

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DELTRAN USA LLC
Petitioner

v.

THE NOCO COMPANY
Patent Owner

Patent No. 11,667,203
Issue Date: June 6, 2023

Title: PORTABLE VEHICLE BATTERY JUMP START APPARATUS WITH
SAFETY PROTECTION

Inter Partes Review No. IPR2024-01219

**DECLARATION OF C. ARTHUR MACCARLEY, Ph.D., P.E. IN
SUPPORT OF PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT NO. 11,667,203**

UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. § 42

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1. I, C. Arthur MacCarley, offer this declaration in support of the Petition for *Inter Partes* Review of U.S. Patent No. 11,667,203 (“the ’203 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.

I. 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 my 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 my 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 '203 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, tenured since 1994, and continued teaching part time at Cal Poly throughout 2022. 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 the International Summer School program at the Munich University of Applied Sciences (Hochschule München, HM), which I have done every summer since 2014, and I 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. My research activities include funded

research projects on electric vehicle battery systems and automated battery exchange and on 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 continue to consult in forensic automotive electronics. I have served as an expert witness in 21 litigated cases since 1999.

10. Based 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 '203 patent at issue here, and I have been an expert in this field since before the '203 patent was effectively 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 "POSITA") would have understood and used the terminology found in the '203 patent at the time of its claimed priority date.

B. Engagement

11. I have been retained as an independent expert consultant by Deltran Corp. ("Petitioner") in connection with a petition for *inter partes* review of the '203 patent [Ex. 1001].

12. I have been asked to investigate and opine on the technology claimed in, and the patentability or unpatentability of certain claims of, the '203 Patent, enumerated below.

13. Although I am being compensated for my services in this matter at my standard consulting rate of \$400 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 and/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. Unless I specifically state otherwise, all the opinions stated in this report are based on my own personal knowledge and professional judgment.

II. MATERIALS CONSIDERED

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

Ex #	Exhibit Description
1001	U.S. Patent No. 11,667,203 (“the ’203 patent”)
1002	Prosecution History of the ’203 patent
1003	[INTENTIONALLY BLANK]

Ex #	Exhibit Description
1004	<i>Curriculum Vitae</i> for C. Arthur MacCarley
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”)
1010	U.S. Patent Publication No. 2004/0130298 A1 to Krieger et al. (“Krieger”)
1011	U.S. Patent Publication No. 2013/0241488 A1 to Dao (“Dao”)
1012	Carku Product Brochure for the Epower-20 jump starter product (“Epower-20”)
1013	Carku Product Brochure for the Epower-21 jump starter product (“Epower-21”)
1014	IPR2020-00944 Exhibit 1022 – Declaration of Xingliang (Leon) Lei
1015	IPR2020-00944 Exhibit 2024 – Transcript of Deposition of Xingliang (Leon) Lei
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.”)

Ex #	Exhibit Description
1025	Battery Charging Specification, Revision 1.0, Mar. 8, 2007, from the Universal Serial Bus Implementers Forum (“USB-IF”), Ex. D to Ravenscraft Decl.
1026	Transcript of Deposition of Bryan A. Legates, dated September 25, 2023 (“Legates Dep. Tr.”)
1027	Bryan Legates, “Current-Limited DC/DC Converter Simplifies USB Power Supplies,” LINEAR TECHNOLOGY MAGAZINE, (Feb. 1, 2001),
1028	Complaint filed against Defendants in the Middle District of Florida (ECF No. 1), filed on November 13, 2023
1029	XR3403 Datasheet by XySemi Inc., Rev. 0.5
1030	Defendants’ Stipulation of Invalidity Contentions
1031	Brents, Barry, “Automotive Electronics Drive The Need For Circuit Protection,” Electronic Design (May 7, 2014), accessed via https://www.electronicdesign.com/technologies/power/article/21799679/automotive-electronics-drive-the-need-for-circuit-protection
1032	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/
1033	U.S. Patent No. 9,007,015 to Nook et al. (“the ’015 Patent”)
1034	Final Written Decision in IPR2020-00944 (Paper 73) as to the ’015 Patent, dated November 3, 2021
1035	Judgment Affirmed, Fed. Cir. R. 36 (ECF No. 52) in Nos. 2022-1646, 2022-1741, Fed. Cir. appealed from IPR2020-00944, dated February 12, 2024
1036	U.S. Patent No. 5,793,185 to Prelec et al. (“Prelec”)
1037	[INTENTIONALLY BLANK]
1038	[INTENTIONALLY BLANK]
1039	Excerpt of Prosecution History of the ’015 patent, Amendment and Response to Non-Final Office Action dated October 25, 2021
1040	U.S. Patent No. 9,954,391 to Lei (“Lei”)
1041	U.S. Patent No. 2007/0108940 to Sainomoto et al. (“Sainomoto”)

Ex #	Exhibit Description
1042	Fronter Economics, The Development of the USB Standard, An Interoperability Case Study (available at https://www.frontier-economics.com/media/uful43pg/case-study-the-development-of-the-usb-standard-final.pdf), last visited July 11, 2024.
1043	Wikipedia.co, USB, (available at https://en.wikipedia.org/wiki/USB), last visited on July 11, 2024.
1044	www.diskmfr.com, USB versions differences and development history (available at https://www.diskmfr.com/usb-versions-differences-and-development-history/), last visited July 11, 2024.
1045	Wikipedia.com, Boost Converter (available at https://en.wikipedia.org/wiki/Boost_converter), last accessed July 11, 2024.
1046	U.S. Patent No. 4,451,743 to Suzuki et al.
1047	IPR2024-00577, Patent Owner Preliminary Response, June 4, 2024
1048	IPR2024-00671, Patent Owner Preliminary Response, June 13, 2024
1049	“Chevrolet, GMC Pack USB Ports Into 2014 Pickups,” cars.com (2013) (available at https://www.cars.com/articles/chevrolet-gmc-pack-usb-ports-into-2014-pickups-1420663052892/) (last accessed July 14, 2024)
1050	Len Sherman, “The Basics of USB Battery Charging: A Survival Guide,” Maxim Integrated (December 9, 2010)
1051	Comparison of invalidated ’015 patent claims to ’203 patent claims
1052	Wayback Machine Capture of www.bestbuy.com from June 3, 2012
1053	Declaration of Yingchun Wan, dated May 11, 2020
1054	IPR2024-0000671, Decision Granting Institution of <i>Inter Partes Review</i> , August 29, 2024
1055	IPR2024-00577, Decision Granting Institution of <i>Inter Partes Review</i> , August 29, 2024

III. LISTING OF CHALLENGED CLAIMS

18. I have been provided with the following list of claims that are challenged in the Petition for Inter Partes Review of the ’203 patent. I understand

the wording and intent of each of the Claims and Limitations.

Claim Limitation	Claim Language
1[PRE]	A jump starter apparatus for jump starting a vehicle battery, comprising:
1[A]	a power supply that includes one or more rechargeable batteries;
1[B]	a USB port configured to receive power from an external power source for charging the one or more batteries;
1[C]	a DC-DC converter coupled between the USB port and the one or more rechargeable batteries and configured to increase a voltage received from the external power source for charging the one or more rechargeable batteries;
1[D]	a vehicle battery isolation sensor configured to detect presence of the vehicle battery connected to the jump starter apparatus;
1[E]	a reverse polarity sensor, separate from the vehicle battery isolation sensor, configured to detect a proper polarity connection between the jump starter apparatus and the vehicle battery; and
1[F]	a power switch configured to electrically connect the power supply to the vehicle battery,
1[G]	wherein the power switch is controlled based on signals from the vehicle battery isolation sensor and the reverse polarity sensor such that the power supply is connected to the vehicle battery when both (i) the vehicle battery isolation sensor currently indicates that the vehicle battery is connected to the jump starter apparatus, and (ii) the reverse polarity sensor currently indicates that the jump starter and the vehicle battery are connected with the proper polarity connection.
2	The jump starter apparatus of claim 1, wherein the jump starter apparatus is a hand-held device.
3[A]	The jump starter apparatus of claim 1, further comprising: a positive battery terminal connector for electrically connecting the jump starter apparatus to a positive terminal of the vehicle battery; and

Claim Limitation	Claim Language
3[B]	a negative battery terminal connector for electrically connecting the jump starter apparatus to a negative terminal of the vehicle battery.
4	The jump starter apparatus of claim 1, further comprising: a controller that receives the signals from the vehicle battery isolation sensor and the reverse polarity sensor and controls the power switch.
5	The jump starter apparatus of claim 4, wherein the controller is configured to automatically cause the vehicle battery isolation sensor to detect presence of the vehicle battery and the reverse polarity sensor to detect polarity of the vehicle battery when the vehicle battery is electrically connected to the jump starter apparatus and the jump starter apparatus becomes operational.
6	The jump starter apparatus of claim 1, wherein the power switch is a FET switch.
7	The jump starter apparatus of claim 1, wherein the reverse polarity sensor comprises an optically coupled isolator phototransistor coupled to a vehicle battery terminal connector via a diode.
8	The jump starter apparatus of claim 1, wherein the vehicle battery isolation sensor comprises an optically coupled isolator phototransistor coupled to a vehicle battery terminal connector via a diode.
9	The jump starter apparatus of claim 1, further comprising: a battery charge controller configure [sic] to control charging of the one or more rechargeable batteries from the USB port.
10	The jump starter apparatus of claim 9, wherein the jump starter apparatus is further configured to provide power for charging an external device.

Claim Limitation	Claim Language
11	The jump starter apparatus of claim 10, further comprising: a USB output port for providing power from the rechargeable power supply for charging the external device.

IV. A PERSON HAVING ORDINARY SKILL IN THE ART

A. Legal Principles

1. Obviousness

19. I have been told that “[a] patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains.”

20. 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).

21. I have been told that the relevant time for considering whether a claim would have been obvious to a POSITA is the time of alleged invention, assumed to be the priority date of the patent.

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

23. In determining whether a prior-art reference could have been combined with another prior-art reference or other information known to a POSITA, 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.

24. I have been told that whether a prior art reference renders a patent claim unpatentable as obvious is determined from the perspective of a POSITA. 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 POSITA would employ are also relevant to the determination of obviousness.

25. 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 POSITA 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 POSITA has good reason to pursue those known options.

26. 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. The Level of a Person of Ordinary Skill In The Art (“POSITA”) For The ’203 Patent

27. 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 “POSITA” to refer to a person (having) ordinary skill in the art throughout my declaration.

28. 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.

29. I have knowledge of what a person having ordinary skill in the art at the time of the claimed invention would understand and do. As of the 2014 priority date of the ’203 patent, I had over 35 years of experience in this field and was at least a person having ordinary skill in the art.

30. In my opinion, based on the five criteria above at the ’203 patent priority date, a POSITA 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.

V. CLAIM CONSTRUCTION

A. Legal Principles

31. I have been informed that in a proceeding for *inter partes* review, claim 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. I have also been informed of the principle that claim terms need only be construed to the extent necessary to resolve the controversy.

B. Opinion of Claim Construction

32. 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.

33. In my opinion, there is no need to otherwise construe terms in 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.

VI. STATE OF THE ART

A. Battery Powered Jump Starters

34. A jump starter is a portable device that electrically connects to the positive and negative terminals of an automotive SLI (starting lighting and ignition) battery that can provide, for a few seconds, up to 400-700 Amps DC current, sufficient to activate the engine starter motor. This procedure is called “jump starting,” a term that originally referred to the use of long heavy gauge “jumper cables” or “booster cables” connected between the discharged battery and a fully charged battery in another vehicle. Portable engine starting devices, aka “jump boxes” or “start boxes,” date back to approximately the 1950s, originally used for off-road racing vehicles that carried only a small or no battery to save weight. Compact jump starters became much more popular for the emergency starting of cars following the development in the late 1990’s of lithium-ion batteries that allowed them to be smaller and lighter than predecessor devices that used a heavy lead-acid SLI battery or many standard size D flashlight batteries.

35. As the ’203 patent admits, jump starters with battery packs and safety features were known in the art. EX1001, 1:28-3:16. For example, the ’203 patent admits that the following devices were known: “a battery booster pack that is polarity sensitive and can detect proper and improper connections before providing a path for electric current flow” (EX1001, 1:28-32); “a polarity independent set of battery

jumper cables for jumping a first battery to a second battery” (EX1001, 2:20-21); “vehicle battery charging device that includes a control housing having cables including a current limiting device to prevent exceeding of a predetermined maximum charging current of about 40 to 60 amps” (EX1001, 2:52-56); and “a hand-held jump starter having control components and circuits to prevent overcharging and incorrect connection to batteries.” (EX1001, 3:10-14).

B. USB Charged Devices

36. Likewise, USB (universal serial bus) charged devices have been known in the art for decades. USB was first created in 1996 by a collaboration among major tech companies as a means for communication between computers and peripheral devices. EX1042, 1. In 2000, USB 2.0 specifically included power transfer for the purpose of charging of device batteries at the nominal USB voltage. Paparrizos teaches the charging of higher voltage batteries, such as car batteries, using a USB standard 5V input. This application of USB connectivity is unsurprisingly ubiquitous since a primary goal of USB technology was to standardize inputs for power transfer as well as data so that consumers could reduce the number of cables and power supplies needed to use or charge their devices.

37. For example, a design guide for battery charging via USB was published December 9, 2010, by Maxim Integrated, one of the manufacturers of USB interface ICs. The abstract of this design guide states:

“Arguably the most useful part of USB's power capabilities is the ability to charge batteries in portable devices, but there is more to battery charging than picking a power source, USB or otherwise. This is particularly true for Li+ batteries, where improper charging can not only shorten battery life, but also can be a safety hazard. A well-designed charger optimizes safety and the user experience. It also lowers cost by reducing customer returns and warranty repairs. Charging batteries from USB requires balancing battery "care and feeding" with the power limitations of USB as well as the size and cost barriers ever present in portable consumer device designs. This article discusses how to achieve this balance.” EX1050, Abstract.

38. The design guide explains that “[t]he MAX14578 contains all circuitry necessary to *detect the connected device* (USB cable, and USB CDP or dedicated charger) and *control an external Li-ion battery charger*. The device implements *USB Battery Charging Rev 1.1-compliant detection* logic which includes data contact detection, *D+/D- short detection*, and CDP identification. In addition, it includes a charge timer and *weak-battery voltage monitor* to support the USB BC1.1 ‘Dead Battery’ provisions.” EX1050, 5.

39. Charging any device from a USB power input almost always requires some voltage level shifting, because the nominal 5V USB input may not match the voltage requirements of the device it is charging, e.g., no lithium batteries, either alone or in series, have a charging voltage of exactly 5V. The typical voltage range of most lithium batteries used in consumer electronics ranges from 2.9 – 3.6, with 3.3 being most common. Accordingly, charging any lithium-ion battery using a 5V

USB input would require a DC-DC converter of some type.

40. Indeed, by 2011, USB technology was so widely adopted that “over *seven-billion* USB-equipped devices were produced globally.” EX1042, 4.

C. DC-DC “Boost” Converters

41. Even older than USB technology is the DC-DC “boost” converter (i.e., a DC-DC converter circuit that “boosts” the input voltage to a higher level). As early as 1977, DC-DC boost converters have been known. EX1045, 2. As a further example, a 1981 patent by Citizen Watch Company teaches a “DC-to-DC voltage converter is disclosed for converting the voltage from a battery to provide a power supply voltage whose value can be equal to the battery voltage multiplied by or divided by a non-integral factor, e.g. $2/3$.” EX1046, abstract. Further and as described below, using DC-DC converters to boost a standard 5V USB input to charge batteries with output voltages as high as 12V was taught prior to the ’203 patent by references such as Paparrizos and Zhao. *See* §VII, IX (discussed below).

D. FET Switches

42. A FET switch is a power Field Effect Transistor, which has been used to control power supplies of all types and purposes since the late 1970’s, although they are now commonly replaced by a newer device, the IGBT (Insulated Gate Bipolar Transistor), which can handle higher power levels at lower cost. The choice of the type of switching transistor does not affect any of the claimed functions of the

'203 patent jump starter.

E. Optoisolators

43. Optoisolators are ubiquitous in power electronics and, especially, in medical devices. The sole purpose of an optoisolator is to isolate the sensitive measurement electronics from a higher power circuit that is being measured. This addition would presumably help to protect the jump starter's 3.3 – 5V microprocessor from the 14V nominal battery voltage, and in this capacity, it would be a useful, but not really necessary, feature that would not affect any of the jump starter's claimed functions. This is the subject of claims 7 and 8 of the '203 patent.

VII. OVERVIEW OF THE '203 PATENT

44. I have read and understand U.S. Patent No. 11,667,203 B2, which is assigned to The NOCO Company ("Patent Owner" or "PO"). I have been advised that the '203 patent lists a priority date of July 3, 2014.

A. Disclosure

45. The '203 patent is directed to a jump starter which can boost, charge, or "jump start" batteries such as the battery of a vehicle. *See* EX1001, Abstract, 1:7-9. The '203 patent uses the phrase "a handheld device for jump starting" interchangeably with the term "jump starter" throughout the figures, specification, and claims. *See, e.g.*, EX1001, 8:32 (claim 1). Although other nomenclature is also common, I will refer to the device of the '203 patent as a "jump starter" throughout

my declaration.

