of AC "power brick" that would be less ubiquitous or less standardized than a USB charger. *Id.* On the other hand, while option 2 would result in a slight increase in cost for including an additional input connector and DC-DC conversion circuitry in Richardson's jump starter, the desirable benefits would include increased flexibility so that the jump starter batteries could be charged via a traditional AC power brick when available, but alternatively by a USB charger if the AC power brick is lost, damaged, or the user is otherwise in a location where only USB power is readily available. *Id.* Both options cater to perceived or actual consumer demand for USB technology as well

as the other benefits and desirable features of USB charging discussed herein. *Id.*, ¶¶ 91-92; EX1025 at 6; EX1024, ¶¶ 1-4, 8.

The desirability of using a USB input to recharge batteries at the voltage level of those found in jump starters is well-documented in the prior art, further corroborating a PHOSITA's motivation and understanding of the desirability of USB. EX1003, ¶¶ 92-93. For example, USB charging ports had become standard equipment in many cars and trucks before the '243 patent's claimed priority date, which is one location where a jump starter for a vehicle would be stored and charged. EX1029; EX1030; EX1003, ¶ 93. As another example, the Paparrizos reference states the following:

The USB specification has become very popular and consumers have become used to being able to charge their USB devices from universal USB power sources. Consumers are used to USB, mini-USB, and micro-USB connectors being present in portable electronics and their use for battery charging from a USB power source.

EX1009, 1:18-23; EX1003, ¶ 93. The '243 patent is explicit that USB connectors, chargers, and cables were "standard" before the claimed priority date. EX1001, 7:21-25; EX1003, ¶ 93.

As another example, as early as **2001** component suppliers such as Linear Technologies had developed and marketed integrated circuits for the specific application of boosting a 5V USB input to charge higher voltage batteries. EX1027 at 26-28; EX1026, 28:14-31:13; 32:22-38:24; 42:23-43:22; 44:2-19; 51:14-54:13;

54:25-56:14; EX1003, ¶ 93. Linear Technologies (among other IC and ASCII manufacturers) had provided integrated circuits that enabled USB charging for higher voltage batteries from a 5V USB source, as further explained by Mr. Bryan Legates in a deposition in the ITC Action. EX1026, 53:2-18; EX1003, ¶ 93.

Like the USB charging applications achieved by customers of Linear Technologies before the claimed priority date, the use of DC-DC converters to boost a USB input voltage to charge a battery with a voltage rating above the USB input voltage was both desirable and known to be interchangeable with non-USB charging systems. EX1003, ¶ 94. Again, this type of application was known to a PHOSITA and is well-documented in prior art, including the following:

- CN 202512152 U—a Chinese utility model patent published and issued in 2012—discloses a digital multimeter device with a 9V internal battery that can be charged from the 5V input from a USB power supply via DC-DC boosting circuit. EX1018; EX1019, Abstract, ¶¶ [0004]-[0005], Fig. 1, Fig. 2; EX1003, ¶ 94.
- CN 201226449Y—a Chinese utility model published and issued in 2009—discloses “a booster type charging control circuit is widely used” in applications where the 5V from a USB charging source cannot meet the charging needs of an electronic device. EX1020; EX1021 at 4 (“Background art”); EX1003, ¶ 94.

- U.S. Patent Publication No. 2013/0285596 (“Zhou”)— filed April 30, 2012—discloses circuits with components that can “increase (e.g., step-up) the voltage received from a battery charger via the USB 104 (e.g., about 5V) to the voltage required to charge the battery 110 (e.g., about 10V to 24V). EX1016, ¶ [0011]; EX1003, ¶ 94.
- U.S. Patent No. 9,035,599 (“Amemiya”)— filed May 20, 2013—discloses a charging circuit where “the input power supply is a USB power supply and the input voltage V_{in} is about 5 volts” and the battery to be charged “is a two-cell lithium-ion secondary battery and the full charge voltage thereof is 8.4 volts.” EX1017, 2:48-59; EX1003, ¶ 94.

Chinese utility model patent CN 203788026 U—filed April 18, 2014 — explicitly contemplates USB charging the batteries of a jump starter via a DC-DC boosting technique. EX1022; EX1023, Abstract, claim 1, ¶¶ [0003]-[0009], [0013], [0016]-[0017], Fig. 1; EX1003, ¶ 94. While this utility model does not qualify as prior art under 35 U.S.C. § 102, it predates the claimed priority date and thus remains powerful evidence demonstrating that, before the ’243 patent’s claimed priority date, a PHOSITA would have recognized and understood the nature of the same problem to which the challenged claims are directed, along with proposed solutions. *Cross Med. Prod., Inc. v. Medtronic Sofamor Danek, Inc.*, 424 F.3d 1293, 1322-23 (Fed. Cir. 2005).

Therefore, Richardson and Zhao render this limitation obvious. EX1003, ¶ 95.

h. Limitation 1(g)

Richardson teaches various features related to charging the jump starter batteries, such as circuitry for detecting a charger voltage and monitoring battery voltage to determine when the charging process is complete. EX1005, ¶ [0029]; EX1005, ¶ [0020] (discussing charging of the batteries), ¶ [0028] (similar); EX1003, ¶ 96. While Richardson does not teach the jump starter's charging circuitry utilizes USB technology, Zhao teaches USB input circuits configured for converting power from a USB power source (such as one providing a 5V input) to increase power voltage to the power supply were well-known for portable battery-powered devices that require charging a multicell battery pack with a voltage rating above the voltage received from the power source. EX1006, Abstract, 1:22-23, 1:25-27, 3:6-11; EX1003, ¶ 96.

Zhao explains a “step-up topology” (*i.e.* a power conversion technique using a DC-DC conversion to boost an input voltage to a higher output voltage) can be used to charge a multicell battery pack using a lower input voltage, such as a 5V USB power source. EX1006, 1:22-23, 1:25-27; Abstract, 1:34-45, 1:46-55, 2:51-62, 2:63-3:11; EX1003, ¶ 97. Zhao teaches a “step-up battery charger or charging management system 100” which constitutes a USB input circuit as claimed. EX1006, 2:63-66, FIG. 1, 3:1-39. This system “can include a step-up converter and

charging control circuit 201.” EX1006, 2:66-67. The step-up converter is a well-known DC-DC converter configured as a boost converter, which boosts (i.e., increases) an input voltage to a higher-voltage output that “can charge a plurality of series connected (e.g., lithium) batteries[.]” EX1006, 3:1-11. In other words, Zhao’s system employs a power conversion technique that allows use of a 5V USB power source to charge multiple series-connected cells (such as lithium-ion cells). EX1003, ¶¶ 98-99.

