

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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**The NOCO Company, Inc.**  
Petitioner

v.

**Pilot, Inc.**  
Patent Owner

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Case No. – Not Yet Assigned  
U.S. Patent No. 11,124,077

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**DECLARATION OF DR. JONATHAN R. WOOD**

## **TABLE OF CONTENTS**

I.	Professional Background.....	2
II.	Relevant Legal Standards .....	8
III.	Technology Background.....	12
IV.	THE '077 PATENT .....	17
	A. Overview of the '077 Patent.....	17
	B. Prosecution History of the '077 Patent .....	22
V.	Level of Skill in the Art.....	23
VI.	Claim Construction.....	23
VII.	the challenged claims are unpatentable .....	24
	A. Overview of the Prior Art.....	24
	i. <i>Krieger</i> .....	24
	ii. <i>Richardson</i> .....	27
	iii. <i>Baxter</i> .....	35
	iv. <i>Tracey</i> .....	36
	v. <i>Lai</i> .....	38
	B. Proposed Grounds of Unpatentability .....	40
	C. Ground 1: <i>Krieger</i> Renders Claims 1-7, 9-11, and 18-20 Obvious ....	41
	D. Ground 2: <i>Krieger</i> in view of <i>Baxter</i> Renders Claim 8 Obvious .....	62
	E. Ground 3: <i>Krieger</i> in view of <i>Tracey</i> Renders Claims 22 and 23 Obvious .....	64
	F. Ground 4: <i>Richardson</i> Renders Claims 1-7, 9-16, 18-21, and 24 Obvious .....	67
	G. Ground 5 <i>Richardson</i> in view of <i>Lai</i> renders claim 17 obvious under 35 U.S.C. § 103 .....	91
	H. Ground 6: <i>Richardson</i> in view of <i>Tracey</i> renders claims 17, 22, and 23 obvious under 35 U.S.C. § 103 .....	94
	I. Ground 7: <i>Richardson</i> in view of <i>Krieger</i> renders claims 3-7, 19, and 20 obvious under 35 U.S.C. § 103 .....	95
	i. Claims 3-7 .....	95
	ii. Claims 19 and 20.....	97
	J. Ground 8 <i>Richardson</i> in view of <i>Krieger</i> and <i>Baxter</i> renders claim 8 obvious under 35 U.S.C. § 103 .....	98
VIII.	Conclusion .....	99

1. I am making this declaration at the request of The NOCO Company, Inc. (“NOCO” or “Petitioner”) in the matter of the *Inter Partes* Review of U.S. Patent No. 11,124,077 (“the ’077 Patent”).

2. My company Altor Limited LC is being compensated for my work in this matter at the standard hourly rate for my consulting services. In no way does my compensation in this matter depend on the outcome of this proceeding.

3. In preparing this Declaration, I considered all materials cited in the body of this Declaration, which includes but is not limited to the following:

- a. the ’077 Patent (Ex. 1001) and its file history (Ex. 1002);
- b. Petition for *Inter Partes* Review of the U.S. Patent No. 11,124,077 (“Petition”);
- c. U.S. Patent Application Pub. No. 2013/0154543 to Richardson, *et al.* (“*Richardson*”) (Ex. 1004);
- d. U.S. Patent Application Pub. No. 2004/0130298 to Krieger, *et al.* (“*Krieger*”) (Ex. 1005);
- e. U.S. Patent Application Pub. No. 2010/0173182 to Baxter, *et al.* (“*Baxter*”) (Ex. 1006);
- f. International (PCT) Application Publication No. WO 2012/080996A1 to Tracey, *et al.* (“*Tracey*”);
- g. U.S. Patent No. 8,232,772 to Lai, *et al.* (“*Lai*”); and
- h. Any other documents referred to in this Declaration.

## **I. PROFESSIONAL BACKGROUND**

4. A detailed description of my professional qualifications, including a listing of my specialties, expertise, and professional activities, is contained in my *curriculum vitae*, a copy of which is included at Exhibit 1009.

5. I have 54 years of experience in power electronics and analog circuits, including battery systems. I hold a Ph.D in Electrical Engineering from the Massachusetts Institute of Technology (1973), an M.E. in Electrical Engineering from the University of Auckland (1969), and a B.E. in Electrical Engineering from the University of Auckland (1968).

6. I have extensive expertise in power electronics, power conversion, power supplies, power supply design, power management, analog circuits, analog electronics, DC-DC converter design, battery circuits, and electrical engineering, among other areas. Furthermore, I have 35 years of experience running my own business in power electronics, an experience which has allowed me to obtain an intimate knowledge of the skills of practicing engineers.

7. More specifically, I have been the President of Altor Limited LC since October 2004, and in that role I have provided my expertise in analog and power electronics to key clients such as Dell, Inc.; Qualcomm Inc.; EMO Labs; ITT Night Vision; Watts Regulator Company; International Rectifier Corporation; Johnson

Outdoors Marine Electronics; MagneMotion, Inc.; ON Semiconductor; Rackspace Hosting; and Argo-Tech Corporation, among others.

8. Prior to that, from 1999 to 2004, I was the Vice President of Engineering at Acumentrics Corporation in Westwood, Massachusetts, where I oversaw the development of military-grade UPS systems, large flywheel-based UPS systems, and fuel cell systems.

9. From 1986 to 1999, I was the President of Altor, Inc., which I founded. The company provided design, prototyping, and manufacturing services to a wide variety of companies such as AT&T Corporation, AirNet Communications Corporation, Bose Corporation, Compaq Computer Corporation, EMC Corporation, GTE Government Systems, International Power Devices, Lockheed Sanders Corporation, Lucent Technologies, Inc., Raytheon Company, Wang Laboratories, and others. In addition, I provided consulting services personally to a number of hardware manufacturers with regard to design issues including hardware failures, and reliability issues. An expanded list of customers is shown in my Curriculum Vitae.

10. While at Altor, Inc., I led the company in designing and developing a wide variety of custom power supplies according to the requirements of our customers, as illustrated in an excerpt of our 1998 company brochure below.

11. Under my guidance, Altor, Inc. developed numerous power supplies for diverse applications, including instrumentation power supplies, medical power supplies, redundant power supplies, programmable linear power supplies, specialty power supplies, computer power supplies, rugged-environment power supplies, dual-redundant power supplies, multiple-redundant power supplies, industrial power supplies, replacement power supplies, network power supplies, and battery backup systems. This can be seen in excerpts of the same company brochure below.



*Figure 1. Excerpt from brochure for Altor, Inc.*

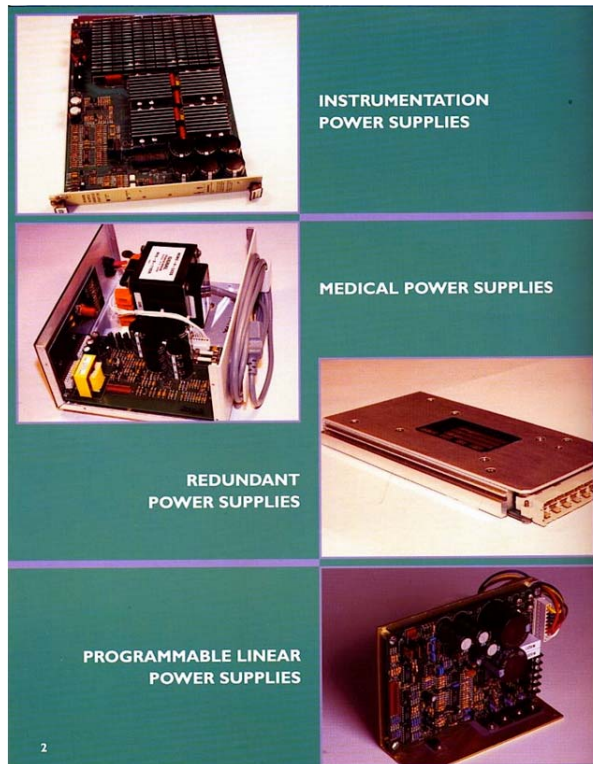


Figure 2. Excerpt from brochure for Altor, Inc.



Figure 3. Excerpt from brochure for Altor, Inc.

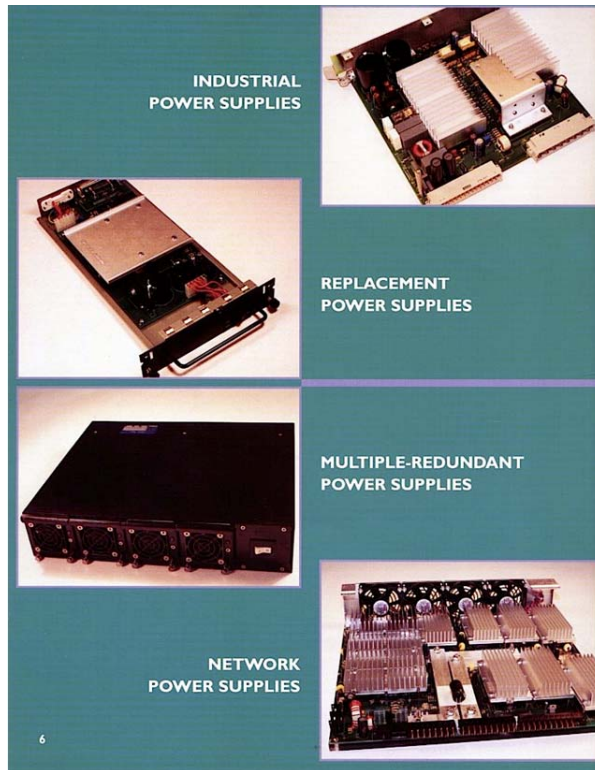


Figure 4. Excerpt from brochure for Altor, Inc.



Figure 5. Excerpt from brochure for Altor, Inc.



12. The engineers under my leadership provided custom-designed and tailored power supplies for different applications in diverse industries. In order to avoid engineering failures at my own expense, I had to know the technical abilities of these employees.

13. Before my time at Altor, Inc., I worked from 1981-1986 as a design and research engineer at Data General Corporation with a primary focus on power supplies, including battery backup systems. As a Senior Engineer at Data General Corporation, I designed a reliable power supply for the company's MV/4000 computer, which was a major revenue-producing product for the company. I carried out modeling, analysis, and design implementation of democratic load-sharing schemes for modular power supplies, and I categorized, modeled, and compared options for power supply front ends for fault-tolerant systems.

14. While at Data General, I also identified, modeled, and explained the occurrence of chaotic system behavior in switching power supplies. In addition, I identified, modeled, and implemented a fast-transient-response feedback loop design method. I presented technical papers at national power conversion conferences (Powercon and APEC) relating to these topics in 1982, 1983, 1984, and 1989.

15. I worked from 1977-1981 as the Systems Group Leader at Mobil Tyco Solar Energy Corporation, with a primary focus on solar photovoltaic power supplies, including battery charge control systems.

16. I have given lectures on feedback systems and power electronics at major universities (including Harvard University, M.I.T., Duke University, and Worcester Polytechnic Institute). I have lectured on feedback systems at the IEEE Applied Power Electronics Conference (APEC), for which I was a founding committee member in 1986. I hold sixteen patents in the field of electronic power conversion, and I have served as an expert witness in over a dozen cases.

## **II. RELEVANT LEGAL STANDARDS**

17. I have been asked to provide my opinion as to whether claims 1-24 (“the Challenged Claims”) of the ’077 Patent are anticipated by the prior art or would have been obvious to a person having ordinary skill in the art (“POSITA”) at the time of the alleged invention, in view of the prior art.

18. I am an engineer and scientist by education and profession. The opinions expressed by me in this Declaration involve the application of my engineering knowledge and experience to the evaluation of certain prior art with respect to the ’077 Patent. I am neither an attorney nor a patent agent. Therefore, I have requested the attorneys from Jones Day, who represent NOCO, to provide me with guidance as to the applicable patent law in this matter. The paragraphs below

express my understanding of how I must apply current legal principles related to patentability.

19. I understand that in determining whether a patent claim is anticipated or obvious in view of the prior art in an *inter partes* review (IPR) proceeding, the Patent Trial and Appeal Board (PTAB) gives claims their ordinary and customary meaning, or the meaning that the term would have to a POSITA at the time of the invention in view of the intrinsic record. I understand that the claim language, specification, and prosecution history are relevant to determine the meaning of a claim term. I understand that the prosecution history of a patent provides the record of the examination of a patent application before the U.S. Patent and Trademark Office (PTO). The prosecution history provides evidence of how the patent examiner and the inventors understood the patent application and the claims and can therefore be instructive on how to interpret the claims. I understand that extrinsic evidence may also be used to interpret the meaning of a claim term. Extrinsic evidence includes dictionaries, treatises, expert testimony, and prior art. But I understand that one should first look to the intrinsic evidence in construing claims.

20. I understand that there are at least two circumstances wherein the words in a patent claim may differ from and not be given their plain and ordinary meaning. One circumstance is when the applicants act as their own lexicographer

by clearly setting forth a definition of a claim term that may differ from the plain and ordinary meaning it would otherwise possess. Another circumstance is when the applicant includes or provides an intentional disclaimer, or disavowal, of claim scope. I understand that an applicant may act as their own lexicographer, or disclaim or disavow claim scope, in either the specification or the prosecution history of the patent. I understand also that the applicant may act as a lexicographer, or disclaim or disavow claim scope, by making amendments to the claims during prosecution, or by making assertions to the PTO about the differences between the claimed inventions and the prior art.

21. I understand that a claim is unpatentable under 35 U.S.C. § 102 if each and every element and limitation of the claim is found either expressly or inherently in a single prior art reference.

22. I understand that a claim is unpatentable under 35 U.S.C. § 103 if the claimed subject matter as a whole would have been obvious to a person of ordinary skill in the art at the time of the alleged invention. I also understand that an obviousness analysis takes into account the scope and content of the prior art, the differences between the claimed subject matter and the prior art, and the level of ordinary skill in the art at the time of the invention.

23. In determining the scope and content of the prior art, I understand that a reference is considered appropriate prior art if it falls within the field of the

inventor's endeavor. In addition, a reference is prior art if it is reasonably pertinent to the particular problem with which the inventor was involved. A reference is reasonably pertinent if it logically would have commended itself to an inventor's attention in considering his problem. If a reference relates to the same problem as the claimed invention, that supports use of the reference as prior art in an obviousness analysis.

24. To assess the differences between prior art and the claimed subject matter, I understand that 35 U.S.C. § 103 requires that the claimed invention be considered as a whole. I also understand that a finding of obviousness requires more than merely demonstrating that each claim element was known in the prior art. Obviousness requires showing that a person of ordinary skill in the art would have been motivated to combine the teachings of the prior art to achieve the claimed invention and would have had a reasonable expectation of success in doing so.

25. I understand that the Supreme Court has recognized several rationales for combining references or modifying a reference to show the obviousness of claimed subject matter. Some of these rationales include: combining prior art elements according to known methods to yield predictable results; simple substitution of one known element for another to obtain predictable results; a predictable use of prior art elements according to their established functions;

applying a known technique to a known device (method or product) ready for improvement to yield predictable results; choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; and some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

### **III. TECHNOLOGY BACKGROUND**

26. Most people know that physical contact with electric wires must be avoided when the voltage on those wires is sufficiently high. Worldwide safety agencies have set 60 volts DC as the voltage level below which human contact is considered safe. Thus, human contact with the 120 volts present in U.S. power outlets must be avoided.

27. In addition to the danger presented by high voltage, a source of electric current may also be hazardous, even at a voltage low enough to be considered non-hazardous. Worldwide safety agencies have set levels of energy and power below which human contact is considered safe, even when the voltage is well below 60 volts. A 12-volt automobile battery exceeds these levels by a wide margin. Placing a metal object such as a wrench directly across the terminals of a vehicle battery will produce sparks and/or a melted wrench and/or a damaged battery and/or a fire if flammable materials are nearby. To emphasize the danger

of energy hazards, Safety Standard UL 478 issued by Underwriters Laboratories, Inc. stated the following:

*25.1. The capability for damage or injury to persons (other than by electric shock) from available electrical energy is considered to exist at any live part, if, between the live part and an adjacent dead metal part or live part of different polarity, a potential of 2 volts or more exists with either (1) an available continuous power level of 240 VA or more, or (2) a reactive energy level of 20 joules or more. For example, a tool or other metal short-circuiting a component could cause a burn or a fire if sufficient energy is available at the component to vaporize, melt, or more than warm the metal.*

28. In my own experience from youth, I well remember my dad impressing upon me the dire importance of preventing metal objects from connecting the two terminals of a vehicle battery. My dad owned an automobile dealership, and on one occasion when changing a vehicle battery, he momentarily allowed the wrench removing one terminal to touch the metal strap of his wristwatch, which happened to be in contact with the other terminal. He received a burn from the watch strap, and the resulting painful wound did not heal for many months.

29. Lead-acid batteries have been used in automobiles for over a hundred years, and throughout that time have exhibited a frustrating tendency to lose charge at inconvenient times, resulting in a “dead” battery which is incapable of starting a vehicle. Throughout the twentieth century, starting a vehicle having a “dead”

battery has been accomplished with a pair of so-called jumper cables made of heavy-gauge wire with alligator clamps at each end. One cable is colored red for attachment to the positive terminals, and the other cable is colored black for attachment to the negative terminals. In use, a direct electrical connection is made between the batteries of the two vehicles. When the engine of the assisted vehicle has started, the cables are disconnected.



*Figure 6. Conventional jumper cables.*

30. When accomplished correctly, the method of jumper cables functions well enough, that is, at least well enough to start the engine of the vehicle with the dead battery. The method is, however, fraught with some danger. This danger results from the fact that a vehicle battery is an electrical energy hazard. Short circuits resulting from accidental misconnection of the jumper cables can produce the unwanted results listed above quickly and unexpectedly, including sparks and/or melted cables and/or damaged batteries and/or fire. In most vehicles, the



negative battery terminal is directly connected to the engine or chassis, and a short circuit will result if the red cable clamp (already attached to the positive battery terminal) touches the engine or chassis. Another danger exists via an accidental direct connection made when red and black cable clamps come into contact with each other, their other ends being attached to an intact battery. Yet another dangerous potential misconnection exists via an accidental reverse-polarity connection between vehicles, in which the positive cable from the intact battery is connected to the negative terminal of the assisted vehicle, and vice versa. Such unintended and dangerous misconnections are easily made.

31. During the last twenty years or so, lithium-ion batteries have become readily available. Such batteries provide a low-impedance source of electrical energy in a compact lightweight package, and manufacturers have produced a variety of handheld devices capable of jump-starting an automobile without the need for connection to another vehicle or to an external battery.



*Figure 7. NOCO portable jump starter.*

32. While lithium-ion batteries provide certain advantages for jump starting a vehicle compared with hooking up the discharged battery to another vehicle's lead-acid battery, lithium-ion batteries present certain heightened risks. Chief among these is thermal runaway failure via an exothermic reaction, whereby if a lithium-ion battery is accidentally short-circuited or allowed to overheat, a situation can arise wherein cells of the lithium-ion battery begin to fail, releasing heat. These temperatures cause other cells to fail, and these failures cascade until the battery itself can erupt in flame. The potential for thermal runaway failure is one reason why, for example, the United States Federal Aviation Administration has banned devices containing lithium-ion batteries, such as laptop computers and hoverboards, from being loaded into cargo compartments of aircraft. Airline crews are taught that the best way to deal with a laptop computer that has erupted in

flame is to pour water on the device. (Even hot coffee will do, but ice cubes will not.)

33. Designers of jump-starters containing lithium-ion batteries need to ensure that the lithium-ion batteries can never be overcharged, because overcharging produces heating, leading to possible thermal runaway. In addition to protective charging circuitry (usually housed within the jump-starting device), reverse-flow protection must be included to ensure that once a vehicle engine has been started, current will not flow from the vehicle battery back into the lithium-ion battery within the jump-starter. Many jump-starters have 12-volt lithium-ion batteries which must be protected from vehicle battery voltages reaching 15 or 16 volts, once the vehicle engine is running. Three common methods to implement reverse-flow protection are: 1) Having the control circuitry within the jump-starter open the connecting switch whenever a reverse-flow situation may occur, 2) Incorporating blocking diodes in series with the switching relay of a jump-starter (if a relay is used as the power switch), and 3) Placing series-connected MOSFET switching transistors in opposite directions to inhibit back-flow through the body diodes of the MOSFET transistors (if such transistors are used for the power switch).

