

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. 11,447,023
Issue Date: September 20, 2022

Title: PORTABLE VEHICLE BATTERY JUMP START APPARATUS WITH
SAFETY PROTECTION AND JUMPER CABLE DEVICE THEREOF

Inter Partes Review No. IPR2024-00577

**DECLARATION OF C. ARTHUR MACCARLEY, Ph.D., P.E. IN
SUPPORT OF PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT NO. 11,447,023**

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I. INTRODUCTION

1. I, C. Arthur MacCarley, offer this declaration in support of the Petition for *Inter Partes* Review of U.S. Patent No. 11,447,023 (“the ’023 patent”). I am over the age of 18, competent to make this declaration, and have personal knowledge of the facts set forth below. If called to testify, I could and would testify honestly, under oath, to the matters set forth herein.

2. I am not an attorney. I have not been asked to offer any legal opinions. I have been informed and understand the law to be applied for determining invalidity, which I explain in places below. I have applied the law told to me in developing my technical opinions in this Declaration.

II. BACKGROUND AND QUALIFICATIONS

A. Education and Work Experience

3. I am a technical expert with over 40 years of experience in the field of electrical engineering and automotive systems, including DC power supplies and battery charging technology. This includes expertise in the areas of electronic circuits, control systems, power electronics, power conversion, safety systems, and battery charging systems.

4. I earned my Bachelor of Science in Engineering (Energy and Kinetics specialization) and a Master of Science (Electrical Engineering) from the University of California, Los Angeles, in 1976 and 1978, respectively. I was employed by Hughes Aircraft Corp between 1976 and 1979. Between 1979 and

1984, I was employed by the University of Denver Research Institute and the American Bosch Division of United Technologies. I then earned a Ph.D. in Electrical Engineering with a specialty in Computer-based Control Systems in 1987 from Purdue University. While at Purdue, I was the recipient of the David Ross Fellowship for doctoral study and focused my research on microprocessor-based control systems and advanced indirect sensing methods for automotive applications. My curriculum vitae contains a detailed description of my work history and education. EX1004.

5. My research and development work since the late 1970s has involved advanced control systems in automotive or transportation applications, including developing microprocessor-based control systems. As an academic, my teaching specialization is control systems and electronics applicable to automotive and similar applications utilizing power supplies. My university teaching and research specialties include digital control systems, microprocessor-embedded systems, automotive and transportation electronics, and advanced sensors, all with applications in the field of power supplies. Accordingly, I have conducted research and managed many projects that are highly relevant to the subject matter of the '023 patent, as further detailed below.

6. I am currently an Emeritus Professor of Electrical and Computer Engineering at the California Polytechnic State University, San Luis Obispo, CA

(Cal Poly), a leading public technical university in the United States. I served on the faculty of the California Polytechnic College of Engineering from 1988 to 2019 and have been tenured since 1994. Since 2019, I have been teaching part time at Cal Poly in addition to consulting in forensic automotive electronics. My academic and research specialties include digital control systems, advanced electronics, and electric and alternative energy vehicle engineering. Among other appointments, I served as the Chair of the Electrical and Computer Engineering Department (2007-2010), as the Director of the Computer Engineering Program (2000-2003), and as the Director of the Transportation Electronics Laboratory (1994-2013).

7. I also teach automotive engineering and electrical engineering as part of an international summer school program at the Munich University of Applied Sciences (Hochschule München, HM), every summer since 2014, and taught during the regular academic year in 2016.

8. I am a Senior Member of the Society of Automotive Engineers (SAE), the Institute of Electrical and Electronic Engineers (IEEE), and Sigma Xi (Scientific Research Honor Society). I have been a Registered Professional Engineer in good standing in the State of Colorado continuously since 1981.

9. I have published 89 technical papers and articles in refereed journals and conference proceedings and as book chapters, in the field of automotive and

transportation electronics and control systems. Among my research activities have been funded research projects on electric vehicle battery systems and automated battery exchange, indirect sensing methods for engine control for the National Science Foundation, the US Department of Energy, the California Energy Commission, US Department of Commerce, and Isuzu Motor Company. I have served as an expert witness in 21 litigated cases since 1999.

10. Based upon on my education, my professional experience from 1978 through the present, and my scholarly publications, I am an expert in the relevant field of the '023 patent at issue here, and I have been an expert in this field since before the '023 patent was filed with the United States Patent and Trademark Office ("USPTO"). I am intimately familiar with how a person of ordinary skill in the art (herein "PHOSITA") would have understood and used the terminology found in the '023 patent at the time of its claimed priority date.

B. Engagement

11. I have been retained as an independent expert consultant by ADC Solutions Auto LLC ("Petitioner") in connection with a petition for *inter partes* review of the '023 patent. EX1001.

12. Specifically, I was asked to investigate and opine on the technology claimed in, and the patentability or unpatentability of certain claims of the '023 Patent. Specifically, I was asked to opine on the validity of claims 1, 32, 38, 39, 47,

52, and 54 (the “Challenged Claims”) of the ’023 Patent.

13. Although I am being compensated for my services in this matter at my standard consulting rate of \$300 per hour, my compensation is not contingent upon the opinions I render or the outcome of this proceeding. I have no financial interest in any of the parties, and I have no other interest in this proceeding.

14. This report is based on information currently available to me. I reserve the right to amend or supplement my analysis in this report and/or to respond to any additional submissions prepared by or on behalf of the Patent Owner. I also reserve the right to amend or supplement my opinions based on further discovery and information provided in the case.

15. I reserve the right to create any additional summaries, tutorials, demonstrations, charts, drawings, tables, and/or animations that may be appropriate to supplement and demonstrate my opinions as necessary.

16. All the opinions stated in this report are based on my own personal knowledge and professional judgment.

III. MATERIALS CONSIDERED

17. I have considered the following list of materials in formulating my opinions in this matter:

Ex #	Exhibit
1001	U.S. Patent No. 11,447,023 (“the ’023 patent”)

Ex #	Exhibit
1002	Prosecution History of the '023 patent
1005	U.S. Patent Publication No. 2013/0154543 A1 to Richardson et al. (“Richardson”)
1006	U.S. Patent No. 9,391,467 B2 to Zhao et al. (“Zhao”)
1007	Chinese Utility Model Patent No. CN 203211234 U to Yu (“Yu”)
1008	Certified English Translation of Yu
1009	U.S. Patent No. 9,219,372 B2 to Paparrizos et al. (“Paparrizos”)
1012	XR3403 Datasheet by XySemi Inc., Rev. 0.5
1013	U.S. Patent No. 9,007,015 to Nook et al. (“the '015 Patent”)
1014	Final Written Decision in IPR2020-00944 (Paper 73) as to the '015 Patent, dated November 3, 2021
1016	U.S. Patent Publication No. 2013/0285596 A1 to Zhou et al. (“Zhou”)
1017	U.S. Patent No. 9,035,599 B2 to Amemiya et al. (“Amemiya”)
1018	Chinese Utility Model Patent No. CN 202512152 U
1019	Certified English Translation of CN 202512152 U
1020	Chinese Utility Model Patent Publication No. CN 201226449Y
1021	Certified English Translation of CN 201226449Y
1022	Chinese Utility Model Patent No. CN 203788026 U
1023	Certified English Translation of CN 203788026 U
1024	Declaration of Jeffrey L. Ravencraft of USB Implementers Forum, Inc., dated October 28, 2023 (“Ravencraft Decl.”)
1025	Battery Charging Specification, Revision 1.0, Mar. 8, 2007 from the Universal Serial Bus Implementers Forum (“USB-IF”), Ex. D to Ravencraft Decl.
1026	Transcript of Deposition of Bryan A. Legates, dated September 25, 2023 (“Legates Dep. Tr.”)
1027	Respondents’ Subpoena Ad Testificandum to Bryan Legates, Ex. 2 to Legates Dep. Tr.
1029	Brents, Barry, “Automotive Electronics Drive The Need For Circuit Protection,” Electronic Design (May 7, 2014), accessed via

Ex #	Exhibit
	https://www.electronicdesign.com/technologies/power/article/21799679/automotive-electronics-drive-the-need-for-circuit-protection
1030	Healey, James R., “Newest VW lacks USB, only iPhones welcome,” USA Today (July 8, 2014), accessed via https://www.usatoday.com/story/money/cars/2014/07/08/vw-gti-2015-usb-iphone/12378577/

IV. OVERVIEW OF THE PATENT AT ISSUE

18. I have read and considered the '023 patent, filed June 24, 2019 (EX1001), as well as its prosecution history (EX1002). I have been told that the '023 patent has a priority date of July 3, 2014.

19. The '023 patent discloses a battery-powered emergency power source that can boost, charge, or “jump start” a depleted or discharged automotive battery. EX1001, Abstract, 1:8-10. Given its capability for jump starting a car battery, I may refer to this type of device as a “jump starter” at various points throughout my declaration.

20. The '023 patent discloses a jump starter with an internal power supply which can be a rechargeable lithium ion battery pack of series-connected cells with a nominal voltage of 11.1V. EX1001, Abstract, Fig. 1, 3:21-23, 3:42-44.

21. The '023 patent discloses jumper cables with cable clamps for connecting the jump starter to the terminal of a vehicle battery. EX1001, Fig. 4, 3:45-52, 7:56-60.

22. The jump starter disclosed in the '023 patent also includes a

microcontroller. EX1001, Abstract, Fig. 1. The '023 patent contemplates the use of a commercial off-the-shelf HT67F30 from Holtek Semiconductor Inc. for the microcontroller. EX1001, 4:17-26.

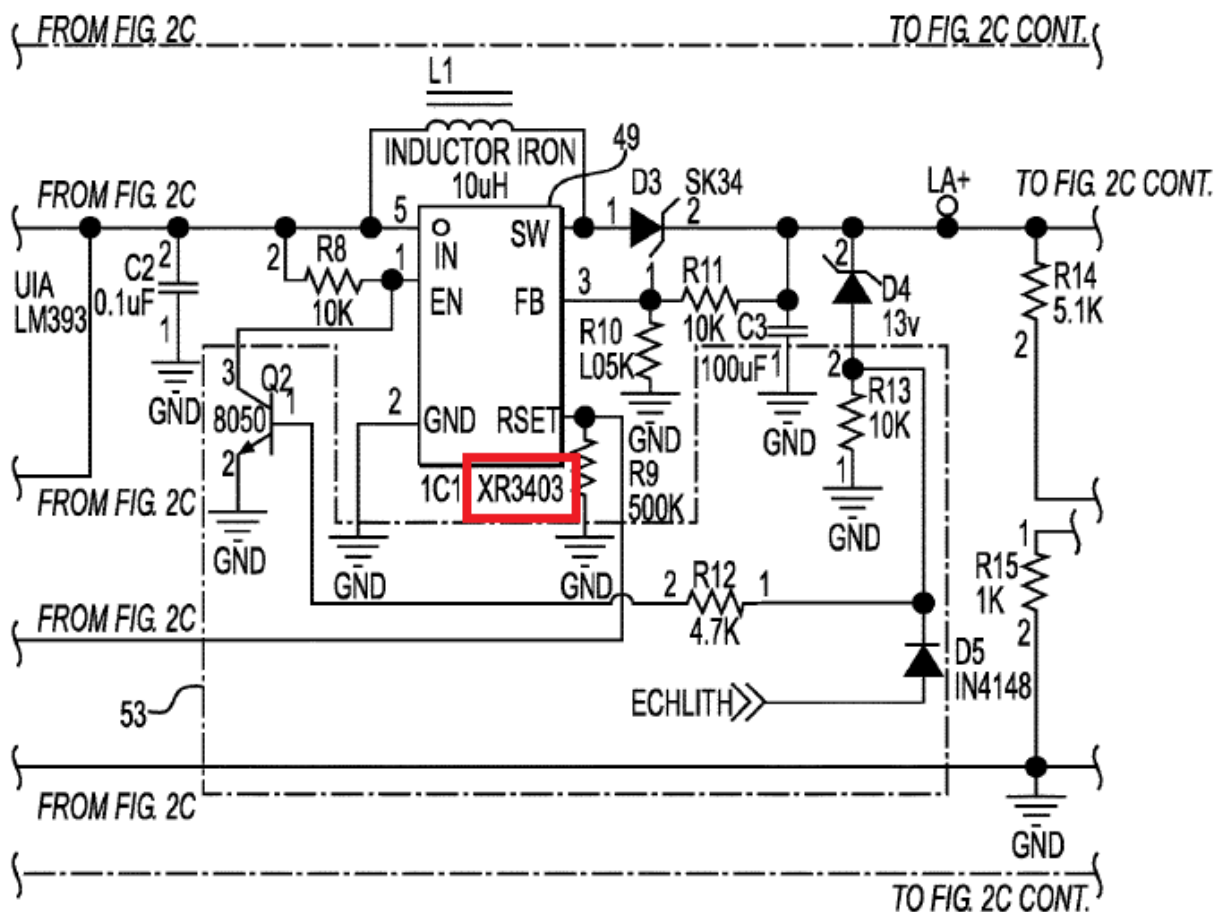
23. The jump starter disclosed in the '023 patent also includes a FET smart switch controlled by the microcontroller. EX1001, Abstract, Fig. 1, 5:64-6:12.

24. The jump starter disclosed in the '023 patent includes two safety features of reverse polarity detection and battery presence detection, which were commonly present in jump starters and battery chargers well before July 3, 2014. EX1001, Abstract, 1:8-3:10. These safety features are implemented in connection with Car Battery Reverse Sensor 10 and Car Battery Isolation Sensor 12. EX1001, Fig. 1, Fig. 2A. These sensors interact with the microcontroller as part of a system that controls the power switch to provide power output for a jump start. EX1001, 3:24-41, 4:27-46, 5:24-63.

25. The jump starter of the '023 patent also includes USB charge circuit 52. EX1001, Fig. 1, Fig. 2C. "USB charge circuit 52 converts power from any USB charger power source, charge voltage and current for charging the lithium battery pack 32." EX1001, 5:15-17. This charge circuit can utilize "a standard USB charger", "a standard micro-USB connector", and "standard cables" for charging the batter pack of the jump starter. EX1001, 7:21-25. A DC-DC converter is used

to boost or up-convert the 5V USB input “to the 12.4 VDC required for charging the internal lithium battery pack.” EX1001, 7:25-28. “DC-DC converter 49 can be turned on and off via circuit 53 by an output from the microcontroller 1.” EX1001, 7:28-29.

26. The component labeled “XR3403” can be the DC-DC converter used in the USB charge circuit. EX1001, Figure 2C (as annotated in the red box shown below).



27. I understand that NOCO submitted a datasheet for the XR3403 chip to the Patent Office during patent prosecution. EX1012. Based on this datasheet and

engineering experience, the XR3403 chip is a commonly available integrated DC-DC converter IC, often used to boost a 5V USB input to various outputs such as 9V, 12V, and 24V. EX1012 at 6. Based on my review of this datasheet, it appears that the named inventors disclosed schematic circuits which implement the XR3403 in the “Typical Application Circuit” shown in the datasheet as Figure 1. EX1012 at 1. The datasheet does not explicitly refer to the 5V input of the DC-DC converter circuit as a USB power input.

A. Prosecution History of the '023 Patent

28. My understanding of pertinent or salient aspects of patent prosecution relating to the '023 patent and the invalidity of the challenged claims is detailed below. At the outset, I understand that the '023 patent is part of a family of applications claiming priority back to U.S. Patent Application No. 14/325,938, which was filed on July 3, 2014, and issued as U.S. Patent No. 9,007,015 (the “'015 patent”).

29. I understand that all claims of the '015 patent were challenged in *inter partes* review assigned the case number IPR2020-00944, which resulted in a Final Written Decision (which I will refer to as the “'015-FWD” for the sake of consistency with the petition) finding all claims except claim 11 unpatentable. EX1014. I also understand that the United States Court of Appeals for the Federal Circuit, affirmed the '015-FWD.

30. During prosecution of the '023 patent, it is my understanding that NOCO began that process with a set of claims that are very similar to those of the '015 patent. EX1002 at 40-43; EX1013 at 8:4-10:22. After that, the claims were amended twice before the Examiner issued a first non-final rejection on August 12, 2020. EX1002 at 88-95, 113-124, 151-182. Before this rejection, none of the independent claims (which were numbered 1, 29, 30, and 38 at the time) included limitations directed to charging a jump starter via USB charging (although at the time claim 11 recited this feature). EX1002 at 113-114, 119-120, 120-121, 123-124. I understand that there were several rejections of the claims including those where the Examiner found all pending independent claims and certain dependent claims to be unpatentable because of Richardson. EX1002 at 155-167.