46. The '203 patent stems from a line of continuation applications claiming priority back to U.S. Patent Application No. 14/325,938, which issued as U.S. Patent No. 9,007,015 (“the '015 patent”), which is a continuation of application No. PCT/US2014/045434, which was filed on July 3, 2014, and shares a substantively identical specification. *Compare*, EX1001 with EX1033.

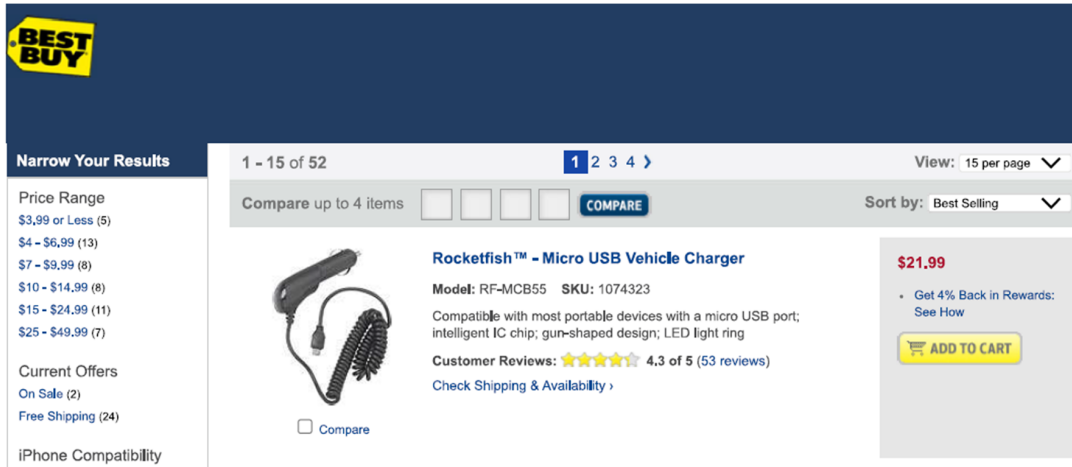
47. In the BACKGROUND OF THE INVENTION section, the '203 patent admits that the following features of jump starters were known: a power supply (*e.g.*, a jump starter’s internal battery) (EX1001, 1:13-19); a circuit-controlled or microprocessor-controlled switch for connecting power from the jump starter’s battery to the vehicle battery (EX1001, 1:28-38, 2:37-41); performing safety checks via sensors or circuitry that determine whether a battery is present or absent and determine whether the cable clamps have been connected to the vehicle battery with proper polarity (EX1001, 1:28-38, 1:52-67, 1:28-3:14).

48. As with the '015 patent, the '203 patent focuses on safety features—a battery presence sensing circuit and a reverse polarity sensor—which purport to improve on the “complexity, cost or potential for malfunction” in the prior art. EX1033, 3:7-10; EX1001, 3:15-18. I disagree with the '203 patent’s characterization of the prior art being complex, costly or prone to malfunction. The *four* basic safety functions usually performed by a “smart charger”, (reverse polarity

detection, detection of electrical contact with the battery, assessment of the chargeability of the battery (e.g., $V_{\text{bat}} > 2.0\text{V}$), and also, detection of the accidental connection of the charger to a battery with a voltage higher than the 14V maximum of a 12 VDC vehicle battery) can and had previously been handled by a classical single op amp circuit found in undergraduate EE circuits textbooks: a window comparator. For this particular application, the circuit will enable charging to proceed if and only if the voltage it measures before charging is in the range from 2.0 to 14.0 V, which implements *all four* (not just the three of '203 patent) safety conditions. At the July 2014 priority date of '203 patent, there was nothing novel about a 'smart' or 'safety' charger of any kind performing these safety checks using either this trivial circuit or the more complex collection of three separate circuits identified in the claims and embodiments of '203 patent.

49. I understand that these "safety features" were recited in the sole independent claim of the '015 patent and were all invalidated by the Board and the Federal Circuit in the '015-IPR as being anticipated by Richardson. EX1033, claim 1; EX1034, 47-67. Except for claim 11—which required a USB charging port for charging the jump starter's battery—the Board also invalidated all of the dependent claims of the '015 patent. As to the USB power input recited in claim 11, the Board only faulted the petition's motivation "to incorporate a USB input charging port in[to] Richardson based on" secondary references as being merely "conclusory and

not adequately supported by the evidence.” EX1034, 92-93. The Board held that the petitioner’s expert failed to support the assertion that “a USB port is commonly used as a power input to devices.” EX1034, 93. The Board did not conclude that claim 11 is patentable over all of the prior art or that a POSITA *would not* have been motivated to include a USB charging port based on other prior art references. As a practitioner and teacher in this field for over 30 years, I affirm the opinion of the petitioner’s expert. Even USB version 1.0, introduced in January 1996, USB could provide power to small devices. By April 2000, with USB 2.0, it became widely adopted for both data transfer and power delivery, and the mini-USB connector was introduced for charging digital cameras and smartphones. By the July 2014 priority date of ’203 patent, there was *absolutely nothing novel* about the use of USB as the power input to electronic devices. It had become the standard power connector most hand-held electronics that that needed current within the 2.0A USB limit. It replaced the menagerie of proprietary power bricks and connectors that had been widely criticized by consumers. A simple scan of product advertisements from that era confirms this, an example from an archived website (www.bestbuy.com) from June 3, 2012 is shown below. EX1052, 2.



50. Claim 1 of the '203 patent includes the USB charging features and the same safety features invalidated by the Board in respect to the '015 patent. The '203 patent provides very little disclosure regarding the claimed USB charging features. The '203 patent refers to USB ports as “standard.” In total, there are only six sentences dedicated to the USB charging features (*i.e.*, the USB port and DC-DC converter to increase the USB voltage). *See* EX1001, 5:32-34, 7:40-48. These portions are reproduced below:

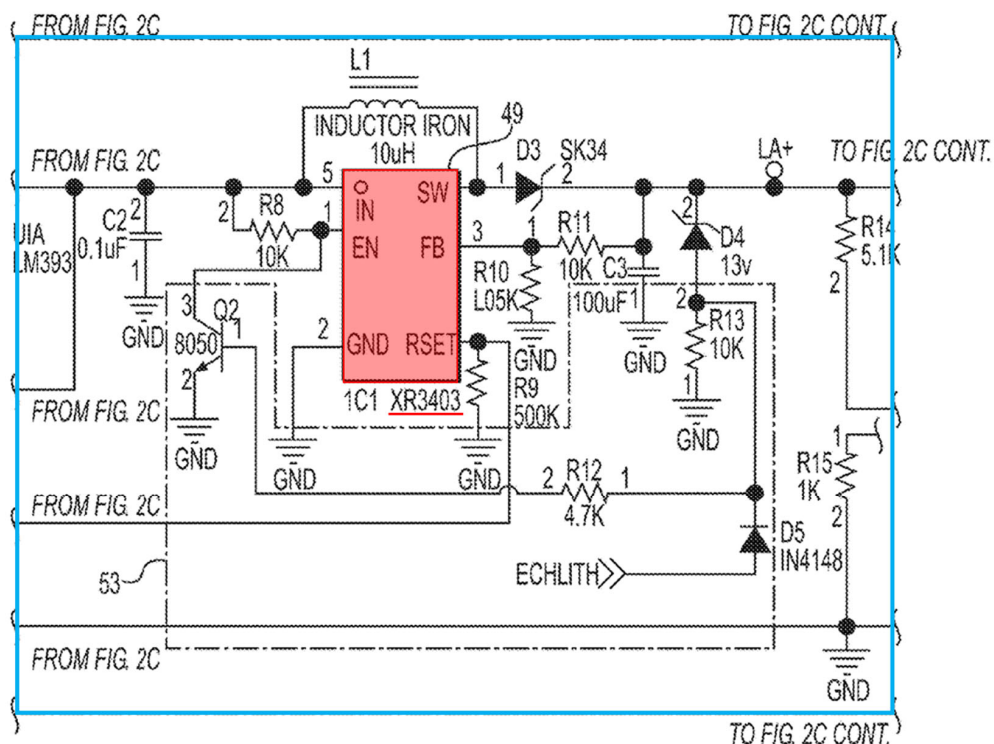
USB charge circuit 52 converts power from any USB charger power source, to charge voltage and current for charging the lithium battery pack 32. EX1001, 5:32-34

...

The USB charge circuit 52 allows the internal lithium battery pack 32 to be charged using a standard USB charger. This charge input uses a standard micro-USB connector 48 allowing standard cables to be used. The 5V potential provided from standard USB chargers is up-converted to the 12.4 VDC voltage required for charging the internal lithium battery pack using a DC-DC converter 49. The DC-DC converter 49 can be turned on and off via circuit 53 by an output from the microcontroller 1. EX1001, 7:40-48.

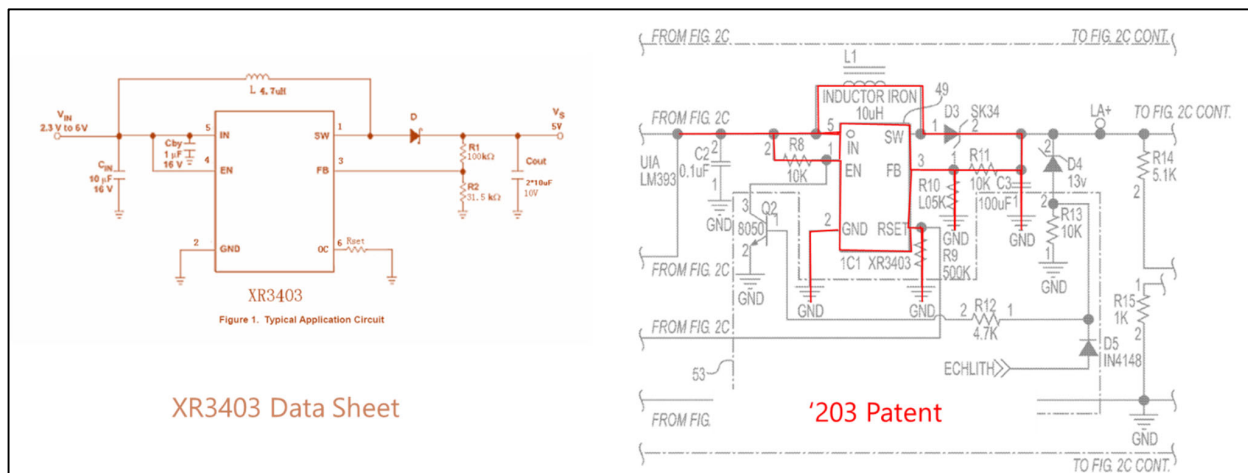
51. As shown above, the '203 patent discloses that “USB charge circuit 52 converts power from **any** USB charger power source, charge voltage and current for charging the lithium battery pack 32.” EX1001, 5:32-34. This makes sense because USB charging and DC-DC converters were well known in the art. Moreover, the '203 patent inventors do not assert that they invented USB charging technology. EX1047, 26.

52. Figure 2C shows a portion of **USB charge circuit 52** which includes a **DC-DC converter 49** which is depicted as a generic box-shaped component labelled “**XR3403**” depicted in Figure 2C of the '203 patent. EX1001, Fig. 2C.



As Patent Owner acknowledged in an IDS filed May 2, 2020, the XR3403 chip is prior art to the '203 patent and is a commercial, off-the-shelf DC-DC converter which can convert a 5V input voltage to 12V. *See* EX1029, 6; EX1002, 2547 (entry 46 – “Xysemi XR3403”).

53. Beyond Figure 2C, however, the '203 patent offers no explanation for how to incorporate the XR3404 DC-DC converter into the USB charge circuit or into the jump starter as a whole. This again makes sense because the XR3403 data sheet explains how to incorporate the DC-DC converter into another product, including selecting necessary circuit componentry, instructions to program the degree of boost, and performance characteristics for the device. *See* EX1029-XR3403, 5-7. Moreover, as shown in the annotated image below, the XR3403 data sheet includes a “typical application circuit” that is nearly identical to the DC-DC converter circuit shown in Figure 2C of the '203 patent.



54. The '203 patent's lack of disclosure regarding the USB charge circuit

and the XR3403 DC-DC converter is a tacit admission that such features were known in the prior art and that a POSITA would have known how to incorporate such features into a jump starter. Considering the reliance on a “standard” USB port “any USB charger power source”, the ’203 patent effectively recognizes that a POSITA would have readily been able to incorporate well-known USB charging capability into the jump-starting device. *See* EX1001, 7:40-48. Doing so would have necessarily included a DC-DC converter, which was available as an off-the-shelf component and well known in the art. *See* EX1029.

B. Prosecution History

55. I have been informed and seen documents to establish the Prosecution history preceding the present action. What follows is a recitation of my understanding of this history.

56. The ’203 patent application was filed just two months prior to the filing of IPR2020-00944, which challenged the claims of the ’015 patent (“the ’015 patent”). Patent Owner originally presented claims substantially similar to those of the ’015 patent. *Compare* EX1002, 26-29 *with* EX1033, 8:4-10:22. The claims were amended once on July 16, 2020, and two Information Disclosure Statements were filed on July 23, 2020, which collectively cited 185 references. EX1002, 71-86, 88-96, 127-39. The Examiner issued a first non-final rejection on August 23, 2021. EX1002, 1069-97. Prior to this first office action, none of the four then-pending

independent claims (then- numbered 24-27) included limitations directed to the USB charging feature (which was only recited in then-numbered claims 69-73). *See* EX1002, 72-76 (claims 24-27), 83-84 (claims 69-73). Among other rejections, the Examiner found all pending independent claims and certain dependent claims anticipated by Richardson. *See* EX1002, 1072-86.

57. In response, PO amended each pending claim to require that the jump starter apparatus “automatically” detect both presence and polarity of the vehicle battery and “automatically” switch on power “only when” both are detected. *See* EX1002 at 1186-90. While the Examiner erroneously indicated the claims were allowable in a final office action asserting a non-statutory obviousness-type double patenting rejection, the claims were then rejected as anticipated by U.S. Patent No. 11,104,236 to Wang. *See* EX1002, 1210-16, 6033-60; *see also* IX.A.5 (discussed below and incorporated here). While outside my scope as a technical expert, I it important to note that the Patent Owner subsequently submitted three more Information Disclosure Statements on May 2, 2022, which collectively identified 271 references totaling over 3,000 pages. *See* EX1002, 2536-48, 4359-69, 5245-52. Over the course of the prosecution history, seven IDS were submitted, which included over 450 references in total. EX1002, 88-96, 127-39, 2536-49, 4359-70, 5245-53, 6220-23, 6297-98. The prosecution history exceeds 6,000 pages; however, 5,735 of said pages were references submitted by the patent owner, including at least

3,095 pages of litigation documents. *See* EX1002. I do not believe that it would be humanly possible for an examiner within normal time constraints to examine even a small percentage of the citations. In a random sampling of ten of the 450+ cited references, I found none to be relevant, and it was not clear why they were included by patent owner. The volume of irrelevant documents could be construed as an effort to obfuscate the facts upon which the examiner must make their decisions, or at least not a good-faith effort to assist the examiner in sorting through the extreme volume of references to find the most relevant.

58. I have also been made aware that following additional prosecution and the Examiner's assertion of additional prior art, PO ultimately canceled all pending claims and presented a new set of claims, numbered 78-91. *See* EX1002, 6135-43. The sole independent claim, claim 78, did not include the USB charging feature at this time. These claims were finally rejected based on the combination of U.S. Patent No. 11,104,236 to Wang and Richardson. *See* EX1002, 6152-64. Patent Owner, following an applicant-initiated Examiner interview, then amended each pending independent claim to include two limitations, one directed to limiting the recited power supply to "one or more rechargeable batteries and the other directed to the USB charging feature. *See* EX1002, 6209. These limitations were imported from claims 86 and 87, the latter of which was finally rejected under the combination of Wang, Richardson, U.S. Patent Application Publication 2017/0012448 to Miller,

and U.S. Patent No. 10,087,904 to Butler. *See* EX1002, 6137, 6159-61. Butler is the reference the Examiner cited as teaching the USB charging feature. With the amendments, Patent Owner argued that Butler did not qualify as a prior art reference. EX1002, 6212-13. Patent Owner did not substantively contest that the remaining claim limitations were taught by the cited art beyond stating that it “respectfully disagrees with this rejection.” *See* EX1002, 6212-23.

59. In response, the Examiner, with Patent Owner’s agreement, entered an Examiner’s Amendment adding the recitation of a “DC-DC converter coupled between the USB port and the” rechargeable batteries, which was originally recited in claim 88, and allowed the claims on that basis. EX1002, 6245-49.

60. In the Notice of Allowance, the Examiner cited one additional reference which apparently taught the claimed USB port to charge the jump starter’s battery. However, the Examiner did not appear to perform any further searching related to the DC-DC converter which was ultimately added to the independent claim. Moreover, the Examiner did not find—nor the Patent Owner submit for consideration—the Zhao and Paparrizos references relied upon in this Petition, both of which disclose DC-DC converter recited in claim 1 of the ’203 patent. *See generally* EX1002; *see also* EX1006, Abstract, 1:22-23, 1:25-27, 3:6- 11; EX1009, 3:58-4:4.