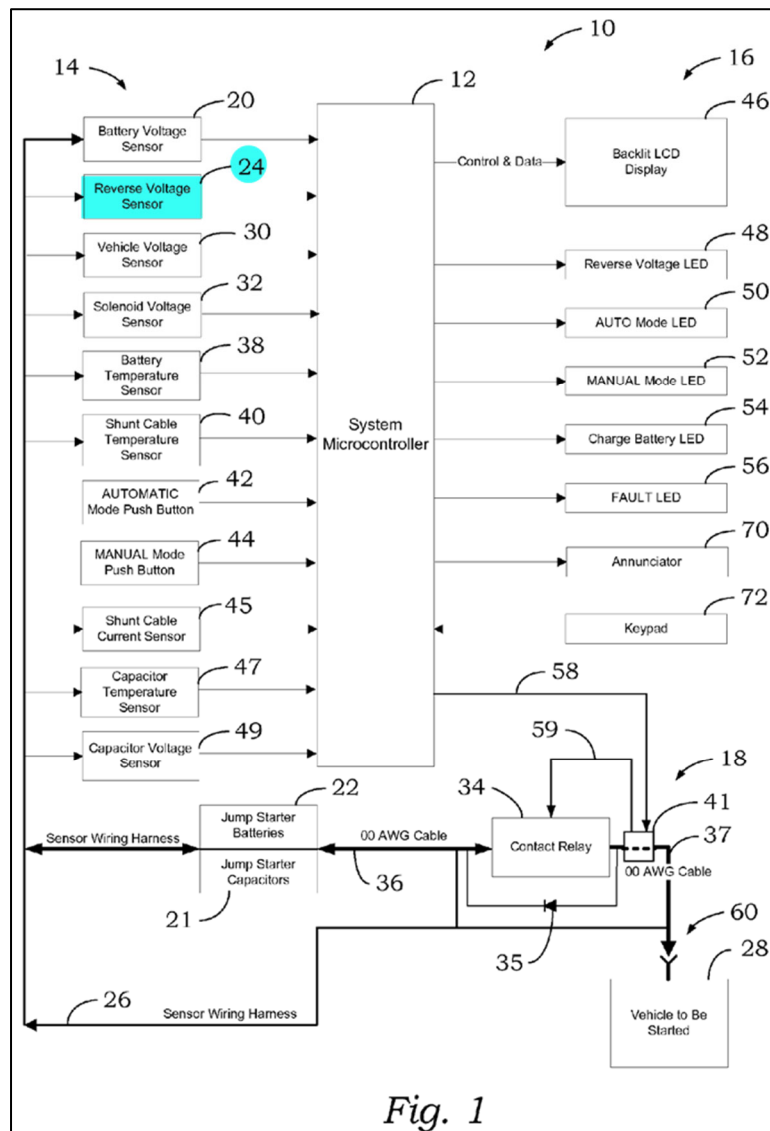
Zhao further discloses “power stage circuit 101 of the step-up converter can be a synchronous rectifier Boost topology including inductor L, main switch S₁, synchronous switch S₂, and output capacitor C_{BD}.” EX1006, 3:12-15. Control circuit 102 can control main switch S₁ via control signal G₁ and synchronous switch S₂ via control signal G₂. EX1006, 3:17-21. An output of power stage circuit 101 can connect to charging control circuit 201 and can then be regulated or controlled for purposes of charging the battery or battery-powered device. EX1006, 3:3-6, 3:25-26. In certain situations, “the battery device can be directly charged by the output signal from the step-up converter.” EX1006, 8:21-24. Accordingly, a PHOSITA would understand how to connect the boosted output voltage of Zhao’s step-up charging system to a battery pack for purposes of charging the battery. EX1003, ¶ 99.

For at least the reasons discussed above in connection with Limitation 1(f), a PHOSITA would have been motivated to modify the design of Richardson's jump starter to either (1) replace the existing charging circuitry with Zhao's step-up charging system and connect the output to Richardson's jump starter batteries, or (2) add Zhao's step-up charging system and connect the output to Richardson's jump starter batteries as an additional and alternatively pathway for charging the jump starter batteries. EX1003, ¶ 100. And as noted above in connection with Limitation 1(f), Zhao provides an explicit teaching, suggestion, or motivation to implement Zhao's USB input circuit (and connector) with a system like Richardson's jump starter. *Id.*; EX1006, 3:6-11. In addition to explicit teachings of Zhao, the desirability of utilizing USB technology to charge higher-voltage battery-powered devices was well-known before the claimed priority date, as discussed above in connection with Limitation 1(f) and incorporated herein by reference. EX1003, ¶ 100.

In sum, before the claimed priority date, USB charging for higher voltage batteries was a predictable technique to achieve the desirable feature of USB charging of higher voltage batteries of devices like Richardson's jump starter. EX1003, ¶¶ 92-93. Therefore, Richardson and Zhao render this limitation obvious. EX1003, ¶ 101.

3. Claim 2

Richardson's device includes a control system that utilizes "reverse voltage sensor 24" to detect whether the battery connectors are connected to a vehicle battery with correct polarity. EX1005, ¶¶ [0016], [0020], FIG. 1 (annotated); EX1003, ¶ 102.



Richardson further explains “once jumper cables 60 have been manually connected to the vehicle to be started 28, the voltage is measured by the reverse voltage sensor 24 to determine if the cables have been properly connected to the vehicle 214.” EX1005, ¶ [0027]. Specifically, “[i]f the voltage measured is significantly less than the voltage of the jump starter capacitors 21 and batteries 22, then a reverse polarity connection of the jumper cables to the vehicle is determined and an error flag is set and the event saved in non-volatile memory 216.” *Id.* Accordingly, “[a]ny further jump starter action by the operator is ignored until the reverse polarity condition is corrected 220, at which point processing returns to the start of the main processing loop 210.” *Id.* Richardson further discloses an exemplary implementation of a reverse voltage sensor in Figure 2B. EX1005, FIG. 2B; EX1003, ¶ 103. Accordingly, Richardson teaches that contact relay 34 is closed only during a time that the device is connected with correct polarity to the vehicle battery. *Id.*

The Board made similar factual findings regarding Richardson in the ’015-FWD, which was affirmed on appeal. EX1014 at 51-67; EX1015 at 2; EX1003, ¶ 104.