31. As next steps, NOCO amended each pending independent claim to include two limitations which recited the term “USB” and described subject matter relating to USB charging. EX1002 at 256-270. NOCO also argued the following regarding the Richardson reference:

Richardson does not teach a jump starting apparatus, including a USB charge circuit and USB connector let alone the claimed subject matter, including “a USB charge circuit connected to the power supply, the USB charge circuit configured for converting power from a USB charger to charge voltage and current for charging the power supply; and a USB connector configure for connecting to the USB charger and providing charge input from the USB charger through the USB connector to the USB charge circuit[.]”

EX1002 at 272-273 (emphasis in original). Besides the discussion quoted above regarding the USB limitations, NOCO did argue against the Examiner's findings that Richardson disclosed the remaining limitations of the claims. EX1002 at 272-273.

32. The Examiner issued more rejections on February 10, 2021. EX1002 at 286-316. NOCO then made further amendments to its claims and provided additional argument on May 10, 2021. EX1002 at 359-387. Among other arguments, NOCO argued again that “**Richardson** fails to disclose a USB input for charging the internal power source of the jump starting device[.]” EX1002 at 376.

33. It is my understanding that prosecution continued, and the Examiner issued more rejections on June 25, 2021. EX1002 at 436-463. This time, the Examiner rejected all pending independent claims based on Richardson in view of Tinaphong. EX1002 at 436-463. The Examiner noted that “Tinaphong discloses at least a USB input charge circuit.” EX1002 at 441.

34. Next, NOCO amended its claims on October 25, 2021 to add the following language: “the USB input charge circuit comprising a DC/DC converter, the USB input charge configured for converting power from a USB charger to increase charge voltage” EX1002 at 477-507. I note here again that NOCO did not argue against the Examiner's findings that Richardson disclosed all the limitations of the claims other than the USB limitations. EX1002 at 477-507.

35. Instead, NOCO's main arguments was that Tinaphong teaches away from modifying Richardson to include the USB charging feature because Tinaphong's power conversion technique would step down a 5V input to 3.7V rather than step up or boost voltage in accordance with the claims. EX1002 at 499-500. Specifically, NOCO argued that "[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 so that the apparatus could be modified to become or be used as a jump starter as asserted in this rejection." EX1002 at 500.

36. Next, the Examiner withdrew the rejections based on NOCO's arguments that argued a distinction between bucking and boosting a USB input voltage. EX1002 at 517-522. After that, NOCO submitted several more Information Disclosure Statements to identify references on February 24, June 10, and August 17, 2022, which listed hundreds of documents. EX1002 at 609-611, 924-936, 1073-1083, 1403-1413, 2200-2212.

37. In one of Notice of Allowability documents, the Examiner identified an additional prior art reference, U.S. Publication No. 2012/0187897 to Lenk, that the Examiner described as teaching a device where there would be a voltage of a USB power source "at a voltage higher than the battery voltage, thus not requiring

any voltage boost.” EX1002 at 642. This portion the Notice of Allowability is a discussion of the prior art technique of bucking (i.e., down-converting or reducing) a USB input voltage, but the Examiner did not discuss the technique of boosting. The Examiner did not appear to conduct further searches for prior art disclosing the technique of boosting a USB input voltage to charge a higher voltage battery. In fact, after reviewing the ’023 patent and its prosecution history, it is apparent that the Examiner did not nor did NOCO submit for consideration the Zhao and Paparrizos references relied upon in my invalidity opinions. Both Zhao and Paparrizos independent disclose a DC-DC boosting technique employed for purposes of using a USB input voltage received from a USB power source to charge a higher voltage battery. EX1006 at Abstract, 1:22-23, 1:25-27, 3:6-11; EX1009 at 3:58-4:4.

B. Listing of Challenged Claims

38. The issued claims of the ’023 patent challenged in the Petition are listed in the table below. To maintain consistency with the Petition, I have adopted the same shorthand numbering for the claims, and individual claim limitations, of the ’023 patent. For example, as indicated in the table below, I may use “Limitation 1(a)” as a shorthand reference to the limitation “a power supply” in Claim 1.

U.S. Patent No. 11,447,023 (Claims 1, 32, 38, 39, 47, 52, and 54)

Claim Designation	Claim Language
Claim 1 Preamble	A jump starting apparatus configured for boosting or charging a depleted or discharged battery having a positive polarity battery terminal and a negative polarity battery terminal, the jump starting apparatus comprising:
Limitation 1(a)	a power supply;
Limitation 1(b)	a positive polarity battery terminal connector configured for connecting the jump starting apparatus to the positive polarity battery terminal of the depleted or discharged battery;
Limitation 1(c)	a negative polarity battery terminal connector configured for connecting the jump starting apparatus to the negative polarity battery terminal of the depleted or discharged battery;
Limitation 1(d)	a power switch or circuit configured to turn on power from the power supply to the positive and negative polarity battery terminal connectors;
Limitation 1(e)	a control system or circuit connected to and controlling the power switch, the control system or circuit configured to detect whether the positive and negative polarity battery terminal connectors have a correct polarity connection with the positive and negative polarity battery terminals of the depleted or discharged battery prior to turning on the power switch or circuit;
Limitation 1(f)	a USB input circuit connected to the power supply, the USB input circuit configured for converting power from a USB power source to increase power voltage to the power supply; and
Limitation 1(g)	a USB input connector connected to the USB input circuit, the USB input connector configured for connecting to the USB power source and providing power input from the USB power source through the USB input connector and the USB input circuit to the power supply.
Claim 32	The apparatus according to claim 1, wherein the DC-DC converter can be turned on and off by a microprocessor.
Claim 38 Preamble	A jump starting apparatus for boosting or charging a depleted or discharged battery having a positive polarity battery terminal and a negative polarity battery terminal, the jump starting apparatus comprising:
Limitation 38(a)	a power supply;
Limitation 38(b)	a positive polarity battery terminal connector configured for

U.S. Patent No. 11,447,023 (Claims 1, 32, 38, 39, 47, 52, and 54)	
Claim Designation	Claim Language
	connecting the jump starting apparatus to the positive polarity terminal of the depleted or discharged battery;
Limitation 38(c)	a negative polarity battery terminal connector configured for connecting the jump starting apparatus to the negative polarity terminal of the depleted or discharged battery;
Limitation 38(d)	a battery presence sensor or circuit connected in circuit with the positive polarity battery terminal connector and the negative polarity battery terminal connector;
Limitation 38(e)	a reverse polarity sensor or circuit connected in circuit with the positive polarity battery terminal connector and the negative polarity terminal connector;
Limitation 38(f)	a power switch or circuit connected or connectable in circuit with the power supply and the positive and negative polarity battery terminal connectors;
Limitation 38(g)	a microcontroller configured to receive input signals provided by the battery presence sensor or circuit and the reverse polarity sensor or circuit, the microcontroller configured to provide an output signal to control the power switch,
Limitation 38(h)	a USB input circuit connected to the power supply, the USB input circuit configured for converting power from a USB power source to increase power voltage to the power supply; and
Limitation 38(i)	a USB input connector connected to the USB input circuit, the USB input connector configured for connecting to the USB power source and providing power input from the USB power source through the USB input connector and the USB input circuit to the power supply.
Claim 39 Preamble	A jump starting device for boosting or charging a depleted or discharged battery having a positive polarity battery terminal and a negative polarity battery terminal, the jump starter device comprising:
Limitation 39(a)	a power supply;
Limitation 39(b)	a positive battery terminal connector for connecting the jump starter device to the positive battery terminal of the depleted or discharged battery;
Limitation 39(c)	a negative battery terminal connector for connecting the jump

U.S. Patent No. 11,447,023 (Claims 1, 32, 38, 39, 47, 52, and 54)	
Claim Designation	Claim Language
	starter device to the negative battery terminal of the depleted or discharged battery;
Limitation 39(d)	a power switch or circuit connected in circuit with the power supply and the positive and negative battery terminal connectors,
Limitation 39(e)	the power switch configured to turn power on from the power supply to the depleted or discharged battery when the positive and negative battery terminal connectors are properly connected to the positive and negative battery connectors;
Limitation 39(f)	a power switch control system or circuit connected to and controlling the power switch, the power switch control system or circuit configured to detect presence of the depleted or discharged battery when connected between the positive and negative battery terminal connectors and to detect polarity of the depleted or discharged battery when connected between the positive and negative battery terminal connectors
Limitation 39(g)	a USB input circuit connected to the power supply, the USB input circuit configured for converting power from a USB power source to increase power voltage to the power supply; and
Limitation 39(h)	a USB input connector configured for connecting to the USB power source and providing power input from the USB power source through the USB input connector and the USB input circuit to the power supply.
Claim 47 Preamble	A jump starting device for boosting or charging a depleted or discharged battery having a positive polarity battery terminal and a negative polarity battery terminal, the jump starter device comprising:
Limitation 47(a)	a power supply;
Limitation 47(b)	a positive battery terminal connector for connecting the jump starter device to the positive battery terminal of the depleted or discharged battery;
Limitation 47(c)	a negative battery terminal connector for connecting the jump starter device to the negative battery terminal of the depleted or discharged battery;
Limitation 47(d)	a power switch or circuit connected in circuit with the power supply and the positive and negative battery terminal connectors,

U.S. Patent No. 11,447,023 (Claims 1, 32, 38, 39, 47, 52, and 54)	
Claim Designation	Claim Language
Limitation 47(e)	the power switch configured to turn power on from the power supply to the depleted or discharged battery when connected to the positive and negative battery terminal connectors;
Limitation 47(f)	a power switch control system or circuit connected to and controlling the power switch, the power switch control system or circuit configured to detect presence of the depleted or discharged battery when connected between the positive and negative battery terminal connectors and to detect correct or incorrect polarity of the depleted or discharged battery when connected between the positive and negative battery terminal connectors;
Limitation 47(g)	a USB input circuit connected to the power supply, the USB input circuit configured for converting power from a USB power source to increase power voltage to the power supply; and
Limitation 47(h)	a USB input connector connected to the USB input circuit, the USB input connector configured for connecting to the USB power source and providing power input from the USB power source through the USB input connector and the USB input circuit to the power supply.
Claim 52 Preamble	A jump starting apparatus configured for boosting or charging a depleted or discharged battery having a positive polarity battery terminal and a negative polarity battery terminal, the jump starting apparatus comprising:
Limitation 52(a)	a power supply;
Limitation 52(b)	a positive polarity battery terminal connector configured for connecting the jump starting apparatus to the positive polarity battery terminal of the depleted or discharged battery;
Limitation 52(c)	a negative polarity battery terminal connector configured for connecting the jump starting apparatus to the negative polarity battery terminal of the depleted or discharged battery;
Limitation 52(d)	a power switch or circuit configured to turn on power from the power supply to the positive and negative polarity battery terminal connectors;
Limitation 52(e)	a control system or circuit connected to and controlling the power switch, the control system or circuit configured to detect

U.S. Patent No. 11,447,023 (Claims 1, 32, 38, 39, 47, 52, and 54)	
Claim Designation	Claim Language
	whether the positive and negative polarity battery terminal connectors have a correct polarity connection with the positive and negative polarity battery terminals of the depleted or discharged battery prior to turning on the power switch or circuit;
Limitation 52(f)	a USB input connector configured for removably connecting to a USB power source and providing power input from the USB power source to the USB input connector; and
Limitation 52(g)	a USB input circuit connecting the USB input connector to the power supply, the USB input circuit comprising a DC/DC converter, the USB input circuit configured for converting power from the USB power source to increase power voltage to the power supply,
Limitation 52(h)	wherein the DC-DC converter can be turned on and off by an output from the microcontroller.
Claim 54 Preamble	A jump starting apparatus configured for boosting or charging a depleted or discharged battery having a positive polarity battery terminal and a negative polarity battery terminal, the jump starting apparatus comprising:
Limitation 54(a)	a power supply;
Limitation 54(b)	a positive polarity battery terminal connector configured for connecting the jump starting apparatus to the positive polarity battery terminal of the depleted or discharged battery;
Limitation 54(c)	a negative polarity battery terminal connector configured for connecting the jump starting apparatus to the negative polarity battery terminal of the depleted or discharged battery;
Limitation 54(d)	a power switch or circuit configured to turn on power from the power supply to the positive and negative polarity battery terminal connectors;
Limitation 54(e)	a control system or circuit connected to and controlling the power switch, the control system or circuit configured to detect whether the positive and negative polarity battery terminal connectors have a correct polarity connection with the positive and negative polarity battery terminals of the depleted or discharged battery and prevent an incorrect polarity connection with the positive and negative polarity battery terminals of the

U.S. Patent No. 11,447,023 (Claims 1, 32, 38, 39, 47, 52, and 54)	
Claim Designation	Claim Language
	depleted or discharged battery prior to turning on the power switch or circuit;
Limitation 54(f)	a USB input connector; and
Limitation 54(g)	a USB input circuit connecting the USB input connector to the power supply, the USB input circuit comprising a DC/DC converter for up-converting the voltage from the USB input connector to the power supply.

V. LEVEL OF ORDINARY SKILL IN THE ART

A. Legal Principles

39. I have been informed that patents are considered from the perspective of a person having ordinary skill in the art, and that this is a hypothetical person who is presumed to know the relevant prior art. As noted previously, I will generally use the shorthand “PHOSITA” to refer to the person having ordinary skill in the art throughout my declaration.

40. I have been informed that the following five factors inform the analysis for determining the level of ordinary skill in the art: (1) type of problems encountered in the art; (2) prior art solutions to those problems; (3) rapidity with which innovations are made; (4) sophistication of the technology; and (5) educational level of active workers in the field. *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). I apply these factors in the section below in providing my opinion as to the level of one having ordinary skill in the art.

B. Opinion as to the Level of a Person Having Ordinary Skill in the Art (“PHOSITA”) for the ’023 Patent

41. I have knowledge relevant to what a person having ordinary skill in the art at the time of the claimed invention would understand and do. As of July 3, 2014, the claimed priority date of the ’023 patent, I had over 35 years of experience in this field and was at least a person having ordinary skill in the art.

42. In my opinion through evaluation of the five favors above as applied in the context of the claimed priority date of July 3, 2014, a PHOSITA would have been a person with 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. Less work experience could be compensated for by a higher level of education, such as a master’s degree, and vice versa.

VI. CLAIM CONSTRUCTION

A. Legal Principles

43. I have been informed that in a proceeding for *inter partes* review, claims terms in an unexpired patent are to be given their plain and ordinary meaning, as understood by a person having ordinary skill in the art, in view of the patent’s specification. 37 C.F.R. § 42.100(b); 83 FR 51340; *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). I have also been informed of the principle that “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); *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

B. Opinion of Claim Construction

44. I believe that all claim terms used in the challenged claims, for the purposes of *inter partes* review, can be given their plain and ordinary meaning.

45. In my opinion, the Board does not need to construe terms of the challenged claims because I am not aware of terms that are in controversy in a manner which would require construction to resolve the controversy. Thus, in my opinion each and every claim term can be given its plain and ordinary meaning, and the challenged claims are invalid under the plain and ordinary meaning of each recited term.

VII. SUMMARY OF THE PRIOR ART

46. I have been informed that each of Richardson, Zhao, Yu, and Paparrizos are prior art to the '023 patent under the law.

A. Richardson

47. Richardson discloses a portable power source that can provide supplemental power to a vehicle's electrical system and jump start vehicle batteries. EX1005, ¶¶ [0002], [0006], [0007]. Richardson discloses a system which includes batteries to provide the power to the battery of the vehicle to be jump started. EX1005, ¶ [0007]. The system of jump starter 10 includes a programmable

microprocessor 12 which receives inputs and produces outputs to control the system. EX1005, ¶ [0014].