#### **IV. THE '077 PATENT**

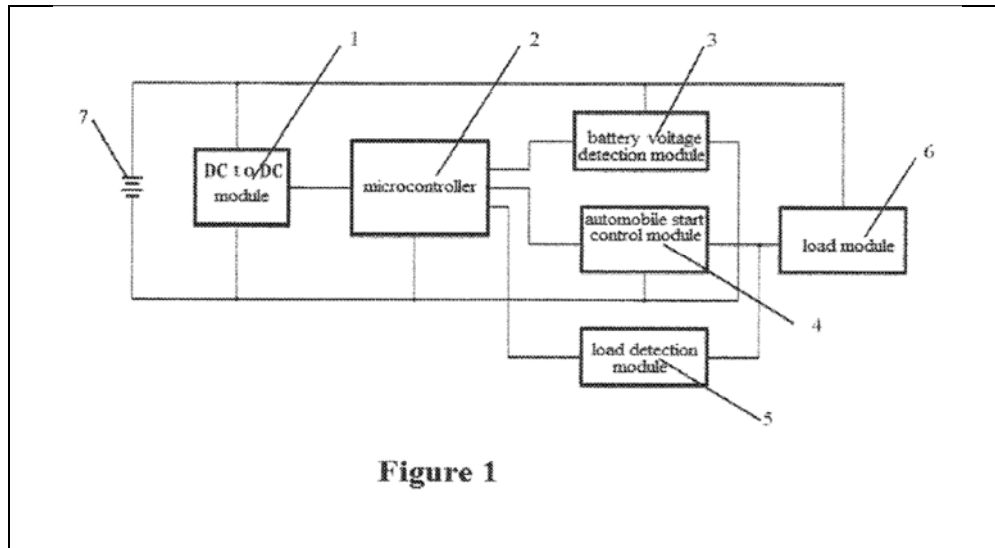
##### **A. Overview of the '077 Patent**

34. In summary, the '077 Patent discloses a jump starter that includes:

- a power supply battery (referred to in the '077 Patent as a “direct current power supply”),
- a power switch made up of six MOSFETs,
- a boost device providing drive voltage to the gates of the six MOSFETs,
- an 8-pin microcontroller U2,
- a 3-terminal voltage regulator U1 providing supply voltage for the microcontroller U2, and
- two resistive dividers.

35. Contrary to standard industry terminology, the '077 Patent refers to the voltage regulator U1 as a “DC to DC module.”

36. The '077 Patent relates to an automobile charging device that prevents operation when the charging electrodes are improperly connected to the automobile battery, such as with reverse polarity. *See* Ex. 1001 at 1:21-34; 42-45. An example of the disclosed automobile charging device is illustrated in Figure 1 of the '077 Patent, set forth below.



Ex. 1001 Figure 1

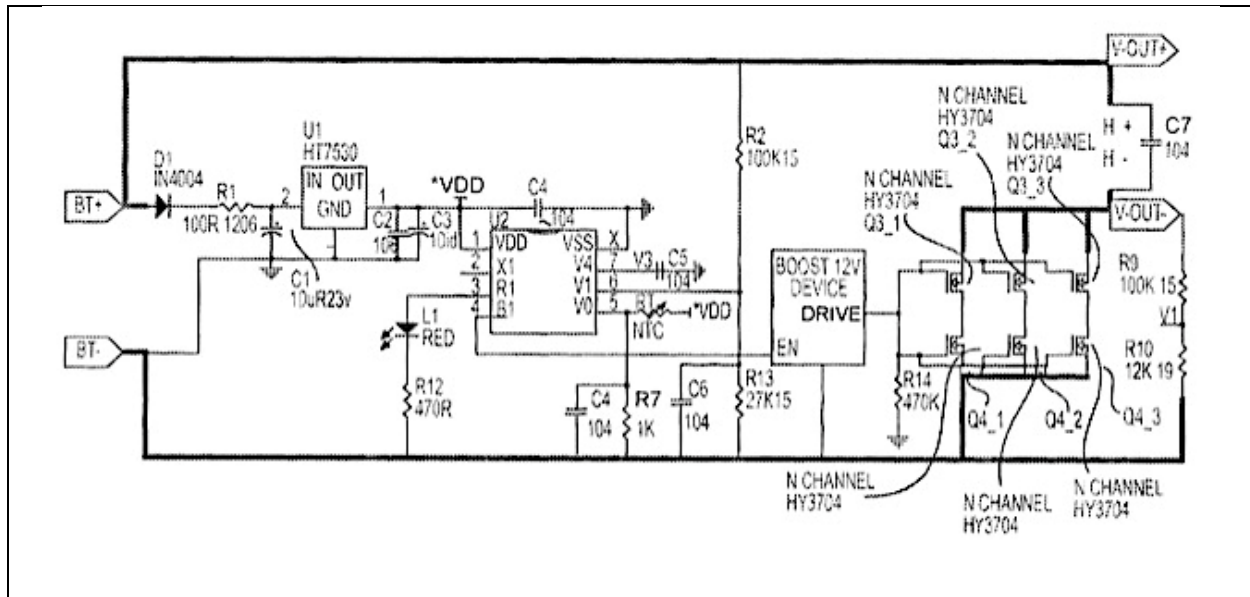
37. As shown in Fig. 1, the automobile charging device described in the '077 Patent includes a direct current power supply 7 (also referred to as a battery) that is used to supply charging current to a load module 6, which “comprises the automobile storage battery and the automobile engine.” *See id.* at 3:15-35; Fig. 1. The automobile charging device is controlled by a microcontroller 2, which collects data from a battery voltage detection module 3 and a load detection module 5 in order to control the supply of power to the load module 6 through an automobile start control module 4. *See id.* at 4:14-22; Fig. 1. Specifically, “[t]he battery voltage detection module [3] conducts the measurement of the battery [7] voltage, the automobile start control module [4] conducts the power supply or the power outage for the load module [6] through the microcontroller [2], wherein the load detection module [5] detects whether the load module [6] is correctly connected.” *Id.* at 4:16-22. The automobile charging device further includes a DC to DC module 1

(commonly known as a 3-terminal voltage regulator, as noted above) that provides a “stable voltage” from the direct current power supply 7 to the microcontroller 2.

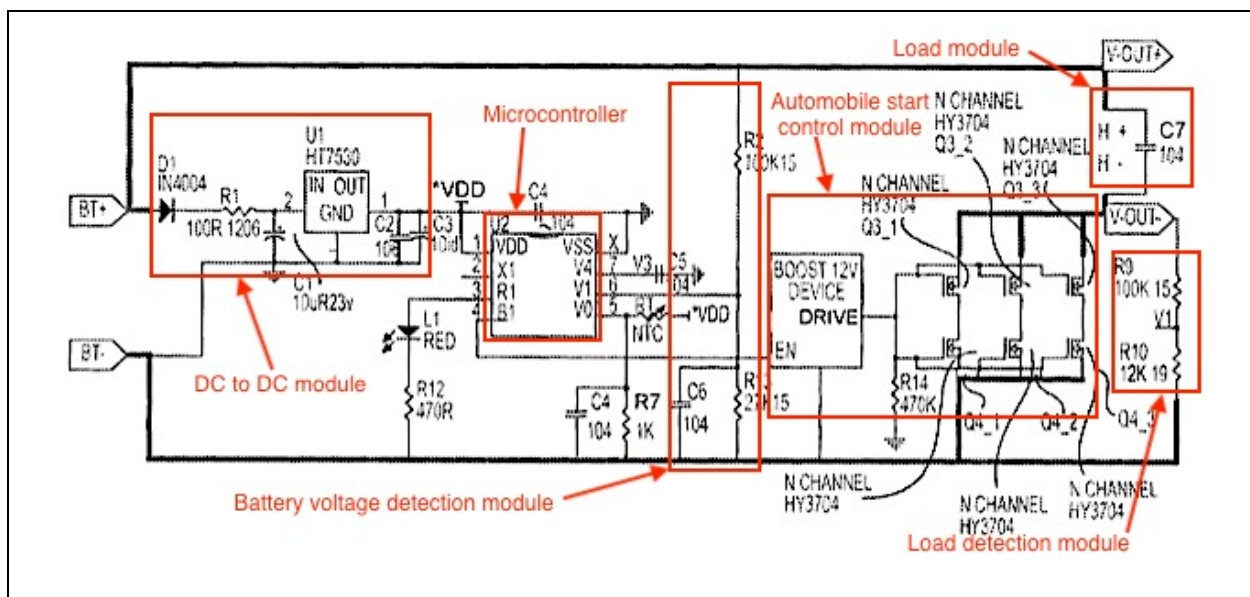
*See id.* at 3:15-35; 4:14-16; Fig. 1.

38. The '077 Patent explains that the microcontroller 2 “determines whether the automobile storage battery is connected with the automobile engine through the load detection module [5]” and that “the automobile start control module is automatically activated and the battery [7] starts to supply power to the load module [6] when the load is correctly connected.” *Id.* at 4:23-28. Further, “the automobile start control module [4] is automatically deactivated and the battery [7] stops supplying power to the load module [6] when assuming that the load is not connected or the positive and negative polarities are reversely connected.” *Id.* at 4:28-32. The microcontroller 2 also causes the automobile charging device to enter a “standby mode” and “closes all outputs when the battery [7] voltage is lower than 9V,” and resumes normal operations “when the battery [7] voltage is larger than 10V.” *Id.* at 4:32-35.

39. Figure 2 from the '077 Patent provides more detail for the items disclosed in Figure 1:



*Ex. 1001 Figure 2*



*Ex. 1001 Figure 2 annotated*

40. The first of the two resistive dividers depicted in Figure 2, comprising resistors R2 and R13, has its output connected to Pin 6 of microcontroller U2 and its input connected to the power supply battery voltage. The second of the two resistive

dividers depicted in Figure 2, comprising resistors R9 and R10, also has its output connected to Pin 6 of microcontroller U2, and has its input connected to the vehicle battery voltage. Thus, Pin 6 of microcontroller U2 receives a linear combination of the voltages of the power supply battery and the vehicle battery. No other pin of microcontroller U2 receives a signal indicating status of the vehicle battery.

**B. Prosecution History of the '077 Patent**

41. I have reviewed the prosecution history of the '077 Patent. Following is a brief summary.

42. U.S. Patent Application No. 17/236,260 (“the '260 Application”) was filed on April 21, 2021 and issued as the '077 Patent on September 21, 2021. *See* Ex. 1001. The '077 Patent claims priority through a series of continuations to U.S. Patent No. 9,525,297, filed on December 12, 2014, which claims the benefit of priority to Chinese Application No. 201420212173.5, filed on April 28, 2014. *See* Ex. 1001 at 1:5-17; *see also* Ex. 1002 at 215-222.

43. The '260 Application was filed with a Preliminary Amendment that cancelled claims 1-6, and added claims 7-30 that ultimately issued (without amendment) as claims 1-24 of the '077 Patent. *See* Ex. 1002 at 191-196. Prior to examination, the Patent Owner filed an information disclosure statement with the Patent Office listing over 200 patent and non-patent references, with no explanation of the relevance of any reference to the claims of the '260 Application. *See id.* at



156-185. A first Office Action was then issued on June 24, 2021, rejecting claims 7-30 of the '260 Application only for non-statutory (obviousness-type) double patenting over co-pending U.S. Application No. 17/131,113. *See id.* at 101-106. The Office Action did not apply or address any of the over 200 references cited in the information disclosure statement. *See id.*

44. The Patent Owner filed a response to the first Office Action and a terminal disclaimer of U.S. Application No. 17/131,113 on June 28, 2021. *Id.* at 79-99. A Notice of Allowance was then issued by the Patent Office on July 12, 2021. *Id.* at 68-73

## **V. LEVEL OF SKILL IN THE ART**

45. In my opinion, a person having ordinary skill in the art (POSITA) at the time of the '077 Patent would have been a person having at least a Bachelor's Degree in a relevant engineering discipline such as electrical engineering and at least two years of relevant experience in the design and/or development of automotive electrical systems, or a Masters or more advanced degree in a relevant engineering discipline such as electrical engineering.

## **VI. CLAIM CONSTRUCTION**

46. I understand that the claims of the '077 Patent should be given their plain meaning, which is the meaning understood by a POSITA at the time of the

invention in view of the patent and file history. This is the meaning that I have applied to the claims in my analysis.

## VII. THE CHALLENGED CLAIMS ARE UNPATENTABLE

### A. Overview of the Prior Art

#### i. *Krieger*

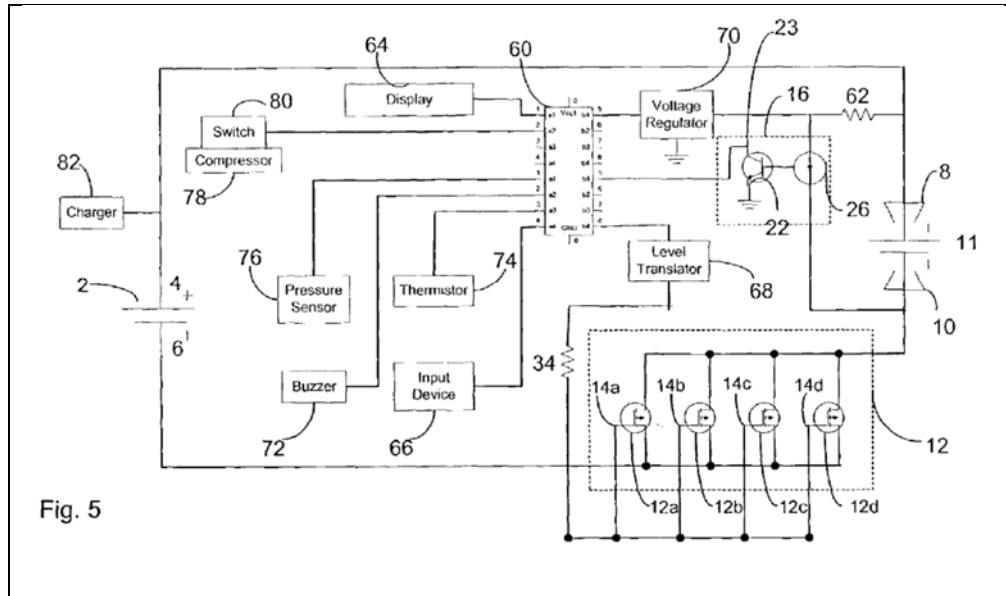
47. *Krieger* was filed on December 10, 2002 and was published on July 8, 2004. I understand that *Krieger* is prior art to the '077 Patent.

48. In summary, *Krieger* discloses a jump starter that includes:

- a built-in battery 2,
- a power switch 12 made up of four MOSFETs,
- a level translator 68 providing drive voltage to the gates of the four MOSFETs,
- a 16-pin microcontroller 60,
- a 3-terminal voltage regulator 70 providing supply voltage for the microcontroller 60, and
- a feedback circuit or other means including a resistive divider to monitor the voltage and/or current of the vehicle battery [0044].

49. *Krieger* describes “a booster device used for boosting a depleted battery and in particular to microprocessor control of the booster apparatus and a polarity protection circuit.” Ex. 1005 ¶ [0002]. “The polarity protection circuit is electrically connected to the battery to be charged (depleted battery) and to a boosting battery or other power source.” *Id.* at ¶ [0010]. “The polarity protection circuit prevents current flow between the batteries unless proper polarity is

achieved.” *Id.* An example of a microprocessor-controlled jump starter system with polarity protection is illustrated in Fig. 5 of *Krieger*, set forth below. *Id.* at ¶ [0043].



*Ex. 1005, Fig. 5.*

50. The microprocessor 60 shown in Fig. 5 of *Krieger* “can be programmed to perform essentially all of the control functions needed for operation of the jump starter.” *Id.* at ¶ [0043]. “By way of a feedback circuit or other means, the microprocessor 60 can monitor the voltage and/or current being supplied to the depleted battery 11 from the booster battery 2, the voltage and/or current of the battery 11 and can detect short circuits or other faults.” *Id.* at ¶ [0044]. The microprocessor 60 is also used to control a switch 12, which is coupled to one of the wires or battery cables to be connected to the depleted battery 11, and is activated to complete a boosting circuit between the boosting battery 2 and the depleted battery

11 only when a correct polarity connection between the batteries is attained. *See id.* at ¶¶ [0029], [0045].

51. *Krieger* explains that polarity detection may be performed by the microprocessor 60 using the opto-isolator 16 shown in Fig. 5. “Opto-isolator 16 is coupled to clamps 8, 10 [to be connected to the battery 11 to be charged] via resistor 62 such that LED 26 is forward biased when a correct polarity connection between the boosting battery 2 and the depleted battery 11 is made.” *Id.* at ¶ [0045]. “When forward biased, LED 26 turns on phototransistor 22.” *Id.* “When the phototransistor 22 is on, a first signal of a first voltage is present at the collector 23 and is sensed by the microprocessor 60.” *Id.* “When the phototransistor 22 is off, a second signal of a second voltage is present at the collector 23 and is sensed by the microprocessor 60.” *Id.* “The microprocessor 60 provides output signals to activate the switch 12 into a conducting state when it receives the first signal and provides an output signal to deactivate the switch 12 into a non-conducting state when it receives the second signal.” *Id.* Thus, “[i]f the polarity connections of clamps 8, 10 to the depleted battery 11 are not correct, the switch 12 remains off.” *Id.* at ¶ [0047].

52. In addition, the “[m]icroprocessor 60 can be programmed to detect if clamps 8, 10 are connected to a battery or have been disconnected.” *Id.* at ¶ [0048]. “To perform the detection, the microprocessor 60 deactivates the switch 12 into a non-conductive state.” *Id.* “Via the feedback circuit or other means, the

microprocessor detects whether clamps 8, 10 are connected to a battery.” *Id.* “If no battery is present, the switch 12 is placed in a non-conducting state, that is, all the FETs 12a-12d are placed into a con-conducting state.” *Id.* “If a battery is present, the jump starting process continues.” *Id.*

53. *Krieger* further explains that “[t]he microprocessor 60 can also be programmed to detect a bad battery or a battery whose voltage is too low to be jump started.” *Id.* at ¶ [0055]. “This type of fault may also be detected if there is no battery connected to clamps 8, 10 or a poor connection is made to the depleted battery 11 and the jump starter is activated.” *Id.* at ¶ [0056]. “When the fault occurs, the microprocessor 60 can be programmed to terminate the jump starting process and to display a suggestion to the user that the battery be reconditioned before jump starting is attempted or to check if the clamps 8, 10 are properly connected to the battery.” *Id.*

54. The microprocessor 60 in *Krieger* is also “programmed to detect when the voltage of the boosting battery 2 falls below a predetermined level, for example, about 80% of its rated value.” *Id.* at ¶ [0053].

## ***ii. Richardson***

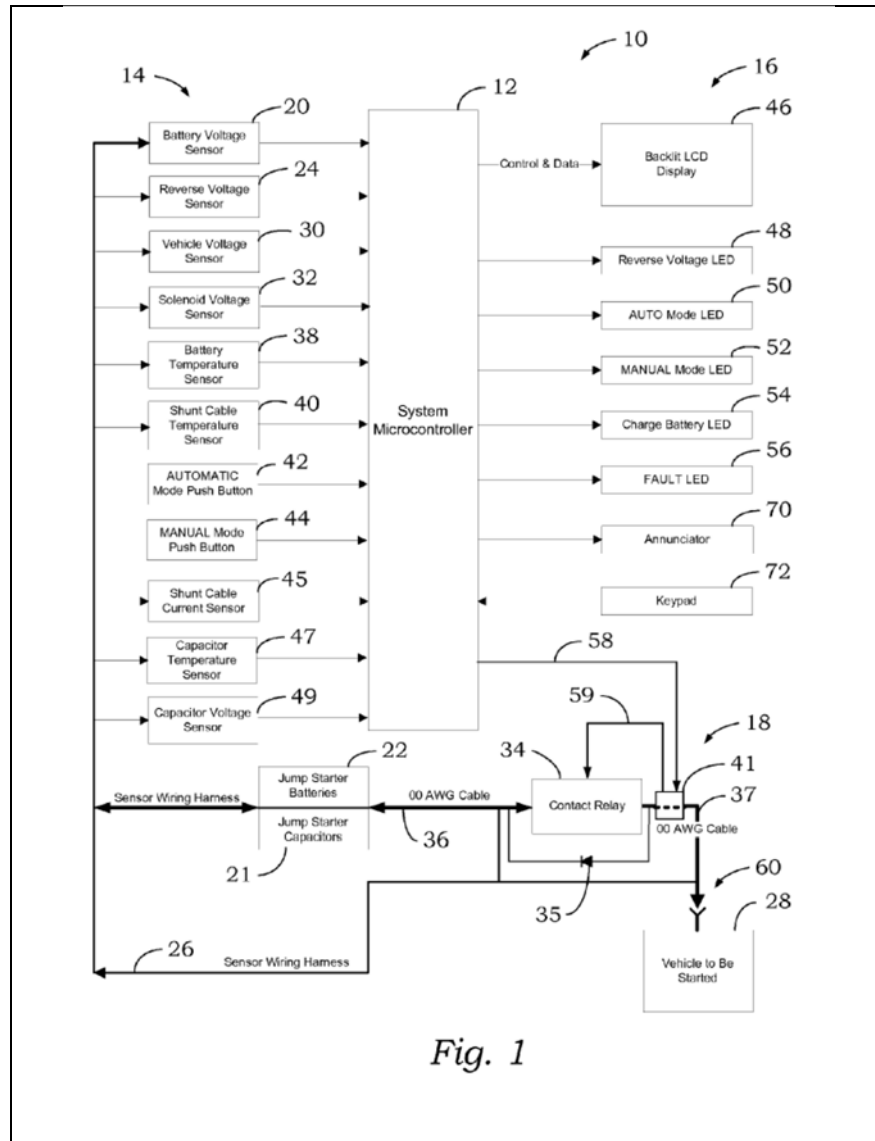
55. *Richardson* was filed in the United States on February 15, 2013 and published on June 20, 2013. I understand that *Richardson* is prior art to the '077 Patent.