B. Ground 2: Claims 15, 17, 18, 51, 54, and 57 are unpatentable under 35 U.S.C. § 103(a) over Richardson in view of Zhao and Dao

1. Combination Overview

Reasons for combining Richardson with Zhao are discussed above. *See* Section X.A. Additionally, a PHOSITA would have found it obvious to combine the disclosures of Richardson and Dao to implement the following features taught by Dao in Richardson's device: (1) a USB output connector, circuit, and control circuitry, (2) using lithium chemistry cells in the battery pack, and (3) implementing overcharge and overdischarge protections for the lithium battery pack. EX1003, ¶ 105.

Both references describe portable power supplies which can jump start vehicle batteries and include various safety features. EX1005, Abstract; EX1031, ¶¶ [0001]-[0002], [0023]. Richardson discloses measuring and monitoring the voltage of the jump starter batteries to prevent overdischarge and overcharge. EX1005, ¶¶ [0028]-[0029]; EX1003, ¶ 106. Dao similarly discloses a portable power supply that measures the voltage of the device's internal battery pack to prevent the pack's voltage from exceeding an upper threshold (*i.e.*, overcharge) or falling below a lower threshold (*i.e.*, overdischarge). EX1031, Abstract, ¶¶ [0020], [0024], [0031]; EX1003, ¶ 106.

A PHOSITA therefore would have understood Richardson and Dao could be combined with predictable results because Dao is similarly directed to a jump starter with safety protections. EX1003, ¶ 107. Dao teaches the desirable features of (1) utilizing lithium-ion battery cells for the battery pack with safety protections; and (2) a USB output port to allow the device to charge portable devices such as smartphones. *Id.*; EX1031, Abstract, ¶¶ [0002], [0019], [0032].

2. Claim 15

While Richardson does not teach a USB output connector as claimed, a PHOSITA would have understood the desirability and advantages of adding a USB output feature to Richardson's device to provide the further convenience of allowing the device to charge portable electronics such as smartphones in addition to the jump start functionality. EX1003, ¶ 108.

Dao discloses USB output functionality for its portable power supply to provide 5V USB power to other devices. EX1031, ¶¶ [0008], [0032], claim 13. Dao discloses a 5V D/C output 114 and 5V USB output ports 243*a* and 234*b*. EX1031, ¶¶ [0023], [0032], Fig. 1, Fig. 2B; EX1003, ¶ 109. This enhances the functionality, versatility, and convenience of Dao's device by allowing it to serve as power bank for USB-chargeable devices in addition to a jump starter for vehicle batteries. EX1003, ¶ 109.

As one example, since jump starters are often needed in emergency situations, the USB output feature ensures that the user is not left stranded with a dead smartphone (since many smartphone charging cables utilized USB connectors prior to the claimed priority date). EX1032, ¶ [0048] (“The USB adaptor 50 provides additional assurance that the operator is able to make an emergency phone call even if the cellular phone has a depleted battery 60”); EX1003, ¶ 110. Thus, Dao is not unique in implementing USB output with a jump starter, as numerous references demonstrate it was a well-known and routine practice implementing a USB output on a jump starter as an accessory feature. EX1033, ¶ [0014]; EX1034, ¶¶ [0008], [0025], [0032]; EX1003, ¶ 110. A PHOSITA would have predictably implemented a USB output feature for a higher-voltage (e.g. >5V) battery through a DC-DC converter configured as a buck converter, which was a well-known practice for decreasing a higher voltage source down to the voltage needed to provide a typically 5V USB output. EX1035 (explaining that persons skilled in the art would recognize how to use converters to obtain various output voltages such as 5 volts from a power supply and provide such power to a USB outlet); EX1003, ¶ 110.

Thus, a PHOSITA would have understood the benefits of including a USB output in Richardson’s device to add the convenient feature of allowing the jump starter to double as a USB power bank and would have implemented this feature

with predictable results. EX1003, ¶¶ 110-111. Regarding convenience, the Board made similar factual findings for adding USB output functionality to Richardson in the '015-FWD, which was affirmed on appeal, albeit based upon brochures for two jump starter products called Epower-20 and Epower-21, as opposed to Dao⁶.

EX1014 at 86-89; EX1015 at 2.

For at least these reasons, a PHOSITA would have been motivated to modify Richardson to add a USB output connector as claimed, as disclosed by Dao.

EX1003, ¶ 111.

3. Claim 17

Dao discloses an electrical connection between the USB output connector and a USB charge circuit which includes inverter 212 and a switch which connects Dao's battery pack 102 to the USB output 114 and/or USB ports 234*a* and 234*b*.

EX1031, ¶¶ [0008], [0023], [0032]-[0033], Fig. 1, Fig. 2A, Fig. 2B. A PHOSITA would have been motivated to modify Richardson with predictable results to include the USB output connector and USB output circuit disclosed by Dao for at least the reasons discussed above in connection with claim 15. EX1003, ¶ 112.

⁶ Petitioner asserts Dao in this Petition, as opposed to the brochures for the Epower products, to avoid issues with authenticating and proving public availability of documents generated by a third party. Additionally, the Epower brochures provide far less description of the inner workings of the USB output circuitry than Dao.

4. Claim 18

Dao discloses circuitry that turns the USB output circuit on and off to prevent unnecessary discharge or over-discharge of the battery pack. EX1031, ¶ [0033]. Dao teaches deactivating the main switching unit 218 to isolate the inverter from the battery unit. EX1031, ¶ [0033], Fig. 2A, Fig. 2B. A PHOSITA would have been motivated to modify Richardson with predictable results to include the USB output connector and USB output circuit disclosed by Dao for at least the reasons discussed above in connection with claims 15 and 17. EX1003, ¶ 113.