48. Richardson discusses problems that can occur when jump starting a vehicle battery such as cross-connecting the jump starter's battery with the vehicle battery or inadvertently contacting electrified cable clamps. EX1005, ¶ [0005]. These problems can cause sparking or battery explosion and fire. EX1005, ¶ [0005]. To address these problems, Richardson's device performs real-time monitoring of all system parameters to increase the safety and effectiveness of the unit's operation while providing additional parametric and diagnostic information obtained before, during and after the vehicle starting operation. EX1005, ¶ [0006]. Among these safety features are Richardson's disclosure of a jump starter that both (1) determines whether a proper polarity connection exists between the jump starter battery and the vehicle battery via reverse voltage sensor 24 (EX1005, ¶ [0016]), and (2) determines the connection status of a vehicle battery via vehicle voltage sensor 30. EX1005, ¶ [0016]. In other words, Richardson's jump starter determines both whether a battery is present or absent in the first instance, and if present, whether such connection has been made with proper or improper polarity.

49. Richardson is in the same field of endeavor as the '023 patent. EX1001, Abstract; EX1005, Abstract. Additionally, Richardson's teachings are reasonably pertinent to problems that the '023 patent claims to address. EX1001 at

1:17-24; EX1005, Abstract.

B. Zhao

50. 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 at 1:22-27, 2:63-3:11. Zhao's system also includes control circuit 102 which can control the ON/OFF state of the step-up converter. EX1006 at 4:59-64.

51. Zhao is in the same field of endeavor as the '023 patent. EX1001, 1:42-44, 4:4-16; EX1006, 1:19-30. Additionally, Zhao's teachings are reasonably pertinent to problems identified in the '023 patent. EX1001, 4:4-16, 7:25-28; EX1006 at 1:25-27, 3:6-11.

C. Yu

52. Yu discloses an automotive starting assist device, commonly referred to as a jump starter. EX1007; EX1008, Abstract. Yu's device comprises an internal battery pack, a control module with a microprocessor, and an output terminal. EX1008, Abstract, ¶ [0004]. The device further comprises a microprocessor-controlled relay which can connect power from the internal battery a vehicle battery for a jump start. EX1008, ¶ [0004]. Before initiating a jump start, Yu's device detects an external battery voltage to determine if a vehicle battery is

present, and separately it detects whether the device is connected with the wrong polarity. EX1008, ¶ [0009].

53. Yu is in the same field of endeavor as the '023 patent. EX1001, Abstract; EX1008, Abstract. Yu also addresses problems that are identified in the text of the '023 patent. EX1001 at 1:17-24; EX1008, Abstract.

D. Paparrizos

54. Paparrizos discloses a battery charging circuit with a forward boost mode that can boost a lower input voltage to a sufficient voltage to charge higher voltage batteries. EX1009, Abstract, 3:31-35, 8:17-31. Paparrizos's circuit can charge multicell, series-connected lithium-ion battery packs specifically from a 5V USB power source. EX1009, 2:30-40, 8:17-31.

55. Paparrizos is in the same field of endeavor as the '023 patent. EX1001, 1:42-44, 4:4-16; EX1009, 1:18-26, 1:30-39, 2:30-40. Paparrizos also addresses problems that are identified by the '023 patent. EX1001 at 4:4-16, 7:25-28; EX1009, 1:23-26, 8:17-31.

VIII. OPINION ON GROUNDS OF UNPATENTABILITY

A. Legal Principles of Obviousness

56. I have been told that according to 35 U.S.C. § 103(a), “[a] patent may not be obtained though the invention is not identically disclosed or described as set forth in Section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have

been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.”

57. When considering the issues of obviousness, I have been instructed to:

- (a) determine the scope and content of the prior art;
- (b) ascertain the differences between the prior art and the claims at issue;
- (c) resolve the level of ordinary skill in the pertinent art; and
- (d) consider evidence of secondary indicia of non-obviousness (if available).

58. I have been told that the relevant time for considering whether a claim would have been obvious to a PHOSITA is the time of alleged invention.

59. I have been told that a reference may be modified or combined with other references or with the PHOSITA’s own knowledge if the person would have found the modification or combination obvious. A PHOSITA is presumed to know all relevant prior art, and the obviousness analysis may consider the inferences and creative steps that a PHOSITA would employ.

60. In determining whether a prior-art reference could have been combined with another prior-art reference or other information known to a PHOSITA, I have been told that the following principles may be considered:

- (a) a combination of familiar elements according to known methods is likely to be obvious if it yields predictable results;
- (b) the substitution of one known element for another is likely to be obvious if it yields predictable results;

- (c) the use of a known technique to improve similar items or methods in the same way is likely to be obvious if it yields predictable results;
- (d) the application of a known technique to a prior art reference that is ready for improvement is likely obvious if it yields predictable results;
- (e) any need or problem known in the field and addressed by the reference can provide a reason for combining the elements in the manner claimed;
- (f) a person of ordinary skill often will be able to fit the teachings of multiple references together like a puzzle; and
- (g) the proper analysis of obviousness requires a determination of whether a person of ordinary skill in the art would have a “reasonable expectation of success”—not “absolute predictability” of success—in achieving the claimed invention by combining prior art references.

61. I have been told that whether a prior art reference renders a patent claim unpatentable as obvious is determined from the perspective of a PHOSITA. Further, I have been told that while there is no requirement that the prior art contain an express suggestion to combine known elements to achieve the claimed invention, a suggestion to combine known elements to achieve the claimed invention may come from the prior art as a whole or individually, as filtered through the knowledge of one skilled in the art. I have also been told that the inferences and creative steps a PHOSITA would employ are also relevant to the determination of obviousness.

62. I have been told that when a work is available in one field, design alternatives and other market forces can prompt variations of it, either in the same field or in another. If a PHOSITA can implement a predictable variation and would

see the benefit of doing so, that variation is likely to be obvious. In many fields, there may be little discussion of obvious combinations, and in these fields market demand—not scientific literature—may drive design trends. When there is a design need or market pressure and there are a finite number of predictable solutions, a PHOSITA has good reason to pursue those known options.

63. I have been told that there is no rigid rule that a reference or combination of references must contain a “teaching, suggestion, or motivation” to combine references. But I also have been told that the “teaching, suggestion, or motivation” test can be a useful guide in establishing a rationale for combining elements of the prior art. This test poses the question whether there is an express or implied teaching, suggestion, or motivation to combine prior art elements in a way that yields the claimed invention and avoids impermissible hindsight analysis.

B. Ground 1: Claims 1, 32, 38, 39, 47, 52, and 54 are unpatentable under 35 U.S.C. § 103(a) over Richardson in view of Zhao

1. Exemplary Rationale for Combining Richardson and Zhao

64. A PHOSITA would have found it obvious to combine the disclosures of Richardson and Zhao. Both Richardson and Zhao involve 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.

65. Richardson teaches a device having a battery pack consisting of series-connected cells. EX1005, Fig. 2A. As one example, Richardson discloses the battery as a nominally 12V battery. EX1005, ¶ [0034]. To reach a 12V rating, a PHOSITA would understand that Richardson's battery requires multiple cells connected in series, such as a series string of lithium-ion cells or a series of lead-acid cells. Zhao discloses a system for charging battery-powered devices that have a multicell pack of series-connected battery cells. EX1006, 2:63-3:11. Zhao specifically contemplates that its battery charging system can use low voltage charging systems like 5V USB to charge batteries with a voltage rating above that of the input voltage received from the USB power source. EX1006 at 1:22-27, 2:51-54, 3:6-11.

66. A PHOSITA therefore would have been motivated to modify Richardson in view of Zhao because Zhao is directed to the known technique of charging a multicell battery pack of series-connected cells of a battery-powered device, which is the same battery architecture in Richardson's jump starter, by using a DC-DC converter in accordance with its established function of converting a lower voltage input to a higher voltage output. Additionally, Zhao's primary objective is the charging of a battery pack with a voltage higher than that of the 5V USB input. This had been in common practice well prior to the 2014 priority date of the '023 patent. A PHOSITA would have been motivated to implement Zhao's

method in a predictable manner to charge nominally 12V automotive starting batteries such as those envisioned by Richardson.

67. In the following, I will provide more detail to support my opinions as applied to specific claims and limitations of the '023 patent.

2. Independent Claim 1

- a. **Claim 1 Preamble: “A jump starting apparatus configured for boosting or charging a depleted or discharged battery having a positive polarity battery terminal and a negative polarity battery terminal, the jump starting apparatus comprising:”**

68. Richardson discloses in detail a jump starting apparatus. Richardson, Abstract, claim 26. Richardson’s apparatus provides supplemental power to jump start a vehicle battery. EX1005, ¶¶ [0002], [0006], [0007]. Richardson discloses jump starter 10 which includes microcontroller 12 to control the system, thereby allowing the jump starter to boost or charge a battery by connecting the internal battery of the jump starter to the positive and negative terminals of a vehicle battery. EX1005, ¶¶ [0007], [0014], [0016], [0021], [0035], Fig. 1, Fig. 2C, Figs. 3-8, ¶ [0004].

69. Similar findings from Richardson were cited by the Board in the '015-FWD. EX1014 at 50.

- b. **Limitation 1(a): “a power supply;”**

70. Richardson teaches its jump starting apparatus has one or more batteries. EX1005, Abstract, ¶ [0007], claim 1. Jump starter batteries 22 supply

power to jump start a vehicle's battery. EX1005, ¶¶ [0016], [0021], [0035]. This is further shown by Figures 1 and 2A, which are highlighted to show the batteries which operate as a power supply.

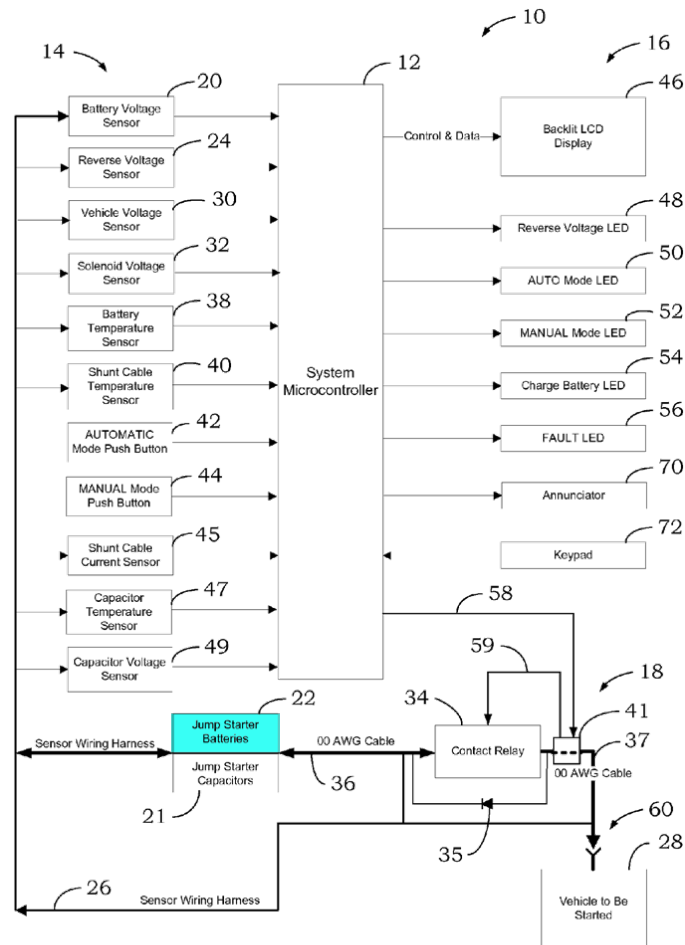
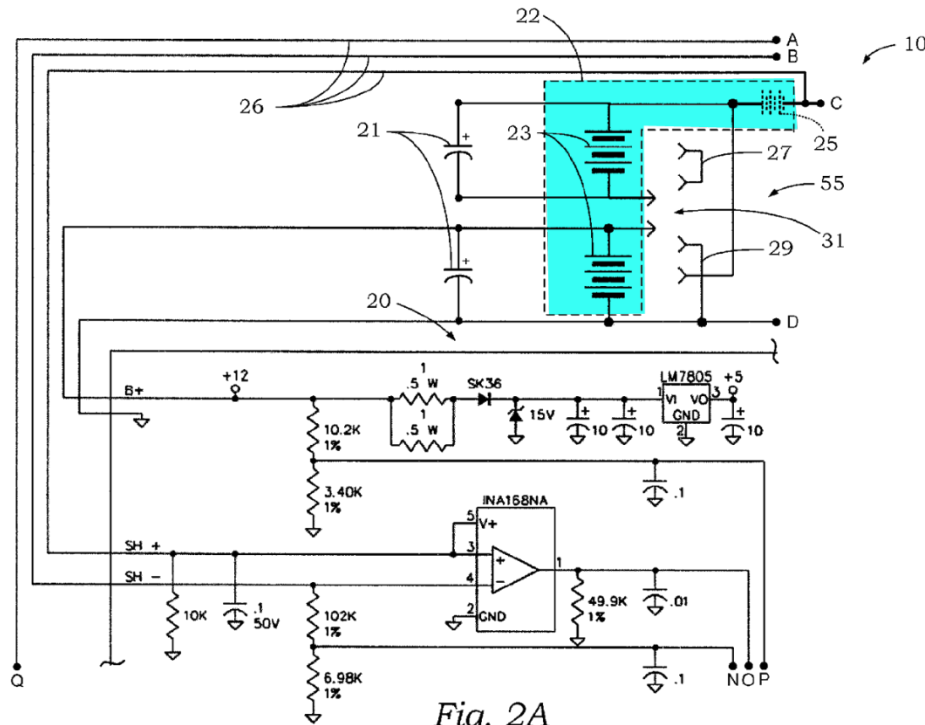


Fig. 1

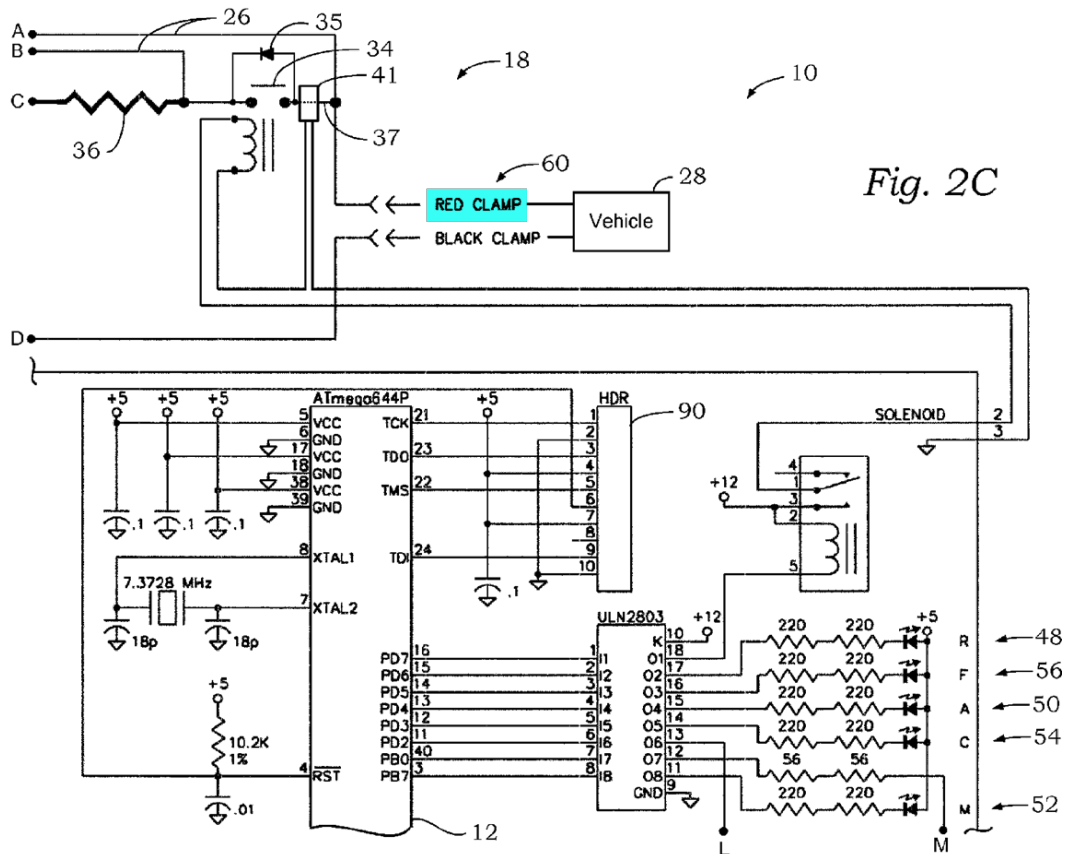


71. Similar factual findings regarding Richardson were provided in the '015-FWD. EX1014 at 50-51.

c. Limitation 1(b): “a positive polarity battery terminal connector configured for connecting the jump starting apparatus to the positive polarity battery terminal of the depleted or discharged battery;”

72. Richardson discloses a pair of conductive leads which include a positive polarity terminal connector as claimed. EX1005, Abstract, claim 26. Richardson’s terminal connectors may include conductive clamps or other types of connectors. EX1005, ¶ [0016]. As shown by Richardson, jumper cables 60 include the conventionally-colored red cable clamp for connecting the positive cable to the positive battery terminal. EX1005, ¶ [0027]; EX1005 at Fig. 2C (with highlighting

showing the red cable clamp).