56. In summary, *Richardson* discloses a jump starter comprising:

- jump-starter batteries 22,
- a contact relay 34,
- a programmable microprocessor 12,
- a 3-terminal voltage regulator (LM7805 in *Richardson* Fig. 2A) providing supply voltage for the microprocessor 12, and
- sensors 24 and 30 to monitor the condition of the vehicle battery.

57. *Richardson* describes a portable power source for providing supplemental power to start internal combustion and turbine engines that “monitors the voltage of the battery of the vehicle to be jump started and the current delivered by the jump starter batteries and capacitors to determine if a proper connection has been established and to provide fault monitoring.” Ex. 1004 ¶¶ [0002], [0007].

*Richardson* explains that “[f]or safety purposes, only if the proper polarity is detected can the system operate.” *Id.* at ¶ [0007]. An example of *Richardson*’s portable power source (also referred to as a jump starter) is illustrated in Fig. 1, set forth below.



*Fig. 1*

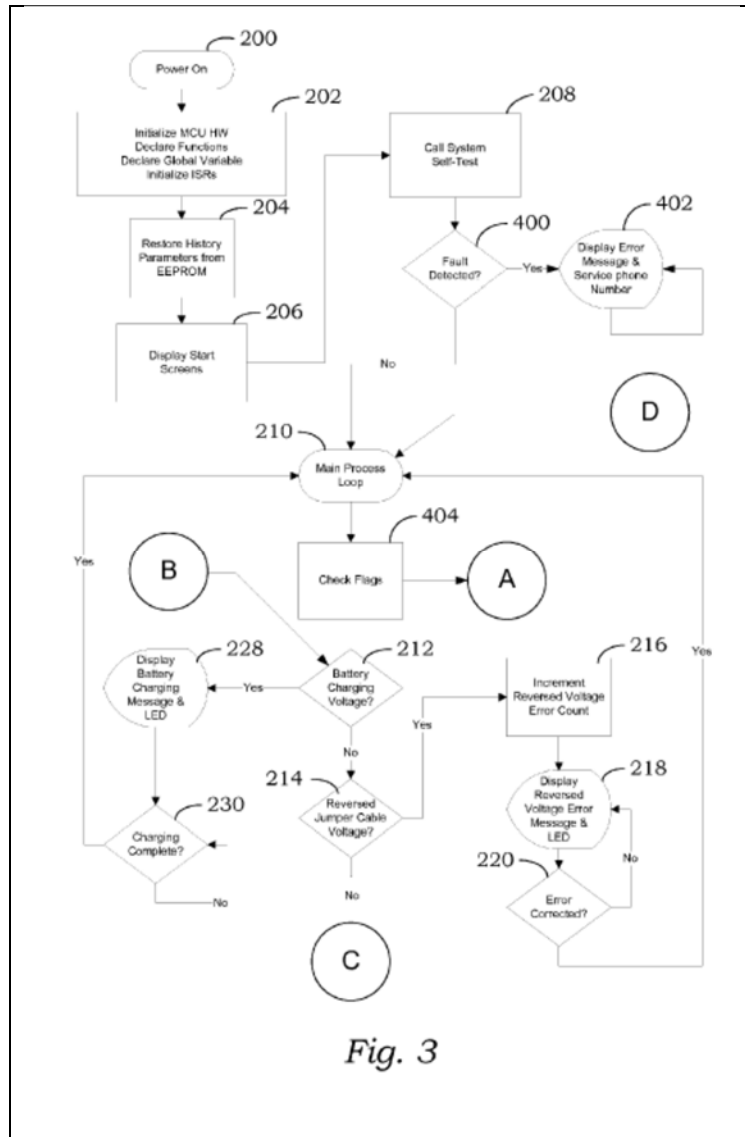
Ex. 1004, Fig. 1.

58. The jump starter 10 shown in Fig. 1 of *Richardson* includes a “programmable microprocessor 12 which receives inputs 14 and produces informational outputs 16 and control outputs 18.” *Id.* at ¶ [0014]. The inputs 14 to the microprocessor 12 include inputs from a battery voltage sensor 20 that “monitors the voltage level of one or more jump starter batteries 22,” a reverse voltage sensor 20 that “monitors the polarity of the jumper cables on line 26 which

are connected to the vehicle's electrical system 28," and a vehicle voltage sensor 30 that "monitors the voltage on line 37 (voltage of the vehicle)." *See id.* at ¶ [0016]. The outputs from the microprocessor are used "to provide information to the user and to control the application of power to the vehicle to be jump started." *Id.* at ¶ [0020]. These outputs include a "contact relay control output 58" that operates a contact relay 34 to connect (or disconnect) jump starter capacitors 21 and batteries 22 with the "the starter system or batteries of the vehicle to be started 28." *Id.* at ¶ [0021].

59. The operation of *Richardson's* jump starter 10 is further described with reference to the circuit diagrams included at Figs. 2A-2D and the flow diagrams included at Figs. 3-9. As shown in Fig. 3, set forth below, once initialization and self-test operations are completed, *Richardson's* jump starter system enters a main processing loop 210. *See id.* at ¶ [0023], Fig. 3.





Ex. 1004, Fig. 3.

60. During the main processing loop shown in Fig. 3, “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.” *Id.* at ¶ [0027]. “If the voltage measured is significantly less than the voltage of the jump starter capacitors 21 and the batteries 22, then a reverse polarity connection of the jumper cables to the vehicle is

determined and an error flag is set and the event saved in non-volatile memory 216.” *Id.* “Any further jump starter action by the operator is ignored until the reverse polarity connection is corrected 220, at which point processing returns to the start of the main processing loop 210.” *Id.* “If the jumper cables 60 are not reverse connected 214, then the state of charge of the capacitors 21 and batteries 22 is determined 222,” as shown in Fig. 5 (set forth below). *Id.* at ¶ [0028].

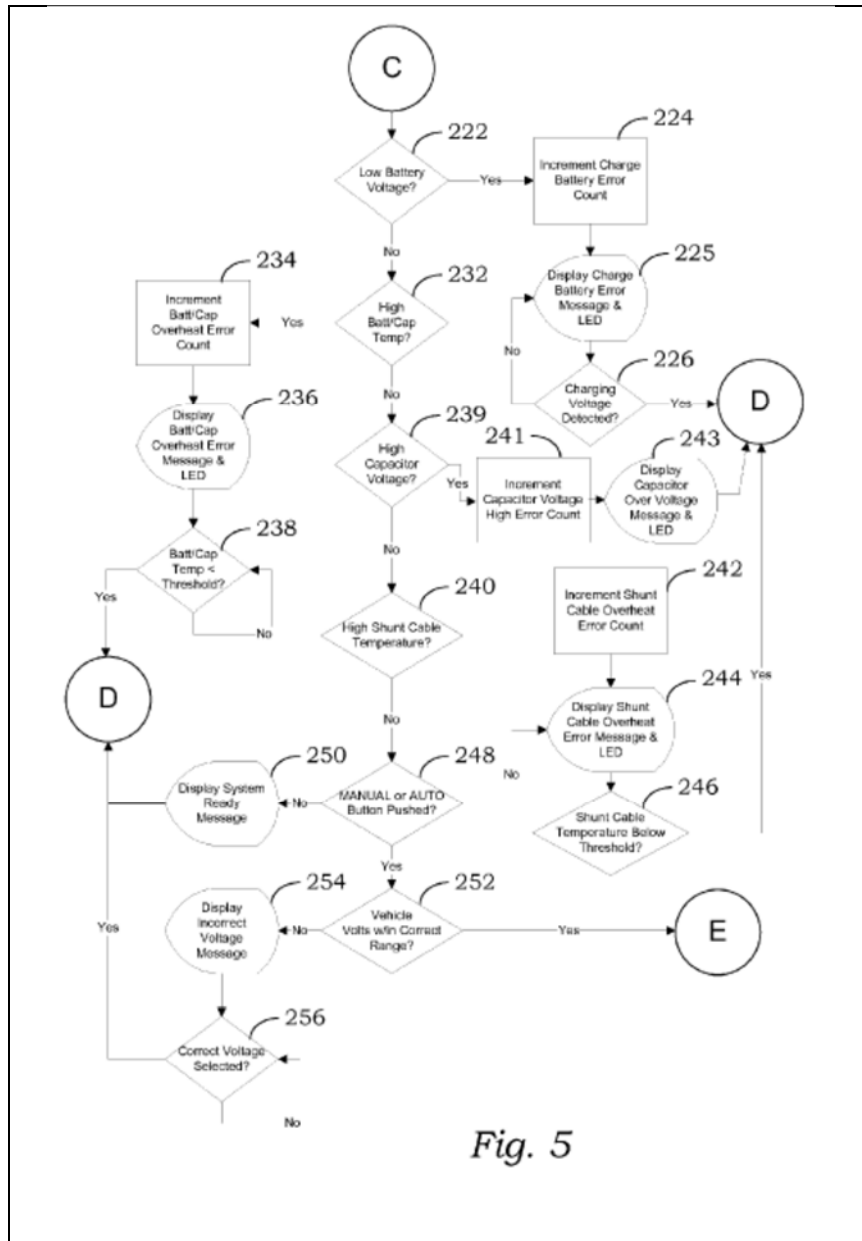


Fig. 5

Ex. 1004, Fig. 5.

61. As illustrated in Fig. 5, “[i]f the voltage level of the system batteries 22 measured by the voltage sensor 30 is equal to a state of charge of eighty percent or more below a fully charged voltage level 222, an error flag is set and the event recorded in memory 224.” *Id.* “The system stays in this condition, which prohibits any further jump starter action by the operator until a charging voltage is detected

226, which is great enough to indicate that a battery charger (not shown) has been connected to the batteries 22.” *Id.*

62. In addition, before jump starting is initiated, *Richardson’s* system compares “the operator-configured starter voltage against the voltage of the vehicle to be started 28.” *Id.* at ¶ [0034]. “The jump starter 10 may be configured for 12, 18, 24, 30, 36, 42 or 48 volts, for example, using a selector jumper 55.” *Id.* “If the difference between the voltage selected and the voltage measured is not within a predetermined range and tolerance 252... further operation is prohibited until the correct voltage is selected 256 at which point processing returns to the main processing loop 210.” *Id.*

63. After jump starting has been initiated by closing the contact relay 34 (at step 268 in Fig. 6), *Richardson’s* system “monitors all input sensors 14 and the current status of the jump starter for possible fault conditions,” as shown in Fig. 7 (set forth below). *Id.* at ¶¶ [0035], [0036]. “If the system detects an increase in the difference between the measured jump starter battery voltage 20 and the voltage measured 30 across the contact relay 34 indicating that one of the jump starter cables has been disconnected 302 from the vehicle’s battery or starter system 28 then a jumper cable unplugged error count is incremented 304, a ‘Jumper Cable Unplugged’ error message is displayed 306 on the LCD 46, the contact relay 34 is opened and the fault LED 56 is illuminated 290.” *Id.* at ¶ [0041].

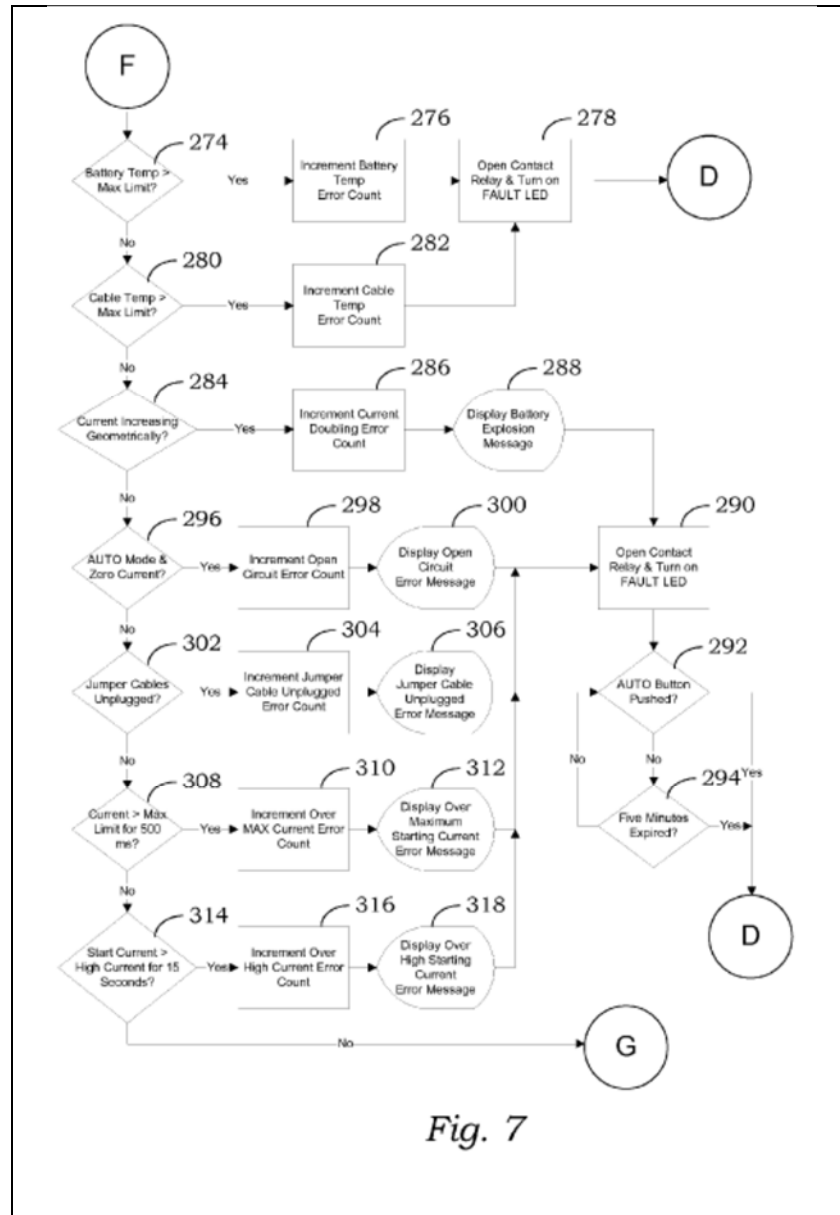


Fig. 7

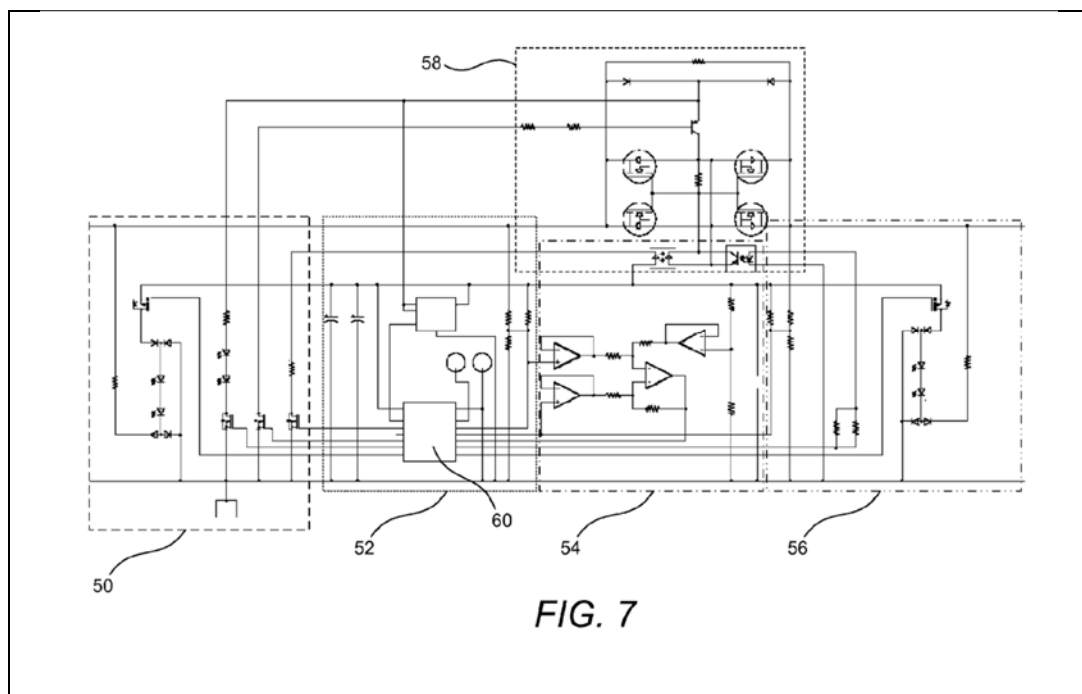
Ex. 1004, Fig. 7.

### iii. Baxter

64. *Baxter* was filed on March 24, 2010 and published on July 8, 2010. I understand that *Baxter* is prior art to the '077 Patent.

65. *Baxter* describes a safety circuit for use in low-voltage systems, such as a circuit for jump starting a battery. See, e.g., Ex. 1006 ¶ [0007]. “When the safety

circuit determines that no unsafe conditions exist and that it is safe to connect the battery, the safety circuit may connect the battery by way of a ‘soft start’ that provides a connection over a period of time.” *Id.* *Baxter* further discloses a method “for detection of proper polarity of the connections between the battery and the low-voltage system.” *Id.* When the safety circuit of *Baxter* determines that no unsafe condition exists, a connection to the battery is made, for example using “one or more high-current transistors as a switch.” *Id.* at [0028]. An example of *Baxter*’s safety circuit is illustrated in Fig. 7, set forth below.



Ex. 1006, Fig. 7.

**iv. Tracey**

66. *Tracey* was filed on December 14, 2011 and published on June 21, 2012. I understand that *Tracey* is prior art to the '077 Patent.

Fig.10

68. Fig. 10 of *Tracey* shows an example of a jump starter circuit 100 that includes “batteries 102, a positive lead 103 with a clamp conductor 104, and a negative lead 105 with a clamp conductor 106.” *Id.* at p. 6, ll. 18-19. As shown at reference 125 in Fig. 10, the positive lead 103 of the jump starter circuit 100 is connected to a trio of “MOSFETS (or alternatives) Q4, Q5 and Q6.” *Id.* at p. 7, ll.

22-23; Fig. 10. “These devices are connected in such a way as to utilize their intrinsic diodes for the purposes of reverse blocking of current.” *Id.* at p. 7, ll. 23-24. “Should the jump starter circuit 100 be connected to a vehicle with a greater voltage than the unit is intended for, the diodes become reverse biased and no current may flow.” *Id.* at p. 7, ll. 26-27. “This feature protects the jump-starter’s internal battery 102 from potentially dangerous overcharge conditions.” *Id.* at p. 7, ll. 27-28.

**v.     *Lai***

69.     *Lai* was filed on May 27, 2008 and issued on July 31, 2012. I understand that *Lai* is prior art to the '077 Patent.

70.     *Lai* describes an over voltage, over current and overcharge protection circuit for use with a battery charging system. *See, e.g.*, Ex. 1008, 1:18-22; 2:32-48. An example of *Lai*’s over voltage, over current and overcharge protection circuit 100 is shown in Fig. 1.





104.” *Id.* at 4:65-66. Comparator 134 monitors the VB pin 104 and issues an over voltage signal when the battery voltage exceeds an over voltage protection (OVP) threshold. *See id.* at 4:66-5:2.