A PHOSITA would further understand the advantages of configuring Richardson's microcontroller to control the ON/OFF status of the USB output circuit to prevent over-discharge of the jump starter batteries, particularly since Richardson discloses monitoring the jump starter batteries to ensure the batteries are adequately charged. EX1005, ¶ [0028]; EX1003, ¶ 114. Additionally, Richardson's microcontroller controls the system by software control and by producing various outputs. EX1005, ¶ [0014]. Accordingly, a PHOSITA would have been motivated to predictably implement the USB output circuit disclosed by Dao in Richardson's device such that Richardson's microcontroller and control circuitry would turn the USB output circuit on and off by software control as claimed. EX1003, ¶ 114. For example, a PHOSITA would have been motivated to

configure Richardson's microcontroller to produce an output controlling a switch that would connect or disconnect Richardson's batteries and the USB output circuit. EX1003, ¶ 114. This configuration would prevent the batteries from getting too low in capacity via discharge through the USB output circuit. *Id.*

5. Claim 51

Richardson discloses that its batteries can be 12-volt batteries but does not specify the chemistry of the batteries. EX1005, ¶ [0034]. However, a PHOSITA would have understood the known benefits of using lithium cells in the pack of Richardson's device. EX1003, ¶ 115. Lithium cells provide various advantages such as high instantaneous discharge current and a relatively higher mass and energy density compared to other common battery chemistries, which allows the cells to be more compact and lightweight at any given output (such as 12V, for example). EX1040, 5:15-21; EX1041, ¶ [0002]; EX1003, ¶ 115. The Board made similar factual findings regarding the desirability of lithium batteries and implementing lithium batteries in Richardson's device in the '015-FWD, which was affirmed on appeal, albeit based upon U.S. Patent No. 9,954,391 as opposed to Dao. EX1014 at 73-74; EX1015 at 2.

Dao discloses a jump starter with a battery pack comprised of lithium cells. EX1031, Abstract, ¶¶ [0002], [0007], [0009]-[0010], [0016], [0019]-[0027]. Dao further teaches that multiple lithium-ion cells can be connected in series to

predictably achieve a 12V output for the pack. EX1031, ¶¶ [0021], [0027]; EX1003, ¶ 116. A PHOSITA would therefore have been motivated to implement a rechargeable lithium battery pack as disclosed by Dao as the power supply of Richardson's device. EX1003, ¶ 116. And using lithium cells in Richardson's device would have been predictable based upon the known interchangeability of battery cells of different types of chemistries. *Id.*

6. Claim 54

Richardson does not specify the chemistry of the batteries used in its jump starter device, but it does teach measuring the voltage of the jump starter batteries to avoid overcharge and overdischarge. EX1005, ¶¶ [0028]-[0029]. When implementing a rechargeable lithium battery pack in Richardson's device (*see* claim 51, *supra*), a PHOSITA would have been motivated to implement a voltage measurement circuit as claimed to prevent voltage potential from rising too high during charging and from dropping to low during discharge. EX1003, ¶ 117. Before the claimed priority date it was well-known that overcharge and overdischarge protections were desirable, if not necessary, to avoid battery degradation or failure due to lithium batteries' low tolerance for over-charge and over-discharge. EX1042, ¶ [0005]; EX1041, ¶ [0002]; EX1043, ¶¶ [0017]-[0018]; EX1003, ¶ 117.

Dao discloses measuring the voltage of the battery pack and comparing the voltage to upper and lower threshold levels to prevent over-charge and over-discharge, respectively. EX1031, ¶¶ [0020], [0024], [0031]. A PHOSITA would have been motivated to implement Dao's teachings regarding over-charge and over-discharge protections when implementing a lithium battery pack as the power supply of Richardson's device. EX1003, ¶ 118. Richardson already contemplates measuring the voltage of the system batteries (via battery voltage sensor 20) to determine whether the batteries are undercharged or fully charged. EX1005, ¶¶ [0028]-[0029]. When implementing a lithium battery pack in Richardson's device and implementing overcharge and overdischarge protections as disclosed by Dao, a PHOSITA would have achieved predictable results by programming Richardson's microprocessor to make the necessary comparison between the measured voltage of the battery pack (received from battery voltage sensor 20) against upper and lower thresholds set for purposes of preventing the lithium pack from reaching a voltage level above or below the optimal range. EX1003, ¶ 118.

7. Independent Claim 57

a. Preamble

See Section X.A.2.a; EX1003, ¶ 119.

b. Limitation 57(a)

See Section X.A.2.b; EX1003, ¶ 120.

c. Limitation 57(b)

See Section X.A.2.c; EX1003, ¶ 121.

d. Limitation 57(c)

See Section X.A.2.d; EX1003, ¶ 122.

e. Limitation 57(d)

See Section X.A.2.e; EX1003, ¶ 123.

f. Limitation 57(e)

See Section X.A.2.f; EX1003, ¶ 124.

g. Limitation 57(f)

See Section X.A.2.g; EX1003, ¶ 125.

h. Limitation 57(g)

See Section X.A.2.h; EX1003, ¶ 126.

i. Limitation 57(h)

See Section X.B.2; EX1003, ¶ 127.

j. Limitation 57(i)

See Section X.B.3; EX1003, ¶ 128.

C. Ground 3: Claims 1, 2, 15, 17, 18, and 57 are unpatentable under 35 U.S.C. § 103(a) over Yu in view of Paparrizos

1. Combination Overview

A PHOSITA would have found it obvious to combine the teachings of Yu and Paparrizos. EX1003, ¶ 129. Both references involve devices with higher voltage (>5V) battery packs. *Id.* A PHOSITA would have been motivated to

modify Yu in view of Paparrizos to include a USB charging input and circuit to achieve the predictable result of effectively charging the batteries of Yu's jump starter. *Id.* Specifically:

- Yu teaches a battery-powered device for jump starting 12V vehicle batteries. EX1008, Abstract, ¶ [0004]. Yu discloses an embodiment with a “12V/1A” input for charging a 12V battery. EX1008, FIG. 9; EX1003, ¶ 130.
- Paparrizos discloses a circuit for charging electronic devices having a multicell pack of series-connected cells. EX1009, 2:32-40. Paparrizos discloses its circuit can use 5V USB to charge higher voltage batteries. EX1009, 8:17-31; EX1003, ¶ 131.

A PHOSITA therefore would have been motivated to combine Yu and Paparrizos with predictable results because Paparrizos is directed to the known technique of charging a 12V battery from a 5V USB source using a DC-DC boost converter in accordance with its established function of converting a lower voltage input to a higher voltage output. EX1003, ¶ 132. Additionally, Paparrizos teaches the desirability of charging higher voltage batteries with a 5V input, which is a known technique a PHOSITA would have been motivated to implement predictably to charge Yu's battery. EX1003, ¶¶ 132-133.