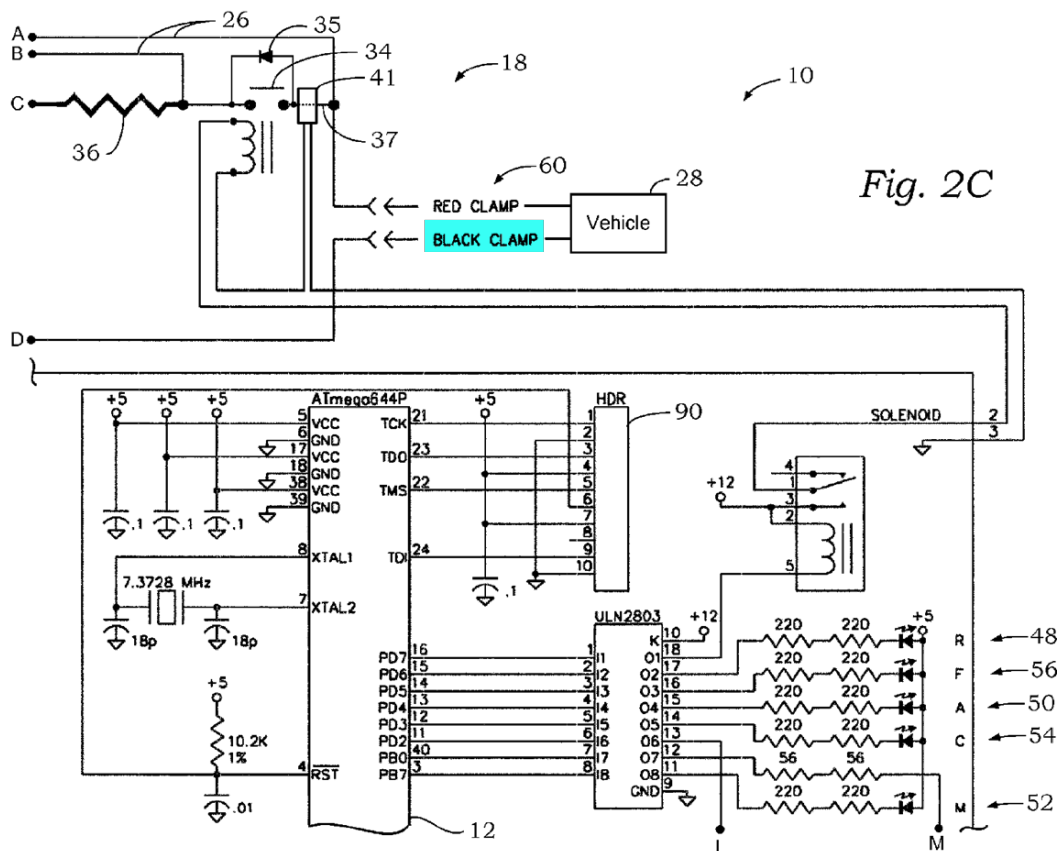


73. A PHOSITA would further understand that Richardson discloses a positive polarity terminal connector as claimed as the cables are disclosed with different polarities. EX1005, ¶¶ [0016]; [0027], [0028]. A PHOSITA would thus understand that one of the two clamps of the jumper cables would be the positive clamp of the positive polarity cable.

- d. **Limitation 1(c): “a negative polarity battery terminal connector configured for connecting the jump starting apparatus to the negative polarity battery terminal of the depleted or discharged battery;”**

74. As discussed in the previous Section, Richardson’s conductive leads

also include a negative polarity battery terminal connector as claimed. EX1005, Abstract, claim 26. Richardson's terminal connectors may include conductive clamps or other types of connectors. EX1005, ¶ [0016]. Richardson shows that the jumper cables 60 include the conventionally-colored black cable clamp for connecting the negative cable to the negative battery terminal. EX1005, ¶ [0027], EX1005 at FIG. 2C (highlighted to show the black cable clamp).



75. A PHOSITA would further understand that Richardson discloses a positive polarity terminal connector as claimed as the cables are disclosed with different polarities. EX1005, ¶¶ [0016]; [0027], [0028]. A PHOSITA would thus understand that one of the two clamps of the jumper cables would be the negative

clamp of the negative polarity cable.

- e. **Limitation 1(d): “a power switch or circuit configured to turn on power from the power supply to the positive and negative polarity battery terminal connectors;”**

76. Richardson discloses contact relay 34 which functions as the claimed power switch or circuit. 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. EX1005, ¶¶ [0021], [0035], [0036], [0054], Fig. 1 (highlighted to show the contact relay serving as a power switch).

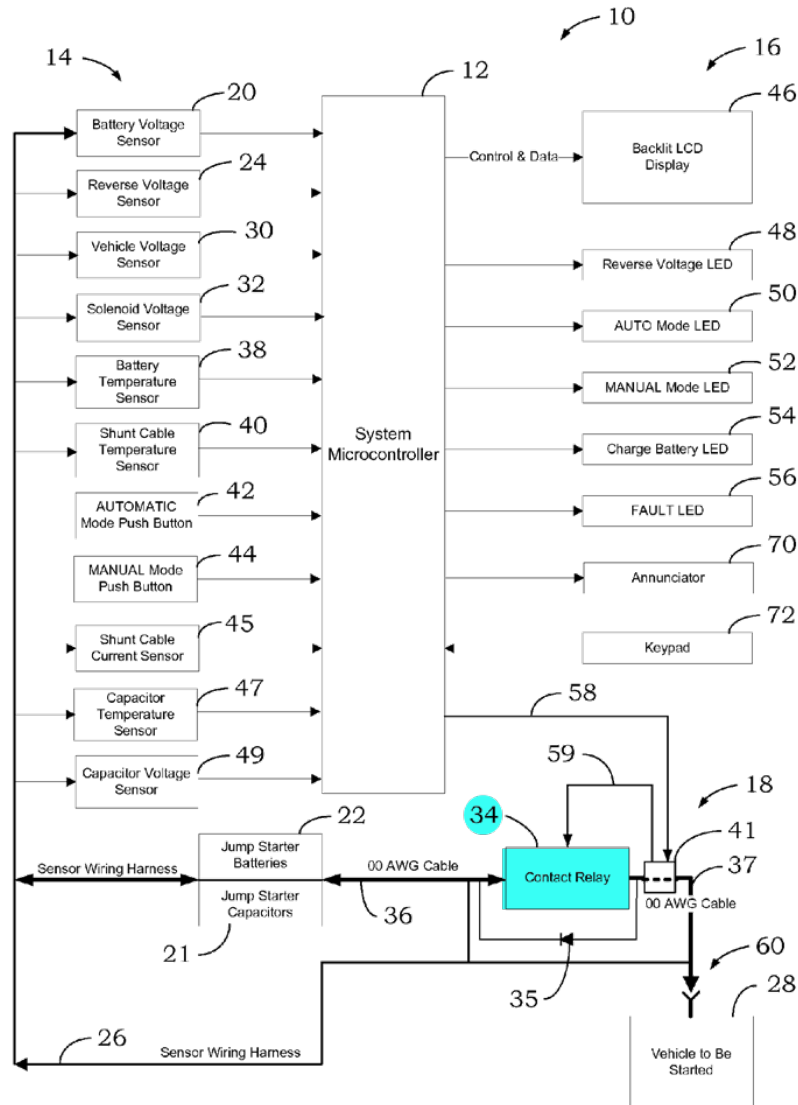


Fig. 1

77. 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 that the relay operates as a power switch as claimed, such as Step 268 in Figure 6 where the starter contact relay is closed.

EX1005, Fig. 6.

78. Similar factual findings regarding Richardson were provided in the '015-FWD. EX1014 at 54-55.

- f. **Limitation 1(e): “a control system or circuit connected to and controlling the power switch, the control system or circuit configured to detect whether the positive and negative polarity battery terminal connectors have a correct polarity connection with the positive and negative polarity battery terminals of the depleted or discharged battery prior to turning on the power switch or circuit;”**

79. Richardson discloses a control system or circuit connected to and controlling contact relay 34. Specifically, the system comprised of microcontroller 12 and associated sensors and circuit components constitutes the control system or circuit as claimed. EX1005, Fig. 1 (highlighted to show parts of the control system).

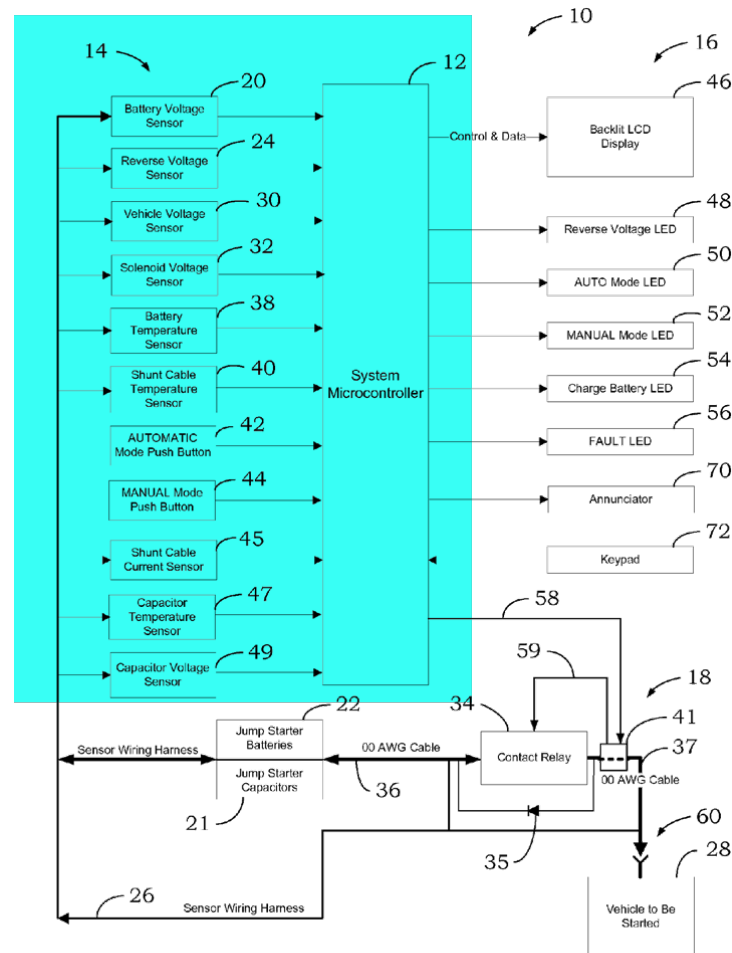


Fig. 1

80. 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. This control system utilizes reverse voltage sensor 24 to detect whether the battery terminal connectors are connected to a vehicle battery with proper polarity prior to controlling contact relay 34 to connect power to the vehicle battery. EX1005, ¶¶ [0016], [0020]; Fig. 1.

81. Richardson further explains that “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 even saved in non-volatile memory 216.” EX1005, ¶ [0027]. 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.” EX1005, ¶ [0027]. Richardson further discloses an implementation of a reverse voltage sensor in Figure 2B. EX1005, Fig. 2B.

82. Lastly, it is worth noting that during prosecution NOCO admitted that “Richardson discloses detecting proper polarity.” EX1002 at 496.

83. Similar factual findings regarding Richardson were provided in the ’015-FWD. EX1014 at 51-67.

g. Limitation 1(f): “a USB input circuit connected to the power supply, the USB input circuit configured for converting power from a USB power source to increase power voltage to the power supply; and”

84. Richardson teaches that the system includes 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], [0020], [0028].

85. While Richardson does not include a jump starter's battery charging circuitry utilizing a USB 5V input, Zhao teaches a USB input circuit configured for converting power from a 5V USB power source to a voltage appropriate for recharging a power supply battery. This was, in fact, common practice for charging portable battery-powered devices that operate internally at voltages above the 5V provided by the USB input. EX1006, Abstract, 1:22-23, 1:25-27, 3:6-11. Zhao teaches a step-up circuit topology, which is a power conversion technique using a DC-DC conversion to boost an input voltage to a higher output voltage, that is used to charge a multicell battery pack using a lower input voltage, such as a 5V USB power source. EX1006, Abstract, 1:22-23, 1:25-27, 1:34-45, 1:46-55, 2:51-62, 2:63-3:11.

86. Zhao teaches a step-up battery charger or charging management system 100 which constitutes a USB input circuit as claimed. EX1006 at 2:63-66, Fig. 1, 3:1-39. This system can include a step-up converter and charging control circuit 201. EX1006 at 2:66-67. The step-up converter is a well-known DC-DC converter configured as a boost converter, which increases an input voltage to a higher-voltage output that can charge a plurality of series connected batteries such as lithium batteries. EX1006, 3:1-11. Thus, 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.

87. Zhao further discloses that power stage circuit 101 of the step-up converter can be a synchronous rectifier Boost topology including inductor L, main switch S_1 , synchronous switch S_2 , and output capacitor C_{BD} . EX1006 at 3:12-15. Control circuit 102 can control main switch S_1 via control signal G_1 and synchronous switch S_2 via control signal G_2 . EX1006 at 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 at 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 at 8:21-24. PHOSITA would understand how to connect the boosted output voltage of Zhao's step-up charging system to Richardson's jump starter for purposes of charging its battery.

88. A PHOSITA would understand that 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, which are both pack configurations that would be well-suited for starting a traditional lead-acid vehicle starter battery rated at 12V. EX1006 at 3:6-11. Thus, the disclosure of Zhao provides an explicit teaching, suggestion, or motivation to

implement Zhao's USB input circuit with a system like Richardson's jump starter. EX1006 at 3:6-11. A PHOSITA would be well-equipped 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. Either option would provide desirable features or improvements to Richardson's jump starter. For example, option (1) 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, although some USB chargers rated to provide lower current levels would result in longer charging times. While option (2) would result in a slight increase in cost for including an additional input connector and DC-DC conversion circuitry alongside the existing input and 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. 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 below.

89. In addition to explicit teachings of Zhao, the known benefits of utilizing USB technology to charge battery-powered devices was known by a PHOSITA before the claimed priority date. For example, in 2007 the Universal Serial Bus Implementers Forum (“USB-IF”) issued its Battery Charging Specification, Revision 1.0 which noted that the convenience of USB charging has led to the creation of dedicated chargers that simply expose a downstream USB port. EX1025 at 6. A PHOSITA would know that USB charging allows the same USB cable to be used for charging devices from multiple different USB charging sources such as a PC or a dedicated charger. EX1025 at 6. On a related note, a PHOSITA would understand other desired benefits of USB technology before the claimed priority date such as (1) reducing the need for suppliers to develop or purchase proprietary chargers to sell with their products, which would reduce cost of goods and also serve the benefit of reducing the electronic waste associated with proprietary chargers, (2) providing device users with a universal power source for battery charging reducing their need to own multiple proprietary chargers and cables for their battery-powered devices, (3) the ease of use of USB technology, and (4) the durability of USB parts and connectors, many of which were known to be more robust than previous non-USB charging options. Convenience was a hallmark of USB technology, and before July 3, 2014 there was a known market need for USB to cater to actual or perceived consumer demand for USB

technology in consumer electronics. EX1016, ¶ [0002].