**B. Proposed Grounds of Unpatentability**

72. As explained in further detail below, it is my opinion that the Challenged Claims of the '077 Patent are unpatentable based on the following Grounds:

<b>Proposed Grounds of Unpatentability</b>	<b>Exhibits</b>
<b><u>Ground 1:</u></b> U.S. Patent Application Pub. No. 2004/0130298 to Krieger, <i>et al.</i> (“ <i>Krieger</i> ”) renders claims 1-7, 9-11, and 18-20 obvious under 35 U.S.C. § 103.	Ex. 1005
<b><u>Ground 2:</u></b> <i>Krieger</i> in view of U.S. Patent Application Pub. No. 2010/0173182 to Baxter, <i>et al.</i> (“ <i>Baxter</i> ”) renders claim 8 obvious under 35 U.S.C. § 103.	Ex. 1005 Ex. 1006
<b><u>Ground 3:</u></b> <i>Krieger</i> in view of International (PCT) Application Publication No. WO 2012/080996A1 to Tracey, <i>et al.</i> (“ <i>Tracey</i> ”) renders claims 22, and 23 obvious under 35 U.S.C. § 103.	Ex. 1005 Ex. 1007
<b><u>Ground 4:</u></b> U.S. Patent Application Pub. No. 2013/0154543 to Richardson, <i>et al.</i> (“ <i>Richardson</i> ”) renders claims 1-7, 9-16, 18-21, and 24 obvious under 35 U.S.C. § 103.	Ex. 1004
<b><u>Ground 5:</u></b> <i>Richardson</i> in view of U.S. Patent No. 8,232,772 to Lai, <i>et al.</i> (“ <i>Lai</i> ”) renders claim 17 obvious under 35 U.S.C. § 103.	Ex. 1004 Ex. 1008

<b><u>Ground 6:</u></b> <i>Richardson</i> in view of <i>Tracey</i> renders claims 22 and 23 obvious under 35 U.S.C. § 103.	Ex. 1004 Ex. 1007
<b><u>Ground 7:</u></b> <i>Richardson</i> in view of <i>Krieger</i> renders claims 3-7, 19, and 20 obvious under 35 U.S.C. § 103.	Ex. 1004 Ex. 1005
<b><u>Ground 8:</u></b> <i>Richardson</i> in view of <i>Krieger</i> and <i>Baxter</i> renders claim 8 obvious under 35 U.S.C. § 103.	Ex. 1004 Ex. 1005 Ex. 1006

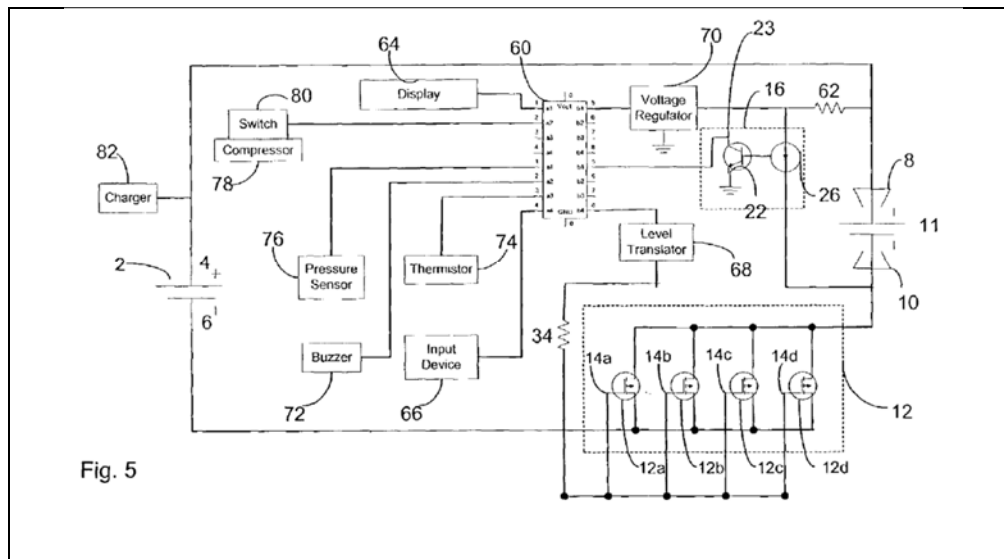
**C. Ground 1: *Krieger* Renders Claims 1-7, 9-11, and 18-20 Obvious**

73. For the reasons set forth below, is it my opinion that claims 1-7, 9-11, and 18-20 would have been obvious over *Krieger*.

***i.* Claim 1**

***1[P] A jumpstarter, comprising:***

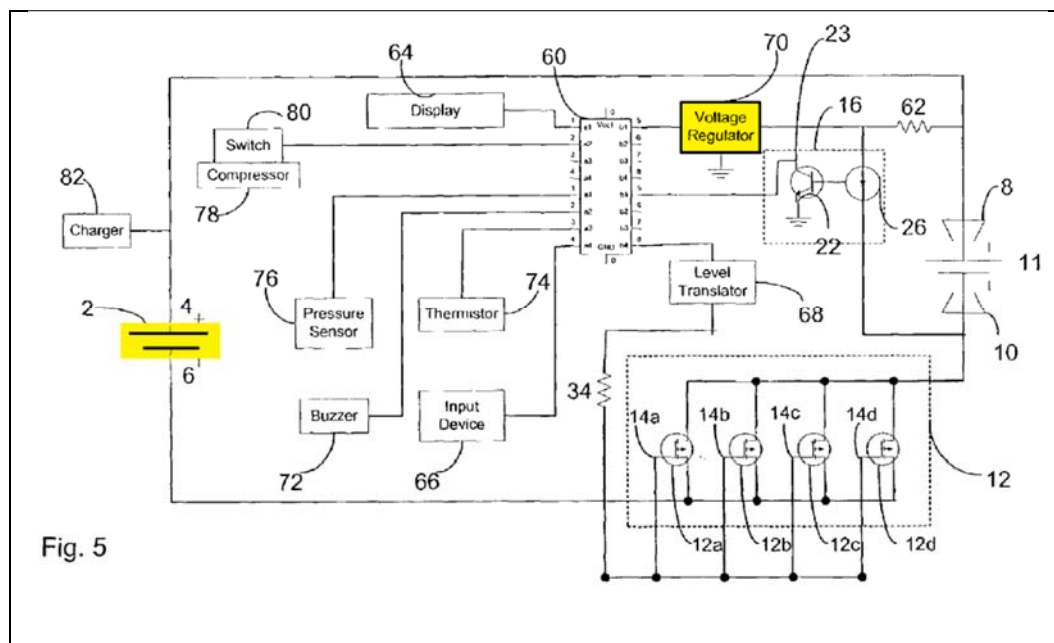
74. To the extent that the preamble is limiting, *Krieger* discloses a jumpstarter. For example, Fig. 5 of *Krieger* (set forth below) discloses “an example of a microprocessor controlled jump starter system.” Ex. 1005 ¶ [0043].



Ex. 1005, Fig. 5.

**[1(a)(i)] a battery connected to a voltage regulator,**

75. *Krieger* discloses a battery connected to a voltage regulator. For example, as highlighted in Fig. 5 below, *Krieger* discloses a “voltage regulator 70” that is “coupled to the boosting battery 2.” See Ex. 1005 ¶ [0052] and Fig. 5 (showing the battery 2 connected to the voltage regulator 70 by resistor 62).

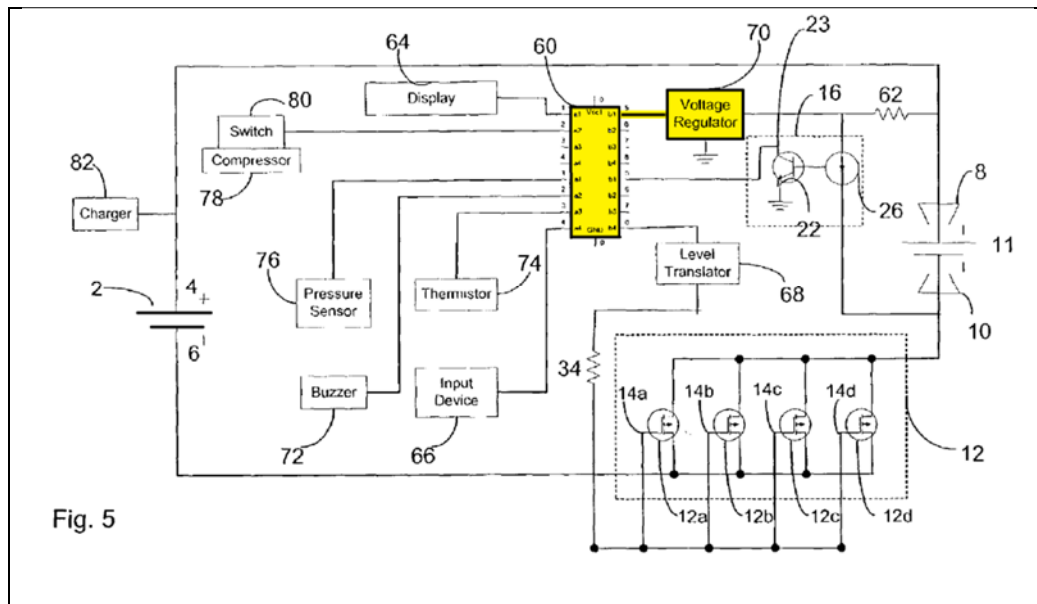


Ex. 1005, Fig. 5 (with highlighting added).

**[1(a)(ii)] the battery capable of supplying power, via the voltage regulator, to at least a microprocessor,**

76. *Krieger* discloses that the battery is capable of supplying power, via the voltage regulator, to at least a microprocessor. For example, *Krieger* discloses that the microprocessor 60 shown in Fig. 5 (highlighted below) is supplied with a low voltage power supply (e.g., 5 volts) from battery 2 via voltage regulator 70.

Ex. 1005¶ [0046].

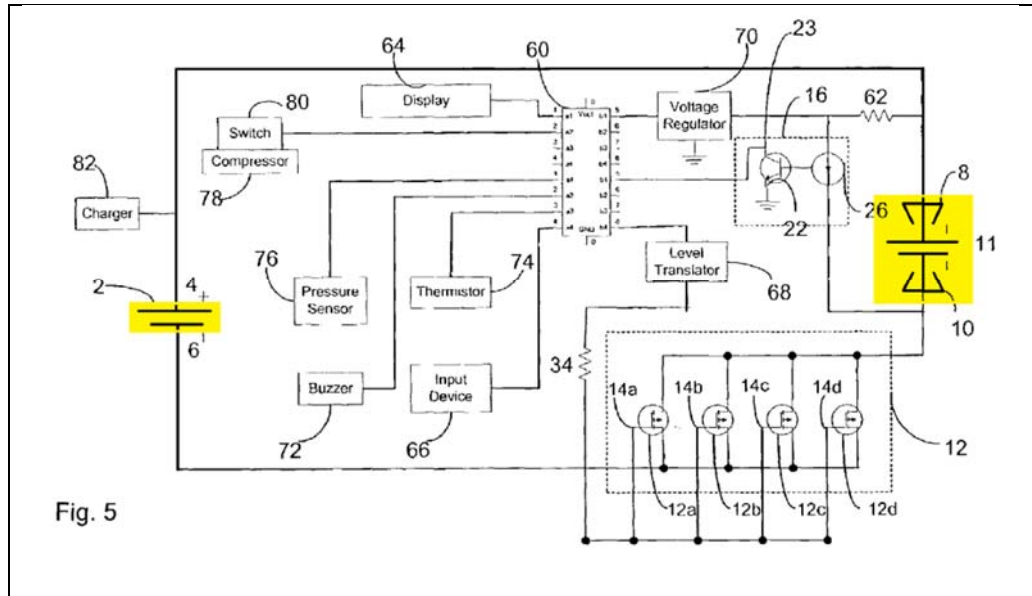


Ex. 1005, Fig. 5 (with highlighting added).

**[1(a)(iii)] the battery also capable of supplying power to an automobile battery when the battery has at least a predetermined voltage;**

77. *Krieger* also discloses that the battery is capable of supplying power to an automobile battery when the battery has at least a predetermined voltage. For example, as highlighted in Fig. 5 below, *Krieger* discloses that the boosting battery

2 is coupled to a pair of alligator clamps 8, 10 to be connected to a vehicle battery 11 to be charged. *See* Ex. 1005 ¶ [0028] and Fig. 5.



*Ex. 1005, Fig. 5 (with highlighted added).*

78. *Krieger* further discloses monitoring the boosting battery 2 to detect when the battery falls below a predetermined voltage needed for supplying power to the automobile battery. *See id.* at ¶ [0044] (“By way of a feedback circuit or other means, the microprocessor 60 can monitor the voltage and/or current being supplied to the depleted battery 11 from the booster battery 2”). *Krieger* explains that the jump starter notifies the operator when the boosting battery 2 is low and needs to be recharged when the microprocessor 60 detects that the boosting battery has fallen below “a predetermined level, for example, about 80% of its rated value.” *See id.* at ¶ [0053]. *Krieger* thus discloses that the boosting battery is “capable” of supplying power to an automobile battery when the battery has at

least a predetermined voltage, *i.e.*, the boosting battery is above the “predetermined level.”

79. To the extent that Patent Owner may argue that claim element 1(a)(iii) also requires that the jumpstarter prevent the boosting battery from supplying power to the automobile battery if the boosting battery does not have a predetermined voltage, this would have been obvious in view of the teachings of *Krieger* and the knowledge of a person of ordinary skill in the art. *Krieger* discloses that the microprocessor may be programmed to terminate the jump starting process upon detection of a fault, such as a disconnected automobile battery. (*See, e.g.*, Ex. 1005 ¶ [0056]). In view of *Krieger*’s disclosure, a POSITA would have understood that a boosting battery that has fallen below 80% of its rated value (*i.e.*, the predetermined level disclosed by *Krieger* at ¶ [0053]), is also a fault that should be corrected before the jump starting process proceeds. For instance, Kopera (US Patent 8,264,205) (Ex. 1011) states:

*Energy-storage devices (ESDs)....may be damaged if operated under extreme conditions. Either improper charging or discharging conditions may lead to damage of an ESD.... Over discharging caused by a short circuit across the ESD may cause a large current to be drawn from the ESD, causing damage to the ESD. For some ESDs, even excessive discharging under normal loading conditions, resulting in a slow drop of the energy stored in the ESD, may deplete the ESD below a level at which it can be fully recharged.*

80. A POSITA would therefore have been motivated to program the microprocessor 60 of *Krieger* to prevent jump starting upon detecting that the boosting battery has fallen below the predetermined level suitable for jump starting the vehicle.

***[1(b)] a load detector circuit, connected to the microcontroller, to detect when the jumpstarter is correctly connected to the automobile battery;***

81. The specification of the '077 Patent does not specifically explain what it means for the load detector circuit to detect when the jumpstarter is "correctly connected" to the automobile battery. However, the specification of the '077 Patent explains that "the automobile start control module is automatically activated and the battery starts to supply power to the load module when the load is correctly connected," and that "the automobile start control module is automatically deactivated and the battery stops supplying power to the load module when assuming that the load is not connected or the positive and negative polarities are reversely connected." Ex. 1001 at 4:26-33. Based on this disclosure, a POSITA would have understood that a detection that the jumpstarter is "correctly connected to the automobile battery" must at least include detecting that (1) the load (*i.e.*, automobile battery) is connected to the jumpstarter and (2) the positive and negative polarities of the load (*i.e.*, automobile battery) are not reversely connected. This is disclosed by *Krieger*.



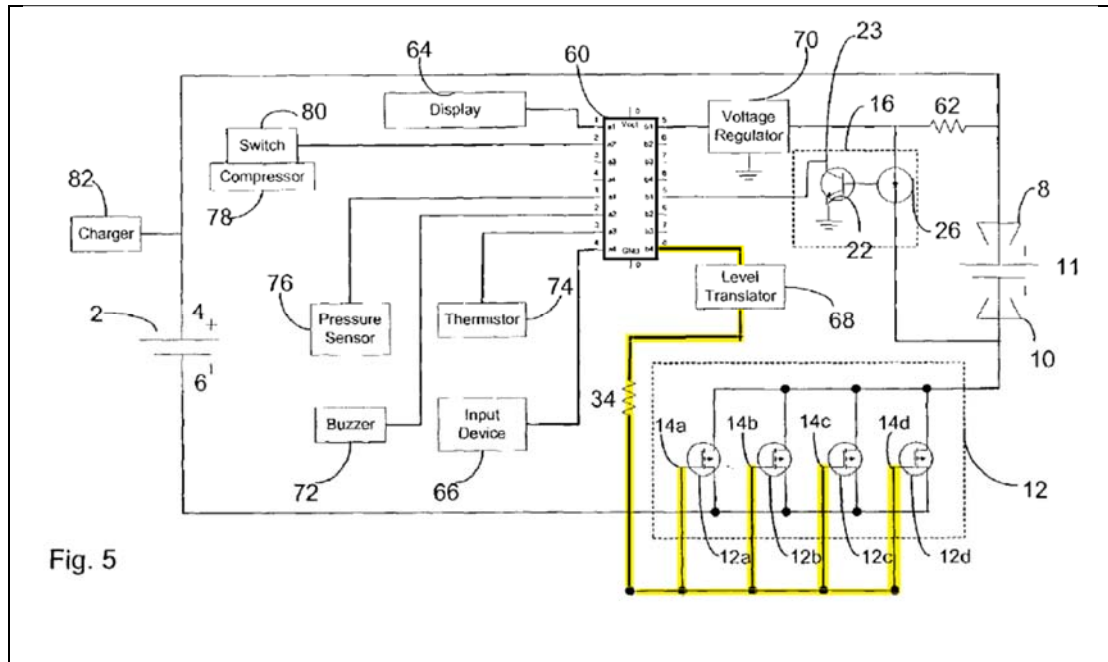
82. For example, *Krieger* discloses that “[b]y way of a feedback circuit or other means, the microprocessor 60 can monitor... the voltage and/or current of the [automobile] battery 11,” and that “[a] resistive divider may be used to provide the voltage and current measurements to the microprocessor's A/D input.” Ex. 1005 ¶ [0044]. *Krieger* thus discloses a load detector circuit (*e.g.*, a feedback circuit such as a resistive divider) that is connected to the microcontroller (*i.e.*, the A/D input of microprocessor 60) in order to monitor the voltage and/or current being supplied to the automobile battery.

83. *Krieger* further discloses that the monitored voltage and/or current (*i.e.*, from the load detector circuit) is used by the microprocessor to detect both that the automobile battery is connected and that the positive and negative polarities of the automobile battery are not reversed (*i.e.*, that the jumpstarter is “correctly connected to the automobile battery.”) For example, *Krieger* discloses that switch 12 is controlled by the microprocessor 60 to supply power from the boosting battery 2 to the depleted automobile battery 11 (*see id.* at ¶ [0045]), and that “[i]f the polarity connections of clamps 8, 10 to the depleted battery 11 are not correct, the switch 12 remains off” (*id.* at ¶ [0048]). *Krieger* also discloses that “[m]icroprocessor 60 can be programmed to detect if clamps 8, 10 are connected to a battery or have been disconnected.” *Id.* at ¶ [0048]. “If no battery is present, the switch 12 is placed in a non-conducting state” and “[i]f a battery is present, the

jump starting process continues.” *Id.*; *see also id.* at ¶ [0056] (disclosing that if no battery is connected to clams 8, 10, the microprocessor 60 can be programmed to terminate the jump starting process).

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

84. *Krieger* discloses a microcontroller (*i.e.*, microprocessor 60) that generates an output signal when the jumpstarter is correctly connected to the automobile battery. As explained in detail above for claim element 1(b), *Krieger* discloses that switch 12 is controlled by the microprocessor 60 to supply power from the boosting battery 2 to the depleted automobile battery 11 when the microprocessor determines that the automobile battery is “correctly connected.” *Krieger* further discloses that “[t]he microprocessor 60 provides output signals to activate the switch 12 into a conducting state” and also that “the microprocessor can deactivate switch 12 to terminate the jump starting process when a fault is detected.” Ex. 1005 ¶ [0045]. The output signal generated by the microprocessor for controlling the switch 12 is further shown in Fig. 5, as highlighted below.

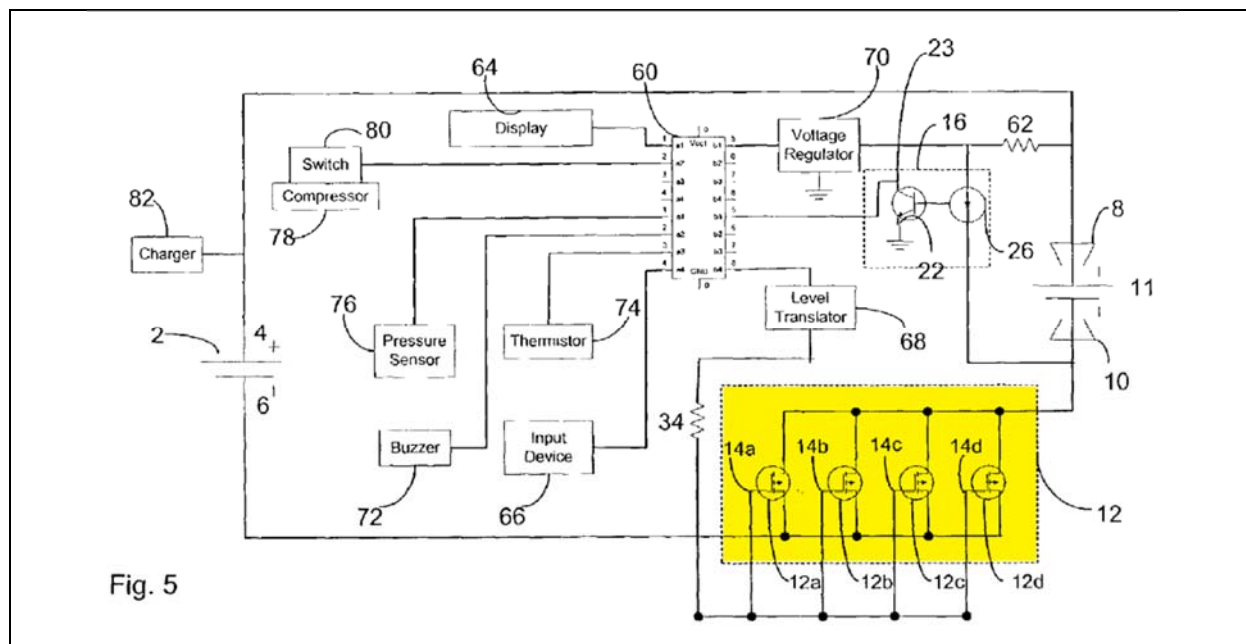


Ex. 1005, Fig. 5 (with highlighting added).