2. Independent Claim 1

a. Preamble

Yu discloses a jump starting device. EX1008, Abstract, claim 1, ¶¶ [0001], [0003]-[0004], [0009], [0021], [0026]. For example, Yu's device has an output terminal for conveying power to jump start a vehicle battery. EX1008, ¶ [0004], FIG. 1 ("output terminal" identified as reference numeral 3). Yu describes its device includes a microprocessor-controlled relay, which can connect the device's internal batteries to an external battery of an automobile to jump start the battery. EX1008, Abstract. Thus, Yu's device can boost or charge a battery by connecting the internal batteries of the jump starter to the positive and negative terminals of a vehicle battery via output terminal 3 and associated wiring. EX1008, ¶¶ [0004], [0026]; FIG. 8 (indicating output terminal with reference numeral 3); EX1003, ¶ 134.

b. Limitation 1(a)

Yu discloses a device with "an internal battery" constituting a power supply. EX1008, Abstract; FIG. 1, claim 1, ¶¶ [0004], [0009], [0021]. The internal battery "will output current to the vehicle to be started through the output terminal 3," indicating the internal battery is a multicell battery pack of series-connected cells with an output voltage of approximately 12V. EX1008, ¶ [0026]; EX1003, ¶ 135.

c. Limitation 1(b)

Yu discloses “wiring” (also referred to as “external battery wiring” or “output terminal 3 wiring”) which includes a positive battery connector as claimed. EX1008, Abstract, claim 1, ¶¶ [0004], [0021], [0026]. Figure 8 depicts output terminal 3 as a receptacle that a PHOSITA would recognize as an EC5 connector, capable of mating with a plug integrated with wiring with cable clamps or other connectors for connecting to the positive terminal of the vehicle battery. EX1003, ¶ 136. The ’243 patent admits such cables (and associated terminals, clamps or other connectors) were known in the prior art. EX1001, 1:11-17; *id.* at 1:18-25, 1:32-36. Thus, a PHOSITA would understand Yu’s wiring for connecting its device to a vehicle battery discloses or renders obvious a positive polarity battery terminal connector as claimed, particularly given Yu’s disclosure of correct versus reverse (or wrong) polarity connections indicating there is a positive battery connector (and separately a negative battery connector). EX1008, Abstract, ¶¶ [0002]-[0003], [0008], [0026]; FIG. 2; EX1003, ¶ 136.

d. Limitation 1(c)

See Section X.C.2.c, *supra*. Yu’s disclosure of wiring, the output terminal 3, and related discussions of polarity further demonstrate Yu discloses or renders obvious a negative battery connector as claimed. EX1008, Abstract, ¶¶ [0002]-[0004], [0008], [0021], [0026]; EX1003, ¶ 137.

e. Limitation 1(d)

Yu discloses a “relay” which functions as a power switch or switch circuit as claimed. EX1008, Abstract, claim 1, ¶¶ [0004], [0009], [0021], FIG 1, FIG. 2; EX1003, ¶ 138. For example, Yu discloses a control module with a microprocessor which “controls the opening and closing of the relay through the relay switch circuit to control current output from the internal battery to the output terminal.” EX1008, Abstract. Yu discloses the jump start process includes closing “relay 2” which then causes the internal battery to output current to the vehicle battery through the output terminal 3. EX1008, ¶ [0026]; EX1003, ¶ 138.

f. Limitation 1(e)

Yu discloses its relay is configured to switch power on as claimed. EX1003, ¶ 139. The relay is configured to be controlled by a system comprised of the control module, microprocessor, and associated sensors and circuitry. EX1008, Abstract, claim 1, claim 3, ¶¶ [0004], [0006], [0021], [0023], [0026]-[0027], FIG. 1, FIG. 2.

For example, Yu discloses “the microprocessor controls the opening and closing of the relay through the relay switch circuit to control current output[.]” EX1008, Abstract, ¶ [0004]. Yu discloses that an initial step of the jump start process is connecting the device to an external battery. EX1008, ¶¶ [0009], [0026]. If appropriate conditions have been satisfied after processing inputs from circuitry

such as the external battery reverse connection detection circuit 44 and external battery voltage detection circuit 45, Yu's device can close its relay to output current to the vehicle battery. EX1008, ¶¶ [0009], [0026]. After the jump start is complete, the microprocessor will control the relay to open and the wiring can be disconnected from the vehicle battery. *Id.* Accordingly, Yu teaches that its relay is configured to switch power on during the time that the device is connected to a vehicle battery via the device's wiring. EX1003, ¶ 140.

g. Limitation 1(f)

Yu discloses a charging input interface, which can be a 12V/1A barrel-style receptacle. EX1008, Abstract, FIG. 9 (reference numeral 10). While Yu is not explicit that the charger's input interface could be a 5V USB input port processed by a boost converter, a PHOSITA would have been motivated to predictably modify Yu's device to implement the USB charging feature of Paparrizos. EX1003, ¶ 141. This modification would be achieved through either (1) replacing the existing charging input, or (2) providing an additional and alternative charging input. *See* Section X.A.2.g, *supra*; EX1003, ¶ 144. For example, Paparrizos identifies a need for using "very popular" USB technology for charging multicell battery packs rated above 5V. EX1009, 1:18-26. Paparrizos goes on to provide an explicit teaching, suggestion, or motivation to implement its USB charging interface (and associated circuit) in a device that has batteries that can output 12V,

like Yu's jump starter. EX1009, 2:32-38, 8:18-31; EX1003, ¶ 141. Thus, a PHOSITA would have been motivated to cater to the demand for, and interest in, the USB technology that consumers are "used to" having present for battery charging from a USB power source. EX1009, 1:18-26; EX1003, ¶ 141.

As another example, outside the explicit teachings of Paparrizos, the desirability of 5V USB charging of devices with batteries above 5V was well-known to a PHOSITA before the claimed priority date. EX1003, ¶ 142. And a PHOSITA would have found the combination of Paparrizos' USB charging feature in Yu's device to involve the predictable application of a standard USB connector and conventional DC-DC boosting technique that Paparrizos explicitly recognizes as prior art. EX1009, 9:36-46; FIG. 8A (identifying a "Basic Boost Converter Circuit" as "prior art"); EX1003, ¶ 142.