90. The desirability of using a USB input to recharge batteries at the voltage level of those found in jump starters is also documented in many patents or publications which were filed or published before NOCO's claimed July 3, 2014 priority date, which further supports my opinion that a PHOSITA would have been motivated to use USB technology and understood the benefits of USB technology for battery charging. For example, USB charging ports had become or were becoming standard equipment in many cars and trucks before 2014, which is a location where a PHOSITA would understand that a user would store and charge their jump starter so that it would be ready and available when they need to use it. EX1029; EX1030. 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 at 1:18-23. The '023 patent is explicit that USB connectors, chargers, and cables were "standard" before the claimed priority date. EX1001 at 7:21-25. As another example, by the earlier 2000's 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 at 28:14-31:13, 32:22-38:24, 42:23-43:22, 44:2-19, 51:14-54:13, 54:25-56:14. Linear Technologies (and several other IC and ASIC 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 who used to work for Linear Technologies. EX1026 at 53:2-18.

91. Similar to 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 nominal voltage rating above the USB input voltage was both desirable and known to be interchangeable with non-USB charging systems. My opinion that this type of application was known to a PHOSITA is further supported by patents and publications filed or published before July 3, 2014 which, such as the following, document these types of applications. For example, CN 202512152 U is a Chinese utility model patent published and issued in 2012 that 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, ¶ [0005]. As another example, CN 201226449Y is a Chinese utility model published and issued in 2009 which 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, Background. As yet another example, U.S.

Patent Application Publication No. 2013/0285596 (“Zhou”) which was filed April 30, 2012 discloses circuit 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]. As another example, U.S. Patent No. 9,035,599 (“Amemiya”) which was 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. Lastly as a final example here, Chinese utility model patent CN 203788026 U which was filed April 18, 2014 explicitly contemplates USB charging the batteries of a jump starter via a DC-DC boosting technique. EX1022; EX1023, ¶ [0013]. This further supports my opinion that a PHOSITA would have recognized and understood the nature of problem of USB charging higher voltage batteries with a 5V USB input, along with proposed solutions.

92. In sum, before the claimed priority date, USB charging for higher voltage batteries was a well-known technique for the charging of higher voltage batteries devices such as Richardson’s jump starter.

93. Therefore, Richardson and Zhao render this limitation obvious.

h. Limitation 1(g): “a USB input connector connected to the USB input circuit, the USB input connector

configured for connecting to the USB power source and providing power input from the USB power source through the USB input connector and the USB input circuit to the power supply.”

94. Richardson is not explicit regarding the type of input connector utilized for charging the jump starter batteries. EX1005, ¶ [0029]. However, as noted in the previous section, a PHOSITA would be well-versed in consulting the relevant USB standards and capable of implementing USB technology when designing a portable battery-powered device. Thus, when modifying Richardson to implement a USB input circuit as taught by Zhao, a PHOSITA would necessarily rely upon their knowledge regarding implementation of commercially-available USB receptables (such as a micro-USB receptable) when designing a USB charging feature. In conjunction with Zhao’s teaching that the input voltage of the system is provided by a “universal serial bus (USB) charger” (EX1005 at 3:6-11), a PHOSITA would know that 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). A PHOSITA’s knowledge of these USB input connectors—which the ’023 patent admits are “standard” (EX1001 at 7:23-25)—is further corroborated by the USB standards and other prior art discussing these standard connectors. EX1009 at 1:20-23 (discussing USB, mini-USB, and micro-USB connectors); EX1018; EX1019, ¶ [0004] (discussing “Mini-USB interface”). This USB receptable (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.

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

3. Claim 32: “The apparatus according to claim 1, wherein the DC-DC converter can be turned on and off by a microprocessor.”

96. Zhao explicitly teaches a step-up converter that is controlled by control circuitry such as a microcontroller. Specifically, control circuit 102 can output control signal G1 to control the ON/OFF state of switch S2, which in turn will either turn the step-up converter ON or OFF. EX1006 at 3:17-19. For example, step-up converter control circuit 102 can turn off switch S2 to complete the charging procedure. EX1006 at 4:59-64. Accordingly, Zhao teaches a system with a step-up converter that can be turned on and off by a microprocessor.

97. A PHOSITA would understand that one desirable, effective, reliable, and cost-effective choice for implementing control circuit 102 would be through the use of a microcontroller, and PHOSITA would have been motivated to implement this feature of Zhao for recharging a jump starter battery, combined with Richardson as discussed above in connection with Limitation 1(f). For example, microcontroller control of the ON/OFF state of the step-up converter allows the device to save power by disabling the DC-DC boosting circuitry when

charging of the internal battery has been completed. A PHOSITA would have a reasonable expectation of success in implementing this feature as signal control of switches is a basic and predictable technique.

98. Richardson, in view of Zhao, therefore renders obvious every element of claim 32.

4. Independent Claim 38

- a. Claim 38 Preamble: “A jump starting apparatus for boosting or charging a depleted or discharged battery having a positive polarity battery terminal and a negative polarity battery terminal, the jump starting apparatus comprising:”**

99. For the same reasons I have discussed above with respect to the preamble of claim 1 in Section VIII.B.2.a, it is my opinion that the preamble of claim 38 is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 68-69 above are incorporated here by reference and also reflect my opinions with respect to the preamble of claim 38, which demonstrates that Richardson teaches the preamble of claim 38.

- b. Limitation 38(a): “a power supply;”**

100. For the same reasons I have discussed above with respect to Limitation 1(a) in Section VIII.B.2.b, it is my opinion that Limitation 38(a) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 70-71 above are incorporated here by reference and also reflect my opinions with respect to Limitation 38(a) and demonstrate that Richardson teaches

Limitation 38(a).

- c. **Limitation 38(b): “a positive polarity battery terminal connector configured for connecting the jump starting apparatus to the positive polarity terminal of the depleted or discharged battery;”**

101. For the same reasons I have discussed above with respect to Limitation 1(b) in Section VIII.B.2.c, it is my opinion that Limitation 38(b) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 72-73 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 38(b) and demonstrate that Richardson teaches Limitation 38(b).

- d. **Limitation 38(c): “a negative polarity battery terminal connector configured for connecting the jump starting apparatus to the negative polarity terminal of the depleted or discharged battery;”**

102. For the same reasons I have discussed above with respect to Limitation 1(c) in Section VIII.B.2.d, it is my opinion that Limitation 38(c) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 74-75 above are incorporated here by reference and also reflect my opinions with respect to Limitation 38(c) and demonstrate that Richardson teaches Limitation 38(c).

- e. **Limitation 38(d): “a battery presence sensor or circuit connected in circuit with the positive polarity battery terminal connector and the negative polarity battery terminal connector;”**

103. Richardson discloses a control system which includes a battery presence sensor or circuit as claimed. EX1005, ¶¶ [0007], [0027], [0034], [0041], Fig. 3, Fig. 4, Fig. 5, Fig. 6. Specifically, Richardson’s control system can use vehicle voltage sensor 30 to monitor voltage received from the vehicle system on line 37. EX1005, ¶ [0016]. Richardson’s battery presence sensor is separate from its reverse polarity sensor or circuit. EX1005, Fig. 1, Fig. 3, ¶ [0027]. Richardson explains that the disclosed invention monitors the voltage of the battery of the vehicle to be jump started and the current delivered by the jump starter batteries and capacitors to determine if a proper connection has been established and to provide fault monitoring. EX1005, ¶ [0007]. Richardson further explains that the voltage is monitored to determine open circuit, disconnected conductive clamps, shunt cable fault, and solenoid fault conditions. EX1005, ¶ [0007].

104. Richardson’s vehicle voltage sensor 30 allows the jump starter to determine the plugged or unplugged status of the jumper cables, indicating whether a vehicle battery is present (i.e. connected to the jump starter) or absent (i.e., disconnected). EX1005, ¶ [0041] (“If the system detects an increase in the difference between the measured jump starter battery voltage 20 and the voltage measured 30 across the contact relay 34 indicating that one of the jump starter

cables has been disconnected 302 from the vehicle's battery or starter system 28 then a jumper cable unplugged error count is incremented 304, a “Jumper Cable Unplugged” error message is displayed 306 on the LCD 46, the contact relay 34 is opened and the fault LED 56 is illuminated 290. The system may be returned to the ready mode if the Automatic button 42 is pressed by the operator 292, or automatically after five minutes 294.”). An exemplary implementation of circuitry for detecting the presence of a vehicle battery is shown in Richardson’s figures. Richardson, Fig. 2A, Fig. 2B, Fig. 2C, Fig. 2D. Specifically, Richardson discloses the following connections: (1) the positive polarity battery terminal connector (RED CLAMP) connects to node A (shown in FIG. 2C), (2) node A connects to node Q (shown in FIG. 2A), (3) node Q is connected to the top node of a series-connected voltage divider (shown in FIG. 2B and labeled as vehicle voltage sensor 30), and (4) the node between the two resistors of the voltage divider is connected to node I and ultimately to pin 31 of the microprocessor 12 (as shown in FIG. 2D).

EX1005 at FIGS. 2A, 2B, 2C, 2D. Richardson further discloses that “[i]f one of the push buttons 42 or 44 has been selected, the system will compare the operator-configured starter voltage against the voltage of the vehicle to be started 28” and “[i]f the different between the voltage selected and the voltage measured is not within a predetermined range and tolerance 252, a ‘Wrong Selector Volts’ message is displayed 254 on the LCD 46 and further operation is prohibited until the correct

voltage is selected 256 at which point processing returns to the main processing loop 210.” EX1005, ¶ [0034]. Based on the component values disclosed in Figures 2A-2C, a low voltage reading of approximately 0.032 volts will be received at pin 31 of the microcontroller when no battery is detected, and a higher voltage of approximately 0.7 volts is received at pin 31 when a 12-volt battery is connected. EX1005, Figs. 2A-2C. Accordingly, in at least one exemplary implementation the Richardson device makes a determination of battery presence at step 252 of the processing loop in connection with the operation of vehicle voltage sensor 30. EX1005, Fig. 5.

105. Similar findings regarding Richardson were provided in the ’015-FWD. EX1014, 51-67.

f. Limitation 38(e): “a reverse polarity sensor or circuit connected in circuit with the positive polarity battery terminal connector and the negative polarity terminal connector;”

106. For the same reasons I have discussed above with respect to Limitation 1(e) in Section VIII.B.2.f, it is my opinion that Limitation 38(e) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 79-83 above are incorporated here by reference and also reflect my opinions with respect to Limitation 38(e) and demonstrate that Richardson teaches Limitation 38(e).

- g. Limitation 38(f): “a power switch or circuit connected or connectable in circuit with the power supply and the positive and negative polarity battery terminal connectors;”**

107. For the same reasons I have discussed above with respect to Limitation 1(d) in Section VIII.B.2.e, it is my opinion that Limitation 38(f) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 76-78 above are incorporated here by reference and also reflect my opinions with respect to Limitation 38(f) and demonstrate that Richardson teaches Limitation 38(f).

- h. Limitation 38(g): “a microcontroller configured to receive input signals provided by the battery presence sensor or circuit and the reverse polarity sensor or circuit, the microcontroller configured to provide an output signal to control the power switch,”**

108. For the same reasons I have discussed above with respect to Limitation 1(e) in Section VIII.B.2.f and Limitation 38(d) in Section VIII.B.4.e, it is my opinion that Limitation 38(g) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 79-83, 103-105 above are incorporated here by reference and also reflect my opinions with respect to Limitation 38(g) and demonstrate that Richardson teaches Limitation 38(g).

109. To the extent NOCO argues that this Limitation requires separate or distinct signals from a battery presence sensor and a reverse polarity sensor, or otherwise requires separate or distinct signals indicating battery presence and

polarity, Richardson discloses separate signals and separate sensors for detecting battery presence and polarity. EX1005, Fig. 1, Fig. 3, ¶ [0027].

110. Similar findings regarding Richardson were provided in the '015-FWD. EX1014, 51-67.

- i. **Limitation 38(h): “a USB input circuit connected to the power supply, the USB input circuit configured for converting power from a USB power source to increase power voltage to the power supply; and”**

111. For the same reasons I have discussed above with respect to Limitation 1(f) in Section VIII.B.2.g, it is my opinion that Limitation 38(h) is also obvious over Richardson in view of Zhao. Specifically, the opinions I have expressed above in paragraphs 82-93 above are incorporated here by reference and also reflect my opinions with respect to Limitation 38(h) and demonstrate that Richardson in view of Zhao renders Limitation 38(h) obvious.

- j. **Limitation 38(i): “a USB input connector connected to the USB input circuit, the USB input connector configured for connecting to the USB power source and providing power input from the USB power source through the USB input connector and the USB input circuit to the power supply.”**

112. For the same reasons I have discussed above with respect to Limitation 1(g) in Section VIII.B.2.h, it is my opinion that Limitation 38(i) is also obvious Richardson in view of Zhao. Specifically, the opinions I have expressed above in paragraphs 94-95 above are incorporated here by reference and also

reflect my opinions with respect to Limitation 38(i) and demonstrate that Richardson in view of Zhao renders Limitation 38(i) obvious.

5. Independent Claim 39

- a. Claim 39 Preamble: “A jump starting device for boosting or charging a depleted or discharged battery having a positive polarity battery terminal and a negative polarity battery terminal, the jump starter device comprising:”**

113. For the same reasons I have discussed above with respect to the preamble of claim 1 in Section VIII.B.2.a, it is my opinion that the preamble of claim 39 is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 68-69 above are incorporated here by reference and also reflect my opinions with respect to the preamble of claim 39 and demonstrate that Richardson teaches the preamble of claim 39.

- b. Limitation 39(a): “a power supply;”**

114. For the same reasons I have discussed above with respect to Limitation 1(a) in Section VIII.B.2.b, it is my opinion that Limitation 39(a) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 70-71 above are incorporated here by reference and also reflect my opinions with respect to Limitation 39(a) and demonstrate that Richardson teaches Limitation 39(a).

- c. Limitation 39(b): “a positive battery terminal connector for connecting the jump starter device to**

the positive battery terminal of the depleted or discharged battery;”

115. For the same reasons I have discussed above with respect to Limitation 1(b) in Section VIII.B.2.c, it is my opinion that Limitation 39(b) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 72-73 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 39(b) and demonstrate that Richardson teaches Limitation 39(b).

d. Limitation 39(c): “a negative battery terminal connector for connecting the jump starter device to the negative battery terminal of the depleted or discharged battery;”

116. For the same reasons I have discussed above with respect to Limitation 1(c) in Section VIII.B.2.d, it is my opinion that Limitation 39(c) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 74-75 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 39(c) and demonstrate that Richardson teaches Limitation 39(c).

e. Limitation 39(d): “a power switch or circuit connected in circuit with the power supply and the positive and negative battery terminal connectors,”

117. For the same reasons I have discussed above with respect to Limitation 1(d) in Section VIII.B.2.e, it is my opinion that Limitation 39(d) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in

paragraphs 76-78 above are incorporated here by reference and also reflect my opinions with respect to Limitation 39(d) and demonstrate that Richardson teaches Limitation 39(d).

- f. Limitation 39(e): “the power switch configured to turn power on from the power supply to the depleted or discharged battery when the positive and negative battery terminal connectors are properly connected to the positive and negative battery connectors;”**

118. For the same reasons I have discussed above with respect to Limitation 1(e) in Section VIII.B.2.f, it is my opinion that Limitation 39(e) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 79-83 above are incorporated here by reference and also reflect my opinions with respect to Limitation 39(e) and demonstrate that Richardson teaches Limitation 39(e).

- g. Limitation 39(f): “a power switch control system or circuit connected to and controlling the power switch, the power switch control system or circuit configured to detect presence of the depleted or discharged battery when connected between the positive and negative battery terminal connectors and to detect polarity of the depleted or discharged battery when connected between the positive and negative battery terminal connectors”**

119. For the same reasons I have discussed above with respect to Limitation 1(e) in Section VIII.B.2.f, Limitation 38(d) in Section VIII.B.2.e, and Limitation 38(g) in Section VIII.B.4.h, it is my opinion that Limitation 39(f) is

fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 79-83, 103-105, 108-110 above are incorporated here by reference and also reflect my opinions with respect to Limitation 39(f) and demonstrate that Richardson teaches Limitation 39(f).

h. Limitation 39(g): “a USB input circuit connected to the power supply, the USB input circuit configured for converting power from a USB power source to increase power voltage to the power supply; and”

120. For the same reasons I have discussed above with respect to Limitation 1(f) in Section VIII.B.2.g, it is my opinion that Limitation 39(d) is also obvious over Richardson in view of Zhao. Specifically, the opinions I have expressed above in paragraphs 84-93 above are incorporated here by reference and also reflect my opinions with respect to Limitation 39(g) and demonstrate that Richardson in view of Zhao renders Limitation 39(g) obvious.

i. Limitation 39(h): “a USB input connector configured for connecting to the USB power source and providing power input from the USB power source through the USB input connector and the USB input circuit to the power supply.”