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

85. Krieger discloses a FET-based switch (i.e., switching circuitry) that includes at least one switch and connects the jump starter battery to the automobile battery when the microprocessor generates the output signal to supply charging current to the automobile battery. The FET-based switch 12 is shown in each of the embodiments of Krieger, including Fig. 5 as highlighted below. Krieger explains that “[t]he switch 12 is activated to complete a boosting circuit between the boosting battery 2 and the depleted battery 11” (*id.* at ¶ [0029]), and that the switch may include “a number [of] FETs 12a-12d connected in parallel with each other” (*id.* at ¶ [0030]), as shown for example in Fig. 5 below. Further, as explained above for claim elements 1(b) and 1(c), the switch 12 is controlled by an

output from the microprocessor 60 (i.e., a microcontroller) that causes the switch 12 to supply charging current from the jump starter battery 2 to the automobile battery 11 when the automobile battery is “correctly connected.”



*Ex. 1005, Fig. 5 (with highlighting added).*

## ii. Claim 2

**2. The jumpstarter of claim 1, further comprising a battery voltage detector circuit to detect a battery voltage of the battery.**

86. Claim 2 depends from claim 1 and further recites, “a battery voltage detector circuit to detect a battery voltage of the battery.” This is disclosed by *Krieger*. For example, *Krieger* discloses that “[b]y way of a feedback circuit or other means, the microprocessor 60 can monitor the voltage and/or current being supplied to the depleted battery 11 from the booster battery 2” and that “[a] resistive divider may be used to provide the voltage and current measurements to

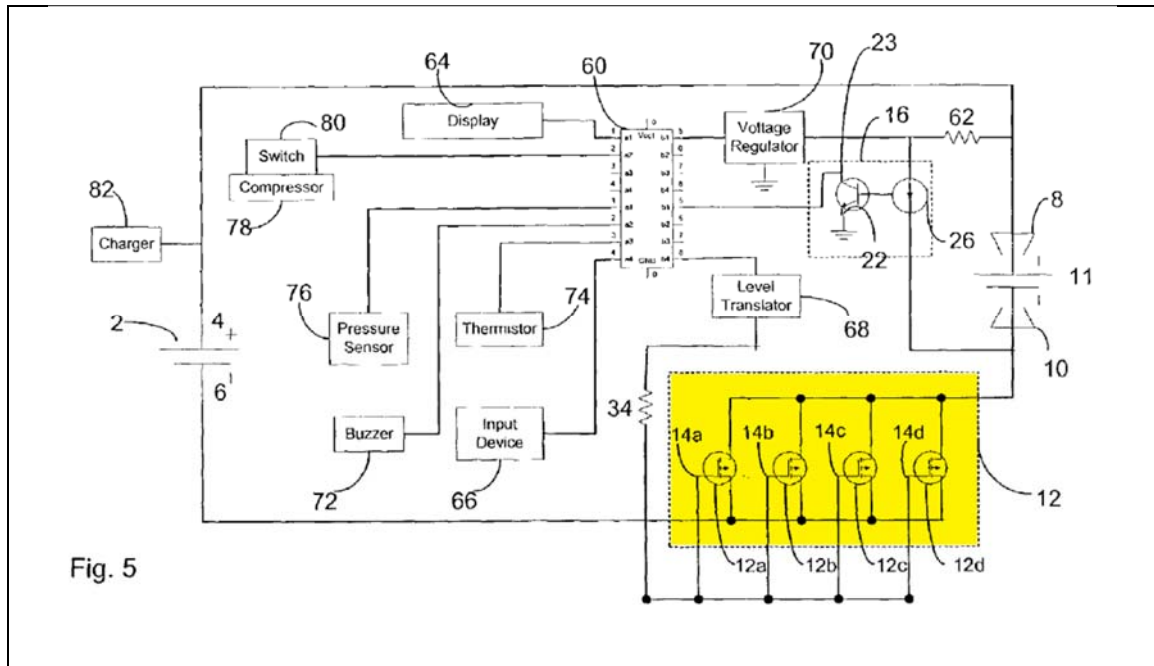
the microprocessor's A/D input.” Ex. 1005 ¶ [0044]; *see also id.* at ¶ [0053] (disclosing that the microprocessor is programmed to detect when the voltage of the boosting battery 2 falls below a predetermined level). *Krieger* therefore discloses a battery voltage detector (*i.e.*, a feedback circuit such as a resistive divider coupled to the microprocessors A/D input) to detect a battery voltage of the battery (*i.e.*, booster battery 2).

**iii. Claim 3**

**3. The jumpstarter of claim 1, wherein the at least one switch is one or more MOSFETs.**

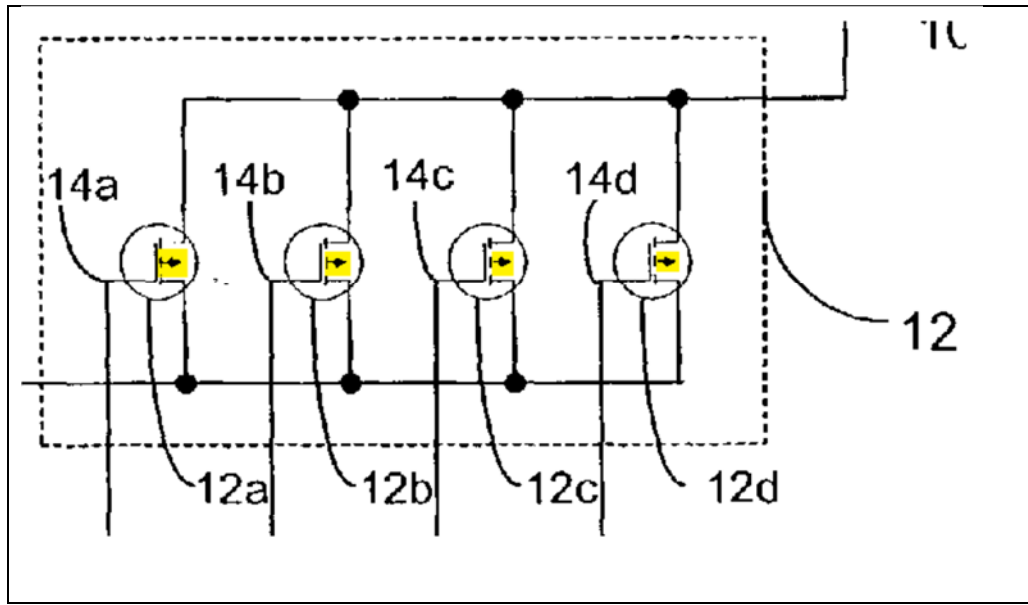
87. Claim 3 depends from claim 1 and further recites, “wherein the at least one switch is one or more MOSFETs.” This is disclosed by, or at least obvious in view of, *Krieger*.

88. As explained above for claim element 1(d), *Krieger* discloses a FET-based switch 12 that includes “a number [of] FETs 12a-12d connected in parallel with each other” (*id.* at ¶ [0030]), as shown for example in Fig. 5 set forth below.



Ex. 1005, Fig. 5 (with highlighting added).

89. *Krieger* specifies that the switch 12 may include field effect transistors (FETs). *Id.* at ¶ [0030]. However, based on the diagram of the FETs included in Figs. 1-5 of *Krieger*, from the symbol used to represent the FETs (including the depiction of an insulated gate and the placement of arrows within the symbol), a POSITA would recognize that the FETs utilized by *Krieger* are MOSFETs.



Ex. 1005, Fig. 5 (with highlighting added).

90. Further, even absent the arrows on the FET diagrams in Figs. 1-5, it would have been obvious to a POSITA, based on common knowledge in the field, to utilize MOSFETs for the FET-based switch 12 shown in *Krieger*. The POSITA would have understood that MOSFETs were, and continue to be, the most common choice for transistor switches in power circuitry, such as the jump starter device described in *Krieger*. Further, *Krieger* specifies that “[t]he FETs 12a-12d are preferably high power, very low on-resistance types” (Ex. 1005 ¶ [0030]), which the POSITA would have recognized as characteristics of n-channel MOSFETs. (In my years of professional experience I have observed that n-channel MOSFETs are more readily available than are p-channel MOSFETs, and I have also observed that n-channel MOSFETs offer lower on-resistances than do p-channel MOSFETs.)

**iv. Claim 4**

***4. The jumpstarter of claim 3, wherein the one or more MOSFETs are n-channel MOSFETs.***

91. Claim 4 depends from claim 3 and further recites, “wherein the one or more MOSFETs are n-channel MOSFETs.” This is disclosed by, or at least obvious in view of, *Krieger*.

92. As explained above for claim 3, *Krieger* discloses a FET-based switch 12 that includes “a number [of] FETs 12a-12d connected in parallel with each other” (*id.* at ¶ [0030]), as shown for example in Fig. 5. *Krieger* specifies that “[t]he FETs 12a-12d are preferably high power, very low on-resistance types” (Ex. 1005 ¶ [0030]), which the POSITA would have recognized as characteristics of n-channel MOSFETs. The POSITA would have further recognized that FETs 12a-12d, as shown in Fig. 5 of *Krieger*, are n-channel MOSFETs because the source terminals are coupled to the negative power rail to provide positive switching, which is characteristic of n-channel MOSFETs. (For this reason, I myself have used n-channel MOSFETs in this manner in numerous product designs. *Krieger*’s outward-pointing arrows in his Fig. 5 FET symbols is an evident drafting error. *Krieger* clearly intended to depict n-channel MOSFETs in his Fig. 5, since the body-diodes of p-channel MOSFETs would cause uncontrolled conduction of current from the boosting battery to the depleted battery.)



93. Further, even if it were determined that *Krieger* does not expressly disclose the use of n-channel MOSFETs for the switching circuit 12, this would have been obvious to a POSITA based on common knowledge in the field. First, the POSITA would have understood that MOSFETs were, and continue to be, the most common choice for switches in power circuitry, such as the jump starter device described in *Krieger*. In addition, the POSITA would have also understood that n-channel MOSFETs are more commonly used in power switching applications because of the ease of manufacture of n-channel MOSFETs compared to p-channel MOSFETs.

**v. Claim 5**

***5. The jumpstarter of claim 1, wherein there are a plurality of switches.***

94. Claim 5 depends from claim 1 and further recites, “wherein there are a plurality of switches.” This is disclosed by *Krieger*. As explained above for claim element 1(d), *Krieger* discloses a FET-based switch 12 that includes “a number [of] FETs 12a-12d connected in parallel with each other.” Ex. 1005 ¶ [0030].

**vi. Claim 6**

***6. The jumpstarter of claim 1, wherein the at least one switch is a plurality of MOSFETs.***

95. Claim 6 depends from claim 1 and further recites, “wherein the at least one switch is a plurality of MOSFETs.” This is disclosed by, or at least obvious in view of, *Krieger* for the same reasons as explained above for claim 3.

**vii. Claim 7**

**7. The jumpstarter of claim 6, wherein the plurality of MOSFETs are connected in parallel.**

96. Claim 7 depends from claim 6 and further recites, “wherein the plurality of MOSFETs are connected in parallel.” This is disclosed by *Krieger*. As explained above for claim 3, *Krieger* discloses a MOSFET-based switch that includes “a number [of] FETs 12a-12d connected in parallel with each other.” Ex. 1005 ¶ [0030].

**viii. Claim 9**

**9. The jumpstarter of claim 1, further comprising a load detector to detect a reverse polarity connection to the automobile battery.**

97. Claim 9 depends from claim 1 and further recites, “a load detector to detect a reverse polarity connection to the automobile battery.” This is disclosed by *Krieger*.

98. As explained above for claim element 1(b), *Krieger* discloses a load detector circuit that is connected to a microcontroller (*i.e.*, the A/D input of microprocessor 60) in order to monitor the voltage and/or current being supplied to the automobile battery. *See* above at Section VII.C.i.1(b). *Krieger* further discloses that the monitored voltage and/or current is used by the microprocessor to detect that positive and negative polarities of the automobile battery are not reversed. *See id.* For example, *Krieger* discloses that switch 12 is controlled by the microprocessor 60 to supply power from the boosting battery 2 to the depleted

automobile battery 11 (*see* Ex. 1005 ¶ [0045]), and that “[i]f the polarity connections of clamps 8, 10 to the depleted battery 11 are not correct, the switch 12 remains off” (*id.* at ¶ [0048]). *Krieger* therefore discloses a load detector to detect a reverse polarity connection to the automobile battery.

**ix. Claim 10**

***10. The jumpstarter of claim 1, wherein the microprocessor includes a standby mode where all outputs are closed.***

99. Claim 10 depends from claim 1 and further recites, “wherein the microprocessor includes a standby mode where all outputs are closed.”

100. The ’077 Patent explains that “[i]n standby mode, the microcontroller closes all outputs when the battery voltage is lower than 9V, and recovers the normal operation only when the battery voltage is larger than 10V.”<sup>1</sup> Ex. 1001, 4:32-35. The ’077 Patent does not explain what it means to “close all outputs.” But the only “outputs” that are evident from the specification of the ’077 Patent are the charging voltage outputs (V-OUT+ and V-OUT-) shown in Figure 2. The POSITA would therefore understand the claim phrase “all outputs are closed” in the context of the ’077 Patent’s specification to mean that the jumpstarter is prevented from supplying a charging voltage to the automobile battery. Claim 10 should therefore be

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<sup>1</sup> The ’077 Patent uses the term “closes” or “closed” to mean that the outputs are disconnected (in contrast to the more conventional use of the term “open” to describe a disconnected circuit).

interpreted to require that the microprocessor includes a standby mode during which the jumpstarter is prevented from supplying a charging voltage to the automobile battery. This is disclosed by *Krieger*.

101. For example, as explained above, *Krieger* discloses standby modes during which the jump starter is prevented from supplying a charging voltage to the automobile battery because of a reverse polarity condition or because the automobile battery is disconnected from the jumpstarter. *See* above at Section VII.C.i.1(b); *see also*, Ex. 1005 ¶ [0047] (“If the polarity connections of clamps 8, 10 to the depleted battery 11 are not correct, the switch 12 remains off”); *Id.* at ¶ [0048] (“If no battery is present, the switch 12 is placed in a non-conducting state, that is, all the FETs 12 a-12 d are placed in a non-conducting state”).

**x. Claim 11**

***11. The jumpstarter of claim 10, further wherein the microcontroller closes all outputs when a voltage of the direct current power supply is lower than that of a state being able to supply power.***

102. Claim 11 depends from claim 10 and further recites, “wherein the microprocessor closes all outputs when a voltage of the direct current power supply is lower than that of a state being able to supply power.” This is disclosed by, or at least obvious in view of, *Krieger*.

103. *Krieger* discloses that the microprocessor 60 monitors and detects when the jump starter battery 2 falls below a predetermined level needed to supply power to the vehicle battery 11. For example, *Krieger* discloses:

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

Ex. 1005 ¶ [0053].

104. To the extent that Patent Owner may argue that *Krieger* does not explicitly disclose “closing all outputs” (*i.e.*, discontinuing charging of the vehicle battery) when the jump starter battery falls below the predetermined level, this would have been obvious to a POSITA in view of common knowledge in the field. *Krieger* discloses that the microprocessor may be programmed to terminate the jump starting process upon detection of a fault, such as a disconnected automobile battery. (*See, e.g.*, Ex. 1005 ¶ [0056]). In view of *Krieger*’s disclosure, the POSITA would have understood that a boosting battery that has fallen below 80% of its rated value (*i.e.*, the predetermined level disclosed by *Krieger* at ¶ [0053]), is also a fault that should be corrected before the jump starting process proceeds. For instance, Kopera (US Patent 8,264,205) (Ex. 1011) states:

*Energy-storage devices (ESDs)....may be damaged if operated under extreme conditions. Either improper charging or discharging*

*conditions may lead to damage of an ESD.... Over discharging caused by a short circuit across the ESD may cause a large current to be drawn from the ESD, causing damage to the ESD. For some ESDs, even excessive discharging under normal loading conditions, resulting in a slow drop of the energy stored in the ESD, may deplete the ESD below a level at which it can be fully recharged.*

105. The POSITA would therefore have been motivated to also program the microprocessor 60 of *Krieger* to terminate the jump starting process upon detecting that the boosting battery has fallen below the predetermined level suitable for jump starting the vehicle.

***xi.* Claim 18**

***18. The jumpstarter of claim 1, further composing a start control module to stop supplying battery power when there is no load.***

106. Claim 18 depends from claim 1 and further recites, “a start control module to stop supplying battery power when there is no load.” This is disclosed by *Krieger*.

107. As explained above for claim element 1(b), *Krieger* discloses that the microprocessor 60 monitors the voltage and/or current being supplied to the automobile battery and controls the switch 12 to terminate the jump starting process upon detecting that the automobile has been disconnected (*i.e.*, when there is not load). *See* above at Section VII.C.i.1(b); *see also*, Ex. 1005 ¶ [0048] (“Microprocessor 60 can be programmed to detect if clamps 8, 10 are connected to

a battery or have been disconnected”); *id.* at ¶ [0056] (disclosing that if no battery is connected to clams 8, 10, the microprocessor 60 can be programmed to terminate the jump starting process). *Krieger* therefore discloses a start control module (*i.e.*, the microprocessor 60 and/or switch 12) that is configured to stop supplying battery power when there is no load.

***xii.* Claim 19**

***19. The jumpstarter of claim 1, wherein the at least one switch switches a negative voltage.***

108. Claim 19 depends from claim 1 and further recites, “wherein the at least one switch switches a negative voltage.” This is disclosed by *Krieger*.

109. For example, *Krieger* discloses that the FET-based switch 12, as shown for example in Fig. 5, includes FETs 12a-12d that are “electrically connected to the negative terminal 6 of the boosting battery 2.” *See* Ex. 1005 ¶ [0032]; *see also*, Fig. 5.

***xiii.* Claim 20**

***20. The jumpstarter of claim 1, wherein the at least one switch is connected to a negative battery terminal.***

110. Claim 20 depends from claim 1 and further recites, “wherein the at least one switch is connected to a negative battery terminal.” This is disclosed by *Krieger*.

111. For example, *Krieger* discloses that the FET-based switch 12, as shown for example in Fig. 5, includes FETs 12a-12d that are “electrically

connected to the negative terminal 6 of the boosting battery 2.” *See* Ex. 1005 ¶ [0032]; *see also*, Fig. 5.

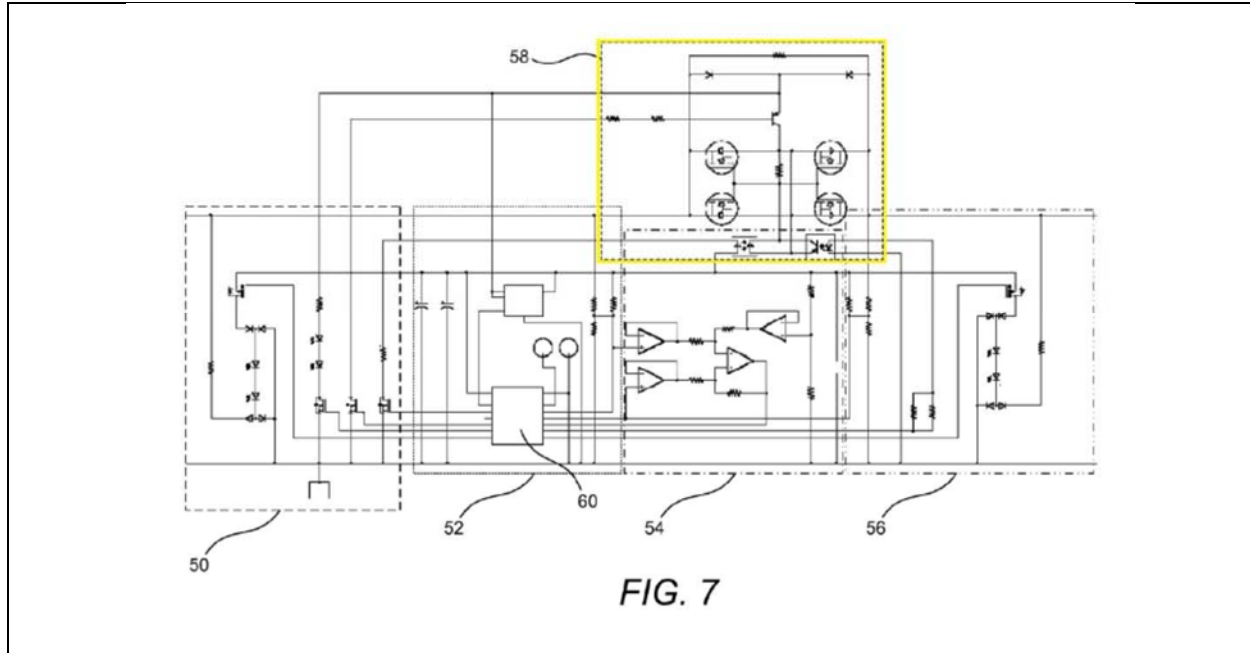
**D. Ground 2: *Krieger* in view of *Baxter* Renders Claim 8 Obvious**

112. Claim 8 depends from claim 6 and further recites, “wherein the plurality of MOSFETs are connected in a series-parallel topology.” As explained above, claim 6 is obvious in view of *Krieger*, which discloses a MOSFET-based switch 12 that includes “a number [of] FETs 12a-12d connected in parallel with each other.” *See* Ex. 1005 ¶ [0030]; *see also* above at Sections VII.C.iii and vi. To the extent, however, that *Krieger* may not expressly disclose that the switch may be implemented using MOSFETs connected in a series-parallel topology, this would have been obvious to the POSITA in view of *Baxter*.