For example, when implementing the USB charging feature of Paparrizos in Yu's device, a PHOSITA would have understood the need to add a USB receptacle, such as a micro-USB or other version of USB connector, as taught by Paparrizos. EX1009, 2:56-63, FIG. 1B (identifying USB connector 16b); FIG. 1C (identifying micro-USB connector 16c); EX1003, ¶ 143. As a standard power input connector, a PHOSITA would have been able to implement such a USB connector with Yu's disclosed device with relative ease. EX1003, ¶ 143. As disclosed by Paparrizos, the USB connectors serve as a USB input connector as claimed as the

connectors connect to an external USB power source and subsequently convey power input from the USB power source to battery charging circuit 100 and ultimately the battery 14. EX1009, 2:59-67, 3:1-6, 4:36-39; EX1003, ¶ 143.

h. Limitation 1(g)

Yu teaches its device has a charging input interface, which is depicted in Figure 9 as a 12V/1A barrel-style receptacle. EX1008, Abstract, FIG. 9 (reference numeral 10). Thus, while Yu does not teach a USB input circuit as claimed, such USB input circuits were well-known and a PHOSITA would have been motivated to combine such a USB input circuit from the prior art to Yu's device with predictability in such circuit's ability to charge the internal battery of Yu's device. EX1003, ¶ 145. Paparrizos teaches a USB input circuit as claimed which a PHOSITA would have been motivated to implement in Yu's device to either (1) replace the charging circuitry, or (2) provide additional charging circuitry. *See* Section X.A.2.h; EX1003, ¶ 145. Either option would have provided desirable features or improvements to Yu's jump starter. *Id.*

For example, Paparrizos discloses a battery charging circuit which can operate in a "boost (power stepped up mode)" and a "forward mode" to boost an input voltage from a USB source to a higher output to charge an internal battery of a device. EX1009, 1:34-38, FIG. 1B, FIG. 1C. Paparrizos discloses battery charging circuit 100 and related components which connect to and charge battery

14. EX1009, 2:30-40. The battery can constitute a series-connected configuration of cells of any suitable battery chemistry, such as lithium-ion batteries, at various voltages above 5V, such as 6-8.4V or higher. *Id.*; EX1003, ¶ 146. Paparrizos further contemplates the charging circuit is an USB input circuit whereby power is received from a USB source. EX1009, 2:56-63, FIG. 1B (depicting an electronic device 16B serving as a power source connected to USB connector 16b), FIG. 1C (depicting a USB power source connected to micro-USB connector 16c); EX1003, ¶ 146.

The battery charging circuit of Paparrizos can operate in a “forward mode” where power from a USB source reaches the internal battery of a device via input terminal 102 and subsequently charging terminal 104. EX1009, 3:1-10. The battery charging circuit can include a buck boost circuit 212 which can operate “as a boost converter” while the circuit is operating in forward mode. EX1009, 3:11-21. And “[a]n output of the buck boost circuit 212 may drive a charger 214 (e.g., a linear charger, or any other suitable circuit) that is connected to the charging terminal 104 to provide a charging current for battery 14.” EX1009, 4:36-39; EX1003, ¶ 147.

When “the voltage level at the input terminal 102 is lower than what is needed by the battery 14, then the battery charging circuit 100 may operate in a ‘forward boost’ mode in order to step up the voltage level to a suitable level.” EX1009, 3:31-35. Accordingly, if a 5V USB power source is connected to the

battery charging circuit when the battery to be charged is above 5V, then the circuit can operate “as a forward boost converter to increase the voltage level that is receive at input terminal 102 to produce suitable voltage level at charging terminal 104 or system terminal 106.” EX1009, 3:58-4:4. Thus, a PHOSITA would understand Paparrizos teaches a USB input circuit that can receive a 5V USB input and increase that power voltage up to approximately 12V via a DC-DC power conversion boosting technique to charge a device with a 3S (three Li-ion cells connected in series) battery pack. *Id.* at 2:31-38 (discussing application to 3S stack of series connected cells), 8:10-30 (discussing use of forward boost mode to use 5V USB input to charge 3S battery which outputs 12V), 9:36-46 (discussing operation and components of boost converter); EX1003, ¶ 148.

In addition to the explicit teachings of Paparrizos, the desirability of utilizing USB technology to charge higher-voltage battery-powered devices was well-known before the claimed priority date, as discussed above in connection with Limitation 1(f) and incorporated herein by reference. EX1003, ¶ 149.

In sum, before the claimed priority date, USB charging for higher voltage batteries was a predictable technique to achieve the desirable feature of USB charging of higher voltage batteries of devices like Yu’s jump starter. EX1003, ¶¶ 92-93. Therefore, Yu and Paparrizos render this limitation obvious. EX1003, ¶ 150.

3. Claim 2

Yu discloses that when the vehicle battery is connected with the wrong polarity, the microprocessor prevents the relay from closing. EX1008, Abstract, ¶¶ [0003], [0009], [0026]. This protection involves the external battery reverse connection detection circuit which provides a signal to the microprocessor indicating whether there is a reverse polarity connection. EX1008, claim 1, ¶¶ [0003]-[0004], [0009], [0021], [0026], FIG. 1; EX1003, ¶ 151.

Yu further discloses an exemplary embodiment where the external battery reverse connection detection circuit is depicted as an optocoupler which can provide an output signal to the microprocessor labeled as “resvese” in Figure 2. EX1007, FIG. 2; EX1008, FIG. 2. Yu’s optocoupler is the same type of component that the ’243 patent discloses as part of the polarity detection feature. EX1001, 5:27-30 (“The reverse battery sensor 10 comprises an optically coupled isolator phototransistor (4N27) connected to the terminal of vehicle battery 72[.]”), 5:32-36 (explaining “if the battery 72 is connected to the terminals of the booster device with the correct polarity, the optocoupler LED 11 will not conduct current, and is therefore turned off, providing a ‘1’ or high output signal to the MCU 1.”); EX1003, ¶ 152. Accordingly, Yu teaches its relay is closed only during a time that the device is connected with correct polarity to the vehicle battery. EX1003, ¶ 152.

4. Claim 15

Yu discloses a 5V output terminal 8 which is a USB output connector as claimed. EX1008, claim 5, ¶¶ [0008], [0025], [0028], Fig. 1, Fig. 4, Fig. 7. Figure 7 depicts the 5V output terminal 8 with an elongated rectangular cross-section containing a strip of pins which a PHOSITA would understand to be a standard Type-A USB connector. EX1003, ¶ 153; EX1036, ¶ [0065] (identifying “four USB type A female connectors 26”), Figs. 2-3 (depicting same); EX1037, ¶ [0021] (identifying “USB Type A receptacle 201”), Fig. 2 (depicting same); EX1038, 4:19-22 (identifying “power outlet or port 36” as a “USB interface”), Fig. 3 (depicting same). Yu teaches the 5V output terminal “can be used as a general power supply for other electrical equipment.” EX1008, ¶ [0028].

Additionally, Figure 7 annotates the output terminal with a rating of 5V/2.1A, which a PHOSITA would further understand to indicate the output terminal is a Type-A USB connector since this rating had been associated with a Type-A USB connector. EX1038, 5:8-9 (identifying USB power outlet rating as “5V @ 2.1 A”); EX1039, ¶ [0037] (disclosing “5V 1A/2.1 A max out” for “USB outlets 40”); EX1003, ¶ 154.