121. For the same reasons I have discussed above with respect to Limitation 1(g) in Section VIII.B.2.h, it is my opinion that Limitation 39(h) is also obvious over Richardson in view of Zhao. Specifically, the opinions I have expressed above in paragraphs 94-95 above are incorporated here by reference and also reflect my opinions with respect to Limitation 39(h) and demonstrate that

Richardson in view of Zhao renders Limitation 39(h) obvious.

6. Independent Claim 47

- a. Claim 47 Preamble: “A jump starting device for boosting or charging a depleted or discharged battery having a positive polarity battery terminal and a negative polarity battery terminal, the jump starter device comprising:”**

122. For the same reasons I have discussed above with respect to the preamble of claim 1 in Section VIII.B.2.a, it is my opinion that the preamble of claim 47 is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 68-69 above are incorporated here by reference and also reflect my opinions with respect to the preamble of claim 47 and demonstrate that Richardson teaches the preamble of claim 47.

b. Limitation 47(a): “a power supply;”

123. For the same reasons I have discussed above with respect to Limitation 1(a) in Section VIII.B.2.b, it is my opinion that Limitation 47(a) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 70-71 above are incorporated here by reference and also reflect my opinions with respect to Limitation 47(a) and demonstrate that Richardson teaches Limitation 47(a).

- c. **Limitation 47(b): “a positive battery terminal connector for connecting the jump starter device to the positive battery terminal of the depleted or discharged battery;”**

124. For the same reasons I have discussed above with respect to Limitation 1(b) in Section VIII.B.2.c, it is my opinion that Limitation 47(b) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 72-73 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 47(b) and demonstrate that Richardson teaches Limitation 47(b).

- d. **Limitation 47(c): “a negative battery terminal connector for connecting the jump starter device to the negative battery terminal of the depleted or discharged battery;”**

125. For the same reasons I have discussed above with respect to Limitation 1(c) in Section VIII.B.2.d, it is my opinion that Limitation 47(c) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 74-75 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 47(c) and demonstrate that Richardson teaches Limitation 47(c).

- e. **Limitation 47(d): “a power switch or circuit connected in circuit with the power supply and the positive and negative battery terminal connectors,”**

126. For the same reasons I have discussed above with respect to Limitation 1(d) in Section VIII.B.2.e, it is my opinion that Limitation 47(d) is fully

disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 76-78 above are incorporated here by reference and also reflect my opinions with respect to Limitation 47(d) and demonstrate that Richardson teaches Limitation 47(d).

- f. Limitation 47(e): “the power switch configured to turn power on from the power supply to the depleted or discharged battery when connected to the positive and negative battery terminal connectors;”**

127. For the same reasons I have discussed above with respect to Limitation 1(e) in Section VIII.B.2.f, it is my opinion that Limitation 47(e) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 79-83 above are incorporated here by reference and also reflect my opinions with respect to Limitation 47(e) and demonstrate that Richardson teaches Limitation 47(e).

- g. Limitation 47(f): “a power switch control system or circuit connected to and controlling the power switch, the power switch control system or circuit configured to detect presence of the depleted or discharged battery when connected between the positive and negative battery terminal connectors and to detect correct or incorrect polarity of the depleted or discharged battery when connected between the positive and negative battery terminal connectors;”**

128. For the same reasons I have discussed above with respect to Limitation 1(e) in Section VIII.B.2.f, Limitation 38(d) in Section VIII.B.4.e, and Limitation 38(g) in Section VIII.B.4.h, it is my opinion that Limitation 47(f) is

fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 79-83, 103-105, 108-110 above are incorporated here by reference and also reflect my opinions with respect to Limitation 47(f) and demonstrate that Richardson teaches Limitation 47(f).

h. Limitation 47(g): “a USB input circuit connected to the power supply, the USB input circuit configured for converting power from a USB power source to increase power voltage to the power supply; and”

129. For the same reasons I have discussed above with respect to Limitation 1(f) in Section VIII.B.2.g, it is my opinion that Limitation 47(g) is also obvious over Richardson in view of Zhao. Specifically, the opinions I have expressed above in paragraphs 84-93 above are incorporated here by reference and also reflect my opinions with respect to Limitation 47(g) and demonstrate that Richardson in view of Zhao renders Limitation 47(g) obvious.

i. Limitation 47(h): “a USB input connector connected to the USB input circuit, the USB input connector configured for connecting to the USB power source and providing power input from the USB power source through the USB input connector and the USB input circuit to the power supply.”

130. For the same reasons I have discussed above with respect to Limitation 1(g) in Section VIII.B.2.h, it is my opinion that Limitation 47(h) is also obvious over Richardson in view of Zhao. Specifically, the opinions I have expressed above in paragraphs 94-95 above are incorporated here by reference and

also reflect my opinions with respect to Limitation 47(h) and demonstrate that Richardson in view of Zhao renders Limitation 47(h) obvious.

7. Independent Claim 52

- a. Claim 52 Preamble: “A jump starting apparatus configured for boosting or charging a depleted or discharged battery having a positive polarity battery terminal and a negative polarity battery terminal, the jump starting apparatus comprising:”**

131. For the same reasons I have discussed above with respect to the preamble of claim 1 in Section VIII.B.2.a, it is my opinion that the preamble of claim 52 is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 68-69 above are incorporated here by reference and also reflect my opinions with respect to the preamble of claim 52 and demonstrate that Richardson teaches the preamble of claim 52.

- b. Limitation 52(a): “a power supply;”**

132. For the same reasons I have discussed above with respect to Limitation 1(a) in Section VIII.B.2.b, it is my opinion that Limitation 52(a) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 70-71 above are incorporated here by reference and also reflect my opinions with respect to Limitation 52(a) and demonstrate that Richardson teaches Limitation 52(a).

- c. Limitation 52(b): “a positive polarity battery terminal connector configured for connecting the jump**

starting apparatus to the positive polarity battery terminal of the depleted or discharged battery;”

133. For the same reasons I have discussed above with respect to Limitation 1(b) in Section VIII.B.2.c, it is my opinion that Limitation 52(b) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 72-73 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 52(b) and demonstrate that Richardson teaches Limitation 52(b).

d. Limitation 52(c): “a negative polarity battery terminal connector configured for connecting the jump starting apparatus to the negative polarity battery terminal of the depleted or discharged battery;”

134. For the same reasons I have discussed above with respect to Limitation 1(c) in Section VIII.B.2.d, it is my opinion that Limitation 52(c) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 74-75 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 52(c) and demonstrate that Richardson teaches Limitation 52(c).

e. Limitation 52(d): “a power switch or circuit configured to turn on power from the power supply to the positive and negative polarity battery terminal connectors;”

135. For the same reasons I have discussed above with respect to Limitation 1(d) in Section VIII.B.2.e, it is my opinion that Limitation 52(d) is fully

disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 76-78 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 52(d) and demonstrate that Richardson teaches Limitation 52(d).

- f. Limitation 52(e): “a control system or circuit connected to and controlling the power switch, the control system or circuit configured to detect whether the positive and negative polarity battery terminal connectors have a correct polarity connection with the positive and negative polarity battery terminals of the depleted or discharged battery prior to turning on the power switch or circuit;”**

136. For the same reasons I have discussed above with respect to Limitation 1(e) in Section VIII.B.2.f, it is my opinion that Limitation 52(c) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 79-83 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 52(e) and demonstrate that Richardson teaches Limitation 52(e).

- g. Limitation 52(f): “a USB input connector configured for removably connecting to a USB power source and providing power input from the USB power source to the USB input connector; and”**

137. For the same reasons I have discussed above with respect to Limitation 1(g) in Section VIII.B.2.h, it is my opinion that Limitation 52(f) is also obvious over Richardson in view of Zhao. Specifically, the opinions I have

expressed above in paragraphs 94-95 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 52(f) and demonstrate that Richardson in view of Zhao renders Limitation 52(f) obvious.

- h. Limitation 52(g): “a USB input circuit connecting the USB input connector to the power supply, the USB input circuit comprising a DC/DC converter, the USB input circuit configured for converting power from the USB power source to increase power voltage to the power supply,”**

138. For the same reasons I have discussed above with respect to Limitation 1(f) in Section VIII.B.2.g, it is my opinion that Limitation 52(g) is also obvious over Richardson in view of Zhao. Specifically, the opinions I have expressed above in paragraphs 84-93 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 52(g) and demonstrate that Richardson in view of Zhao renders Limitation 52(g) obvious.

- i. Limitation 52(h): “wherein the DC-DC converter can be turned on and off by an output from the microcontroller.”**

139. For the same reasons I have discussed above with respect to claim 32 in Section VIII.B.3, it is my opinion that Limitation 52(h) is also obvious over Richardson in view of Zhao. Specifically, the opinions I have expressed above in paragraphs 96-98 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 52(h) and demonstrate that Richardson in view of Zhao renders Limitation 52(h) obvious.

8. Independent Claim 54

- a. **Claim 54 Preamble: “A jump starting apparatus configured for boosting or charging a depleted or discharged battery having a positive polarity battery terminal and a negative polarity battery terminal, the jump starting apparatus comprising:”**

140. For the same reasons I have discussed above with respect to the preamble of claim 1 in Section VIII.B.2.a, it is my opinion that the preamble of claim 54 is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 68-69 above are incorporated here by reference and also reflect my opinions with respect to the preamble of claim 54 and demonstrate that Richardson teaches the preamble of claim 54.

- b. **Limitation 54(a): “a power supply;”**

141. For the same reasons I have discussed above with respect to Limitation 1(a) in Section VIII.B.2.b, it is my opinion that Limitation 54(a) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 70-71 above are incorporated here by reference and also reflect my opinions with respect to Limitation 54(a) and demonstrate that Richardson teaches Limitation 54(a).

- c. **Limitation 54(b): “a positive polarity battery terminal connector configured for connecting the jump starting apparatus to the positive polarity battery terminal of the depleted or discharged battery;”**

142. For the same reasons I have discussed above with respect to

Limitation 1(b) in Section VIII.B.2.c, it is my opinion that Limitation 54(b) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 72-73 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 54(b) and demonstrate that Richardson teaches Limitation 54(b).

d. Limitation 54(c): “a negative polarity battery terminal connector configured for connecting the jump starting apparatus to the negative polarity battery terminal of the depleted or discharged battery;”

143. For the same reasons I have discussed above with respect to Limitation 1(c) in Section VIII.B.2.d, it is my opinion that Limitation 54(c) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 74-75 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 54(c) and demonstrate that Richardson teaches Limitation 54(c).

e. Limitation 54(d): “a power switch or circuit configured to turn on power from the power supply to the positive and negative polarity battery terminal connectors;”

144. For the same reasons I have discussed above with respect to Limitation 1(d) in Section VIII.B.2.e, it is my opinion that Limitation 54(d) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 76-78 above are incorporated here by reference and also reflect my

opinions with respect to the Limitation 54(d) and demonstrate that Richardson teaches Limitation 54(d).

- f. Limitation 54(e): “a control system or circuit connected to and controlling the power switch, the control system or circuit configured to detect whether the positive and negative polarity battery terminal connectors have a correct polarity connection with the positive and negative polarity battery terminals of the depleted or discharged battery and prevent an incorrect polarity connection with the positive and negative polarity battery terminals of the depleted or discharged battery prior to turning on the power switch or circuit;”**

145. For the same reasons I have discussed above with respect to Limitation 1(e) in Section VIII.B.2.f, it is my opinion that Limitation 54(e) is fully disclosed by Richardson. Specifically, the opinions I have expressed above in paragraphs 79-83 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 54(e) and demonstrate that Richardson teaches Limitation 54(e).

- g. Limitation 54(f): “a USB input connector; and”**

146. For the same reasons I have discussed above with respect to Limitation 1(g) in Section VIII.B.2.h, it is my opinion that Limitation 54(f) is also obvious over Richardson in view of Zhao. Specifically, the opinions I have expressed above in paragraphs 94-95 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 54(f) and demonstrate that

Richardson in view of Zhao renders Limitation 54(f) obvious.

- h. Limitation 54(g): “a USB input circuit connecting the USB input connector to the power supply, the USB input circuit comprising a DC/DC converter for up-converting the voltage from the USB input connector to the power supply.”**

147. For the same reasons I have discussed above with respect to Limitation 1(f) in Section VIII.B.2.g, it is my opinion that Limitation 54(g) is also obvious over Richardson in view of Zhao. Specifically, the opinions I have expressed above in paragraphs 84-93 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 54(g) and demonstrate that Richardson in view of Zhao renders Limitation 54(g) obvious.

C. Ground 2: Claims 1, 32, 38, 39, 47, 52, and 54 are unpatentable under 35 U.S.C. § 103(a) over Yu in view of Paparrizos

1. Exemplary Rationale for Combining Yu and Paparrizos

148. A PHOSITA would have found it obvious to combine the disclosures of Yu and Paparrizos. Both references involve devices with higher voltage (>5V) battery packs. 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.

149. 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.

150. Paparrizos discloses a circuit for charging electronic devices having a multicell pack of series-connected cells. EX1009, 2:32-40. Paparrizos discloses that its circuit can use 5V USB to charge higher voltage batteries. EX1009, 8:17-31.

151. 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. Additionally, Paparrizos specifically teaches the desirability of charging higher voltage batteries with a 5V input, which is a known technique that a PHOSITA would have been motivated to implement predictably to charge Yu's battery.

152. I provide more detail regarding my opinions as applied to specific claims and limitations below.

2. Independent Claim 1

- a. **Claim 1 Preamble: "A jump starting apparatus configured for boosting or charging a depleted or discharged battery having a positive polarity battery terminal and a negative polarity battery terminal, the jump starting apparatus comprising:"**

153. Yu discloses a jump starting apparatus. 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 having a discharged battery. EX1008 at ¶ [0004], Fig. 1 (the “output terminal” is identified in the figure as reference numeral 3). Yu describes that 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. Yu, 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).

b. Limitation 1(a): “a power supply;”

154. 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”, which indicates the internal battery is a multicell battery pack of series-connected cells with an output voltage of approximately 12V. EX1008, ¶ [0026].

c. Limitation 1(b): “a positive polarity battery terminal connector configured for connecting the jump starting apparatus to the positive polarity battery terminal of the depleted or discharged battery;”

155. Yu discloses “wiring” (also referred to as “external battery wiring” or “output terminal 3 wiring”) which includes a positive polarity terminal connector as claimed. EX1008, Abstract, claim 1, ¶¶ [0004], [0021], [0026]. Figure

8 depicts output terminal 3 as a receptable 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. The '023 patent admits that such cables (and associated terminals, clamps or other connectors) were known in the prior art. EX1001 at 1:10-16 (“Prior art devices are known, which provide either a pair of electrical connector cables ... or portable booster devices which include a fully-charged battery which can be connected in circuit with the vehicle’s engine starter through a pair of cables”); EX1001 at 1:17-24, 1:31-35. Thus, a PHOSITA would understand that Yu’s wiring for connecting the device to a vehicle battery discloses or renders obvious a positive polarity battery terminal connector as claimed, particularly in light of Yu’s emphasis on correct polarity versus reverse (or wrong) polarity connections. This indicates that there is both a positive polarity connector (and separately a negative polarity connector). EX1008, Abstract, ¶¶ [0002], [0003], [0008], [0026]; Fig. 2.

d. Limitation 1(c): “a negative polarity battery terminal connector configured for connecting the jump starting apparatus to the negative polarity battery terminal of the depleted or discharged battery;”

156. Yu discloses “wiring” as discussed in the previous section, which is incorporated here by reference. Specifically, Yu’s disclosure of wiring, the output terminal 3, and related discussions of polarity further demonstrate that Yu discloses or renders obvious a negative polarity battery terminal connector as

claimed. EX1008, Abstract, ¶¶ [0002], [0003], [0004], [0008], [0021], [0026].