VIII. SUMMARY OF THE PRIOR ART

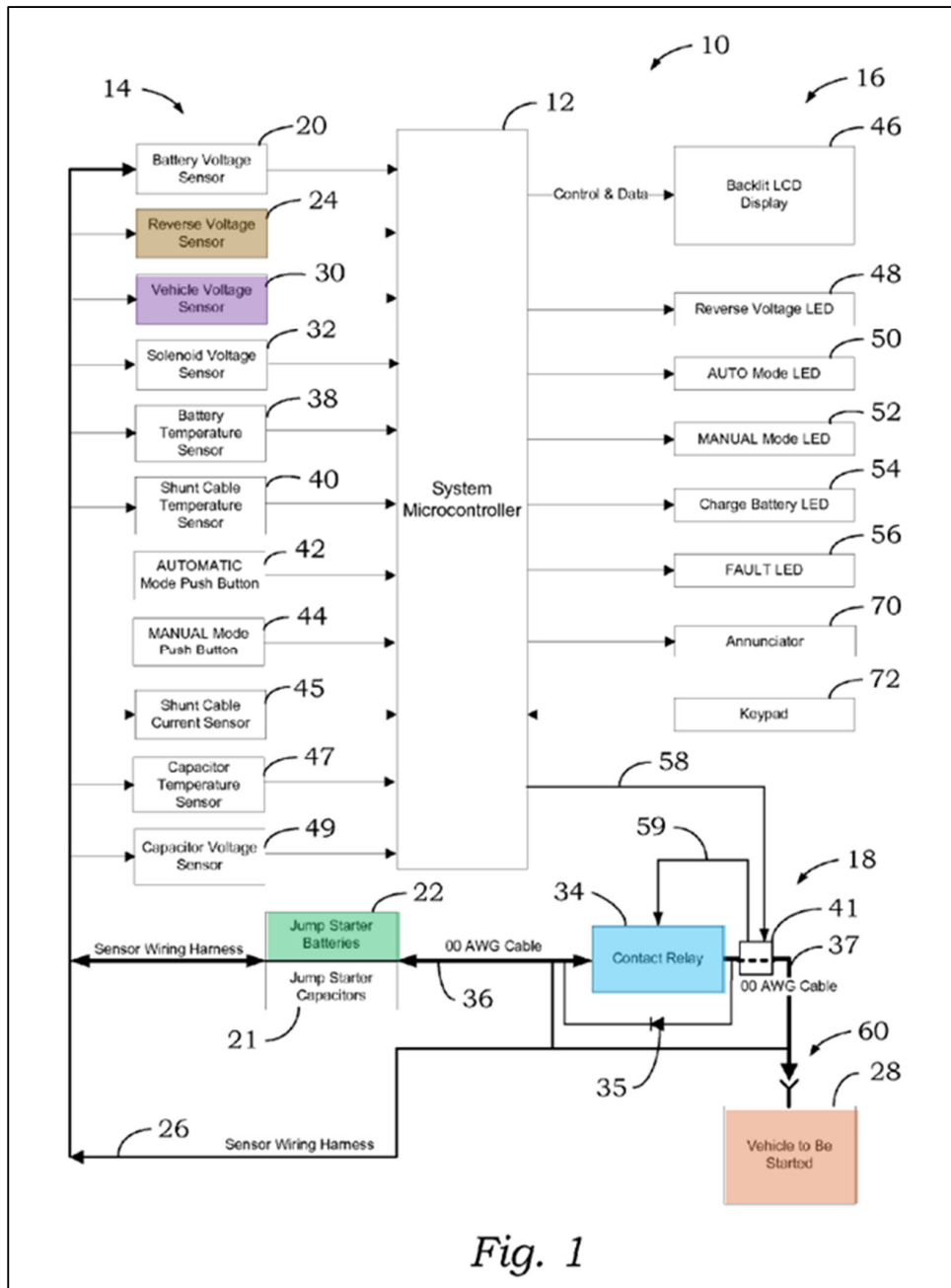
61. I am aware that each of Richardson, Zhao, Yu, Paparrizos, E-Power, and Krieger are prior art to the '203 patent, which claims a priority date of July 3, 2014.

1. Richardson

62. Richardson discloses a portable power source that can provide supplemental power to a vehicle's electrical system and jump start vehicle batteries. *See, e.g.*, EX1005, ¶¶[0002], [0006]-[0007]. Richardson's jump starter 10 also includes a programmable microprocessor 12, which controls the jump-starting system. *See* EX1005, ¶[0014].

63. Just like the '203 patent, Richardson acknowledges the “potential 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 live (*i.e.*, electrified) cable clamps causing sparking, fire, and/or injury. *See* EX1005-Richardson, ¶[0005]; EX1001, 1:20-27. Accordingly, Richardson teaches “real-time monitoring of all system parameters to increase the safety and effectiveness of the unit's operation.” EX1005, ¶[0006]. More specifically, Richardson teaches automatically determining (1) whether a *proper polarity* connection exists between the **jump starter battery 22** and **the vehicle battery** via **reverse voltage sensor 24** and (2) the *presence* (*i.e.*, connection to) a vehicle battery

via **vehicle voltage sensor 30**. See, e.g., EX1005, ¶[0016]. When both proper polarity and the presence of a battery are detected, **the contact relay 34** of Richardson closes to distribute charge to **the vehicle battery**. EX1005, Fig.1 (annotated).



64. Accordingly, Richardson is in the same field of endeavor as the '203 patent and addresses subject matter that was reasonably pertinent to problems facing the named inventors. *Compare* EX1001, Abstract, 1:17-24 *with* EX1005-Richardson, Abstract. Further, I understand that, in its Final Written Decision in the IPR challenge of the '015 Patent, IPR2020-00944 (“the '944 IPR” or “the '015 IPR”), the Board has already confirmed the following teachings of Richardson as they relate to the invalidated claims of the '015 patent (and transversely to claim 1 of the '203 patent):

- Richardson discloses an apparatus for jump starting a vehicle engine. EX1034, 50.
- Richardson’s disclosure relating to “jump starter batteries 22” constitutes an “internal power supply” as claimed in the '015 patent. See *id.*, 50-51.
- The parties agreed that Richardson’s vehicle voltage sensor 30 is “a vehicle battery isolation sensor connected in circuit with said positive and negative polarity outputs, configured to detect presence of a vehicle battery connected between said positive and negative polarity outputs” as claimed in the '015 patent. *Id.*, 52-53.
- Richardson’s “reverse voltage sensor 24” is a “reverse polarity sensor...” as claimed in the '015 patent. See *id.*, 53-54.

- The “contact relay 34” was shown to be a “power switch...” as claimed in the ’015 patent. See id. 54-55.
- Richardson’s “system microcontroller 12” constitutes a “microcontroller...” as claimed in the ’015 patent. See id., 55-67.

I further understand that the Board found that various combinations of Richardson with certain prior art references was found to be proper and supported. For example, the Board found that “the proposed combination of Richardson and Krieger is proper and teaches” FET power switches and optically coupled isolator phototransistor sensors, both of which are elements present in the claims of the ’203 patent. EX1034, 77-78. The Board further found “that the proposed combination of Richardson and Epower-20 and Richardson and Epower-21 are proper and that both combinations teach [a USB output port configured to provide charging power from said internal power supply to a USB-chargeable device].” EX1034, 86-88. I agree with the conclusions reached by the Board as summarized above. Other findings from the Board’s decision are discussed as appropriate in my opinions below. See §IX (discussed below).

2. Zhao

65. Zhao discloses a battery charging system that includes a step-up converter for boosting a DC input voltage to charge higher voltage batteries. EX1006, Abstract. Specifically, 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. *See, e.g.*, EX1006, 1:22-27; EX1006 at 2:63-3:11. Zhao's system also includes a "control circuit 102" which can control the ON/OFF state of the step-up converter. *See, e.g.*, EX1006, 4:59-64.

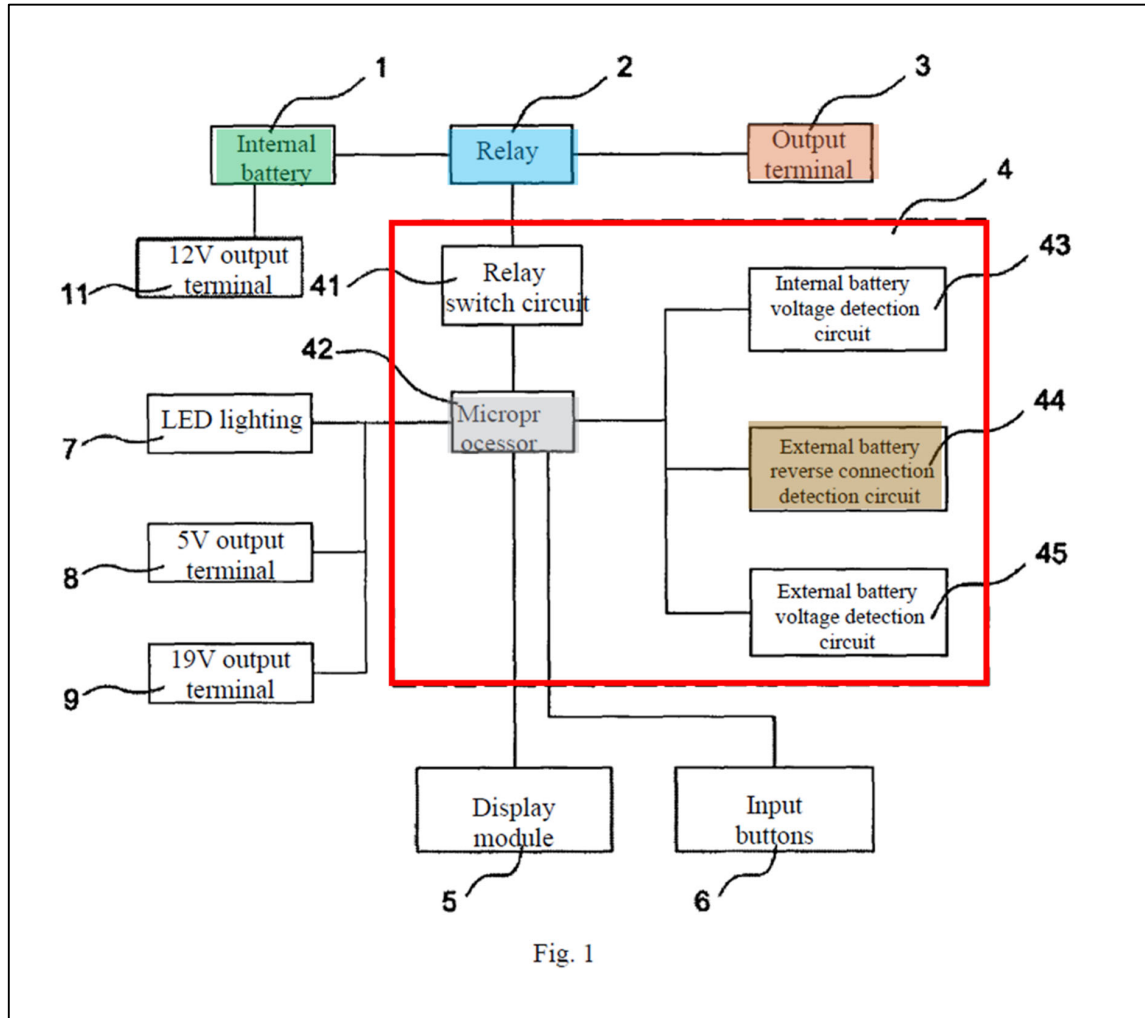
66. Zhao is in the same field of endeavor as the '203 patent. *Compare* EX1001, 1:42-44, 4:4-16 *with* EX1006, 1:19-30. Both Zhao and the '203 patent describe systems that include battery charging systems for high-voltage battery systems such as multi-cell lithium-ion battery packs. EX1006-Zhao, 1:22-27. Similarly, the '203 patent teaches that "[i]n one example embodiment, a high surge lithium polymer battery pack includes three 3.7, 2666 mAh lithium polymer batteries...." EX1001, 4:27-30. As a POSITA would have understood, Zhao's battery charging system is analogous to the '203 patent's USB charging circuit, regardless of the intended discharge target of the '203 patent. In other words, a POSITA would have understood that the use of a battery is a different issue than how it was charged. Additionally, Zhao addresses subject matter that was reasonably pertinent to problems facing the named inventors. *Compare* EX1001, 4:4-16, 7:25-28 *with* EX1006, 1:25-27, 3:6-11.

3. Yu

67. Yu discloses an automotive starting device (*e.g.*, jump starter).

EX1007; EX1008¹, Abstract. Yu's jump starter includes an internal battery pack 1, a control module 4 with a microprocessor 42, and an output terminal 3. EX1008, Abstract, ¶[0004]. The microprocessor controls a relay 2, which can connect power from the internal battery to a vehicle battery for a jump start. EX1008, ¶[0004]. Before initiating a jump start, an external battery reverse connection detection circuit 44 detects an external battery voltage to determine if a vehicle battery is present and also detects whether the device is connected to the external battery with the correct polarity. EX1008, ¶[0009], Fig.1 (annotated).

¹ Citations to Yu will be to the English translation (EX1008).



68. Yu is in the same field of endeavor as the '203 patent. *Compare* EX1001, Abstract *with* EX1008, Abstract. Additionally, Yu addresses subject matter that was reasonably pertinent to problems facing the named inventors of the '203 patent. *Compare* EX1001, 1:17-24 *with* EX1008, Abstract.

4. Paparrizos

69. Paparrizos discloses a battery charging circuit with a forward boost mode that can boost a lower input voltage (i.e., 5V USB input) to a sufficient voltage

to charge higher voltage batteries, including 12V multicell lithium-ion battery packs.

EX1009, Abstract, 3:31-35, 2:30-40, 8:17-31.

70. Paparrizos is in the same field of endeavor as the '203 patent. *Compare* EX1001, 1:42-44, 4:4-16 *with* EX1009, 1:18-26, 1:30-39, 2:30-40. Both Paparrizos and the '203 patent describe battery charging systems for high-voltage battery systems such as multi-cell lithium-ion battery packs and both describe charging 12V batteries. *Compare* EX1009, 2:30-40, 8:17-31 *with* EX1001, 4:27-30 (“In one example embodiment, a high surge lithium polymer battery pack includes three 3.7, 2666 mAh lithium polymer batteries...”). As a POSITA would have understood, Paparrizos battery charging system is analogous to the '203 patent's USB charging circuit, regardless of the intended discharge target of the '203 patent. Additionally, Paparrizos addresses subject matter that was reasonably pertinent to problems facing the named inventors. *Compare* EX1001, 4:4-16, 7:25-28 *with* EX1009, 1:23-26, 8:17-31.

5. E-Power 20 and E-Power 21

71. E-Power 20 and E-Power 21 disclose handheld car battery jump starters using lithium-ion battery packs. These devices are functionally identical to the devices described and claimed in the '203 patent and are thus in the same field of endeavor. *See* EX1034, 85-91. I have been told the Board has previously found that E-Power 20 and E-Power 21 are prior art and that EX1012 and EX1013

(describing the two devices) are printed publications. *See* EX1034, 95-99. I understand that the Board, in the 944 IPR, found the following: “the combinations of Richardson and Epower-20 and Richardson and Epower-21 are proper and both combinations teach a USB output port configured to provide charging power from an internal battery to a USB-chargeable device.” *See* EX1034, 88. I note that the Epower-20 and Epower-21 are also both hand-held devices weighing 1 kg (2.2 lbs) and 1.5 kg (3.3 lbs) respectively. EX1012, 1 (“Whole set Weight: 1KG”), EX1013, 1 (“Whole set Weight: 1.5KG). The Board further found “that the proposed combination of Richardson and Epower-20 and Richardson and Epower-21 are proper and that both combinations teach [a USB output port configured to provide charging power from said internal power supply to a USB-chargeable device].” EX1034, 86-88. I agree with the conclusions reached by the Board as summarized above. Other findings from the Board’s decision are discussed as appropriate in my opinions below. *See* §IX (discussed below).

6. Krieger

72. Krieger discloses a jump starter including a battery, a semiconductor switch, a polarity sensing circuit, and a microprocessor for activating the semiconductor switch to enable a current flow between the boosting battery and the depleted battery. EX1010, ¶16. Krieger further discloses a power switch comprising a plurality of FETs in parallel: “[t]he switch 12 is preferable a solid state

device, such as a transistor, diode, field effect transistor (FET), etc. FIG. 1 represents the switch 12 as a number of FETs 12a-12d connected in parallel with each other.” Ex. 1010, ¶30. Krieger further discloses a vehicle isolation sensor and reverse polarity sensor comprising an optically coupled isolator phototransistor: “[i]n the embodiment shown in FIG. 1, the polarity sensing circuit comprises an optoisolator 16. The opto-isolator 16 comprises a phototransistor 22 and a light emitting diode (LED) 26.” Ex. 1010, ¶32.