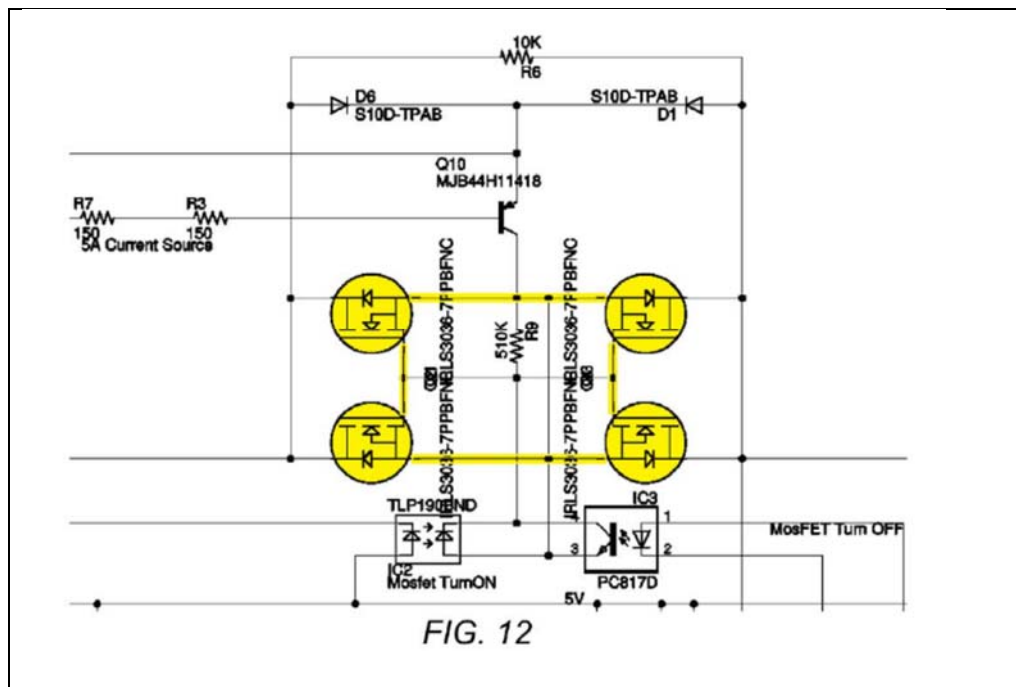
113. Similar to *Krieger*, *Baxter* discloses a safety circuit for jump starting a battery that detects when the battery is connected with a reversed polarity. *See*, e.g., Ex. 1006 ¶¶ [0007]-[0010]. The safety circuit disclosed in *Baxter* leaves the battery disconnected until the safety circuit determines that making a connection is safe. *See*, e.g., *id.* at ¶¶ [0025]-[0026]. When the safety circuit of *Baxter* determines that no unsafe condition exists, a connection to the battery is made, for example using “one or more high-current transistors as a switch.” *See*, e.g., *id.* at ¶ [0028]. An example is shown in Figs. 7 and 12 of *Baxter* in which the high-



current transistor-based switch is implemented using MOSFETS connected in a series-parallel topology, as highlighted below.



*Ex. 1006, Fig. 7 with highlighting added.*



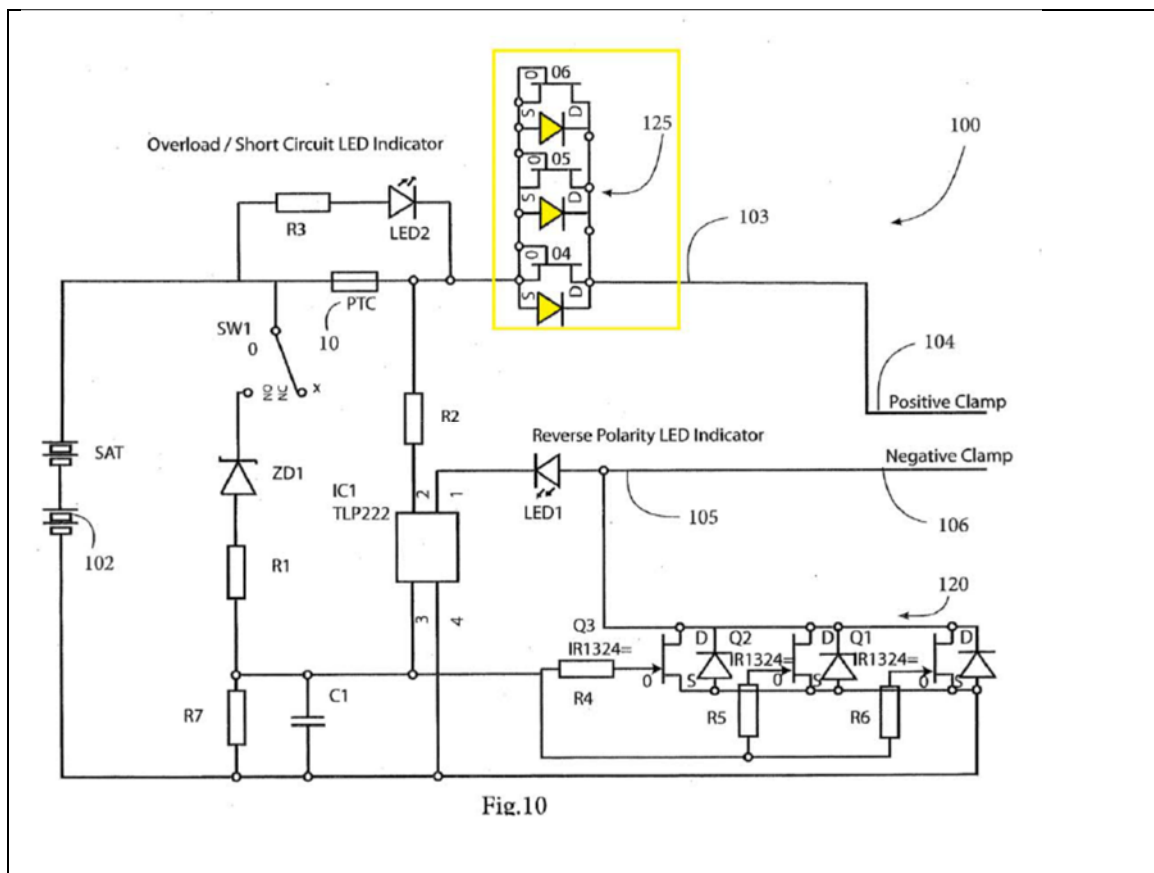
*Ex. 1006, Fig. 12 with highlighting added.*

114. A POSITA would have been motivated to utilize a series-parallel MOSFET switch, as disclosed in *Baxter*, in the MOSFET-based switch 12 of *Krieger*. The POSITA would have understood that a series FET connection, as shown in Figs. 7 and 12 of *Baxter*, blocks reverse current flow when the FETs are turned off (by contrast with a single FET which always allows current flow in one direction, even when the FET is turned off). The POSITA would therefore have been motivated, based on common knowledge in the field, to utilize a pair of series connected MOSFETs, as disclosed by *Baxter*, for each of the parallel-connected FETs 12a-12d in *Krieger*'s switch 12. This combination would have provided the desirable and predictable result of preventing reverse current flow from the automobile battery 11 to the boosting battery 2 in *Krieger*'s jump starter.

**E. Ground 3: *Krieger* in view of *Tracey* Renders Claims 22 and 23 Obvious**

115. Claim 22 depends from claim 1 and further recites “a voltage back-flow protection.” Claim 23 depends from claim 22 and recites, “wherein the voltage back-flow protection [is] for an abnormal load.” To the extent that *Krieger* may not expressly disclose the use of a voltage back-flow protection circuit to prevent back-flow from the vehicle battery to the jump starter battery in case of an abnormal load (*e.g.*, when the jump starter is connected to a vehicle battery having a higher voltage than the jump starter battery), this would have been obvious in view of *Tracey*.

116. Similar to *Krieger*, *Tracey* discloses a jump starter circuit that “protects from voltage mismatch, reverse polarity, short circuit, over-discharge, and over-use.” *See, e.g.*, Ex. 1007, p. 6, ll. 28-29. To protect against voltage mismatch between the vehicle battery and the jump starter battery (*i.e.*, an abnormal load), *Tracey* discloses the use of a voltage back-flow protection circuit, as highlighted below in Fig. 10.



Ex. 1007, Fig. 10 with highlighting added.

117. As shown at reference 125 in Fig. 10, the positive lead 103 of the jump starter circuit 100 is connected to a trio of “MOSFETS (or alternatives) Q4, Q5 and Q6.” *Id.* at p. 7, ll. 22-23; Fig. 10. “These devices are connected in such a

way as to utilize their intrinsic diodes for the purposes of reverse blocking of current.” *Id.* at p. 7, ll. 23-24. *Tracey* uses the three MOSFETs as diodes by connecting their gate terminals to their source terminals, thereby ensuring that the MOSFETs are permanently turned off. *Id.* at p. 7, ll. 24-25. “Should the jump starter circuit 100 be connected to a vehicle with a greater voltage than the unit is intended for, the diodes become reverse biased and no current may flow.” *Id.* at p. 7, ll. 26-27. “This feature protects the jump-starter’s internal battery 102 from potentially dangerous overcharge conditions.” *Id.* at p. 7, ll. 27-28. *Tracey* thus discloses “voltage back-flow protection for an abnormal load.”

118. The POSITA would have been motivated to combine *Krieger* and *Tracey* to provide further back-flow protection between the vehicle battery and jump starter battery in *Krieger*’s system. *Krieger* and *Tracey* are in the same field of endeavor, namely jump starter circuits that include protections against unsafe conditions such as reverse polarity connections and improper battery conditions. Further, as evidenced by *Tracey*, it was well known in the field that reverse current flow from a vehicle battery to a jump starter battery can cause unsafe conditions, especially when the vehicle battery has a higher voltage than that for which the jump starter is intended (*i.e.*, an abnormal load). The combination of *Tracey*’s back-flow protection circuit 125 with *Krieger*’s jump starter circuit would therefore have had the predictable result of protecting against unsafe conditions

caused by connecting the jump starter to a vehicle with an abnormally high voltage load.

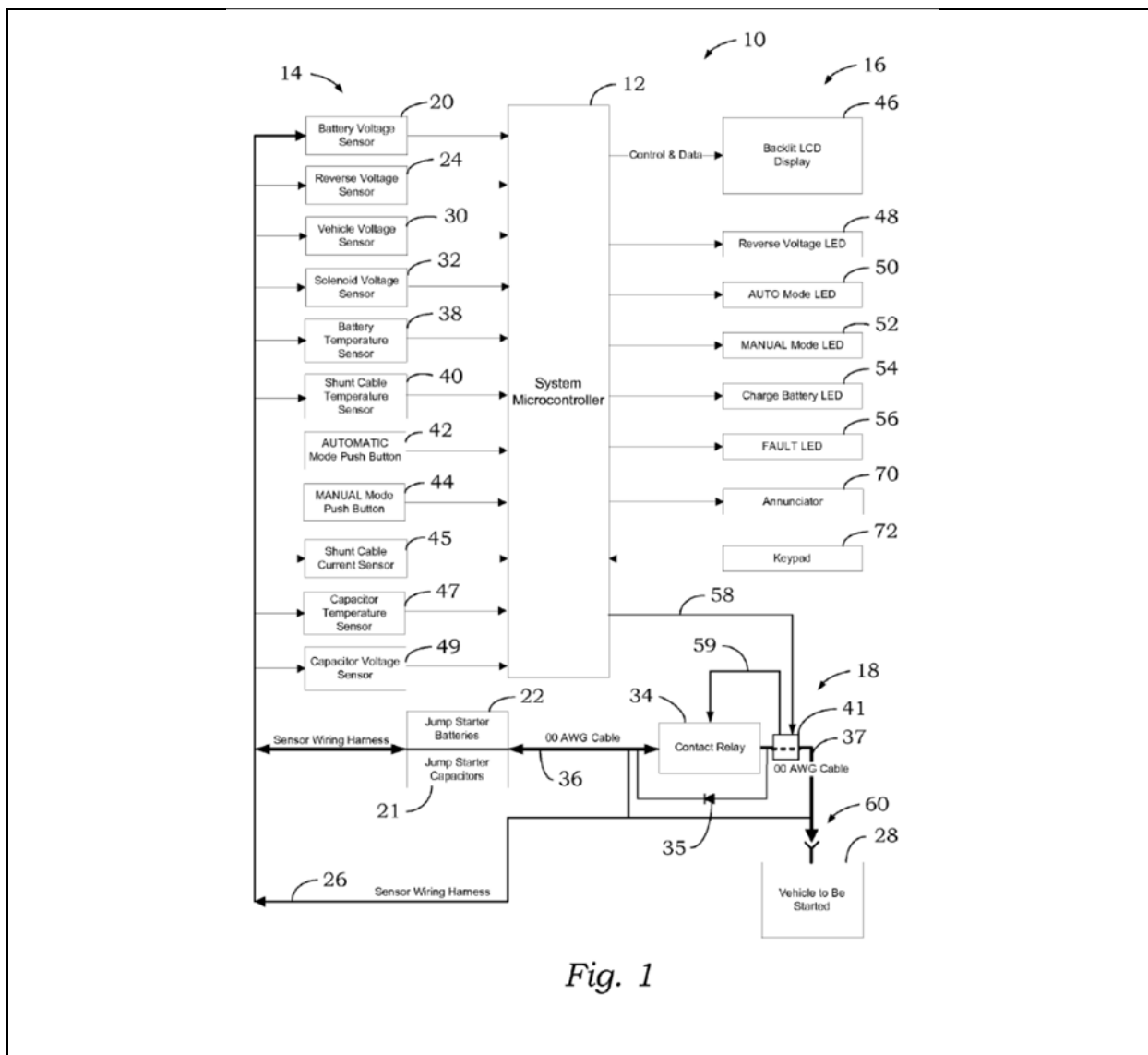
**F. Ground 4: *Richardson* Renders Claims 1-7, 9-16, 18-21, and 24 Obvious**

119. For the reasons set forth below, is it my opinion that claims 1-7, 9-16, 18-21, and 24 would have been obvious over *Richardson*.

***i.* Claim 1**

***1[P] A jumpstarter, comprising:***

120. To the extent that the preamble is limiting, *Richardson* discloses a jumpstarter. For example, Fig. 1 of *Richardson* (set forth below) discloses a “portable supplemental power source (jump starter) of the present invention [that] is generally indicated by reference numeral 10.” Ex. 1004 ¶ [0014].

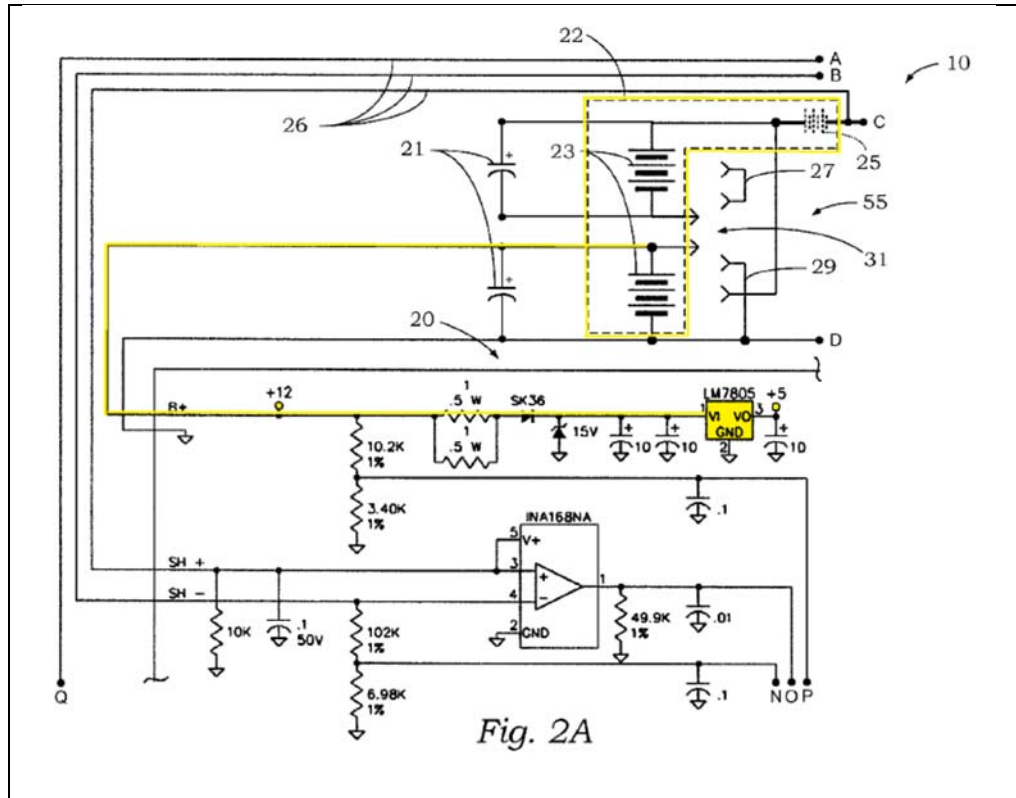


Ex. 1004, Fig. 1

**[1(a)(i)] a battery connected to a voltage regulator,**

121. *Richardson* discloses a battery connected to a voltage regulator. A schematic hardware diagram of *Richardson's* jump starter 10 is illustrated in Figs. 2A-2D. Ex. 1004 ¶ 21. As shown in Figs. 1 and 2A, the jump starter 10 includes “one or more jump starter batteries 22” as well as “one or more capacitors 21... to provide additional energy storage.” *Id.* at ¶¶ [0015], [0016]. In addition, Fig. 2A

shows that the one or more jump starter batteries 22 are connected to a voltage regulator (LM7805), as highlighted below.



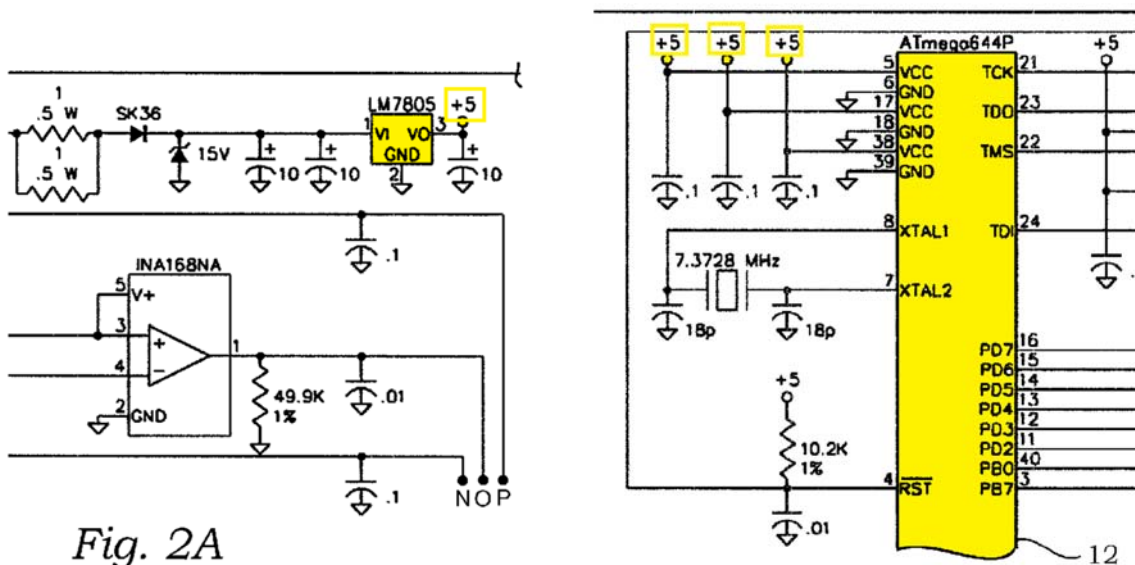
Ex. 1004, Fig. 2A with highlighting added.

122. To the extent that Patent Owner may argue that *Richardson* does not expressly disclose that the part labeled LM7805 in Fig. 2A is a voltage regulator, this would have been obvious to the POSITA based on common knowledge in the field. The POSITA would have recognized that LM7805 is a standard part number for a voltage regulator. (See for instance US 7,363,129 (Ex. 1012) at 9:51-53). Further, it can be seen from Fig. 2A that the LM7805 voltage regulator receives a +12V input from the batteries 22 and generates the +5V system voltage, an

arrangement which the POSITA would have recognized as standard for the use of a voltage regulator.

***[1(a)(ii)] the battery capable of supplying power, via the voltage regulator, to at least a microprocessor,***

123. *Richardson* discloses that the battery is capable of supplying power, via the voltage regulator, to at least a microprocessor. As shown in Figs. 1 and 2C, *Richardson* discloses that “[j]ump starter 10 includes a programmable microprocessor 12 which receives inputs 14 and produces informational outputs 16 and control outputs 18.” Ex. 1004 ¶ [0014]. The microprocessor 12 is supplied with power (+5V) from the one or more batteries 22 via the voltage regulator (LM7805), as highlighted below.