- e. **Limitation 1(d): “a power switch or circuit configured to turn on power from the power supply to the positive and negative polarity battery terminal connectors;”**

157. Yu discloses a “relay” which functions as a power switch or circuit configured to turn on power as claimed. EX1008, Abstract, claim 1, ¶ [0004], [0009], [0021], Fig. 1, Fig. 2. For example, Yu discloses a control module with a microcontroller 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 that 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].

- f. **Limitation 1(e): “a control system or circuit connected to and controlling the power switch, the control system or circuit configured to detect whether the positive and negative polarity battery terminal connectors have a correct polarity connection with the positive and negative polarity battery terminals of the depleted or discharged battery prior to turning on the power switch or circuit;”**

158. Yu discloses a control system or circuit connected to and controlling the relay. Specifically, the system comprised of the control module, microcontroller, and associated sensors or circuitry constitutes the control system or circuit as claimed. EX1008, Abstract, claim 1, claim 3, [0004], [0006], [0021],

[0023], [0026], [0027], FIG. 1, FIG. 2. For example, when the vehicle battery is connected with the wrong polarity, Yu's device prevents the relay from closing. EX1008, Abstract. This is achieved through a battery reverse connection detection circuit which provides a signal to the microcontroller indicating whether there is a correct or incorrect polarity connection. EX1008, claim 1, [0003], [0004], [0009], [0021], [0026]; FIG. 1 (identifying "External battery reverse connection detection circuit" as reference numeral 44).

159. 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. EX1008, FIG. 2. Yu's optocoupler is the same type of component that the '023 patent discloses as part of the polarity detection feature. EX1001 at 5:27-30 (The reverse battery sensor 10 comprises an optically coupled isolator phototransistor (4N27) connected to the terminal of vehicle battery 72[.]"); EX1001 at 5:32-36 (explaining that "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.").

g. Limitation 1(f): "a USB input circuit connected to the power supply, the USB input circuit configured for converting power from a USB power source to increase power voltage to the power supply; and"

160. Yu discloses that 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 explicitly disclose 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. Specifically, Paparrizos teaches a USB input circuit as claimed which a PHOSITA would be motivated to combine to Yu's device to either (1) replace the charging circuitry, or (2) provide additional charging circuitry to enable an alternate means to charge Yu's device from a USB power source. Either option would provide desirable features or improvements to Yu's jump starter. For example, option (1) 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, although some USB chargers rated to provide lower current levels would result in longer charging times. While option (2) would result in a slight increase in cost for including an additional input connector and DC-DC conversion circuitry alongside the existing input and circuitry in Yu'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. 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 below.

161. For example, Paparrizos discloses a battery charging circuit which can operate in either “forward mode” or “reverse mode.” EX1009, 3:2-21; Fig. 5; Fig. 6,. In forward mode, the input voltage is processed by the buck-boost converter to match (usually step-up) the voltage to that of the battery to be charged. EX1009 at 1:34-38, 3:2-21, Fig. 1B, Fig. 1C. Paparrizos discloses battery charging circuit 100 and related components which connect to and charge battery 14. EX1009 at 2:30-40. The battery can be 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. EX1009 at 2:30-40. Paparrizos further contemplates that the charger input circuit is an USB input circuit whereby power is received from a USB source. EX1009 at 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).

162. As discussed above, the power transfer and voltage conversion capability of Paparrizos allows it to operate in a mode in which “[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.”).

163. Also, 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 at 3:31-35 and 1:34-39. 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 at 3:58-4:4. Thus, a PHOSITA would understand Paparrizos as disclosing 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. EX1009 at 3:58-4:4; 2:31-38 (discussing application to 3S stack of series connected cells); 8:10-30 (discussing use of forward boost mode to use a 5V USB input to charge a 3S battery which outputs 12V); 9:36-46 (discussing operation and components of boost converter).

164. A PHOSITA would have found it obvious to implement the battery charging circuit of Paparrizos in Yu’s device. For example, Paparrizos identifies a need for using “very popular” USB technology for charging multicell battery packs rated above 5V. EX1009 at 1:18-26. Paparrizos goes on to provide an explicit

teaching, suggestion, or motivation to implement its battery charging circuit in a device that has batteries that can output 12V, like Yu's jump starter. EX1009 at 2:32-38; 8:18-31. As another example, outside the explicit teachings of Paparrizos, the desirability of 5V USB charging of devices with batteries that have a nominal voltage of 5V was well-known to a PHOSITA before the claimed priority date, as previously noted in connection with my discussion of Limitation 1(f) in Ground 1 which is incorporated here by reference as to the discussion of the desirability and predictability of USB. And a PHOSITA would have found the combination of Paparrizos' battery charging circuit in Yu's device to add DC-DC boosting techniques that Paparrizos explicitly recognizes as prior art. EX1009 at 9:36-46, FIG. 8A (identifying a "Basic Boost Converter Circuit" as "prior art").

- h. Limitation 1(g): "a USB input connector connected to the USB input circuit, the USB input connector configured for connecting to the USB power source and providing power input from the USB power source through the USB input connector and the USB input circuit to the power supply."**

165. 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 IC, a PHOSITA would have found it obvious to combine the relevant disclosure of Paparrizos's USB-powered device with Yu's device in order to implement a USB charging feature for the device. USB

technology was highly popular and provided desirable benefits such as avoiding proprietary chargers through universal chargers, cables, and connectors and other convenience such as ease of use and durability. Thus, a PHOSITA would have been motivated to cater to this actual or perceived popularity of USB. Moreover, Paparrizos provides the explicit teaching, suggestion, or motivation to implement a USB connector (e.g. a USB input connector as claimed) on a device for purposes of USB charging. EX1009 at 1:18-23 (“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.”).

166. For example, when implementing the USB input circuit of Paparrizos as discussed in connection with Limitation 1(f) above, a PHOSITA would have understood the need to add a USB receptable, such as a micro-USB or other version of USB connector, to Yu’s device as taught by Paparrizos. EX1009 at 2:56-63; Fig. 1B (identifying USB connector 16b); Fig. 1C (identifying micro-USB connector 16c). 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. 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 at 2:59-67; 3:1-

6; 4:36-39.

3. Claim 32: “The apparatus according to claim 1, wherein the DC-DC converter can be turned on and off by a microprocessor.”

167. Paparrizos explicitly teaches that buck-boost circuit 212 is used as a DC-DC converter to increase the 5V USB level to the nominal voltage required to recharge a higher voltage battery. EX1009 at 4:45-46; 7:7-10; 8:10-31; 9:10-46. Figure 5 of Paparrizos discloses a “workflow” which a PHOSITA would understand to be best implemented by a microprocessor/microcontroller. EX1009, FIG. 5. Otherwise, a PHOSITA would need to implement various configurations in hardware which are not explicitly described in Paparrizos for performing the workflow of Figure 5. Additionally, a PHOSITA would understand that a microprocessor/microcontroller would be one of the most effective, reliable, and cost-effective choice for implementing control of the ON/OFF state of the buck boost circuit 212. EX1009, FIG. 6. Accordingly, Paparrizos teaches or renders obvious the use of a buck-boost step-up converter that can be turned on and off by a microprocessor or microcontroller.

168. A PHOSITA would have been motivated to implement this feature of Paparrizos in the USB charging circuitry combined with Yu as discussed above in connection with Limitation 1(f). Additionally, microprocessor control of the ON/OFF state of the boost converter allows the device to save power by disabling

the DC-DC boosting feature when charging through the USB input circuit is terminated. A PHOSITA would have a reasonable expectation of success in implementing this feature as signal control of switches is a basic and predictable technique.

169. Yu, in view of Paparrizos, therefore renders obvious every element of claim 32.

4. Independent Claim 38

- a. Claim 38 Preamble: “A jump starting apparatus for boosting or charging a depleted or discharged battery having a positive polarity battery terminal and a negative polarity battery terminal, the jump starting apparatus comprising:”**

170. For the same reasons I have discussed above with respect to the preamble of claim 1 in Section VIII.C.2.a, it is my opinion that the preamble of claim 38 is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 153 above is incorporated here by reference and also reflects my opinions with respect to the preamble of claim 38 and demonstrate that Yu teaches the preamble of claim 38.

- b. Limitation 38(a): “a power supply;”**

171. For the same reasons I have discussed above with respect to Limitation 1(a) in Section VIII.C.2.b, it is my opinion that Limitation 38(a) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 154 above is incorporated here by reference and also reflects my opinions with

respect to Limitation 38(a) and demonstrate that Yu teaches Limitation 38(a).

- c. **Limitation 38(b): “a positive polarity battery terminal connector configured for connecting the jump starting apparatus to the positive polarity terminal of the depleted or discharged battery;”**

172. For the same reasons I have discussed above with respect to Limitation 1(b) in Section VIII.C.2.c, it is my opinion that Limitation 38(b) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 155 above is incorporated here by reference and also reflects my opinions with respect to Limitation 38(b) and demonstrate that Yu teaches Limitation 38(b).

- d. **Limitation 38(c): “a negative polarity battery terminal connector configured for connecting the jump starting apparatus to the negative polarity terminal of the depleted or discharged battery;”**

173. For the same reasons I have discussed above with respect to Limitation 1(c) in Section VIII.C.2.d, it is my opinion that Limitation 38(c) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 156 above is incorporated here by reference and also reflects my opinions with respect to Limitation 38(c) and demonstrate that Yu teaches Limitation 38(c).

- e. **Limitation 38(d): “a battery presence sensor or circuit connected in circuit with the positive polarity battery terminal connector and the negative polarity battery terminal connector;”**

174. Yu discloses a control system which includes a battery presence sensor or circuit as claimed. Specifically, Yu discloses that its control system also

detects whether a battery is present (i.e. connected) or absent (i.e., disconnected) by detecting the voltage of an external battery when it is connected to the device. EX1008, claim 3, ¶¶ [0006], [0009], [0023], [0026], [0027], Fig. 1, Fig. 2. This battery detection is achieved through the microprocessor receiving a signal from the external battery voltage detection circuit which conveys information regarding the detected voltage. EX1008, ¶¶ [0006], [0009], [0026], Fig. 1, Fig. 2. Yu's battery presence sensor is separate from its reverse polarity sensor or circuit. EX1008, ¶¶ [0006], [0009], [0026], Fig. 1, Fig. 2. Yu discloses an example of an external battery detection circuit 45 which includes a voltage divider that provides the "OUT-CHECK" output signal. EX1008, FIG. 2.

175. To the extent Patent Owner argues that Yu does not disclose a battery presence sensor or circuit as claimed (or otherwise argues that Yu lacks a control system or circuit configured to detect presence of a vehicle battery when such battery is connected to the jump starter), it would have been trivial and within the general knowledge of a PHOSITA to program Yu's microprocessor to detect battery presence based upon the OUT-CHECK signal received from external battery detection circuit 45. Specifically, a PHOSITA would have been motivated to program the microprocessor/microcontroller of Yu's device to treat the OUT-CHECK signal as indicative of the absence or presence of a vehicle battery by correlating the signal to predetermined thresholds. For example, after accounting

for the selected resistor values for R70 and R72, if the OUT-CHECK signal indicates that no voltage has been detected or a voltage near 0 volts have been detected, the microprocessor/microcontroller would be programmed to make the make the determination that no battery is connected to the device. Similarly, if a voltage is detected by the external battery voltage detection circuit at or above a predetermined threshold (for example, 1V), the microprocessor/microcontroller would be programmed to determine that an external battery is present and connected to the device. This is further corroborated by Yu's disclosure of the feature of preventing "generation of electric sparks when connecting or disconnecting from the vehicle" which indicates to a PHOSITA that the microprocessor would be programmed to make the determination of whether a battery is present to the wiring of Yu's device before energizing the connections to the vehicle battery terminals. EX1008, ¶¶ [0003], [0009], [0026]. A PHOSITA would have been motivated to implement these changes to Yu's device by programming the microprocessor accordingly in view of a PHOSITA's general knowledge in order to obtain the desirable benefit of enhancing safety and avoiding generation of sparks as described by Yu. A PHOSITA would have made such modifications with predictable results as programming a microprocessor to compare values indicative of voltage against thresholds written into the microprocessor's programming, would allow the microprocessor to predictably

determine whether a voltage indicative of battery presence has been detected by the control system.

- f. **Limitation 38(e): “a reverse polarity sensor or circuit connected in circuit with the positive polarity battery terminal connector and the negative polarity terminal connector;”**

176. For the same reasons I have discussed above with respect to Limitation 1(e) in Section VIII.C.2.f, it is my opinion that Limitation 38(e) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraphs 158-159 above are incorporated here by reference and also reflect my opinions with respect to Limitation 38(e) and demonstrate that Yu teaches Limitation 38(e).

- g. **Limitation 38(f): “a power switch or circuit connected or connectable in circuit with the power supply and the positive and negative polarity battery terminal connectors;”**

177. For the same reasons I have discussed above with respect to Limitation 1(d) in Section VIII.C.2.e, it is my opinion that Limitation 38(f) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 157 above is incorporated here by reference and also reflects my opinions with respect to Limitation 38(f) and demonstrate that Yu teaches Limitation 38(f).

- h. **Limitation 38(g): “a microcontroller configured to receive input signals provided by the battery presence sensor or circuit and the reverse polarity sensor or circuit, the microcontroller configured to provide an output signal to control the power switch,”**

178. For the same reasons I have discussed above with respect to

Limitation 1(e) in Section VIII.C.2.f and Limitation 38(d) in Section VIII.C.4.e, it is my opinion that Limitation 38(g) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraphs 158-159, 174-175 above are incorporated here by reference and also reflect my opinions with respect to Limitation 38(g) and demonstrate that Yu teaches Limitation 38(g).

179. To the extent NOCO argues this Limitation requires separate or distinct signals from a battery presence sensor and a reverse polarity sensor (or otherwise requires separate or distinct signals indicating battery presence and polarity), Yu discloses separate signals and separate sensors for detecting battery presence and polarity. EX1008, Fig. 1, Fig. 2, claim 1, claim 3, ¶¶ [0004], [0006], [0009], [0026].

i. Limitation 38(h): “a USB input circuit connected to the power supply, the USB input circuit configured for converting power from a USB power source to increase power voltage to the power supply; and”

180. For the same reasons I have discussed above with respect to Limitation 1(f) in Section VIII.C.2.g, it is my opinion that Limitation 38(h) is also obvious over Yu in view of Paparrizos. Specifically, the opinions I have expressed above in paragraphs 160-164 above are incorporated here by reference and also reflect my opinions with respect to Limitation 38(h) and demonstrate that Yu in view of Paparrizos renders Limitation 38(h) obvious.

- j. **Limitation 38(i): “a USB input connector connected to the USB input circuit, the USB input connector configured for connecting to the USB power source and providing power input from the USB power source through the USB input connector and the USB input circuit to the power supply.”**

181. For the same reasons I have discussed above with respect to Limitation 1(g) in Section VIII.C.2.h, it is my opinion that Limitation 38(i) is also obvious over Yu in view of Paparrizos. Specifically, the opinions I have expressed above in paragraphs 165-166 above are incorporated here by reference and also reflect my opinions with respect to Limitation 38(i) and demonstrate that Yu in view of Paparrizos renders Limitation 38(i) obvious.

5. Independent Claim 39

- a. **Claim 39 Preamble: “A jump starting device for boosting or charging a depleted or discharged battery having a positive polarity battery terminal and a negative polarity battery terminal, the jump starter device comprising:”**

182. For the same reasons I have discussed above with respect to the preamble of claim 1 in Section VIII.C.2.a, it is my opinion that the preamble of claim 39 is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 153 above is incorporated here by reference and also reflects my opinions with respect to the preamble of claim 39 and demonstrate that Yu teaches the preamble of claim 39.

b. Limitation 39(a): “a power supply;”

183. For the same reasons I have discussed above with respect to Limitation 1(a) in Section VIII.C.2.b, it is my opinion that Limitation 39(a) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 154 above is incorporated here by reference and also reflects my opinions with respect to Limitation 39(a) and demonstrate that Yu teaches Limitation 39(a).

c. Limitation 39(b): “a positive battery terminal connector for connecting the jump starter device to the positive battery terminal of the depleted or discharged battery;”

184. For the same reasons I have discussed above with respect to Limitation 1(b) in Section VIII.C.2.c, it is my opinion that Limitation 39(b) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 155 above is incorporated here by reference and also reflects my opinions with respect to Limitation 39(b) and demonstrate that Yu teaches Limitation 39(b).

d. Limitation 39(c): “a negative battery terminal connector for connecting the jump starter device to the negative battery terminal of the depleted or discharged battery;”

185. For the same reasons I have discussed above with respect to Limitation 1(c) in Section VIII.C.2.d, it is my opinion that Limitation 39(c) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 156 above is incorporated here by reference and also reflects my opinions with respect to Limitation 39(c) and demonstrate that Yu teaches Limitation 39(c).