73. Krieger is in the same field of endeavor as the '203 patent. *Compare* EX1001, 1:7-9 *with* EX1010, ¶2. Additionally, Krieger addresses subject matter that was reasonably pertinent to problems facing the named inventors. *Compare* EX1001, 1:20-27 *with* EX1010, ¶9. Further, I understand that the Board, in the 944 IPR, has found the following teachings of Krieger as they relate to the invalidated claims of the '015 patent (and transversely to claim 1 of the '203 patent):

- Krieger’s “switch 12” was a solid state device such as a number of FETs connected in parallel. EX1034, 77.
- The combination of Richardson and Krieger was proper and teaches the additional limitation of a solid-state power switch comprising a plurality of FETs in parallel. *See* EX1034, 77-78.

- Krieger’s “opto-isolator 16” with “phototransistor 22” were shown to be inherently digital and perform the functions of both a vehicle isolation sensor and a reverse polarity sensor. *See* EX1034, 78.
- Combining Richardson and Krieger is proper and teaches the additional limitation of a vehicle isolation sensor and a reverse polarity sensor comprising optically coupled isolator phototransistors as claimed by the ’015 patent. *See* EX1034, 78-79.

I further understand that the Board found that various combinations of Richardson and Krieger is proper and teaches” FET power switches and optically coupled isolator phototransistor sensors, both of which are elements present in the claims of the ’203 patent. EX1034, 77-78. I agree with the conclusions reached by the Board as summarized above. Other findings from the Board’s decision are discussed as appropriate in my opinions below. *See* §IX (discussed below).

IX. OPINION ON GROUNDS OF UNPATENTABILITY

A. Ground 1: Claims 1, 3-5, and 9 are unpatentable under 35 U.S.C. § 103(a) over Richardson in view of Zhao

1. Overview of the Combined Teachings

74. A POSITA would have found it obvious to combine the teachings of Richardson and Zhao. Both references relate to systems that charge a multicell battery pack at a voltage higher than 5 volts, and a POSITA would have been motivated to modify Richardson in view of Zhao to include both a USB input port

and the use of the associated DC-DC boost converter to achieve the predictable result of charging the batteries of Richardson's jump starter.

75. Specifically, Richardson teaches a battery-powered device having a pack of series-connected batteries. *See* EX1005, FIG 2A (depicting "batteries 23"). As one example, Richardson discloses each battery as a "12-volt batter[y]." EX1005, ¶[0034]. Richardson is silent as to the specific chemistry of its series connected batteries. A POSITA would have understood, however, that Richardson's description and figures are describing multi-cell series connected lithium-ion batteries, which are well-known for use as 12V rechargeable batteries.

76. 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 teaches that its battery charging system can use low voltage charging systems like 5V USB to charge higher voltage batteries. EX1006, 1:22-27; 2:51-54; 3:6-11. Zhao achieves this USB charging circuit through a DC-DC converter that increases the voltage of the 5V USB input to the appropriate, higher voltage level required by the battery cells.

77. A POSITA, therefore, would have been motivated to combine the teachings of Richardson and Zhao because Zhao is directed to the known technique of charging (and recharging) 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 boost converter in accordance with its established function of converting a lower voltage input to a higher voltage output. Additionally, Zhao specifically teaches the desirable feature of charging a battery pack rated above 5V with a 5V USB input, which is a known technique that a POSITA would have been motivated to implement in a predictable manner to charge 12V batteries such as those disclosed by Richardson. As a POSITA would have understood, the inclusion of a standardized power input port such as USB would provide a reliable and ubiquitous power input for users to easily charge the batteries. Adding USB charging to Richardson's system would allow the jump starter batteries to be charged in diverse ways, even though USB charging is current-limited to a slower rate than charging directly from a vehicle battery as taught by Richardson. As an example, a user could charge the jump starter batteries using the USB input in situations other than when an operational vehicle (i.e., without a dead battery) is available to charge the jump starter's battery. Also, when the vehicle is in use if an interior USB port or port adaptor is available. A user could, for example, plug in the jump-starter's USB charging input and leave the jump starter's batteries to charge overnight. Accordingly, the fact that a USB power input may be slower than using the vehicle's battery to charge the jump starter's battery does not mean that a POSITA would not combine the teachings of Richardson and Zhao. In fact, the opposite is true—the benefits of adding the USB power input to charge the batteries of Richardson's jump

starter would have been readily apparent to a POSITA since it was already common practice on many, if not most, portable electronics.

78. Additionally, a POSITA would have been motivated to combine the particular teachings of Richardson and Zhao with a reasonable expectation of success for several reasons. **First**, A POSITA would have been familiar with the relevant USB standards and been motivated to implement USB technology when designing a portable battery-powered device. Thus, when modifying Richardson to implement a USB input circuit as taught by Zhao, a POSITA would have necessarily relied upon their knowledge regarding implementation of commercially-available USB receptables (such as a micro-USB receptable) when designing a USB charging feature. *See* §IX.A.2.d (discussed below and incorporated here).

79. **Second**, Zhao describes the details of the USB charging circuit in sufficient detail for a POSITA to implement the circuit in Richardson's system. Zhao teaches the circuit topology including control circuits 102 which control the DC-DC conversion circuit to increase the input USB voltage to a desired output voltage. Indeed, Zhao describes its USB charging circuit in more detail than the '203 patent, which only alludes to the off-the-shelf XR3403 chip. *See* §VII.A. Specifically, Zhao teaches that "power stage circuit 101 of the step-up converter can be a synchronous rectifier Boost topology including inductor L, main switch S1, synchronous switch S2, and output capacitor CBD." EX1006, 3:12-15. Control

circuit 102 can control main switch S1 via control signal G1 and synchronous switch S2 via control signal G2. EX1006, 3:17-21. An output of power stage circuit 101 can connect to charging control circuit 201 and can then be regulated or controlled for purposes of charging the battery or battery-powered device. EX1006, 3:3-6, 3:25-26. In certain situations, “the battery device can be directly charged by the output signal from the step-up converter.” EX1006, 8:21-24. Accordingly, a POSITA would have understood how to connect the boosted output voltage of Zhao’s step-up charging system to a battery pack for purposes of charging the battery and would, therefore, have had a reasonable expectation of success in combining the teachings of Richardson and Zhao. **Third**, I am told that in a January 17, 2014 email, the ’203 patent inventor, Mr. Jonathan Nook, requested that Carku produce a battery powered jump starter that included a USB input to charge the jump starter’s batteries. EX1053, 159. Mr. Nook’s request of Carku to add the USB charging feature to Carku’s product aligns with what a POSITA would have expected in January 2014—that there would be no significant issues in modifying a battery powered jump starter to include a USB input to charge the jump starter’s batteries.

80. In the following, I provide additional details to support my opinions as applied to specific claims and limitations of the ’203 patent.

2. **Independent Claim 1**

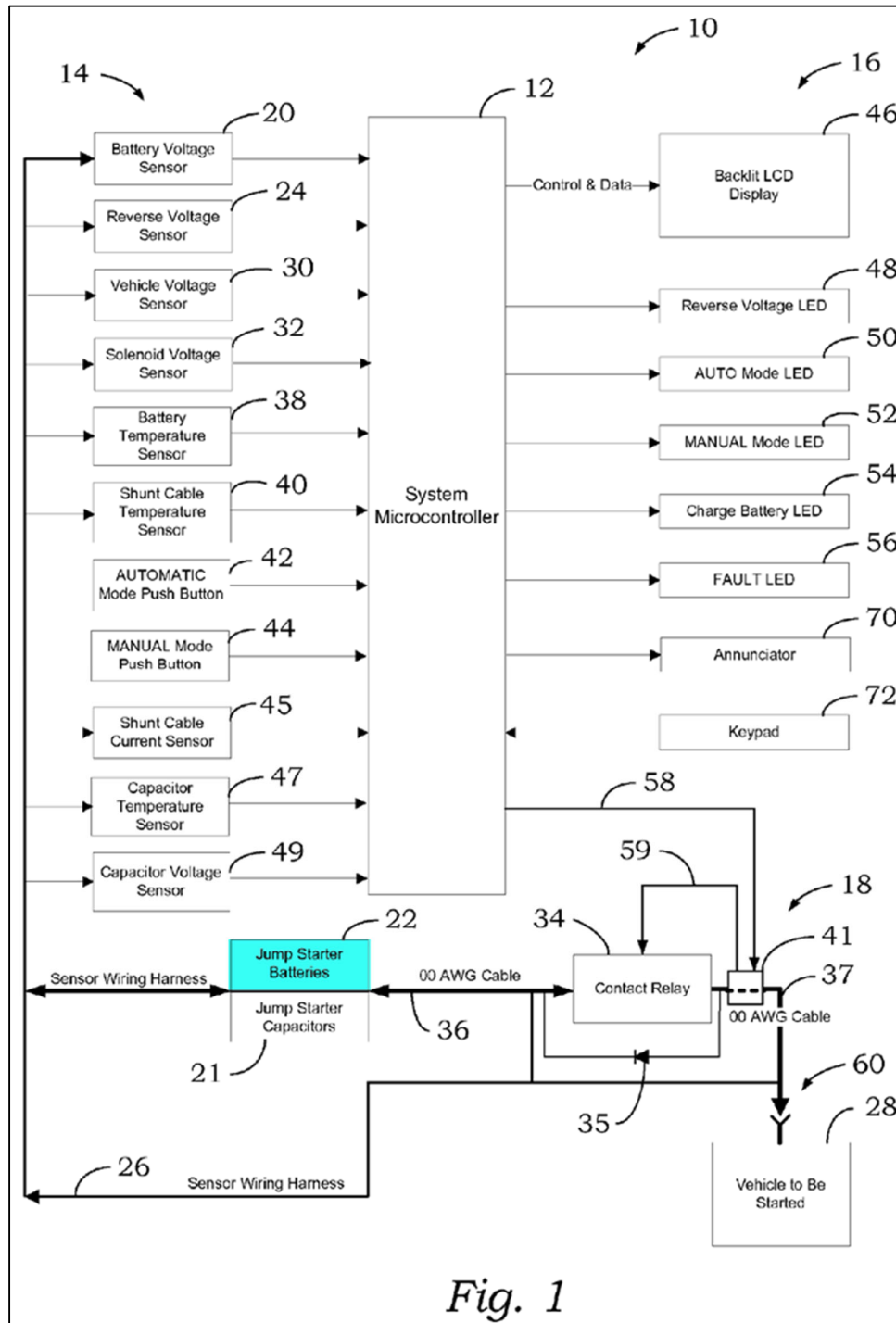
a. **Claim 1 Preamble: “A jump starter apparatus for jump starting a vehicle battery, comprising:”**

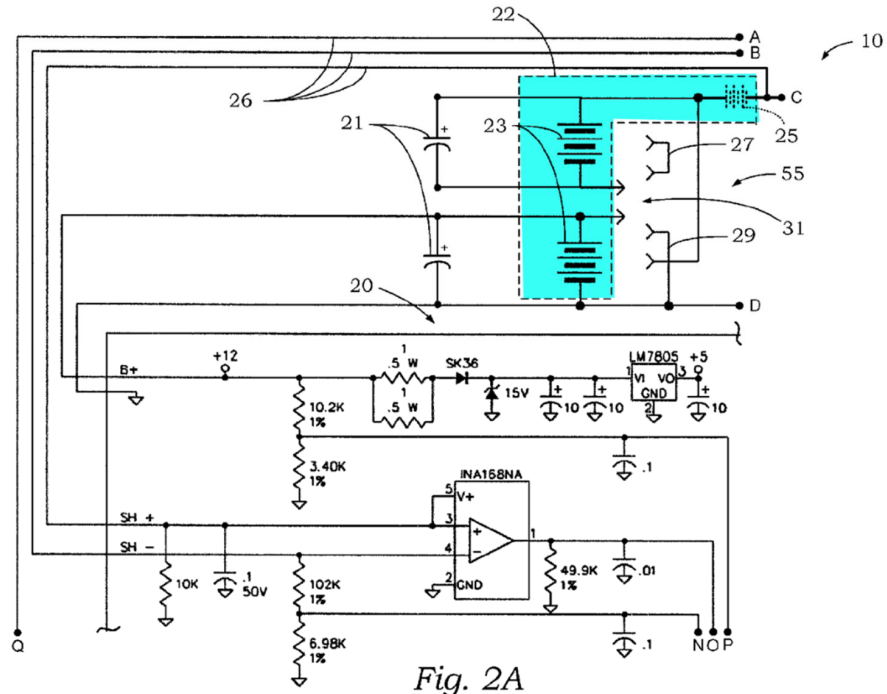
81. Richardson discloses in detail a jump-starting apparatus. Richardson, Abstract, claim 26. Richardson’s apparatus provides supplemental power to jump start a vehicle battery. EX1005, ¶¶ [0002], [0006], [0007]. Richardson discloses jump starter 10 which includes microcontroller 12 to control the system, 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].

82. I understand that similar findings from Richardson were cited by the Board in the ’015-FWD. EX1034 at 50.

b. **Limitation 1[A] “a power supply that includes one or more rechargeable batteries”**

83. Richardson teaches this limitation. 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, annotated below, to indicate the **batteries 22, 23** which operate as a power supply. EX1005, Figs. 1 and 2A (annotated).





84. I have been told that the Board made similar factual findings regarding Richardson in the '015- FWD, which was affirmed on appeal. *See* EX1034, 50-51; EX1035, 2. Richardson expressly teaches that the jump starter batteries are rechargeable. EX1005, ¶¶ [0007], [0055] (“This allows the capacitors 21 and jump starter batteries 22 to be fully recharged...”), claim 25.

85. I understand similar factual findings regarding Richardson were provided in the '015-FWD. EX1034 at 50-51, 73-74.

c. **Limitation 1[B] “a USB port configured to receive power from an external power source for charging the one or more batteries”**

86. The Richardson-Zhao combination renders this limitation obvious. Richardson is not explicit regarding the type of input connector utilized for charging the jump starter batteries. *See, e.g.*, EX1005, ¶[0029]. Zhao teaches using a USB input to receive power from an external power source for charging one or more batteries. As a POSITA would have understood, Zhao’s USB charging circuit would necessarily include a USB port. Indeed, PO admits that USB input connectors are “standard.” EX1001, 7:23-25; §VII.A (discussed above and incorporated here). For the reasons discussed above, a POSITA would have been motivated to combine Zhao and Richardson. *See* ¶¶74-80. In the combined Richardson-Zhao device, which includes Zhao’s USB charging circuit, a USB port would be included.

d. **Limitation 1[C] “a DC-DC converter coupled between the USB port and the one or more rechargeable batteries and configured to increase a voltage received from the external power source for charging the one or more rechargeable batteries.”**

87. The Richardson-Zhao combination renders this limitation obvious. Richardson’s jump starter includes circuitry for detecting a charger voltage and monitoring battery voltage to determine when the charging process is complete. Therefore, Richardson’s system includes components to detect an input charging voltage and to detect the charge level of the battery. *See* EX1005, ¶[0029]; *see also*

EX1005, ¶[0020] (discussing charging of the batteries), ¶[0028]; ¶¶74-80, 83-86 (discussed above and incorporated here).

88. As discussed above, Zhao teaches a USB charging circuit that uses a DC-DC converter to increase a 5V USB input to a higher voltage in order to charge high voltage multi-cell batteries. *See* EX1006, 1:22-27, 1:34-45, 1:46-55, 2:51-3:11; *see also in the same exhibit*, Abstract (“a battery charger can include: (i) a step-up converter configured to generate an output signal by boosting a DC input...”).

89. Specifically, Zhao’s system “include[s] a step-up converter and charging control circuit 201.” EX1006, 2:66-67. This step-up converter is a DC-DC converter which boosts (*i.e.*, increases) an input power signal to a higher-voltage output that “can charge a plurality of series connected (e.g., lithium-ion) batteries[.]” EX1006, 3:1-11. As a POSITA would have understood, Zhao’s step-up converter is a DC-DC converter recited in claim 1 of the ’203 patent. Further, a POSITA would have understood that Zhao’s system is suitable for use with a battery such as a 4S (4 cells in series) pack of lithium-ion cells nominally rated at 14.8V (which would be well-suited for starting a traditional lead-acid vehicle having an electrical system nominally rated at 12V). EX1006, 3:6-11. Indeed, Zhao acknowledges series-connected lithium batteries and provides one example of an “8.4V [battery] if two lithium batteries are connected in series.” EX1006, 4:39-41.

90. A POSITA would have been motivated to combine Zhao's charging system—which includes both direct charging (for high voltage inputs) and step-up charging (for low voltage USB input)—with Richardson's jump starter in order to provide multiple ways of charging Richardson's battery, including through the use of a 5V USB input. A POSITA would have appreciated that such a combination would increase flexibility so that the jump starter batteries can be charged via a traditional high-voltage inputs, like an AC power brick and—when an AC power-outlet is unavailable—the user can rely on a USB power outlet to charge the jump starter's battery. As discussed above, by 2011, USB technology had been widely adopted in over *seven billion* consumer devices. ¶¶36-40 (discussed above and incorporated here). A POSITA would have understood that the inclusion of USB charging into Richardson's jump starter would drastically increase the availability of power sources (i.e., USB outlets) that could be used to charge the jump starter's batteries.