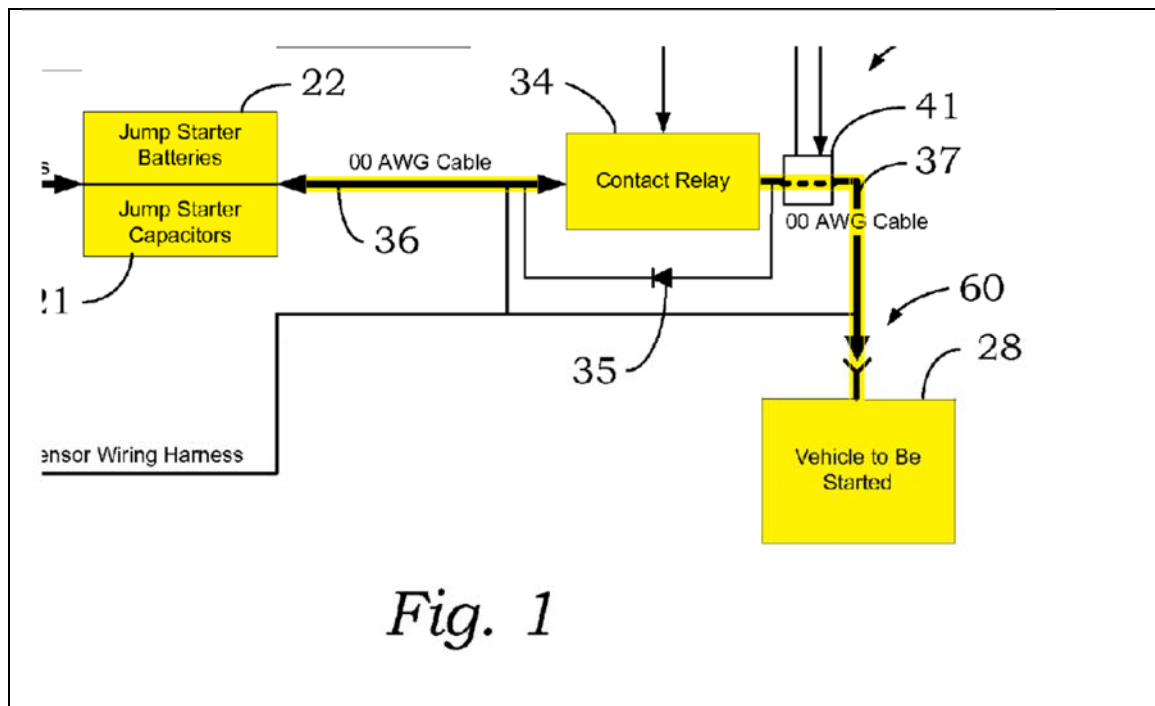


Ex. 1004, Figs. 2A and 2C, with highlighting added.

***[1(a)(iii)] the battery also capable of supplying power to an automobile battery when the battery has at least a predetermined voltage;***



124. *Richardson* also discloses that the battery is capable of supplying power to an automobile battery when the battery has at least a predetermined voltage. For example, as highlighted in Fig. 1 below, *Richardson* discloses that “[t]he system includes one or more internal batteries [22] and capacitors [21] to provide the power to the battery of the vehicle to be jump started.” Ex. 1004 ¶ [0007]. “When the jump starter operation has been successfully initiated, the contact relay 34 is closed and the jump starter capacitors 21 and batteries 22 are connected to the starter system or batteries of the vehicle to be started 28.” *Id.* at ¶ [0021].



Ex. 1004, Fig. 1 with emphasis added.

125. *Richardson* further discloses monitoring the jump starter batteries 22 to detect when the batteries fall below a predetermined voltage needed for jump

starting the automobile. *See id.* at ¶ [0020] (“If the voltage level of the jump starter batteries 22 drop below a value of twenty percent of the normal level, a charge battery LED 54 is illuminated. The charge battery LED 54 remains illuminated until the batteries 22 are charged to a minimum state of charge such as fifty percent, for example.”) *Richardson* therefore discloses that the boosting battery is “capable” of supplying power to an automobile battery when the battery has at least a predetermined voltage, *i.e.*, the jump starter batteries 22 are charged to a minimum state of charge such as fifty percent.

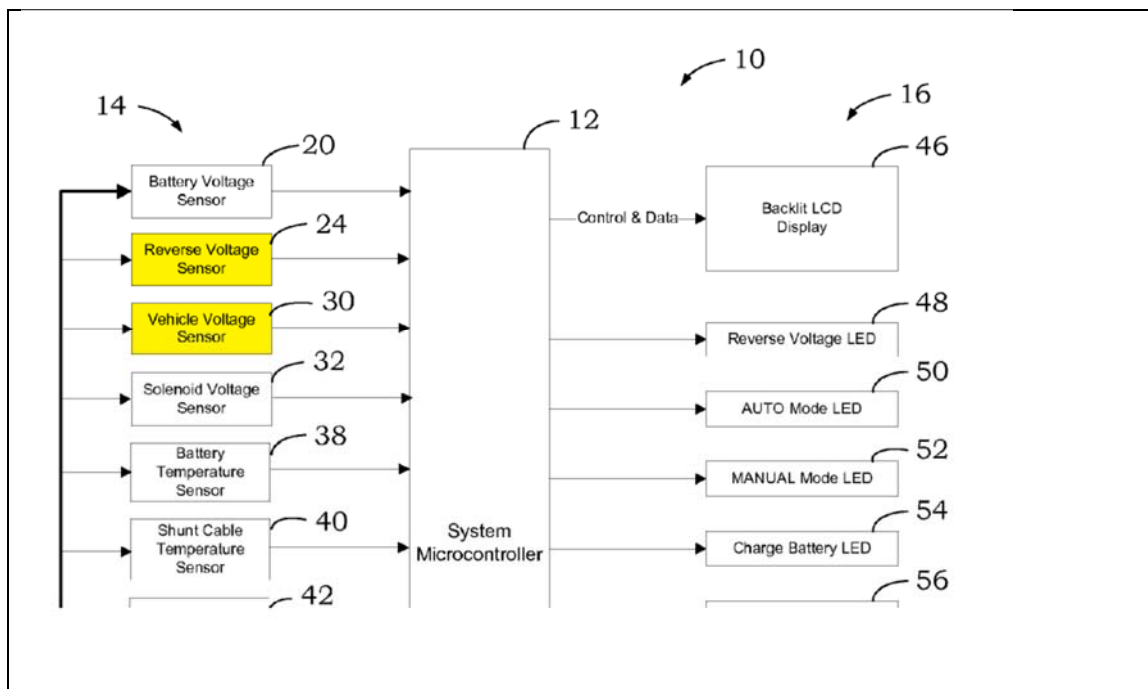
126. Further, to the extent that Patent Owner may argue that claim element 1(a)(iii) also requires that the jumpstarter prevent the battery from supplying power to the automobile battery if the battery does not have a predetermined voltage, this is also disclosed by *Richardson*. For example, *Richardson* discloses that when the voltage level of the batteries 22 falls below a predetermined voltage, an error flag is set which prevents any further jump starter action by the operator until an adequate charging voltage is detected. *Id.* at ¶ [0028] (“If the voltage level of the system batteries 22 measured by the voltage sensor 30 is equal to a state of charge of eighty percent or more below a fully charged voltage level 222, an error flag is set and the event recorded in memory 224... The system stays in this condition, which prohibits any further jump starter action by the operator until a charging

voltage is detected 226, which is great enough to indicate that a battery charger (not shown) has been connected to the batteries 22.”)

***[1(b)] a load detector circuit, connected to the microcontroller, to detect when the jumpstarter is correctly connected to the automobile battery;***

127. As explained above, based on the disclosure set forth in the ‘077 Patent, a POSITA would have understood that a detection that the jumpstarter is “correctly connected to the automobile battery” must at least include detecting that (1) the load (*i.e.*, automobile battery) is connected to the jumpstarter and (2) the positive and negative polarities of the load (*i.e.*, automobile battery) are not reversely connected. *See* above at Section VII.B.i.1(b). This is disclosed by *Richardson*.

128. For example, as detailed below, *Richardson* discloses a reverse voltage sensor 24 connected to microprocessor 12 that monitors the polarity of the jumper cables connected to the vehicle battery (*see* Ex. 1004 ¶¶ [0016], [0020], [0027]) and a vehicle voltage sensor 30 connected to microprocessor 12 that monitors the voltage of the vehicle battery to detect possible fault conditions such as a disconnected vehicle battery (*see id.* at ¶¶ [0016], [0036], [0041]). Fig. 1 of *Richardson* is set forth below with the reverse voltage sensor 24 and vehicle voltage sensor 30 highlighted.



Ex. 1004, Fig. 1 with highlighting added.

129. *Richardson* discloses that the “reverse voltage sensor 24 monitors the polarity of the jumper cables on line 26 which are connected to the vehicle's electrical system 28.” Ex. 1004 ¶ [0016]. “A reverse voltage LED 48 is illuminated when the microprocessor 12 determines that a reverse voltage jumper cable voltage is detected by reverse voltage sensor 24.” *Id.* at ¶ [0020]. More specifically, *Richardson* discloses the following process for using the reverse voltage sensor 24 to prevent jump starting when a reverse polarity is detected:

If the system does not detect a battery charging voltage 212, once jumper cables 60 have been manually connected to the vehicle to be started 28, the voltage is measured by the reverse voltage sensor 24 to determine if the cables have been properly connected to the vehicle 214. If the voltage measured is significantly less than the voltage of the jump starter capacitors 21 and batteries 22, then a reverse polarity connection of the jumper cables to the vehicle is determined and an error flag is set and the

event saved in non-volatile memory 216. A “Reverse Polarity” error message is displayed 218 on the LCD 46, and the reverse voltage LED 48 is illuminated 216. Any further jump starter action by the operator is ignored until the reverse polarity condition is corrected 220, at which point processing returns to the start of the main processing loop 210.

130. *Id.* at ¶[0027]. *Richardson* further discloses that the “vehicle voltage sensor 30 monitors the voltage on line 37 (voltage of the vehicle).” *Id.* at ¶ [0016]. If the vehicle voltage sensor 30 detects that the vehicle battery has been disconnected, then the contact relay 34 is opened by the microprocessor to stop the jump starting process (*Id.* at ¶ [0041]):

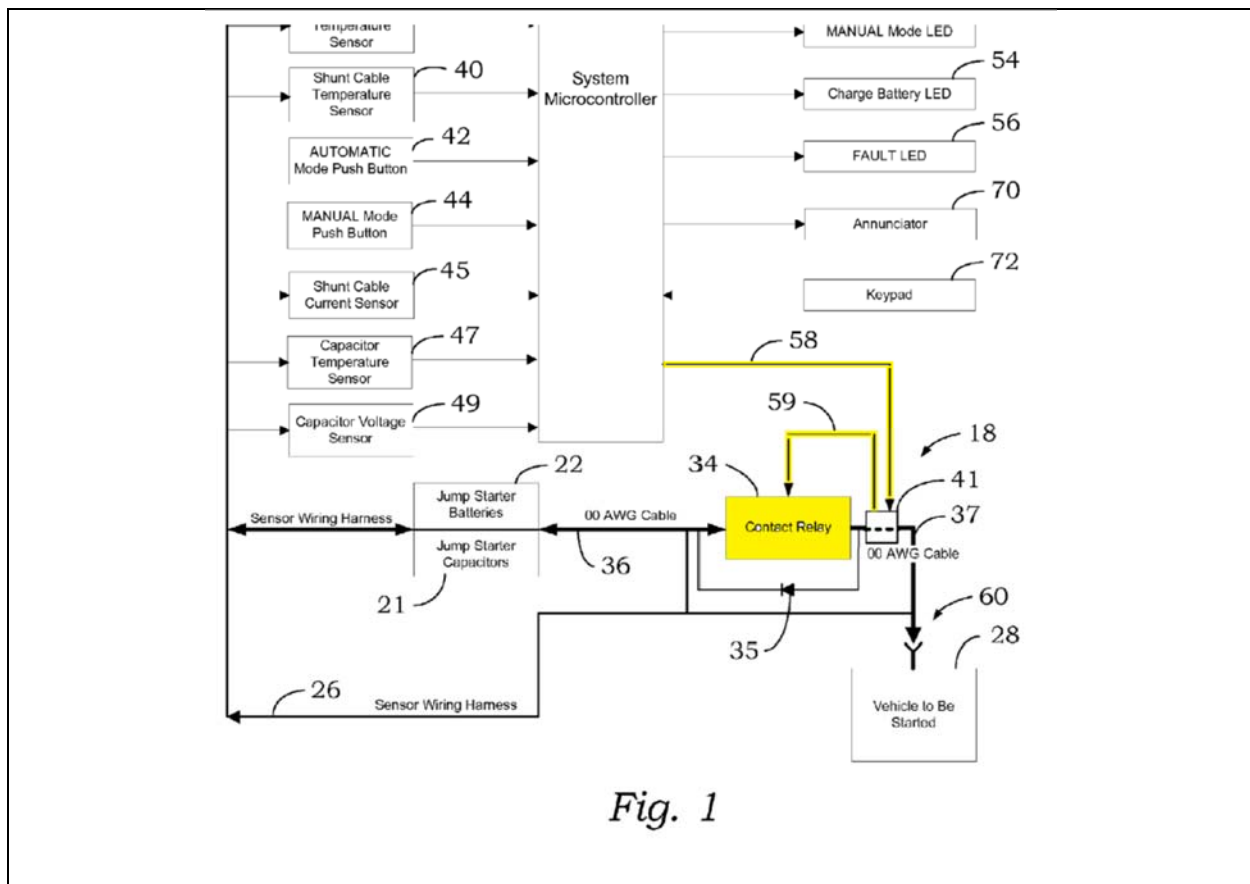
If the system detects an increase in the difference between the measured jump starter battery voltage 20 and the voltage measured 30 across the contact relay 34 indicating that one of the jump starter cables has been disconnected 302 from the vehicle's battery or starter system 28 then a jumper cable unplugged error count is incremented 304, a “Jumper Cable Unplugged” error message is displayed 306 on the LCD 46, the contact relay 34 is opened and the fault LED 56 is illuminated 290.

131. Based at least on the above disclosure, a POSITA would have understood that the reverse voltage sensor 24 and vehicle voltage sensor 30 of *Richardson* are part of a “load detector circuit” connected to the microcontroller (*i.e.*, microprocessor 12) to detect when the jump starter 10 is correctly connected to the automobile battery 28.

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

132. *Richardson* discloses that a microcontroller (*i.e.*, microprocessor 12) generates an output signal when the jump starter 10 is correctly connected to the

automobile battery. For example, *Richardson* discloses a “contact relay control output 58” generated by the microprocessor 12 that “operates the contact relay 34 through temperature sensor 41,” as highlighted in Fig. 1 below. *See* Ex. 1004 ¶ [0021]. “When the jump starter operation has been successfully initiated, the contact relay 34 is closed and the jump starter capacitors 21 and batteries 22 are connected to the starter system or batteries of the vehicle to be started 28.” *Id.* As explained above for claim element 1(b), control of the contact relay 34 by the microprocessor 12 is conditioned on a determination that the automobile battery is correctly connected. *See* above at Section VII.F.1.1(b).



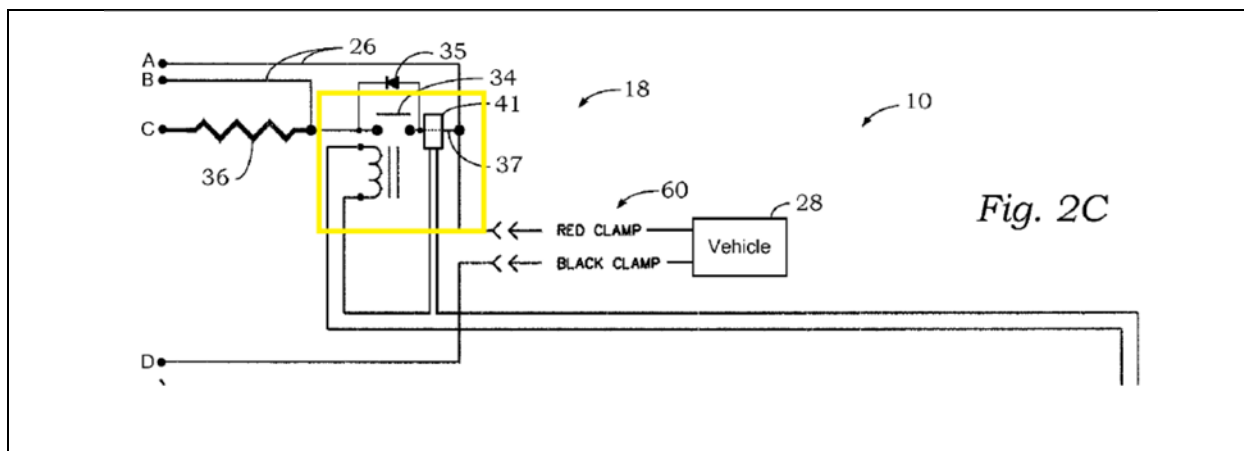
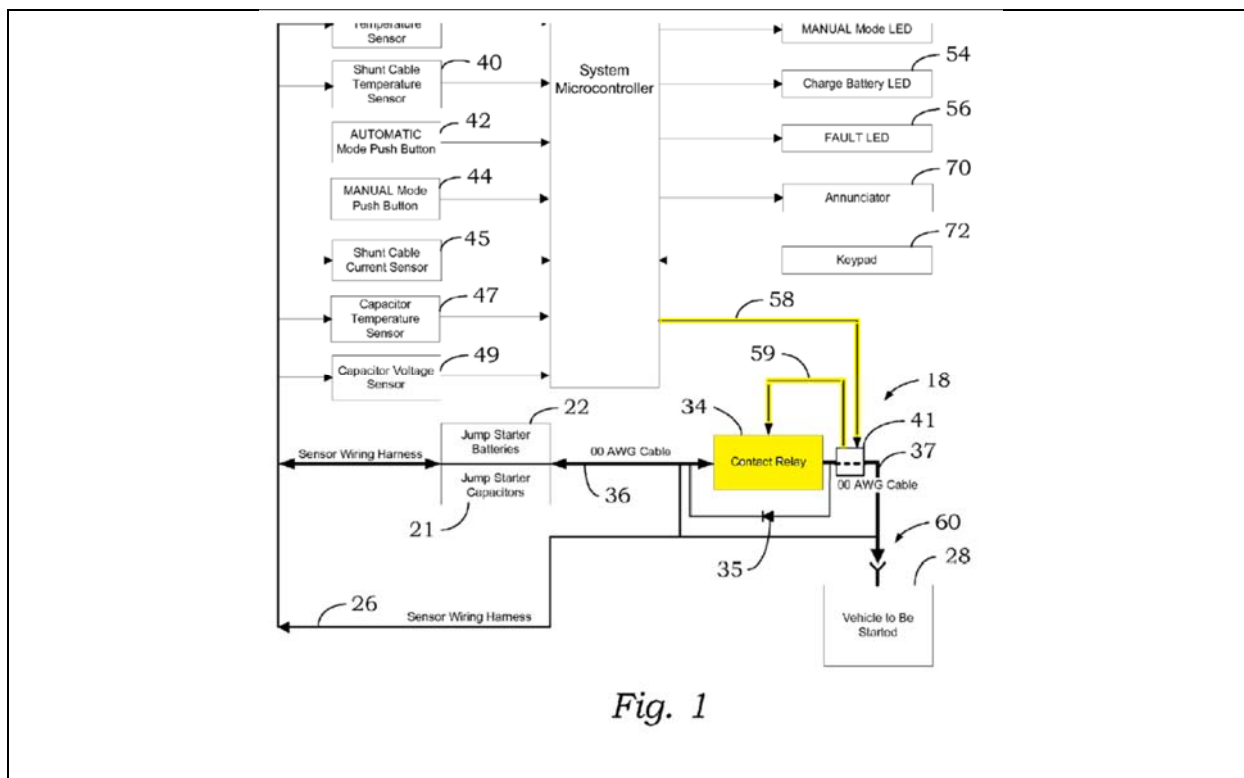
*Ex. 1004, Fig. 1 with highlighting added.*

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

133. *Richardson* discloses a contact relay 34 (*i.e.*, switching circuitry that includes at least one switch) that connects the jump starter batteries 22 to the automobile battery 28 when the microprocessor 12 generates the contact relay control output signal 58 to supply charging current to the automobile battery 28 (Ex. 1004 ¶ [0021]):

A contact relay control output 58 operates the contact relay 34 through temperature sensor 41. When the jump starter operation has been successfully initiated, the contact relay 34 is closed and the jump starter capacitors 21 and batteries 22 are connected to the starter system or batteries of the vehicle to be started 28.