- e. **Limitation 39(d): “a power switch or circuit connected in circuit with the power supply and the positive and negative battery terminal connectors,”**

186. For the same reasons I have discussed above with respect to Limitation 1(d) in Section VIII.C.2.e, it is my opinion that Limitation 39(d) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 157 above is incorporated here by reference and also reflects my opinions with respect to Limitation 39(d) and demonstrate that Yu teaches Limitation 39(d).

- f. **Limitation 39(e): “the power switch configured to turn power on from the power supply to the depleted or discharged battery when the positive and negative battery terminal connectors are properly connected to the positive and negative battery connectors;”**

187. For the same reasons I have discussed above with respect to Limitation 1(e) in Section VIII.C.2.f, it is my opinion that Limitation 39(e) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraphs 158-159 above are incorporated here by reference and also reflect my opinions with respect to Limitation 39(e) and demonstrate that Yu teaches Limitation 39(e).

- g. **Limitation 39(f): “a power switch control system or circuit connected to and controlling the power switch, the power switch control system or circuit configured to detect presence of the depleted or discharged battery when connected between the positive and negative battery terminal connectors and to detect polarity of the depleted or discharged battery when connected between the positive and negative battery terminal connectors”**

188. For the same reasons I have discussed above with respect to

Limitation 1(e) in Section VIII.C.2.f, Limitation 38(d) in Section VIII.C.4.e, and Limitation 38(g) in Section VIII.C.4.h, it is my opinion that Limitation 39(f) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraphs 158-159, 174-175, 178-179 above are incorporated here by reference and also reflect my opinions with respect to Limitation 39(f) and demonstrate that Yu teaches Limitation 39(f).

h. Limitation 39(g): “a USB input circuit connected to the power supply, the USB input circuit configured for converting power from a USB power source to increase power voltage to the power supply; and”

189. For the same reasons I have discussed above with respect to Limitation 1(f) in Section VIII.C.2.g, it is my opinion that Limitation 39(d) is also obvious over Yu in view of Paparrizos. Specifically, the opinions I have expressed above in paragraphs 160-164 above are incorporated here by reference and also reflect my opinions with respect to Limitation 39(g) and demonstrate that Yu in view of Paparrizos renders Limitation 39(g) obvious.

i. Limitation 39(h): “a USB input connector configured for connecting to the USB power source and providing power input from the USB power source through the USB input connector and the USB input circuit to the power supply.”

190. For the same reasons I have discussed above with respect to Limitation 1(g) in Section VIII.C.2.h, it is my opinion that Limitation 39(h) is also obvious over Yu in view of Paparrizos. Specifically, the opinions I have expressed

above in paragraphs 165-166 above are incorporated here by reference and also reflect my opinions with respect to Limitation 39(h) and demonstrate that Yu in view of Paparrizos renders Limitation 39(h) obvious.

6. Independent Claim 47

- a. Claim 47 Preamble: “A jump starting device for boosting or charging a depleted or discharged battery having a positive polarity battery terminal and a negative polarity battery terminal, the jump starter device comprising:”**

191. For the same reasons I have discussed above with respect to the preamble of claim 1 in Section VIII.C.2.a, it is my opinion that the preamble of claim 47 is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 153 above is incorporated here by reference and also reflects my opinions with respect to the preamble of claim 47 and demonstrate that Yu teaches the preamble of claim 47.

- b. Limitation 47(a): “a power supply;”**

192. For the same reasons I have discussed above with respect to Limitation 1(a) in Section VIII.C.2.b, it is my opinion that Limitation 47(a) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 154 above is incorporated here by reference and also reflects my opinions with respect to Limitation 47(a) and demonstrate that Yu teaches Limitation 47(a).

- c. Limitation 47(b): “a positive battery terminal connector for connecting the jump starter device to**

the positive battery terminal of the depleted or discharged battery;”

193. For the same reasons I have discussed above with respect to Limitation 1(b) in Section VIII.C.2.c, it is my opinion that Limitation 47(b) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 155 above is incorporated here by reference and also reflects my opinions with respect to Limitation 47(b) and demonstrate that Yu teaches Limitation 47(b).

d. Limitation 47(c): “a negative battery terminal connector for connecting the jump starter device to the negative battery terminal of the depleted or discharged battery;”

194. For the same reasons I have discussed above with respect to Limitation 1(c) in Section VIII.C.2.d, it is my opinion that Limitation 38(b) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 156 above is incorporated here by reference and also reflects my opinions with respect to Limitation 47(c) and demonstrate that Yu teaches Limitation 47(c).

e. Limitation 47(d): “a power switch or circuit connected in circuit with the power supply and the positive and negative battery terminal connectors,”

195. For the same reasons I have discussed above with respect to Limitation 1(d) in Section VIII.C.2.e, it is my opinion that Limitation 47(d) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 157 above is incorporated here by reference and also reflects my opinions with respect to Limitation 47(d) and demonstrate that Yu teaches Limitation 47(d).

- f. Limitation 47(e): “the power switch configured to turn power on from the power supply to the depleted or discharged battery when connected to the positive and negative battery terminal connectors;”**

196. For the same reasons I have discussed above with respect to Limitation 1(e) in Section VIII.C.2.f, it is my opinion that Limitation 47(e) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraphs 158-159 above are incorporated here by reference and also reflect my opinions with respect to Limitation 47(e) and demonstrate that Yu teaches Limitation 47(e).

- g. Limitation 47(f): “a power switch control system or circuit connected to and controlling the power switch, the power switch control system or circuit configured to detect presence of the depleted or discharged battery when connected between the positive and negative battery terminal connectors and to detect correct or incorrect polarity of the depleted or discharged battery when connected between the positive and negative battery terminal connectors;”**

197. For the same reasons I have discussed above with respect to Limitation 1(e) in Section VIII.C.2.f, Limitation 38(d) in Section VIII.C.4.e, and Limitation 38(g) in Section VIII.C.4.h, it is my opinion that Limitation 47(f) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraphs 158-159, 174-175, 178-179 above are incorporated here by reference and also reflect my opinions with respect to Limitation 47(f) and demonstrate that Yu teaches Limitation 47(f).

- h. Limitation 47(g): “a USB input circuit connected to the power supply, the USB input circuit configured for converting power from a USB power source to increase power voltage to the power supply; and”**

198. For the same reasons I have discussed above with respect to Limitation 1(f) in Section VIII.C.2.g, it is my opinion that Limitation 47(g) is also obvious over Yu in view of Paparrizos. Specifically, the opinions I have expressed above in paragraphs 160-164 above are incorporated here by reference and also reflect my opinions with respect to Limitation 47(g) and demonstrate that Yu in view of Paparrizos renders Limitation 47(g) obvious.

- i. Limitation 47(h): “a USB input connector connected to the USB input circuit, the USB input connector configured for connecting to the USB power source and providing power input from the USB power source through the USB input connector and the USB input circuit to the power supply.”**

199. For the same reasons I have discussed above with respect to Limitation 1(g) in Section VIII.C.2.h, it is my opinion that Limitation 47(h) is also obvious over Yu in view of Paparrizos. Specifically, the opinions I have expressed above in paragraphs 165-166 above are incorporated here by reference and also reflect my opinions with respect to Limitation 47(h) and demonstrate that Yu in view of Paparrizos renders Limitation 47(h) obvious.

7. Independent Claim 52

- a. Claim 52 Preamble: “A jump starting apparatus configured for boosting or charging a depleted or discharged battery having a positive polarity battery**

terminal and a negative polarity battery terminal, the jump starting apparatus comprising:”

200. For the same reasons I have discussed above with respect to the preamble of claim 1 in Section VIII.C.2.a, it is my opinion that the preamble of claim 52 is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 153 above is incorporated here by reference and also reflects my opinions with respect to the preamble of claim 52 and demonstrate that Yu teaches the preamble of claim 52.

b. Limitation 52(a): “a power supply;”

201. For the same reasons I have discussed above with respect to Limitation 1(a) in Section VIII.C.2.b, it is my opinion that Limitation 52(a) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 154 above is incorporated here by reference and also reflects my opinions with respect to Limitation 52(a) and demonstrate that Yu teaches Limitation 52(a).

c. Limitation 52(b): “a positive polarity battery terminal connector configured for connecting the jump starting apparatus to the positive polarity battery terminal of the depleted or discharged battery;”

202. For the same reasons I have discussed above with respect to Limitation 1(b) in Section VIII.C.2.c, it is my opinion that Limitation 52(b) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 155 above is incorporated here by reference and also reflects my opinions with respect to Limitation 52(b) and demonstrate that Yu teaches Limitation 52(b).

- d. Limitation 52(c): “a negative polarity battery terminal connector configured for connecting the jump starting apparatus to the negative polarity battery terminal of the depleted or discharged battery;”**

203. For the same reasons I have discussed above with respect to Limitation 1(c) in Section VIII.C.2.d, it is my opinion that Limitation 52(c) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 156 above is incorporated here by reference and also reflects my opinions with respect to Limitation 52(c) and demonstrate that Yu teaches Limitation 52(c).

- e. Limitation 52(d): “a power switch or circuit configured to turn on power from the power supply to the positive and negative polarity battery terminal connectors;”**

204. For the same reasons I have discussed above with respect to Limitation 1(d) in Section VIII.C.2.e, it is my opinion that Limitation 52(d) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 157 above is incorporated here by reference and also reflects my opinions with respect to the Limitation 52(d) and demonstrate that Yu teaches Limitation 52(d).

- f. Limitation 52(e): “a control system or circuit connected to and controlling the power switch, the control system or circuit configured to detect whether the positive and negative polarity battery terminal connectors have a correct polarity connection with the positive and negative polarity battery terminals of the depleted or discharged battery prior to turning on the power switch or circuit;”**

205. For the same reasons I have discussed above with respect to

Limitation 1(e) in Section VIII.C.2.f, it is my opinion that Limitation 52(c) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraphs 158-159 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 52(e) and demonstrate that Yu teaches Limitation 52(e).

- g. Limitation 52(f): “a USB input connector configured for removably connecting to a USB power source and providing power input from the USB power source to the USB input connector; and”**

206. For the same reasons I have discussed above with respect to Limitation 1(g) in Section VIII.C.2.h, it is my opinion that Limitation 52(f) is also obvious over Yu in view of Paparrizos. Specifically, the opinions I have expressed above in paragraphs 165-166 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 52(f) and demonstrate that Yu in view of Paparrizos renders Limitation 52(f) obvious.

- h. Limitation 52(g): “a USB input circuit connecting the USB input connector to the power supply, the USB input circuit comprising a DC/DC converter, the USB input circuit configured for converting power from the USB power source to increase power voltage to the power supply,”**

207. For the same reasons I have discussed above with respect to Limitation 1(f) in Section VIII.C.2.g, it is my opinion that Limitation 52(g) is also obvious over Yu in view of Paparrizos. Specifically, the opinions I have expressed

above in paragraphs 160-164 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 52(g) and demonstrate that Yu in view of Paparrizos renders Limitation 52(g) obvious.

i. Limitation 52(h): “wherein the DC-DC converter can be turned on and off by an output from the microcontroller.”

208. For the same reasons I have discussed above with respect to claim 32 in Section VIII.C.3, it is my opinion that Limitation 52(h) is also obvious over Yu in view of Paparrizos. Specifically, the opinions I have expressed above in paragraphs 167-169 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 52(h) and demonstrate that Yu in view of Paparrizos renders Limitation 52(h) obvious.

8. Independent Claim 54

a. Claim 54 Preamble: “A jump starting apparatus configured for boosting or charging a depleted or discharged battery having a positive polarity battery terminal and a negative polarity battery terminal, the jump starting apparatus comprising:”

209. For the same reasons I have discussed above with respect to the preamble of claim 1 in Section VIII.C.2.a, it is my opinion that the preamble of claim 54 is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 153 above is incorporated here by reference and also reflects my opinions with respect to the preamble of claim 54 and demonstrate that Yu teaches the preamble of claim 54.

b. Limitation 54(a): “a power supply;”

210. For the same reasons I have discussed above with respect to Limitation 1(a) in Section VIII.C.2.b, it is my opinion that Limitation 54(a) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 154 above is incorporated here by reference and also reflects my opinions with respect to Limitation 54(a) and demonstrate that Yu teaches Limitation 54(a).

c. Limitation 54(b): “a positive polarity battery terminal connector configured for connecting the jump starting apparatus to the positive polarity battery terminal of the depleted or discharged battery;”

211. For the same reasons I have discussed above with respect to Limitation 1(b) in Section VIII.C.2.c, it is my opinion that Limitation 54(b) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 155 above is incorporated here by reference and also reflects my opinions with respect to Limitation 54(b) and demonstrate that Yu teaches Limitation 54(b).

d. Limitation 54(c): “a negative polarity battery terminal connector configured for connecting the jump starting apparatus to the negative polarity battery terminal of the depleted or discharged battery;”

212. For the same reasons I have discussed above with respect to Limitation 1(c) in Section VIII.C.2.d, it is my opinion that Limitation 54(c) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 156 above is incorporated here by reference and also reflects my opinions with

respect to Limitation 54(c) and demonstrate that Yu teaches Limitation 54(c).

- e. **Limitation 54(d): “a power switch or circuit configured to turn on power from the power supply to the positive and negative polarity battery terminal connectors;”**

213. For the same reasons I have discussed above with respect to Limitation 1(d) in Section VIII.C.2.e, it is my opinion that Limitation 54(d) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraph 157 above is incorporated here by reference and also reflects my opinions with respect to the Limitation 54(d) and demonstrate that Yu teaches Limitation 54(d).

- f. **Limitation 54(e): “a control system or circuit connected to and controlling the power switch, the control system or circuit configured to detect whether the positive and negative polarity battery terminal connectors have a correct polarity connection with the positive and negative polarity battery terminals of the depleted or discharged battery and prevent an incorrect polarity connection with the positive and negative polarity battery terminals of the depleted or discharged battery prior to turning on the power switch or circuit;”**

214. For the same reasons I have discussed above with respect to Limitation 1(e) in Section VIII.C.2.f, it is my opinion that Limitation 54(e) is fully disclosed by Yu. Specifically, the opinions I have expressed above in paragraphs 158-159 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 54(e) and demonstrate that Yu teaches Limitation 54(e).

g. Limitation 54(f): “a USB input connector; and”

215. For the same reasons I have discussed above with respect to Limitation 1(g) in Section VIII.C.2.h, it is my opinion that Limitation 54(f) is also obvious over Yu in view of Paparrizos. Specifically, the opinions I have expressed above in paragraphs 165-166 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 54(f) and demonstrate that Yu in view of Paparrizos renders Limitation 54(f) obvious.

h. Limitation 54(g): “a USB input circuit connecting the USB input connector to the power supply, the USB input circuit comprising a DC/DC converter for up-converting the voltage from the USB input connector to the power supply.”

216. For the same reasons I have discussed above with respect to Limitation 1(f) in Section VIII.C.2.g, it is my opinion that Limitation 54(g) is also obvious over Yu in view of Paparrizos. Specifically, the opinions I have expressed above in paragraphs 160-164 above are incorporated here by reference and also reflect my opinions with respect to the Limitation 54(g) and demonstrate that Yu in view of Paparrizos renders Limitation 54(g) obvious.

IX. CONCLUSION

217. For these reasons, it is my opinion that claims 1, 32, 38, 39, 47, 52, and 54 the '023 patent are unpatentable.

* * *

I understand that this declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also understand that I may be subject to cross-examination concerning this declaration, and I will appear for cross-examination, if required of me, during the time allotted for cross-examination.

I hereby declare that all of the statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Executed on this 15th day of February, 2024.



C. Arthur MacCarley, Ph.D., P.E.