91. The benefits of using USB as a charger has been well-known and utilized for years before the '203 patent. For example, in 2007 the Universal Serial Bus Implementers Forum ("USB-IF") issued its Battery Charging Specification, Revision 1.0 which noted the "convenience" of USB charging "has led to the creation of dedicated chargers that simply expose a downstream USB port." EX1025 at 6; EX1024, ¶¶1-4, 8. By the 2014 priority date of the '203 patent, a POSITA

would have been well aware of the convenience benefits of including 5V USB charging, inasmuch as this was already common practice. *See* EX1016 (US 2013/0285596 A1), ¶[0002] (“In order to achieve the greatest user convenience, modern mobile devices should support five volt and universal serial bus (USB) charging.”).

92. In addition to the explicit teachings of Zhao, the desirability of utilizing USB technology to charge battery-powered devices was well-known before the claimed priority date. The USB-IF even noted what was well-known to a POSITA: 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. *See* EX1025. Relatedly, a POSITA would have understood that the desired benefits of USB technology before the claimed priority date included at least the following: (1) reducing the need for suppliers to ship product with proprietary chargers (thus reducing cost of goods and avoiding electronic waste), (2) providing device users with the desired result of reducing their need to possess or carry multiple proprietary chargers and cables for their battery-powered devices (*e.g.* the goal of universal compatibility), (3) ease of use, and (4) durability. *See, e.g.*, EX1016 (US 2013/0285596 A1), ¶[0002] (“In order to achieve the greatest user convenience, modern mobile devices should support five volt and universal series bus (USB) charging.”).

93. The desirability of using a USB input to recharge batteries at the voltage level of those found in jump starters is also documented in the prior art, further corroborating a POSITA's motivation and understanding of the desirability of USB. For example, USB charging ports had become standard equipment in many cars and trucks before the '203 patent's claimed priority date, which is one location where a jump starter for a vehicle would be stored and charged. EX1049, 1 ("With USB ports now commonplace in new cars, trucks and SUVs, it didn't take long for engineers to realize more is better."); EX1031; EX1032. As another example, the Paparrizos reference states that 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" using "USB, mini-USB, and micro-USB connectors ... present in portable electronics." EX1009, 1:18-23. The '203 patent is explicit that the USB connectors, chargers, and cables were "standard" before the claimed priority date. *See* EX1001, 7:40-48. As another example, as early as **2001**, component suppliers such as Linear Technologies and Maxim Integrated had developed and marketed integrated circuits for the specific application of boosting a 5V USB input to charge higher voltage batteries. EX1027; EX1026, 28:14-31:13; 32:22-38:24; 42:23-43:22; 44:2-19; 51:14-54:13; 54:25-56:14; EX1050. More specifically, Linear Technologies (among other IC and ASCI manufacturers) had provided integrated circuits that enabled USB charging for higher voltage batteries

from a 5V USB source, as further explained by Mr. Bryan Legates in deposition in the ITC Action. *See* EX1026, 53:2-18.

94. Again, this type of application was known to a POSITA and is well-documented in prior art, such as CN 202512152 U—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, Abstract, ¶¶[0004]-[0005], Fig. 1, Fig. 2.

95. Also, CN 201226449Y—a Chinese utility model patent published and issued in 2009—discloses “a booster type charging control circuit is widely used” in applications where the 5V from a USB charging source cannot meet the charging needs of an electronic device. EX1020; EX1021 at 4 (“Background art”).

96. U.S. Patent Publication No. 2013/0285596 (“Zhou”)—which was filed April 30, 2012—discloses circuits with components that can “increase (e.g., step- up) the voltage received from a battery charger via the USB 104 (e.g., about 5V) to the voltage required to charge the battery 110 (e.g., about 10V to 24V). EX1016, ¶[0011].

97. 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.

98. Lastly, Chinese patent CN203788026 to—filed April 18, 2014—explicitly contemplates USB charging the batteries of a jump starter via a DC-DC boosting technique. EX1022; EX1023, Abstract, claim 1, ¶¶[0003]-[0009], [0013], [0016]-[0017], Fig. 1. While CN203788026 does not qualify as prior art, its filing predates the '203 patent and is, therefore, evidence that a POSITA would have recognized and understood the nature of the same problem to which the challenged claims are directed (i.e., charging jump starter batteries), along with proposed solutions (i.e., USB charging and DC-DC conversion circuits).

99. Accordingly, a POSITA would have been motivated to combine the teachings of Richardson and Zhao with a reasonable expectation of success and predictable results.

e. **Limitation 1[D] “a vehicle battery isolation sensor configured to detect presence of the vehicle battery connected to the jump starter apparatus”**

100. Richardson teaches this limitation. I am told the Board previously found—and the Federal Circuit affirmed—that Richardson’s vehicle voltage sensor 30 is “a vehicle battery isolation sensor connected in circuit with said positive and negative polarity outputs, configured to detect presence of a vehicle battery

connected between said positive and negative polarity outputs.” EX1034, 51-67; EX1035, 2.

101. Richardson discloses a vehicle battery isolation sensor as claimed. EX1005, ¶¶[0007], [0027], [0034], [0041], Figs. 3-6. Richardson’s control system uses vehicle voltage sensor 30 to monitor voltage received from the vehicle system on line 37 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-Richardson, ¶¶[0016],[0041]. Richardson’s battery presence sensor is separate from its reverse polarity sensor or circuit. EX1005, Figs. 1, 3, ¶[0027].

102. Richardson’s Fig. 5 (annotated below) show an exemplary flowchart of the various detections and logic decisions made in the jump starter system. EX1005, Fig. 5A.

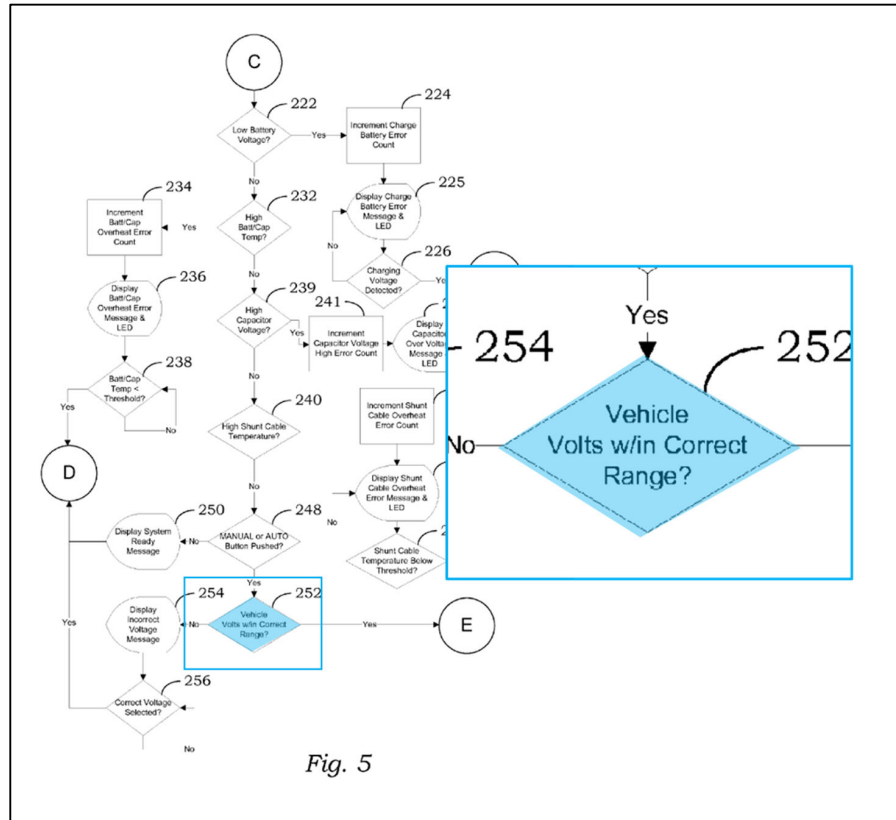


Fig. 5

103. As a POSITA would have understood, Richardson’s device makes a determination of the presence of a non-dead battery at **step 252** of the processing loop in connection with the operation of vehicle voltage sensor 30. EX1005, Fig. 5.

- f. **Limitation 1[E] “a reverse polarity sensor, separate from the vehicle battery isolation sensor, configured to detect a proper polarity connection between the jump starter apparatus and the vehicle battery”**

104. Richardson teaches this limitation. I am told the Board previously found—and the Federal Circuit affirmed—that Richardson discloses a “reverse polarity sensor....” See EX1034, 51-67; EX1035, 2.

105. Richardson teaches a reverse polarity sensor as claimed. For example, Richardson discloses a control system that includes microprocessor 12 and associated sensors, including the reverse voltage sensor 24. EX1005, FIG. 1 (annotated below). “[O]nce 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]; *see also* EX1005, ¶¶[0016], [0020], FIG. 1. “[O]nce 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]; *see also* EX1005, ¶¶[0016], [0020], FIG. 1.

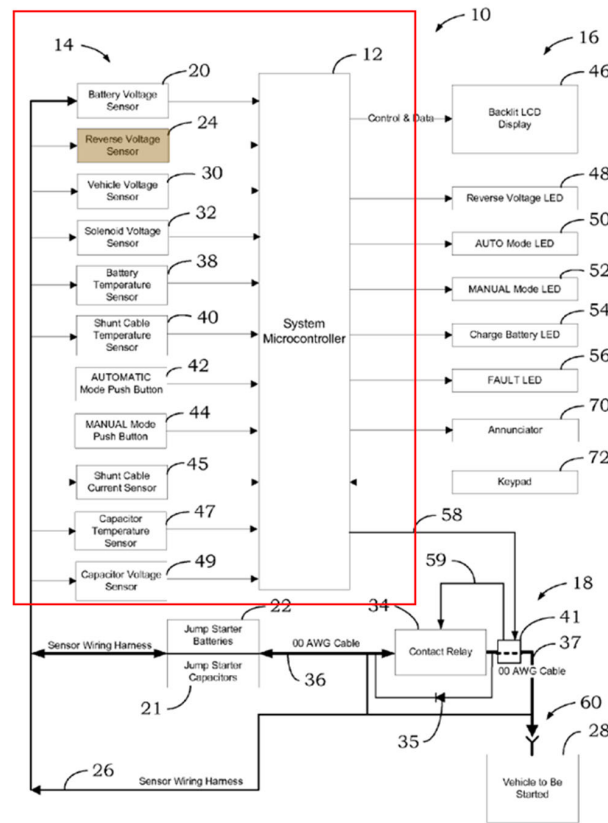


Fig. 1

106. 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....” EX1005, ¶[0016]. “[A]ny further jump starter action by the operator is ignored until the reverse polarity condition is corrected 220....” EX1005, ¶[0016]. Accordingly, Richardson teaches the “reverse polarity sensor” as claimed. Indeed, Patent Owner admitted that “**Richardson** discloses detecting proper polarity” during prosecution of the related ’023 patent. See EX1039 at 20 (emphasis in original).

g. **Limitation 1[F]: “a power switch configured to electrically connect the power supply to the vehicle battery”**

107. Richardson discloses this limitation. I am told the Board previously found—and the Federal Circuit affirmed—that Richardson discloses a “power switch” as claimed. *See* EX1034, 54-55; EX1035, 2.

108. Richardson teaches the claimed “power switch.” Richardson discloses “[contact relay 34](#)” which functions as a power switch to turn on power as claimed. 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. *See* EX1005, ¶¶[0021], [0035]-[0036], [0054], FIG. 1 (annotated).

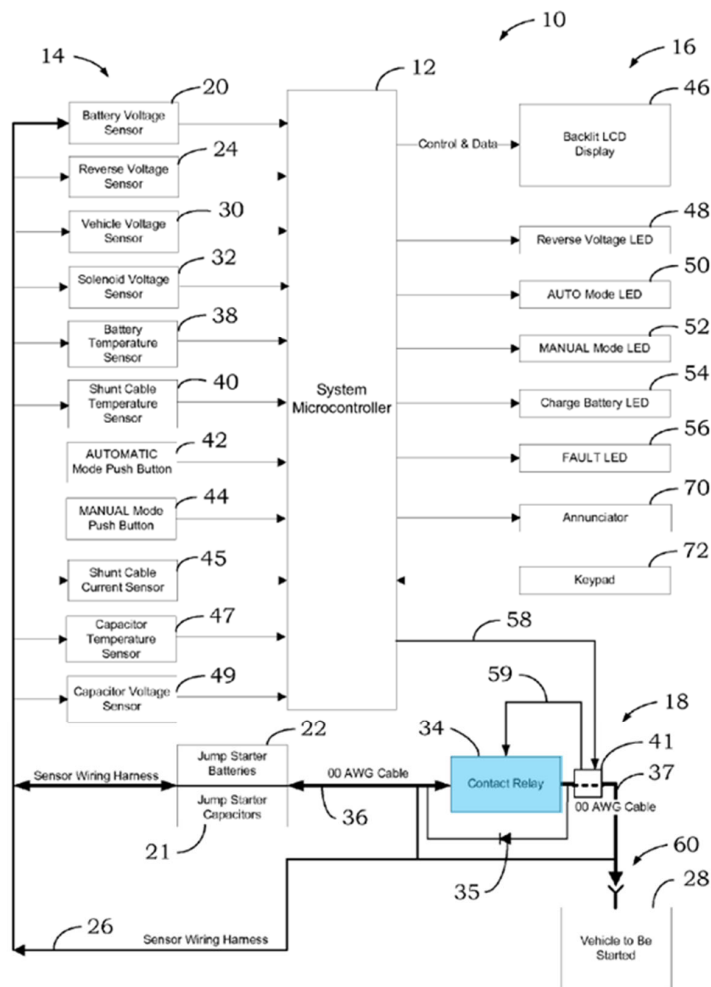


Fig. 1

109. 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

Fig. 6 shows the processing steps which control the operation of the contact relay

34. *See, e.g.*, EX1005, FIG. 6 (Step 268: “Close Starter Contact Relay”).

- h. Limitation 1[G] “wherein the power switch is controlled based on signals from the vehicle battery isolation sensor and the reverse polarity sensor such that the power supply is connected to the vehicle battery when both (i) the vehicle battery isolation sensor currently indicates that the vehicle battery is connected to the jump starter apparatus, and (ii) the reverse polarity sensor currently indicates that the jump starter and the vehicle battery are connected with the proper polarity connection”

110. I have been told that the Board previously found that Richardson discloses controlling the power switch based on signals from the vehicle battery isolation sensor and the reverse polarity sensor as claimed. EX1034, 51-67; EX1035, 2.

111. Richardson discloses Limitation 1[G]. *See* ¶¶100-106 (discussed above and incorporated here). To the extent Patent Owner 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), Richardson discloses separate signals and separate sensors for detecting battery presence and polarity. EX1005, Fig. 1, Fig. 3, ¶[0027]. As shown in Figure 1, Richardson’s reverse voltage sensor 24 and vehicle voltage sensor 30 are separate components. EX1005, Fig. 1 (annotated).

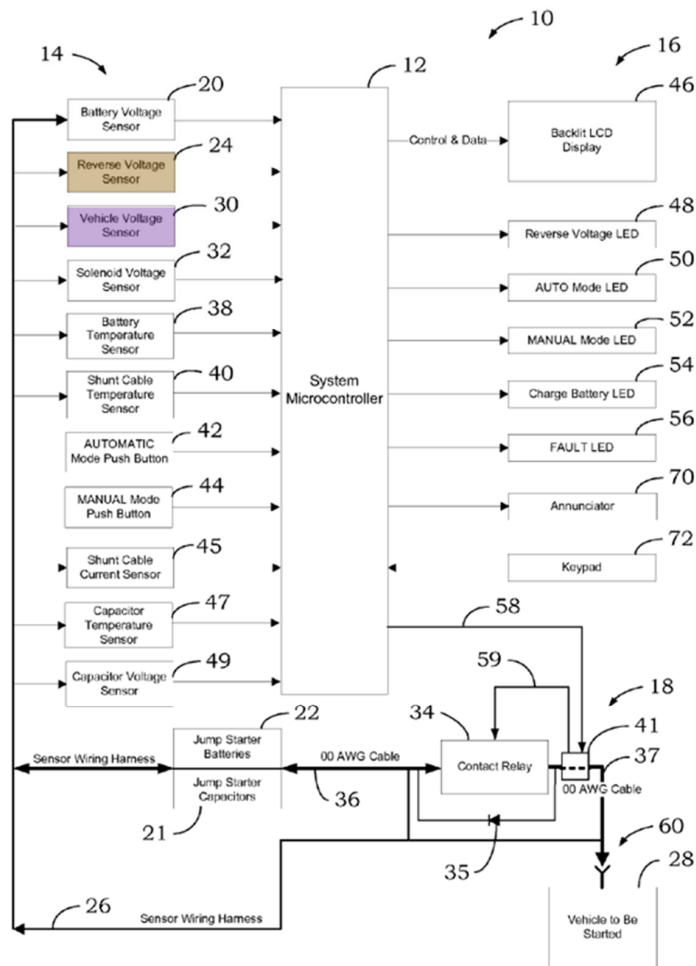


Fig. 1

3. Claim 3

- a. Limitation 3[A] “a positive battery terminal connector for electrically connecting the jump starter apparatus to a positive terminal of the vehicle battery” and
Limitation 3[B] “a negative battery terminal connector for electrically connecting the jump starter apparatus to a negative terminal of the vehicle battery”

112. Richardson teaches this limitation. Richardson discloses a “pair of conductive leads” which include a positive polarity terminal connector as claimed. EX1005, Abstract; see also EX1005, claim 26. Richardson discloses a “pair of conductive leads” which include a positive polarity terminal connector as claimed. EX1005, Abstract; *see also* EX1005, claim 26. The conductive leads are depicted in FIG 2C as jumper cables 60 as “**RED CLAMP**” and “**BLACK CLAMP.**” EX1005, ¶[0016], [0027]. As a POSITA would have understood, Richardson chooses conventional colors for his jumper cables: **red** for connecting to a positive battery terminal and **black** for connecting to a negative (or ground) terminal. *See* EX1005, ¶[0027]; *see also* EX1005, FIG. 2C (annotated). As a POSITA would have further understood, Richardson discloses a positive polarity terminal connector and negative polarity terminal because Richardson’s system detects whether proper polarity is connected. EX1005, ¶¶[0016]; [0027]-[0028]. If the terminals were arbitrary (i.e., either one could be positive or negative), then there would be no need for detection

of a reverse polarity connection. Accordingly, one of the two clamps of the jumper cables would be the positive clamp of the positive polarity cable.