5. Claim 17

Yu discloses an electrical connection between the 5V output terminal and a USB charge circuit which connects Yu’s internal battery to the 5V output terminal.

Yu discloses a “5V voltage output circuit” which is a USB charge circuit as claimed. EX1008, claim 5. The 5V output circuit is connected to the 5V output terminal and allows Yu’s device to serve as a power supply for other electrical equipment. EX1008, ¶¶ [0008], [0025], [0028], Fig. 4; EX1003, ¶ 155.

6. Claim 18

Yu discloses microprocessor 42 which, together with control circuitry, allows the 5V output circuit to be turned on and off by software control as claimed. EX1008, Fig. 1, Fig. 4. As shown in Figure 4, Yu discloses an “ON/OFF” control signal that reaches an integrated circuit (IC9) connected to the +5V output of the USB output connector via an inductor (L2). EX1008, Fig. 4. A PHOSITA would thus understand that in Yu’s device, the control scheme allows signal control by the microprocessor and control circuit to turn the USB output circuit on and off for the purpose of preserving power (*e.g.*, preventing the battery from getting too low in capacity) when the 5V output feature is not needed for charging an external device. EX1003, ¶ 156.

7. Independent Claim 57

a. Preamble

See Section X.C.2.a; EX1003, ¶ 157.

b. Limitation 57(a)

See Section X.C.2.b; EX1003, ¶ 158.

c. Limitation 57(b)

See Section X.C.2.c; EX1003, ¶ 159.

d. Limitation 57(c)

See Section X.C.2.d; EX1003, ¶ 160.

e. Limitation 57(d)

See Section X.C.2.e; EX1003, ¶ 161.

f. Limitation 57(e)

See Section X.C.2.f; EX1003, ¶ 162.

g. Limitation 57(f)

See Section X.C.2.g; EX1003, ¶ 163.

h. Limitation 57(g)

See Section X.C.2.h; EX1003, ¶ 164.

i. Limitation 57(h)

See Section X.C.4; EX1003, ¶ 165.

j. Limitation 57(i)

See Section X.C.5; EX1003, ¶ 166.

D. Ground 4: Claims 15, 17, 18, 51, 54, and 57 are unpatentable under 35 U.S.C. § 103(a) over Yu in view of Paparrizos and Dao

1. Combination Overview

Reasons for combining Yu with Paparrizos are discussed above. *See* Section X.C.

Additionally, a PHOSITA would have found it obvious to combine the disclosures of Yu and Dao. EX1003, ¶ 167. Both references describe portable power supplies which can jump start vehicle batteries and include various safety features. *Id.*; EX1008, Abstract; EX1031, ¶¶ [0001]-[0002], [0023].

Yu discloses a jump starter designed to jump start a vehicle. EX1008, Abstract. Yu's jump starter uses circuitry (including a microprocessor) to control the system and implement various safety features. EX1008, Abstract, Fig. 1, Fig. 2, ¶¶ [0004], [0006], [0009], [0026]; EX1003, ¶ 167.

Dao similarly discloses a portable power supply with safety features such as an overcharge and overdischarge protections for the device's battery pack. EX1031, Abstract, ¶¶ [0020], [0024], [0031]; EX1003, ¶ 167.

A PHOSITA therefore would have understood that Yu and Dao could be combined with predictable results because Dao is similarly directed to a jump starter with safety protections. EX1003, ¶ 168. Additionally, Dao teaches the desirable features of (1) utilizing lithium-ion battery cells for the battery pack with overcharge and overdischarge protections; and (2) a USB output accessory to allow the device to charge portable USB-chargeable devices such as smartphones. EX1031, Abstract, ¶¶ [0002], [0019], [0032]; EX1003, ¶ 168.

2. Claim 15

To the extent Patent Owner contends Yu does not teach claim 15, a PHOSITA would have been motivated to predictably implement a USB output connector as claimed by modifying Yu in view of Dao. EX1003, ¶ 169. For example, the desirability and predictability of implementing a USB output accessory feature for a jump starter is detailed above. *See* Section X.B.2. Accordingly, a PHOSITA would have been motivated to add the USB output feature taught by Dao to Yu's device. EX1003, ¶ 169.

Dao discloses USB output functionality for its device to provide 5V USB power to other devices. EX1031, ¶¶ [0008], [0032], claim 13. Dao discloses a 5V D/C output 114 and 5V USB output ports 243*a* and 234*b*. EX1031, ¶¶ [0023], [0032], Fig. 1, Fig. 2B. This enhances the functionality, versatility, and convenience of Dao's device by allowing it to serve as power bank for USB-chargeable devices in addition to a jump starter for vehicle batteries. EX1003, ¶ 170.

Thus, a PHOSITA would have understood the benefits of including a USB output in Yu's device to add the convenient feature of allowing the jump starter to double as a USB power bank and would have been able to implement this feature with predictable results. EX1003, ¶ 171.

For at least these reasons, a PHOSITA would have been motivated to modify Yu to add a USB output connector as claimed, as disclosed by Dao. EX1003, ¶¶ 169-171.

3. Claim 17

To the extent Patent Owner contends Yu does not teach claim 17, a PHOSITA would have been motivated to predictably implement a USB output connector and USB output circuit as claimed by combining modifying Yu in view of Dao. EX1003, ¶ 172.

Dao discloses an electrical connection between the USB output connector and a USB charge circuit which includes inverter 212 and a switch which connects Dao's battery pack 102 to the USB output 114 and/or USB ports 234*a* and 234*b*. EX1031, ¶¶ [0008], [0023], [0032]-[0033], Fig. 1, Fig. 2A, Fig. 2B. A PHOSITA would have been motivated to modify Yu with predictable results to include the USB output connector and USB output circuit disclosed by Dao for at least the reasons discussed above in connection with claim 15. EX1003, ¶ 173.

4. Claim 18

To the extent Patent Owner contends Yu does not teach claim 18, a PHOSITA would have been motivated to predictably implement a USB output connector, USB charge circuit, and microcontroller with a control circuit as claimed by modifying Yu in view of Dao. EX1003, ¶ 174.

Dao discloses circuitry that turns the USB output circuit on and off to prevent unnecessary discharge or over-discharge of the battery pack. EX1031, ¶ [0033]. Dao teaches deactivating the main switching unit 218 to isolate the inverter from the battery unit. EX1031, ¶ [0033], Fig. 2A, Fig. 2B. A PHOSITA would have been motivated to modify Yu with predictable results to include the USB output connector and USB output circuit disclosed by Dao for at least the reasons discussed above in connection with claims 15 and 17. EX1003, ¶ 175.