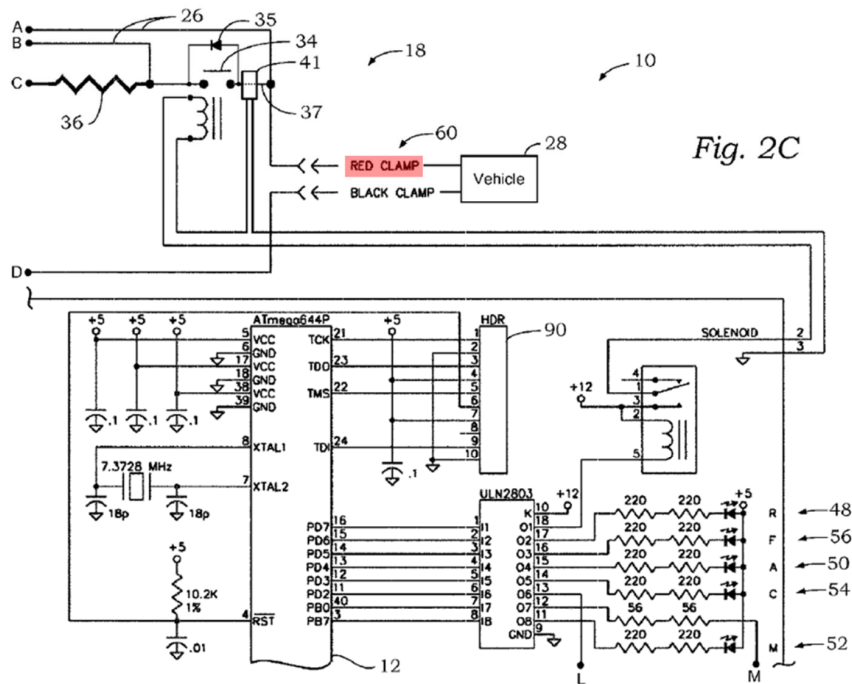


Fig. 2C

113. Accordingly, Richardson teaches a positive battery terminal connector (“RED CLAMP”, shown in Fig. 2C) for electrically connecting the jump starter apparatus to a positive terminal of the vehicle battery and a negative battery terminal connector (“BLACK CLAMP” shown in Fig. 2C), for electrically connecting the jump starter apparatus to a negative terminal of the vehicle battery”.

4. **Claim 4 “a controller that receives the signals from the vehicle battery isolation sensor and the reverse polarity sensor and controls the power switch”**

114. Richardson teaches this limitation. Specifically, Richardson teaches a controller (**microcontroller 12**) that receives the signals from the vehicle battery isolation sensor (**vehicle voltage sensor 30**) and the reverse polarity sensor (reverse voltage sensor 24) and controls the power switch (**contact relay 34**). Fig. 1 (annotated below) shows that “a contact relay control output 58 operates the contact relay 34 through temperature sensor 41” and that microcontroller 12 receives signals from various sensors including **vehicle voltage sensor 30** and **reverse voltage sensor 24**. EX1005, Fig.1, ¶[0021].

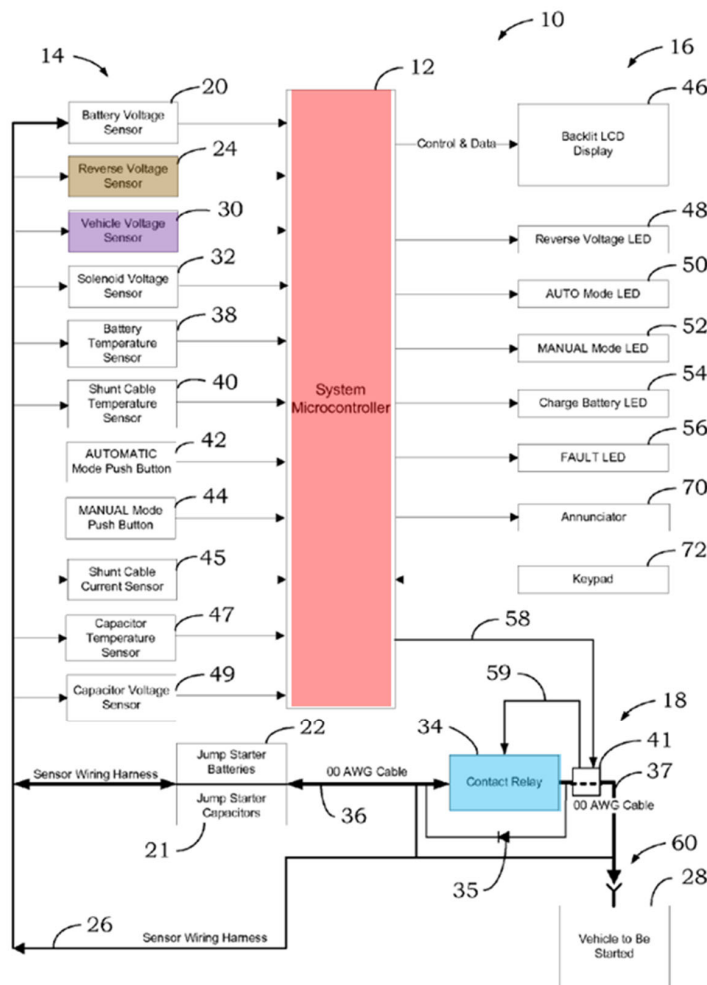


Fig. 1

115. I have been told the Board made similar factual findings regarding Richardson in the '015-FWD, which was affirmed on appeal. EX1034, 51-67; EX1035, 2.

5. Claim 5 “wherein the controller is configured to automatically cause the vehicle battery isolation sensor to detect presence of the vehicle battery and the reverse polarity sensor to detect polarity of the vehicle battery when the vehicle battery is electrically connected to the jump starter apparatus and the jump starter apparatus becomes operational”

116. Richardson teaches this limitation. Richardson discloses a controller (microcontroller 12) configured to automatically cause the vehicle battery isolation sensor (vehicle voltage sensor 30) to detect presence of the vehicle battery and the reverse polarity sensor (reverse voltage sensor 24) to detect the polarity of the vehicle battery when it is electrically connected to the jump starter apparatus and the jump starter apparatus becomes operational. EX1005, Fig.1 (annotated above), ¶¶27, 35; *see also* ¶¶100-106 (discussed above and incorporated here). Richardson monitors (*i.e.*, “detects”) vehicle battery voltage and connection polarity automatically once the jump starter is connected to the vehicle battery (connecting the jump starter cables to the vehicle battery establishes an electrical connection). EX1005, ¶¶[0016]. For example, Richardson teaches 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. EX1005, ¶27. And further teaches that the vehicle voltage sensor 30 automatically monitors the vehicle voltage for a voltage drop of more than twenty percent. EX1005, ¶35.

117. I have been told that the Board made similar factual findings regarding Richardson in the '015-FWD, which was affirmed on appeal. EX1034, 51-67; EX1035, 2. It is my opinion that a POSITA would have found that Richardson and Zhao render this limitation obvious.

6. **Claim 9 “a battery charge controller configure[d] to control charging of the one or more rechargeable batteries from the USB port”**

118. The Richardson-Zhao combination renders this limitation obvious. As discussed above, Richardson teaches one or more rechargeable batteries. *See* ¶¶83-85 (discussed above and incorporated here). Further, Richardson that “[t]he voltage profile of the [jump starter] battery 22 is monitored to determine if the charge is complete 230.” EX1005, ¶[0029], ¶[0020] (discussing charging of the batteries), ¶[0028] (similar). Thus, Richardson teaches circuitry that detects the progress of charging the jump starter’s batteries.

119. Zhao discloses a charging control circuit 201 configured to control the charging of one or more rechargeable batteries from a USB port. *See* EX1006 at 2:63-3:11 (“charging control circuit 201 can charge a plurality of series connected (e.g., lithium-ion) batteries” using, for example “DC input voltage V_{in} ... provided to the step-up converter by a universal serial bus (USB) charger”); ¶¶86-99 (discussed above and incorporated here).

120. For reasons provided above, a POSITA would have found it obvious to

combine the teachings of Richardson and Zhao. A POSITA would have further understood that when adding Zhao's USB charging circuitry, the charging control circuit must also be included in order to facilitate charging and avoid damage to batteries. EX1006-Zhao, 1:25-30; *see also* ¶¶74-80 (discussed above and incorporated here). A POSITA would have understood that the teachings of Richardson and Zhao could be combined to arrive at the claimed battery charger controller. ¶¶74-80 (discussed above and incorporated here).

B. Ground 2: Claims 2, 10, and 11 are unpatentable under 35 U.S.C. § 103(a) over Richardson in view and Zhao in further view of Applicant Admitted Prior Art or E-Power 20/E-Power 21

1. Claim 2 “wherein the jump starter apparatus is a hand-held device”

121. As discussed above, the Richardson-Zhao combination renders claim 1 obvious. *See* ¶¶81-111 (discussed above and incorporated here). The combination of Richardson-Zhao and AAPA renders obvious claim 2. Richardson repeatedly disclosed its power source as “portable”. EX1005 at ¶¶2, 8-11, 14, claim 1. The '203 Patent admits that hand-held jump starters were known in the prior art. *See* EX1001, 3:10-14 (“U.S. Pat. No. 5,793,185 issued Aug. 11, 1998, discloses a hand-held jump starter....”). To the extent that Richardson's disclosure of “portable” does not constitute “hand-held,” a POSITA would have been motivated to make Richardson-Zhao combined device “hand-held” in order to improve the portability of the device.

122. Alternatively, claim 2 is also obvious in view of Richardson and Zhao

in further view of E-Power 20 and/or E-Power 21. I am told that the Board previously found that the “combination of Richardson and Epower-20 and Richardson and EPower-21 are proper.” EX1034, 88. Further, the Board previously found that “Epower-20 and Epower-21 each constitute a printed publication.” EX1034, 97. I agree with this conclusion since Richardson, Epower-20 and Epower-21 all teach portable jump starter devices that are, analogous to the ’203 patent and ’015 patent. . Thus, a POSITA would have found it obvious to construct a jump starter device taught by the combined teachings of Richardson and Zhao in the form shown in either Epower-20 or Epower-21. §VII.A (discussed above and incorporated here); ¶¶74-80 (discussed above and incorporated here).

2. Claims 10 and 11

123. As discussed above, the Richardson–Zhao–AAPA /EPower20/ EPower21 combined device renders claim 9 obvious and the same combination renders claims 10 and 11 obvious.

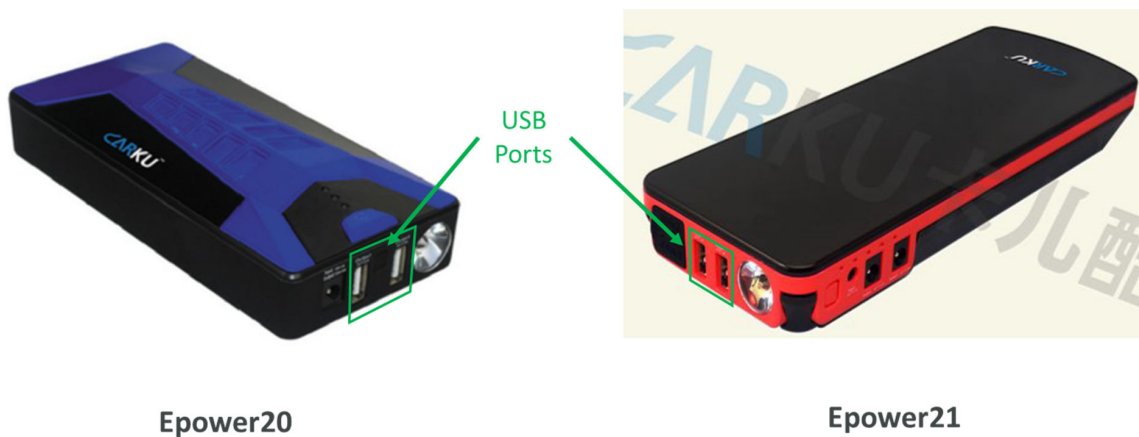
124. Claim 10 requires that the jump starter apparatus be “configured to provide power for charging an external device” and claim 11 further requires that “a USB output port for providing power from the rechargeable power supply” to provide the power to an external device.

125. Epower-20 discloses an “Output” described as “5V/2A” and “5V/1A” for use with “mobile phone, tablet PC, other digital devices.” EX1012. Epower-21

discloses similar outputs. EX1013. A POSITA would have understood that the “5V/2A” and “5V/1A” outputs would be USB outputs. This understanding is further supported by the depiction of a “3-in-1 Mobile Phone Cable” having a USB connector and reproduced below. EX1012; EX1013.

Accessories for Option		
3-in-1 Mobile Phone Cable	Micro USB, iPhone4, iPhone5	
		

126. As shown in the annotated images of the Epower20 and Epower21, both devices include USB ports.



127. The Board's finding of a virtually identical claim of the '015 patent to be unpatentable in view of Richardson and Epower-20 or Epower-21 further support the obviousness of claim 10. *See* EX1034, 86-89 (finding unpatentable a claim reciting "a USB output port configured to provide charging power from said internal power supply to a USB-chargeable device"). The disclosure of USB outputs for charging external devices is sufficient to render obvious both claims 10 and 11. §§VII.A (discussed above and incorporated here), IX.A.1 (discussed above and incorporated here).

128. A POSITA would have found it obvious to include the USB output ports taught by Epower20/Epower21 in the Richardson-Zhao-AAPA/ Epower20/ Epower21 device in order to power external devices, as taught by Epower20/ Epower21. I am told that the Board invalidated a nearly identical claim of the '015 Patent based on the combination of Richardson and Epower20 or Epower21. This decision by the Board further confirms that claims 10 and 11 are obvious. *See* EX1034, 86-89 (finding unpatentable a claim reciting "a USB output port configured to provide charging power from said internal power supply to a USB-chargeable device").

C. **Ground 3: Claims 6-8 are unpatentable under §103 by Richardson in view and Zhao in further view of Krieger**

129. As discussed above, the Richardson-Zhao combined device renders claim 1 obvious. The same combination in further view of Krieger renders claims 6-

8 obvious. Richardson and Krieger both teach jump starter devices. As discussed above, Krieger teaches a power switch 12 that is akin to Richardson's contact relay 34, where Krieger's power switch is a FET switch. Krieger also teaches vehicle battery isolation and reverse polarity sensors—akin to Richardson's vehicle voltage sensor and reverse voltage sensor—that an optically coupled isolator phototransistor. *See* Ex. 1010, ¶¶30, 32; §VIII.6 (discussed above and incorporated here). A POSITA would have recognized that the improvements provided by these features in Krieger would improve the device of the Richardson-Zhao combination in the same way given the similarity of the devices.

130. I am told the Board has already confirmed that the combination of Richardson and Krieger is proper and that substantially identical features to those recited in claims 6-8 are rendered obvious by the combination of Richardson and Krieger. EX1034, 78; §IX.A.1(discussed above and incorporated here). Each of claim 6-8 are discussed below.

1. Claim 6 “wherein the power switch is a FET switch”

131. Claim 6 further limits the power switch to “a FET switch.” EX1001, 9:15-16. FET is an electronic acronym for Field Effect Transistor. This type of power transistor is preferable when higher switching current is needed, because multiple devices can simply be placed in parallel (i.e., tie sources together, tie drains together) to provide additional current switching capacity. Krieger discloses a

power switch comprising a plurality of FETs. *See* EX1010, ¶30; §VIII.6 (discussed above and incorporated here). A POSITA would have found it obvious to use one or more FET switch, taught by Krieger, as the contact relay 34 (i.e., the power switch) in the Richardson-Zhao combined device. The Board’s previous finding that Krieger and Richardson rendered obvious a substantively identical claim of the ’015 patent that recited that “said power switch comprises a plurality of FETs in parallel” further confirms that claim 6 is rendered obvious by the Richardson-Zhao-Krieger combination. EX1034, 77-78; §IX.A.1 (discussed above and incorporated here).

2. Claims 7-8

132. Claim 7 further limits the reverse polarity sensor to “an optically coupled isolator phototransistor coupled to a vehicle battery terminal connector via a diode.” EX1001, 17-20. Claim 8 further limits the vehicle battery isolation sensor to “an optically coupled isolator phototransistor coupled to a vehicle battery terminal connector via a diode.” EX1001, 10:1-4.