A PHOSITA would further understand the advantages of configuring Richardson's microcontroller to control the ON/OFF status of the USB output circuit to prevent over-discharge of the jump starter batteries, particularly since Yu discloses monitoring the jump starter's internal battery. EX1008, ¶¶ [0005], [0022], [0027]; EX1003, ¶ 176. Additionally, Yu's microcontroller controls the system by software control. EX1008, Fig. 1. Accordingly, a PHOSITA would have been motivated to predictably implement the USB output circuit disclosed by Dao in Yu's device such that Yu's microcontroller and control circuitry would turn the USB output circuit on and off by software control as claimed. EX1003, ¶ 176. For example, a PHOSITA would have been motivated to configure Yu's microcontroller to produce an output controlling a switch that would connect or disconnect Yu's internal battery and the USB output circuit. *Id.* This configuration

would prevent the batteries from getting too low in capacity via discharge through the USB output circuit. *Id.*

5. Claim 51

Yu does not specify the chemistry of its device's internal battery. However, a PHOSITA would have understood the known benefits of using lithium cells in the pack of Yu's device, particularly given the compact size of Yu's device.

EX1008, Figs. 6-9; EX1003, ¶ 177. Lithium cells provide various advantages such as high instantaneous discharge current and a relatively higher mass and energy density compared to other common battery chemistries, which allows the cells to be more compact and lightweight at any given output (such as 12V, for example). EX1040, 5:15-21; EX1041, ¶ [0002]; EX1003, ¶ 177.

Dao discloses a jump starter with a battery pack comprised of lithium cells. EX1031, Abstract, ¶¶ [0002], [0007], [0009]-[0010], [0016], [0019]-[0027]. Dao further teaches that multiple lithium-ion cells can be connected in series to predictably achieve a 12V output for the pack. EX1031, ¶¶ [0021], [0027]. A PHOSITA would therefore have been motivated to implement a rechargeable lithium battery pack as disclosed by Dao as the power supply in Yu's device. EX1003, ¶ 178. And using lithium cells in Yu's device would have been predictable based upon the known interchangeability of battery cells of different

types of chemistries, the known suitability of lithium cells for providing the voltage and current needed for a jump start operation. *Id.*

6. Claim 54

Yu discloses internal battery voltage detection 43 which is signal-connected to the microprocessor. EX1008, claim 2, ¶¶ [0005], [0022], [0027]. While Yu discloses that internal battery voltage detection circuit 43 is used to monitor the battery charge, Yu does not expressly disclose monitoring for purposes of overcharge and overdischarge protections. EX1008, ¶ [0027]. However, a PHOSITA would have been motivated to implement overcharge and overdischarge protections in Yu's device as disclosed by Dao. EX1003, ¶ 179.

When implementing a rechargeable lithium battery pack in Yu's device (*see* Section X.D.5, *supra*), a PHOSITA would have been motivated to implement a voltage measurement circuit as claimed to prevent voltage potential from rising too high during charging and from dropping to low during discharge. EX1003, ¶ 179. Specifically, before the claimed priority date it was well-known that overcharge and overdischarge protections were desirable, if not necessary, to avoid battery degradation or failure due to lithium batteries' low tolerance for over-charge and over-discharge. *Id.*; EX1042, ¶ [0005]; EX1041, ¶ [0002]; EX1043, ¶¶ [0017]-[0018].

Dao discloses measuring the voltage of the battery pack and comparing the voltage to upper and lower threshold levels to prevent over-charge and over-discharge, respectively. EX1031, ¶¶ [0020], [0024], [0031]. A PHOSITA would have been motivated to implement Dao's teachings regarding over-charge and over-discharge protections when implementing a lithium battery pack as the power supply of Yu's device. EX1003, ¶ 180. Yu already contemplates measuring the voltage of the device's internal battery. EX1008, ¶¶ [0005], [0022], [0027]. When implementing a lithium battery pack in Yu's device and implementing overcharge and overdischarge protections as disclosed by Dao, a PHOSITA would have achieved predictable results by programming Yu's microprocessor to make the necessary comparison between the measured voltage of the battery pack (received from internal battery voltage detection circuit 43) against upper and lower thresholds set for purposes of preventing the lithium pack from reaching a voltage level above or below the optimal range. EX1003, ¶ 180.

1. Independent Claim 57

a. Preamble

See Section X.C.2.a; EX1003, ¶ 181.

b. Limitation 57(a)

See Section X.C.2.b; EX1003, ¶ 182.

c. Limitation 57(b)

See Section X.C.2.c; EX1003, ¶ 183.

d. Limitation 57(c)

See Section X.C.2.d; EX1003, ¶ 184.

e. Limitation 57(d)

See Section X.C.2.e; EX1003, ¶ 185.

f. Limitation 57(e)

See Section X.C.2.f; EX1003, ¶ 186.

g. Limitation 57(f)

See Section X.C.2.g; EX1003, ¶ 187.

h. Limitation 57(g)

See Section X.C.2.h; EX1003, ¶ 188.

i. Limitation 57(h)

See Sections X.C.4, X.D.2; EX1003, ¶ 189.

j. Limitation 57(i)

See Sections X.C.5, X.D.3; EX1003, ¶ 190.

XI. CONCLUSION

Petitioner has demonstrated in this Petition that Claims 1, 2, 15, 17, 18, 51, 54, and 57 of the '243 Patent are unpatentable. Petitioner respectfully requests institution of an *inter partes* review of the '243 patent and Claims 1, 2, 15, 17, 18, 51, 54, and 57 be cancelled.

Patent No. 11,584,243
Petition for *Inter Partes* Review

Respectfully submitted,

Dated: March 12, 2024

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CERTIFICATION

The Petition excluding the caption, Table of Contents, Table of Exhibits, Mandatory Notices under 37 C.F.R. § 42.8, and this Certification contains 13,650 words.

Respectfully submitted,

Dated: March 12, 2024

By: /Daisy Manning/
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Lead Counsel for Petitioner

Patent No. 11,584,243
Petition for *Inter Partes* Review

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.105, Petitioner certifies that this Petition for Inter Partes Review and supporting evidence was served by Federal Express®, on March 12, 2024, to the Patent Owner of U.S. Patent No. 11,584,243 at their correspondence address of record according to USPTO records:

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