133. Krieger discloses a vehicle isolation sensor and reverse polarity sensor comprising of an optically coupled isolator phototransistor (aka, an opto-isolator) Ex. 1010, ¶32; §VIII.6 (discussed above and incorporated here).

134. Krieger uses the opto-isolator 16 to perform both the vehicle isolation sensor and reverse polarity sensor functions. Krieger explains that “[t]he opto-



135. A POSITA would have found it obvious to use an optoisolator as the vehicle minimum battery voltage and separately as the reverse voltage sensor of Richardson. A POSITA would have been particularly motivated to use an optoisolator (optocoupler) of the type disclosed by Krieger for sensing correct polarity connection because the opto-coupler used in Krieger is used as an ON/OFF or *digital* device. Since its function in this circuit is solely to either turn on or off the FET switches, it is a simpler and more reliable solution than the use of a voltage comparator to implement a desired switching current threshold.

136. Thus, both claims 7 and 8 are rendered obvious by the Richardson-Zhao combination in further view of Krieger. The Board's previous findings that Krieger and Richardson rendered obvious a substantively identical claim of the '015 patent that recited that "said vehicle isolation sensor and reverse polarity sensor comprise optically coupled isolator phototransistors" further confirms that claims 7 and 8 are rendered obvious by the Richardson-Zhao-Krieger combination. EX1034, 77-79; §IX.A.1 (discussed above and incorporated here).

D. Ground 4: Claims 1, 3-5, and 9 are unpatentable under 35 U.S.C. § 103(a) over Yu in view of Paparrizos

1. Overview of the Combination

137. A POSITA would have found it obvious to combine teachings of Yu and Paparrizos. Both references involve devices with higher voltage (>5V) battery

packs. A POSITA 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."

138. Specifically, Yu teaches a battery-powered device for jump starting 12V vehicle batteries. EX1008, Abstract, ¶[0004]. Yu discloses an embodiment with a "12V/1A" input for charging a 12V battery. EX1008, FIG. 9.

139. Paparrizos teaches a circuit for charging electronic devices having a multicell pack of series-connected cells. EX1009, 2:32-40. Paparrizos discloses its circuit can use 5V USB to charge higher voltage batteries and specifically refers to "a high surge lithium polymer battery pack includes three 3.7, 2666 mAh lithium polymer batteries...." EX1009, 8:17-31.

140. A POSITA would have found it obvious to combine teachings of Yu and Paparrizos. Both references involve devices with higher voltage (>5V) battery packs and are, therefore, analogous to each other and the '203 patent. A POSITA would have been motivated to modify Yu in view of Paparrizos to include a USB charging input and associated circuit to achieve the predictable result of effectively charging the batteries of Yu's jump starter through a ubiquitous readily available power-source (*i.e.*, USB).

141. A POSITA therefore would have combined Yu and Paparrizos with a reasonable expectation of success and predictable results because Paparrizos

employs well-known and widely utilized concepts of using 5V USB input and a DC-DC boost converter to charge higher voltage batteries. Additionally, implementing Paparrizos USB charging circuit—including the DC-DC conversion circuit—would have required nothing more than implementing a well-known circuit into the jump-starter-battery-charging portions of Richardson’s jump-starter.

142. Further discussion of motivations to combine with expectation of success are detailed herein for each challenged claim.

2. Claim 1

a. Preamble

143. Yu teaches this limitation. Yu discloses a jump-starting apparatus for jump starting a vehicle battery. EX1008, Abstract; claim 1, ¶¶1, 3-4, 9, 21, 26. For example, Yu’s device has an output terminal for conveying power to jump start a vehicle battery. *See, e.g.*, EX1008, ¶4, FIG. 1 (“output terminal” identified as reference numeral 3).

b. Limitation 1[A]

144. Yu alone and/or in combination with Paparrizos teaches this limitation. Yu discloses a device with “an internal battery” constituting a power supply. EX1008, Abstract; FIG. 1, claim 1, ¶¶4, 9, 21. The internal battery “will output current to the vehicle to be started through the output terminal 3.” As a POSITA would have understood, Yu’s internal battery is a multicell battery pack of series-

connected cells with an output voltage of approximately 12V such that a vehicle battery (which is typically 12V) can be jump started using Yu's device. EX1008, ¶26. Yu expressly discloses that the disclosed internal battery is rechargeable. *See* EX1008, ¶¶4 (disclosing "a charging input interface"), 19, 21 (same), 28 ("To allow the internal battery 1 to be charged, a charging input 10 interface is provided on the device.").

145. Further, Paparrizos discloses a battery charging unit with a battery pack comprised of rechargeable lithium cells. EX1009, 2:30-40. Paparrizos further teaches that the battery may further comprise "more than one battery cell connected in series" to predictably achieve a 12V output for the pack. For example, Paparrizos teaches that "[t]he battery voltage of such batteries typically range from 6-8.4V but can provide lower or higher voltages."). EX1009, 2:30-40.

146. To the extent that Yu does not specifically teach that an internal battery that is rechargeable, a POSITA would have been motivated to include the rechargeable battery pack disclosed by Paparrizos as the power supply in Yu's device in order to allow the battery to be recharged between uses. A POSITA would have had a reasonable expectation of success using Paparrizos lithium-ion multi-cell battery because Paparrizos specifically teaches that such a battery is suitable for voltage ranges "higher" than 8.4V—the 12V battery output required for jump starting a vehicle battery is in the range of "higher than 8.4V." The benefits of using

rechargeable batteries in any device are very well known, and a POSITA would have had a reasonable expectation of success in combining the teachings of Yu and Paparrizos and would have yielded predictable results.

c. Limitation 1[B]

147. The Yu-Paparrizos combination renders this limitation obvious. Yu discloses a charging input interface, which can be a 12V/1A barrel-style receptacle. EX1008, Abstract, FIG. 9 (reference numeral 10).

148. Paparrizos teaches charging battery packs with voltages higher than 5V using a 5V USB input. EX1009, Abstract, 3:31-35, 2:30-40, 8:17-31. Paparrizos recognizes the convenience benefits of utilizing the “very popular [USB specification]” to allow consumers “to charge their USB devices from universal USB power sources.” EX1009, 1:18-26. Paparrizos also teaches the inclusion of a USB port to as the USB charging input. EX1009, 7:66-67, 8:7-9.

149. A POSITA would have been motivated to combine the teachings of Yu and Paparrizos to include the USB charging feature of Paparrizos in the jump-starter of Yu so that the jump-starter’s internal battery can be charged using a 5V USB input. As taught by Paparrizos, the addition of a USB input for charging would allow consumers to utilize a very-popular (and widely adopted) means of charging Yu’s jump-starter. A POSITA would have been motivated to include the USB charging feature as an additional and alternative charging input so that Yu’s device could be

charged with a 12V power input (if available) and the 5V USB input when an outlet providing 12V is not available (this likely would be an AC outlet and a power-brick that converts the AC power to 12V). *See also* ¶86 (discussed above and incorporated here). Indeed, Paparrizos teaches that USB charging circuit may be configured to activate the DC-DC boost circuit when the input voltage is detected to be lower than the charged voltage charging level (i.e., the fully-charged voltage level of the battery). EX1009, 8:10-28. Accordingly, Paparrizos acknowledges that different input voltages can be used, and a POSITA would have understood the benefits of allowing for multiple different input voltages. Thus, a POSITA would be motivated to include an additional USB input in order to allow Richardson's jumper starter batteries to be charged using a USB input.

150. Further, when implementing the USB charging features of Paparrizos in Yu's device, a POSITA would have included a USB receptacle, such as a micro-USB or other version of USB port, as taught by Paparrizos. EX1009, 2:56-63, FIG. 1B (identifying USB connector 16b); FIG. 1C (identifying micro-USB connector 16c). A POSITA would have had a reasonable expectation of success in adding Paparrizos' USB charging features because USB is a well-known and standardized specification for which application specific integrated circuits were readily available, and complete circuit design suggestions were published by manufacturers. For example, Maxim Integrated provides circuit design suggestions for their product.

EX1050. Further, a POSITA would have achieved predictable results because the Yu-Paparrizos combination would have required nothing more than the addition of known ports (i.e., USB port) and known circuit components (i.e., the USB charging circuits). As discussed regarding the Richardson-Zhao combination, the use of USB charging in high-voltage batteries was known in the art well before the '203 patent, including the use of USB charging of jump-starters. ¶¶86-99 (discussed above and incorporated here).

d. Limitation 1[C]

151. The Yu-Paparrizos combined device renders this limitation obvious. As discussed above regarding limitation 1[B], the Yu-Paparrizos combined device includes the USB-charging features taught by Paparrizos.

152. For example, Paparrizos discloses a battery charging circuit which can operate in a “boost (power stepped up mode)” and a “forward mode” to boost an input voltage from a USB source to a higher output to charge an internal battery of a device. EX1009, 1:34-38, FIG. 1B, FIG. 1C. Paparrizos discloses battery charging circuit 100 and related components which connect to and charge battery 14. EX1009, 2:30-40. The battery can constitute a series-connected configuration of cells of any suitable battery chemistry, such as lithium-ion batteries, at various voltages above 5V, such as 6-8.4V or higher. EX1009, 2:30-40.

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

154. As a POSITA would have understood, this buck boost circuit 212 is a “DC-DC converter” recited in limitation 1[C] because it converts the higher voltage of the charger’s internal battery to the 5 VDC USB level to charge a battery connected to the USB port when operating in “forward mode.”

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

at input terminal 102 to produce suitable voltage level at charging terminal 104 or system terminal 106.” EX1009, 3:58-4:4.

156. As a POSITA would have understood, Paparrizos teaches a USB input circuit that can receive a 5V USB input and increase that power voltage up to 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, 2:31-38 (discussing application to 3S stack of series connected cells), 8:10-30 (discussing use of forward boost mode to use 5V USB input to charge 3S battery which outputs 12V), 9:36-46 (discussing operation and components of boost converter).

157. As discussed above, the addition of Paparrizos’ USB charging features—including the DC-DC boost converter circuit—in the device of Yu would have been obvious to a POSITA, and a POSITA would have had a reasonable expectation of success and would have achieved predictable results. *See* ¶¶147-150 (discussed above and incorporated here).

e. Limitation 1[D]

158. Yu teaches and/or renders obvious this limitation. Yu discloses a control system which includes a vehicle battery isolation sensor as claimed. Specifically, Yu’s system includes a **microprocessor 12** connected to sensors which include an external battery voltage detection circuit 45 which detects whether a battery is present (*i.e.* connected) or absent (*i.e.*, disconnected) by detecting the

voltage of an external battery (i.e., vehicle battery) when it is connected to the device. EX1008, claim 3, ¶¶6, 9, 23, 26-27, Fig. 1 (annotated below), Fig. 2. Yu's battery presence sensor (external battery voltage detection circuit 45) is separate from its reverse polarity sensor (external battery reverse connection detection circuit 44). EX1008, Fig. 1. Yu teaches that "[w]hen the device is connected to an external vehicle battery, the device will detect the external battery voltage and display the voltage on the LCD simultaneously." EX1008. As a POSITA would have understood, the detection of the external battery voltage is an indication of whether the battery external battery is connected or not (i.e., when no battery is connected, no voltage will be displayed). This is further corroborated by Yu's disclosure preventing "generation of electric sparks when connecting or disconnecting from the vehicle." A POSITA would have understood that, in order to prevent generating sparks, Yu's microprocessor would determine whether a battery is present (i.e., connected to Yu's jump starter) before switching on the relay 2 to energize the connections to the vehicle battery terminals. EX1008, ¶¶3, 9, 26.

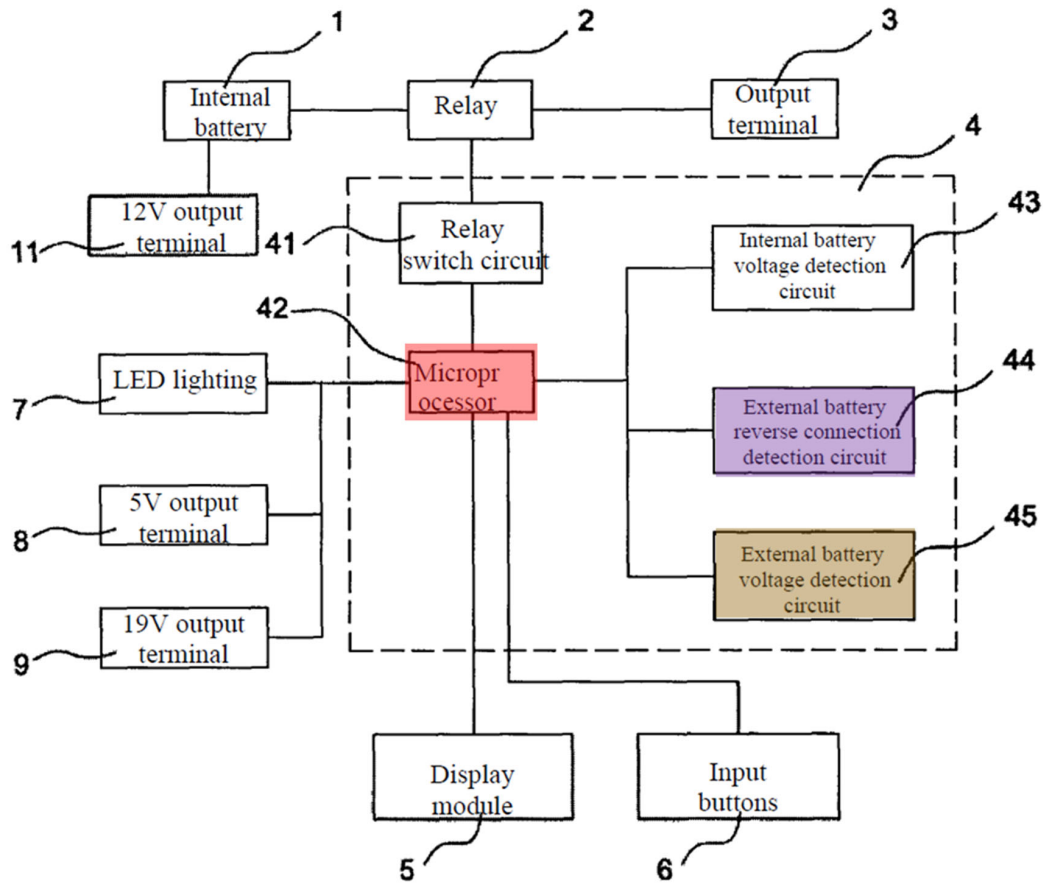


Fig. 1

159. Fig. 2 of Yu shows an example of the external battery detection circuit 45, which includes a voltage divider that provides the “OUT-CHECK” output signal. EX1008, FIG. 2.

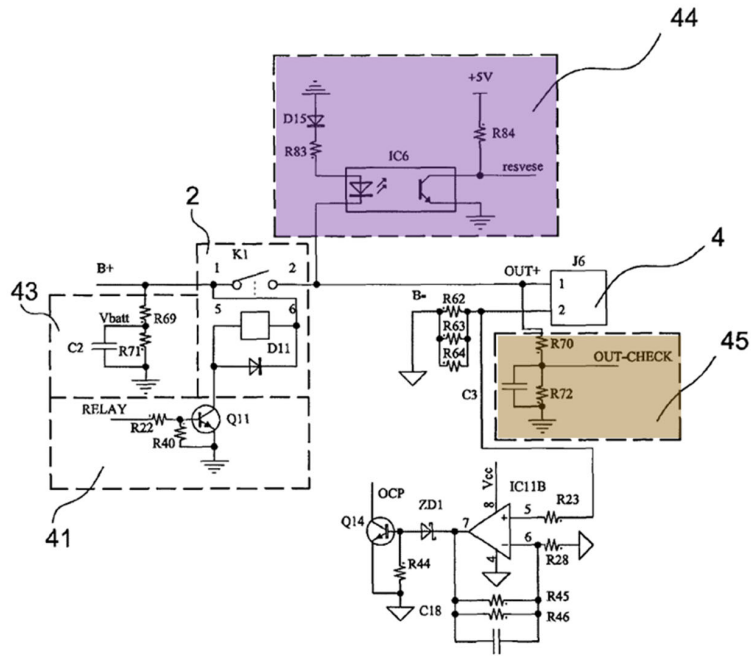


Fig. 2

160. To the extent Patent Owner argues that Yu does not disclose a battery presence sensor, it would have been obvious to a POSITA to detect the presence of the vehicle battery based upon the OUT-CHECK signal received from external battery detection circuit 45. A POSITA would have recognized that the OUT-Check signal will have a different value when an external battery is detected compared with when no battery is connected. Accordingly, using the OUT-CHECK signal to detect the presence of a vehicle battery would have required only comparing the signal to predetermined thresholds. For example, if the OUT-CHECK signal indicates that no voltage has been detected or a voltage near 0 volts have been detected, the microprocessor 12 can determine that no vehicle battery is connected to the device.

Conversely, if a voltage is detected by the external battery voltage detection circuit at or above a predetermined threshold (for example, 1V), the microprocessor would be programmed to determine an external battery is present and connected to the device. A POSITA would have been motivated to implement these changes in order to obtain the known benefit of enhancing safety and avoiding generation of sparks, as taught by Yu. A POSITA would have made such modifications with predictable results because the comparison of values against predetermined thresholds requires nothing more than basic knowledge of electrical circuits and microprocessors.

f. Limitation 1[E]

161. Yu teaches this limitation. Yu teaches a reverse polarity sensor (external battery reverse connection detection circuit 44) as claimed. EX1008, Abstract, claim 1, claim 3, ¶¶4, 6, 21, 23, 26-27, FIG. 1, FIG. 2. For example, Yu teaches that when a vehicle battery is connected with the wrong polarity, the external battery reverse connection detection circuit detects this incorrect connection and the relay (i.e., the power connection switch) is prevented from closing. EX1008, Abstract, claim 1, ¶¶3-4, 9, 21, 26; FIG. 1 (annotated below).

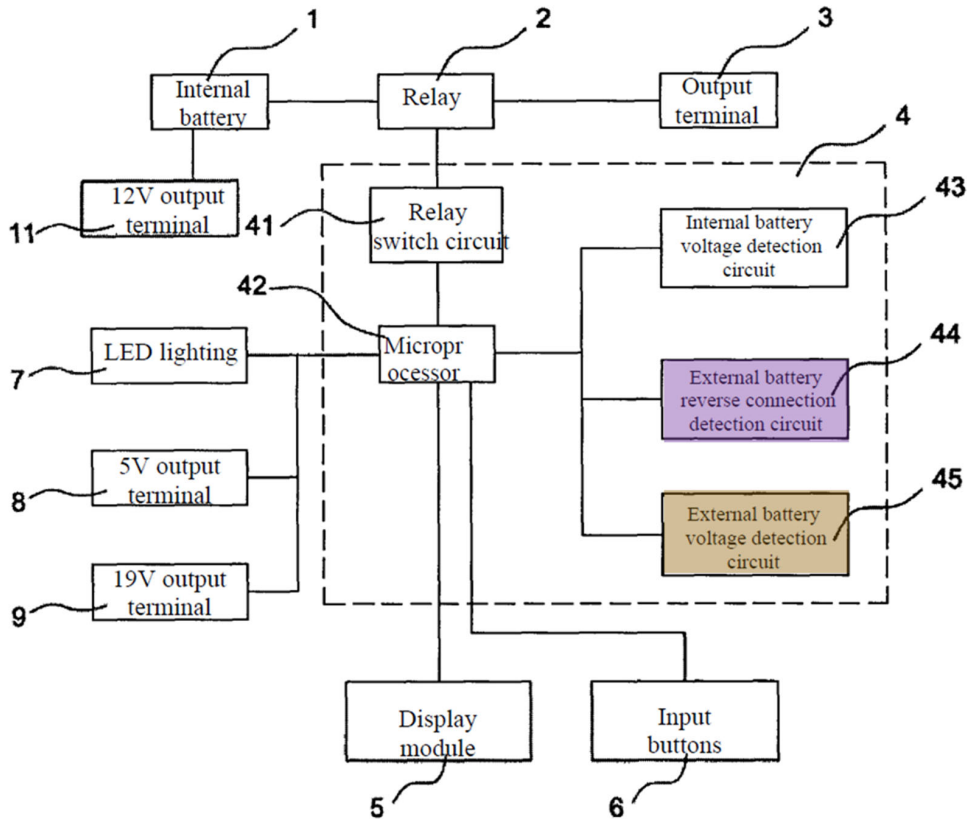


Fig. 1

162. Yu further discloses an exemplary embodiment where the external battery reverse connection detection circuit is an optocoupler which can provide an output signal to the microprocessor labeled as “resvese” (appears to be a typo; Yu correctly uses “reverse” in block 44 of Figure 1) in block 40 of Figure 2. EX1007, FIG. 2; EX1008, FIG. 2. Yu’s optocoupler is the same as the “optically coupled isolator phototransistor” described in the ’203 patent as the reverse battery sensor. *See, e.g.*, EX1001, 5:44-47 (“The reverse battery sensor 10 comprises an optically coupled isolator phototransistor (4N27) connected to the terminal of vehicle battery

72...”); 5:49-53 (“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]

163. Yu discloses a “relay” which functions as a power switch configured to electrically connect the power supply to the vehicle battery as claimed. EX1008, Abstract, claim 1, ¶¶4, 9, 21, FIG 1, FIG. 2. For example, Yu discloses a control module with a microprocessor that “controls the opening and closing of the relay through the relay switch circuit to control current output from the internal battery to the output terminal.” EX1008, Abstract. Yu discloses the jump start process includes closing “relay 2”, which then causes the internal battery to output current to the vehicle battery through the output terminal 3. EX1008, ¶26.

164. Yu teaches this limitation. Yu teaches a power switch ([relay 2](#)) configured to electrically connect the power supply to the vehicle battery as claimed. EX1008, Abstract, claim 1, ¶¶4, 9, 21, FIG.1, FIG.2.

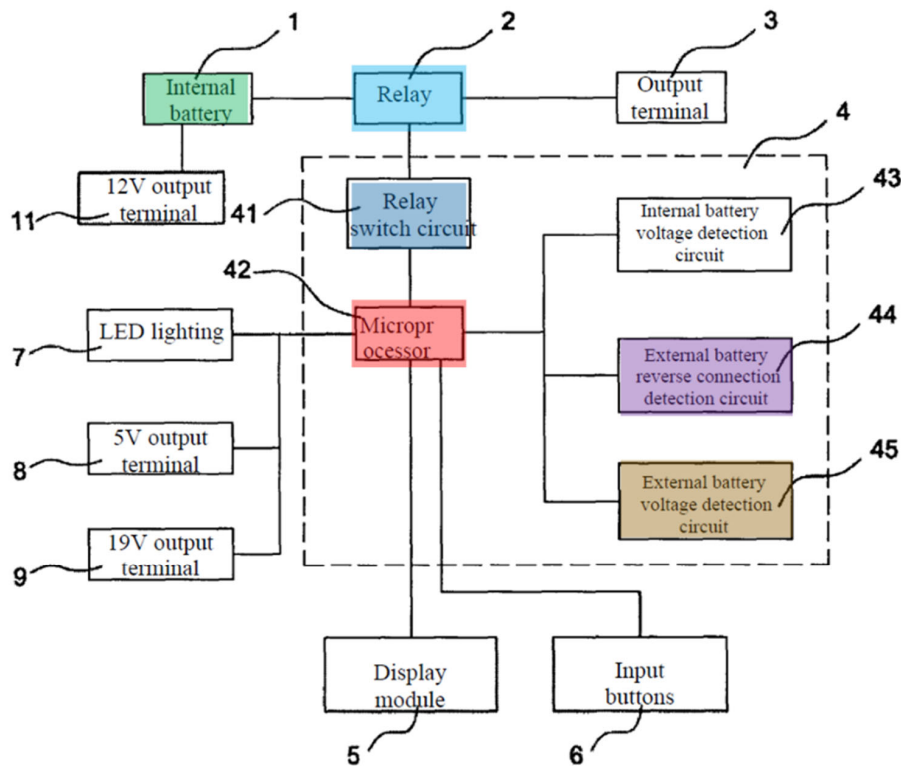


Fig. 1

165. Specifically, Yu discloses a that **microprocessor 42** “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 sequence includes closing “**relay 2**”, which then causes the internal battery to output current to the vehicle battery through the output terminal 3. EX1008, ¶26.

h. Limitation 1[G]

166. Yu teaches this limitation. Specifically, Yu teaches that “[u]nder normal circumstances, the relay is in an off state. If the output terminal 3 is connected

to an external battery with incorrect polarity, a signal is provided to the microprocessor 42 through the external battery reverse connection detection circuit 44, so that the relay 2 controlled by the microprocessor 42 will not close, preventing the wrong polarity from causing a large flow of current.” Accordingly, Yu teaches that the power switch (relay 2) is controlled (i.e., kept in an off state) based on the external battery reverse connection circuit. EX1008, ¶26. Further, Yu teaches that “[i]f the output terminal 3 is connected to the external battery with correct polarity, the external battery voltage detection circuit 45 will operate” and “[i]f the external battery voltage is within the normal range, then the JUMP button of the input buttons 6 can be pressed to close the relay 2.” Accordingly, the power switch (relay 2) is only closed if a proper connection (i.e., not reversed) is detected and if a normal battery voltage is detected. EX1008, ¶26.

3. Claim 3

a. Limitation 3[A] and 3[B]

167. Yu teaches this limitation. Yu discloses “wiring” (also referred to as “external battery wiring” or “output terminal 3 wiring”), which includes a positive battery terminal connector and negative battery terminal connector as claimed. EX1008, Abstract, claim 1, ¶¶[0004], [0021], [0026]. As a POSITA would have understood, in order to jump start a vehicle battery, both negative and positive terminal connectors must be present in the device of Yu. Indeed, Yu’s inclusion of

a reverse connection detection circuit indicates that there must be both a positive polarity connector and a negative polarity connector which a user could accidentally connect in a reverse manner.

168. To the extent that Patent Owner argues that Yu does not explicitly disclose or depict the positive or negative terminal connectors, a POSITA would have understood that Yu implicitly or inherently discloses these features. For example, Figure 8 depicts output terminal 3 as a receptacle that a POSITA would have recognized 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. EX1008, FIG.8; *see also* EX1008, Abstract, ¶¶[0002]-[0003], [0008], [0026]; FIG. 2. Moreover, the '203 patent admits such cables (and associated terminals, clamps or other connectors) were known. EX1001, 1:13-19 (“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, 1:20-27, 1:34-38.

169. Thus, a POSITA would have understood Yu’s wiring for connecting the device to a vehicle battery discloses or renders obvious a positive polarity battery terminal connector and a negative polarity battery terminal connector as claimed.

4. Claim 4

170. Yu teaches this limitation. Yu discloses “the microprocessor controls the opening and closing of the relay through the relay switch circuit to control current output[.]” EX1008, Abstract, ¶[0004]; *see* §IX.D.2.h (discussed above and incorporated here). Yu teaches that the microprocessor 42 receives “signal[s] from the external battery reverse connection circuit 44” and the external battery voltage sensor 45. EX1008, ¶¶23, 26. Yu further teaches that once the vehicle battery is connected to the device, if appropriate conditions are detected by the external battery reverse connection detection circuit 44 and external battery voltage detection circuit 45, Yu’s microprocessor 42 can close the relay 2 to output current to the vehicle battery. EX1008, ¶¶[0009], [0026]. After the jump start is complete, the microprocessor will control the relay to open, and the wiring can be disconnected from the vehicle battery. EX1008, ¶¶[0026]. Based on these teachings of YU, a POSITA would have understood that Yu’s microprocessor 42 receives inputs from the external vehicle battery reverse connection circuit 44 and the external vehicle battery voltage detection circuit 45 and controls the relay 2 based on signals from those detection circuits. In my opinion, a POSITA would have understood Yu’s teaches and/or renders obvious a positive polarity battery terminal connector and a negative polarity battery terminal connector as claimed.

5. Claim 5

171. Yu teaches this limitation. Yu discloses a controller configured to automatically cause the vehicle battery isolation sensor to detect presence of the vehicle battery and the reverse polarity sensor to detect polarity of the vehicle battery when the vehicle battery is electrically connected to the jump starter apparatus and the jump starter apparatus becomes operational. Yu's relay is configured to be controlled by a system comprised of the control module, microprocessor, and associated sensors and circuitry. EX1008, Abstract, claim 1, claim 3, ¶¶[0004], [0006], [0021], [0023], [0026]-[0027], FIG. 1, FIG. 2.

172. Yu discloses that the detection of the presence of a battery and the detection of a correct polarity connection is automatic. For example, Yu teaches that “[i]f the output terminal 3 is connected to an external battery with incorrect polarity, a signal is provided to the microprocessor 42 through the external battery reverse connection detection circuit 44, so that the relay 2 controlled by the microprocessor 42 will not close... If the output terminal 3 is connected to the external battery with correct polarity, the external battery voltage detection circuit 45 will operate.” EX1008, ¶[0026]

6. Claim 9

173. The Yu-Paparrizos combined device renders this claim obvious. As discussed above, Paparrizos' USB charging features include a battery charging

circuit which can operate in a “boost (power stepped up mode)” and a “forward mode” to boost an input voltage from a USB source to a higher output to charge an internal battery of a device. EX1009, 1:34-38, FIG. 1B, FIG. 1C. When in “forward mode,” a buck-boost circuit 212 operates “as a boost converter” in order to drive a charger 214 (e.g., a linear charger, or any other suitable circuit) ... to provide a charging current for battery 14.” EX1009, 4:36-39, 3:11-23. Paparrizos further teaches a USB charging circuit that may be configured to activate the DC-DC boost circuit when the input voltage is detected to be lower than the charged voltage charging level (i.e., the fully-charged voltage level of the battery). EX1009, 8:10-28. *See* ¶¶144-157 (discussed above and incorporated here). Thus, Paparrizos’ USB charging circuit controls charging of the batteries by activating the “forward mode” when certain conditions are met (i.e., the input voltage is lower than the target battery voltage).

E. Ground 5: Claims 2, 10, and 11 are unpatentable under 35 U.S.C. § 103(a) over Yu in view of Paparrizos in further view of E-Power 20/E-Power 21

1. Claim 2

174. As discussed above, the Yu-Paparrizos combined device renders claim 1 obvious. The same combination in further view of Epower20 and/or Epower21 renders claim 2 obvious. As discussed in regard to Ground 2, Claim 2 above, Epower20 and Epower21 teach handheld jump-starter devices. For the same or

similar reasons discussed above, it would have been obvious to a POSITA to modify the Yu-Paparrizos device to have a hand-held form factor. *See* ¶¶121-122, 137-166(discussed above and incorporated here).

2. Claims 10 and 11

175. As discussed above, the Yu-Paparrizos-Epower20/Epower21 combination render claim 9 obvious. Yu teaches the additional limitations recited in claims 10 and 11. Specifically, Yu's device includes "a 5V voltage output circuit connected to the 5V output terminal 8," the output terminal and 5V output circuit being "use[able] as a general power supply for other electrical equipment." EX1008, ¶¶24, 28. Figure 7 of Yu (annotated below) depicts output terminal 8 as a USB port.

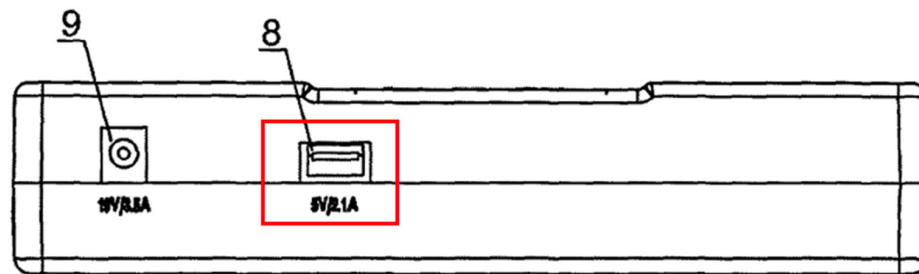


Fig. 7

176. Accordingly, Yu teaches a USB output port (output terminal 8) for providing power from the rechargeable power supply for charging the external device, as recited in claim 11. This same output terminal 8 is configured to provide power for charging an external device as recited in claim 10. As a POSITA would

have understood, any USB port that is used as “a general power supply,” as taught by Yu, can be used to charge an external device.

F. Ground 6: Claims 6-8 are unpatentable under 35 U.S.C. § 103(a) over Yu in view of Paparrizos in further view of Krieger

1. Claim 6

177. As discussed above, the Yu-Paparrizos combined device renders claim 1 obvious. The same combination in further view Krieger renders claim 6 obvious. As discussed in regard to Ground 3 above, Krieger teaches using a FET switch as a power switch in jump-starter device. For the same or similar reasons discussed above, it would have been obvious to a POSITA to modify the Yu-Paparrizos device to use the FET switch taught by Krieger as the relay switch of Yu. *See* ¶¶42, 131, 137-166 (discussed above and incorporated here).

2. Claims 7-8

178. As discussed above, the Yu-Paparrizos combined device renders claim 1 obvious. The same combination in further view Krieger renders claims 7 and 8 obvious. As discussed in regard to Ground 3 above, Krieger discloses a vehicle isolation sensor and reverse polarity sensor comprising of an optically coupled isolator phototransistor. Ex. 1010, ¶32; ¶¶72-73 (discussed above and incorporated here). For the same or similar reasons discussed above, a POSITA would have found it obvious to use opto-isolator sensors as the external vehicle battery voltage detection circuit of Yu and as the external vehicle battery reverse

connection detection circuit of Yu. *See* ¶¶43, 132-166(discussed above and incorporated here).

X. CONCLUSION

179. For these reasons, it is my opinion that claims 1-11 of the '203 patent are not novel and, within my understanding as an external technical expert, appear to be unpatentable.

II. CERTIFICATION

180. 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 if required, at the time allotted for cross-examination.

181. 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. I reserve the option to modify my conclusions in the event that authentic contradictory information should become known at a future time.

Executed on this 9th day of September, 2024.

A handwritten signature in black ink, appearing to read "C. Arthur MacCarley", written over a horizontal line.

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