134. The contact relay (*i.e.*, switching circuitry) is shown in Figs. 1 and 2C of *Richardson*, as highlighted below.



*Ex. 1004, Figs. 1 and 2C with highlighting added.*

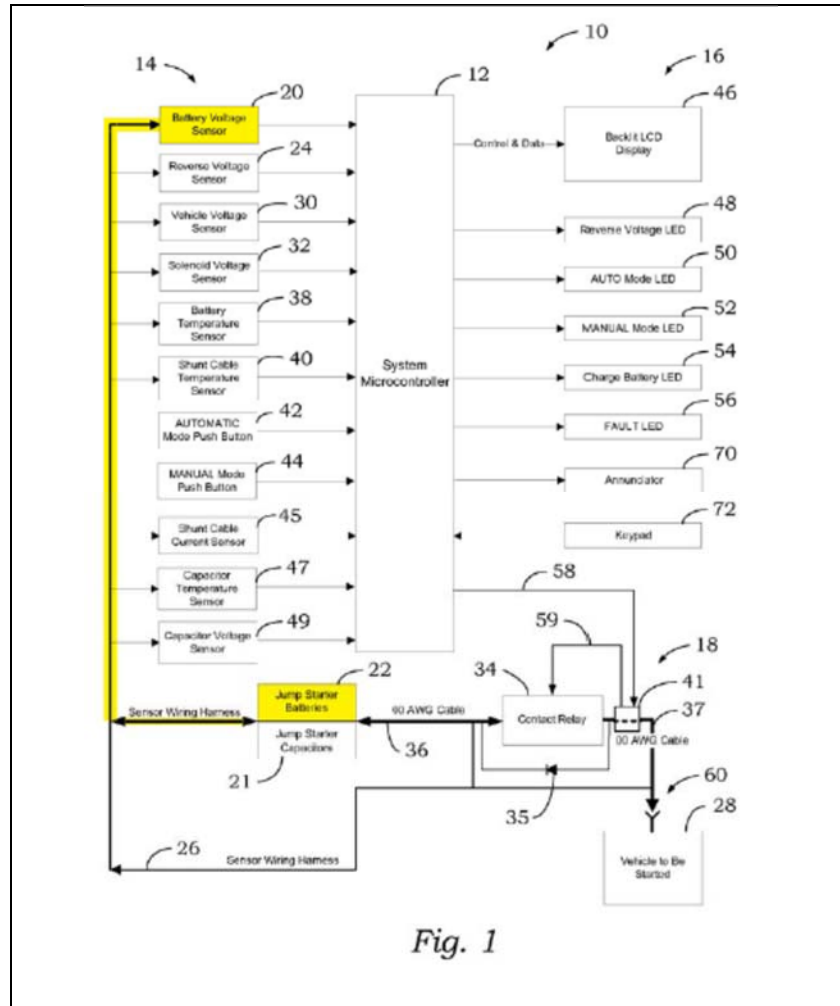
**ii. Claim 2**

**2. The jumpstarter of claim 1, further comprising a battery voltage detector circuit to detect a battery voltage of the battery.**

135. Claim 2 depends from claim 1 and further recites, “a battery voltage detector circuit to detect a battery voltage of the battery.” This is disclosed by



*Richardson*. For example, *Richardson* discloses “[a] battery voltage sensor 20 [that] monitors the voltage level of one or more jump starter batteries 22,” as highlighted in Fig. 1 below. See Ex. 1004 ¶ [0016].



Ex. 1004, Fig. 1 with highlighting added.

**iii. Claim 3**

**3. The jumpstarter of claim 1, wherein the at least one switch is one or more MOSFETs.**

136. Claim 3 depends from claim 1 and further recites, “wherein the at least one switch is one or more MOSFETs.” This would have been obvious in view of *Richardson* and common knowledge in the field.

137. A POSITA would have understood, based on common knowledge in the field, that MOSFETs were, and continue to be, the most common choice for switches in power circuitry, such as the jump starter device described in *Richardson*. The POSITA would have understood that a MOSFET-based power switch is advantageous over a relay at least because of a) smaller size, b) the ability to control the rate of increase of load current, and c) physical ruggedness and reliability. The POSITA would therefore have been easily motivated to substitute a MOSFET-based switching circuit for the contact relay 34 in *Richardson* to provide the predictable result of improving product reliability while providing the advantages of smaller size and control of load current.

**iv. Claim 4**

***4. The jumpstarter of claim 3, wherein the one or more MOSFETs are n-channel MOSFETs.***

138. Claim 4 depends from claim 3 and further recites, “wherein the one or more MOSFETs are n-channel MOSFETs.” This would have been obvious in view of *Richardson* and common knowledge in the field.

139. As explained above for claim 3, a POSITA would have been motivated, based on common knowledge in the field, to substitute a MOSFET-based switching

circuit for the contact relay 34 in *Richardson*. The POSITA would have further understood that, compared to p-channel MOSFETs, n-channel MOSFETs are more commonly used in power switching applications because of the wider variety of available types resulting from the comparative ease of manufacture of n-channel MOSFETs. The POSITA would therefore have been further motivated, based on common knowledge in the field, to utilize an n-channel MOSFET switch in place of the contact relay 34 in *Richardson*.

**v. Claim 5**

***5. The jumpstarter of claim 1, wherein there are a plurality of switches.***

140. Claim 5 depends from claim 1 and further recites, “wherein there are a plurality of switches.” This would have been obvious in view of *Richardson* and common knowledge in the field.

141. As explained above for claim 3, a POSITA would have been motivated, based on common knowledge in the field, to substitute a MOSFET-based switching circuit for the contact relay 34 in *Richardson*. The POSITA would have further understood that the use of a plurality of MOSFET switches connected in parallel is commonly used in power switching circuits to allow for higher current flow. The POSITA would therefore have been further motivated, based on common knowledge in the field, to utilize a MOSFET switching circuit with a plurality of MOSFETs connected in parallel in place of the contact relay 34 in *Richardson*.

**vi. Claim 6**

***6. The jumpstarter of claim 1, wherein the at least one switch is a plurality of MOSFETs.***

142. Claim 6 depends from claim 1 and further recites, “wherein the at least one switch is a plurality of MOSFETs.” This would have been obvious in view of *Richardson* and common knowledge in the field for at least the same reasons detailed above for claim 5.

**vii. Claim 7**

***7. The jumpstarter of claim 6, wherein the plurality of MOSFETs are connected in parallel.***

143. Claim 7 depends from claim 6 and further recites, “wherein the plurality of MOSFETs are connected in parallel.” This would have been obvious in view of *Richardson* and common knowledge in the field for at least the same reasons detailed above for claim 5.

**viii. Claim 9**

***9. The jumpstarter of claim 1, further comprising a load detector to detect a reverse polarity connection to the automobile battery.***

144. Claim 9 depends from claim 1 and further recites, “a load detector to detect a reverse polarity connection to the automobile battery.” This is disclosed by *Richardson*. As explained above for claim element 1(b), the load detector circuit disclosed in *Richardson* includes a reverse voltage sensor 24 (*i.e.*, a load detector) that monitors the polarity of the jumper cables connected to the vehicle battery,

thereby enabling prevention of jump starting when a reverse polarity connection is detected. *See* above at Section VII.F.i.1(b); *see also* Ex. 1004 ¶¶ [0016], [0020], [0027].

**ix. Claim 10**

***10. The jumpstarter of claim 1, wherein the microprocessor includes a standby mode where all outputs are closed.***

145. Claim 10 depends from claim 1 and further recites, “wherein the microprocessor includes a standby mode where all outputs are closed.”

146. As explained above, claim 10 should be interpreted in the context of the ’077 Patent’s specification to require that the microprocessor includes a standby mode during which the jumpstarter is prevented from supplying a charging voltage to the automobile battery. *See* above at Section VII.C.ix. This is disclosed by *Richardson*.

147. For example, *Richardson* discloses a “Charge Battery” condition that is a standby mode during which the jump starter 10 is prevented from supplying a charging voltage to the automobile battery:

If the voltage level of the system batteries 22 measured by the voltage sensor 30 is equal to a state of charge of eighty percent or more below a fully charged voltage level 222, an error flag is set and the event recorded in memory 224. The charge battery LED 54 is illuminated and the LCD 46 displays a “Charge Battery” message 225. The system stays in this condition, which prohibits any further jump starter action by the operator until a charging voltage is detected 226, which is great enough to indicate that a battery charger (not shown) has been connected to the batteries 22... The jump starter batteries 22 only need to reach a 50% charge in order for the system to attempt to start the battery.

Ex. 1004 ¶ [0028].

**x. Claim 11**

***11. The jumpstarter of claim 10, further wherein the microcontroller closes all outputs when a voltage of the direct current power supply is lower than that of a state being able to supply power.***

148. Claim 11 depends from claim 10 and further recites, “wherein the microprocessor closes all outputs when a voltage of the direct current power supply is lower than that of a state being able to supply power.” This is disclosed by *Richardson*.

149. As explained above for claim 10, *Richardson* discloses that the microprocessor prevents jump starting (*i.e.*, closes all outputs) when a voltage of the batteries 22 “is equal to a state of charge of eighty percent or more below a fully charged voltage level” (*i.e.*, when the battery voltage is lower than a state of being able to supply power). *See* above at Section VII.F.ix.; *see also* Ex. 1004 ¶ [0028].

**xi. Claim 12**

***12. The jumpstarter of claim 10, wherein the jumpstarter is in a standby mode when the battery has less than 9 volts.***

150. Claim 12 depends from claim 10 and further recites, “wherein the jumpstarter is in a standby mode when the battery has less than 9 volts.” This would have been obvious in view of *Richardson* and common knowledge in the field.

151. As explained above for claim 10, *Richardson* discloses that the microprocessor prevents jump starting (*i.e.*, enters a standby mode) when a voltage

of the batteries 22 “is equal to a state of charge of eighty percent or more below a fully charged voltage level.” See above at Section VII.F.ix.; see also Ex. 1004 ¶ [0028]. *Richardson* further discloses that the jump starter 10 may be configured to operate at different operating voltages, including for example, 12, 18, 24, 30, 36, 42, and 48 volts. See Ex. 1004 ¶ [0034]. In view of this disclosure, a POSITA would have understood that the exact value for the disclosed threshold of “eighty percent or more below a fully charged voltage level” would be dependent on the type of battery being used and the operational voltage of the jump starter 10. It would have therefore been obvious to the POSITA, based on the disclosure of *Richardson* and common knowledge in the field, that *Richardson*’s jump starter 10 would enter “standby mode when the battery has less than 9 volts” upon selection of the appropriate type of battery and operational voltage.

**xii. Claim 13**

***13. The jumpstarter of claim 10, wherein the jumpstarter is not in a standby mode when the battery has more than 10 volts.***

152. Claim 13 depends from claim 10 and further recites, “wherein the jumpstarter is not in a standby mode when the battery has more than 10 volts.” As explained above for claim 10, *Richardson* discloses that the microprocessor prevents jump starting (*i.e.*, enters a standby mode) when a voltage of the batteries 22 “is equal to a state of charge of eighty percent or more below a fully charged voltage level” and allows further jump starting (*i.e.*, is not in standby mode) when the jump

starter batteries 22 reach a 50% charge. *See* above at Section VII.F.ix.; *see also* Ex. 1004 ¶ [0028]. *Richardson* further discloses that the jump starter 10 may be configured to operate at different operating voltages, including for example, 12, 18, 24, 30, 36, 42, and 48 volts. *See* Ex. 1004 ¶ [0034]. In view of this disclosure, a POSITA would have understood that the exact value for the disclosed threshold of a 50% charge for coming out of standby mode would be dependent on the type of battery being used and the operational voltage of the jump starter 10. It would have therefore been obvious to the POSITA, based on the disclosure of *Richardson* and common knowledge the field, that *Richardson*'s jump starter 10 would exit standby mode when the battery has more than 10 volts upon selection of the appropriate type of battery and operational voltage.

**xiii. Claim 14**

***14. The jumpstarter of claim 10, wherein the jumpstarter is in a normal mode when the battery has more than 10 volts.***

153. Claim 14 depends from claim 10 and further recites, “wherein the jumpstarter is in a normal mode when the battery has more than 10 volts.” This would have been obvious over *Richardson* and common knowledge in the field for at least the same reasons as explained above for claim 12.

**xiv. Claim 15**

***15. The jumpstarter of claim 1, wherein the supply power to the automobile battery is 12 volts.***



154. Claim 15 depends from claim 1 and further recites, “wherein the supply power to the automobile battery is 12 volts.” This is disclosed by *Richardson*. For example, *Richardson* discloses that “[t]he jump starter 10 may be configured for 12, 18, 24, 30, 36, 42 or 48 volts, for example, using a selector jumper 55.” Ex. 1004 ¶ [0034].

**xv. Claim 16**

***16. The jumpstarter of claim 1, wherein the predetermined voltage is 10 volts.***

155. Claim 16 depends from claim 1 and further recites, “wherein the predetermined voltage is 10 volts.” This would have been obvious over *Richardson* and common knowledge in the field for at least the same reasons as explained above for claim 13.

**xvi. Claim 18**

***18. The jumpstarter of claim 1, further composing a start control module to stop supplying battery power when there is no load.***

156. Claim 18 depends from claim 1 and further recites, “a start control module to stop supplying battery power when there is no load.” This is disclosed by *Richardson*. As explained above for claim element 1(b), the load detector circuit disclosed in *Richardson* includes a vehicle voltage sensor 30 connected to the microprocessor 12 (*i.e.*, a start control module) that monitors the voltage of the vehicle battery to detect possible fault conditions such as a disconnected vehicle battery. See above at Section VII.F.i.1(b); see also Ex. 1004 ¶¶ [0016], [0036],

[0041]. If the vehicle voltage sensor 30 detects that the vehicle battery has been disconnected (*i.e.*, there is no load), then the contact relay 34 is opened by the microprocessor to stop supplying battery power to the vehicle battery. *Id.*

***xvii. Claim 19***

***19. The jumpstarter of claim 1, wherein the at least one switch switches a negative voltage.***

157. Claim 19 depends from claim 1 and further recites, “wherein the at least one switch switches a negative voltage.” This would have been obvious in view of *Richardson* and common knowledge in the field.

158. As shown in Figs. 2A and 2C, the contact relay 34 in *Richardson* is connected to the positive terminal (C) of the jump starter batteries 22. See Ex. 1004, Figs. 2A and 2C. However, it would have been obvious to a POSITA based on common knowledge in the field, that connection of the contact relay 34 to either the positive (C) or negative (D) battery terminals is an arbitrary design choice that would have no effect on the overall operation of *Richardson*’s jump starter circuit 10. A POSITA would have known what has been known since the beginning of the use of electricity in the 1840s, namely, that if an electrical loop circuit is broken at any point in that circuit, current ceases to flow. Thus, a switch can be placed anywhere in a loop circuit in order to perform the function of interrupting current flow. Accordingly, to perform its function of interrupting current flow in the circuit connecting the internal battery to the vehicle battery, a relay could equally

effectively be placed either on the positive side (C) or the negative side (D). A POSITA would therefore have been equally motivated to connect *Richardson's* contact relay 34 to switch the negative battery voltage, instead of the positive battery voltage.

**xviii. Claim 20**

***20. The jumpstarter of claim 1, wherein the at least one switch is connected to a negative battery terminal.***

159. Claim 20 depends from claim 1 and further recites, “wherein the at least one switch is connected to a negative battery terminal.” This would have been obvious in view of *Richardson* and common knowledge in the field for at least the same reasons detailed above for claim 19.

**xix. Claim 21**

***21. The jumpstarter of claim 1, wherein the jumpstarter has a fast charging function.***

160. Claim 21 depends from claim 1 and further recites, “wherein the jumpstarter has a fast charging function.” This is disclosed by *Richardson*.

161. For example, *Richardson* discloses a fast charging function for quickly recharging the jump starter batteries 22 using the vehicle battery:

Referring to FIGS. 1 and 2, a diode 35 may be connected across the contact 34 to charge the capacitors 21 and jump starter batteries 22 from the vehicle charging system 28. The charging system of the vehicle may be used to charge the capacitors 21 and jump starter batteries 22. Whenever the vehicle has a working charging system this will occur as long as the cables are connected to the vehicle. This allows the capacitors 21 and jump starter batteries 22 to be fully

recharged in about 1 to 5 minutes and can therefore start many vehicles in a row without becoming discharged. Even in situations in which the jump starter batteries 22 may be discharged to an extent that they alone may not be able to provide the necessary power to start a vehicle, the capacitors 21 may be rapidly recharged to start many vehicles in a row. This is very useful when starting fleets of vehicles with dead batteries.

Ex. 1004 ¶ [0055].

**xx. Claim 24**

***24. The jumpstarter of claim 1, wherein the microcontroller determines whether a battery state is suitable for heavy current power generation.***

162. Claim 24 depends from claim 1 and further recites, “wherein the microcontroller determines whether a battery state is suitable for heavy current power generation.” This is disclosed by, or at least obvious in view of, *Richardson*.

163. For example, *Richardson* discloses that the microprocessor 12 detects whether the battery state is suitable for heavy current power generation. *See, e.g., id.* at ¶ [0028] (“If the voltage level of the system batteries 22 measured by the voltage sensor 30 is equal to a state of charge of eighty percent or more below a fully charged voltage level 222, an error flag is set and the event recorded in memory 224.”) Therefore, a POSITA would have understood that *Richardson*’s process of detecting that the voltage level of the batteries 22 is “equal to a state of charge of eighty percent or more below a fully charged voltage level” would operate to determine whether the battery state is suitable for heavy current power generation.

**G. Ground 5 *Richardson* in view of *Lai* renders claim 17 obvious under 35 U.S.C. § 103**

164. Claim 17 depends from claim 1 and further requires “a start control module to prevent recharging of a normal voltage of the battery.” As explained in the specification of the ’077 patent, “the automobile engine will generate the normal voltage to recharge the battery after the automobile starts, whereas the automobile start control module is deactivated immediately once the recharging voltage is larger than the voltage before that battery starts the power supply, to protect the battery from damages caused by charging with the normal voltage.” Ex. 1001 at 4:36-41. In other words, claim 17 requires that the “start control module” prevents recharging of the internal jumpstarter battery (from the automobile battery) when the voltage of the jumpstarter battery is at “a normal voltage of the battery.” This type of protection against overcharging a battery has been well known long before the ’077 patent, and would therefore have been obvious to a POSITA based on common knowledge in the field, as evidenced for example by *Lai*. See also, e.g., U.S. Patent No. 7,969,119 (Ex. 1010) and U.S. Patent No. 8,264,205 (Ex. 1011).

165. As explained above, *Richardson* discloses a fast charging function for quickly recharging the jump starter batteries 22 using the vehicle battery. See above at Section VII.F.xix. As shown in Fig. 1 of *Richardson*, “a diode 35 may be connected across the contact 34 to charge the capacitors 21 and jump starter batteries 22 from the vehicle charging system 28.” Ex. 1004 ¶[0055]. As explained by *Lai*,

however, rechargeable batteries are sensitive to overcharge, which may lead to explosion, flame or other hazardous conditions. *See* Ex. 1008 at 1:34-36. “From a safety point of view, it is very critical that the Li-ion battery is properly protected against over charge.” *Id.* at 1:39-41. A POSITA would therefore have been easily motivated to add an overcharge protection circuit, such as disclosed in *Lai*, to *Richardson’s* fast charging system in order to protect against dangerous conditions that may be caused if the jump starter batteries 22 are overcharged by the vehicle charging system 28.

166. *Lai* describes an over voltage, over current and overcharge protection circuit for use with a battery charging system (*e.g.*, such as the fast charging system in *Richardson*). *See, e.g.*, Ex. 1008, 1:18-22; 2:32-48. An example of *Lai’s* over voltage, over current and overcharge protection circuit 100 is shown in Fig. 1:



the VB pin 104 and issues an over voltage signal when the battery voltage exceeds an over voltage protection (OVP) threshold”. *See id.* at 4:65-5:2. *Lai* therefore discloses a start control module (*i.e.*, IC 100, p-channel MOSFET 102, and comparator 134) to prevent recharging of a normal voltage of a battery.

168. As explained above, a POSITA would have been motivated to utilize an overcharge protection circuit, such as disclosed in *Lai*, to protect against dangerous overcharging conditions in the jump starter of *Richardson*. This could have been easily achieved by replacing the diode 35 shown in Fig. 1 of *Richardson* with a switched overcharge protection circuit, for example as disclosed in *Lai*. This combination would have provided the predictable result of preventing recharging of the jump starter batteries 22 from the vehicle battery 28 once the charge on the jump starter batteries 22 reaches an over voltage protection threshold (*i.e.*, to prevent recharging of a normal voltage of the battery).

**H. Ground 6: *Richardson* in view of *Tracey* renders claims 17, 22, and 23 obvious under 35 U.S.C. § 103**

169. Claim 22 depends from claim 1 and further recites “a voltage back-flow protection.” Claim 23 depends from claim 22 and recites, “wherein the voltage back-flow protection [is] for an abnormal load.” To the extent that *Richardson* may not disclose expressly the use of a voltage back-flow protection circuit to prevent back-flow from the vehicle battery to the jump starter battery in case of an abnormal load,



this would have been obvious in view of *Tracey* for the same reasons as explained above at Section VII.E.

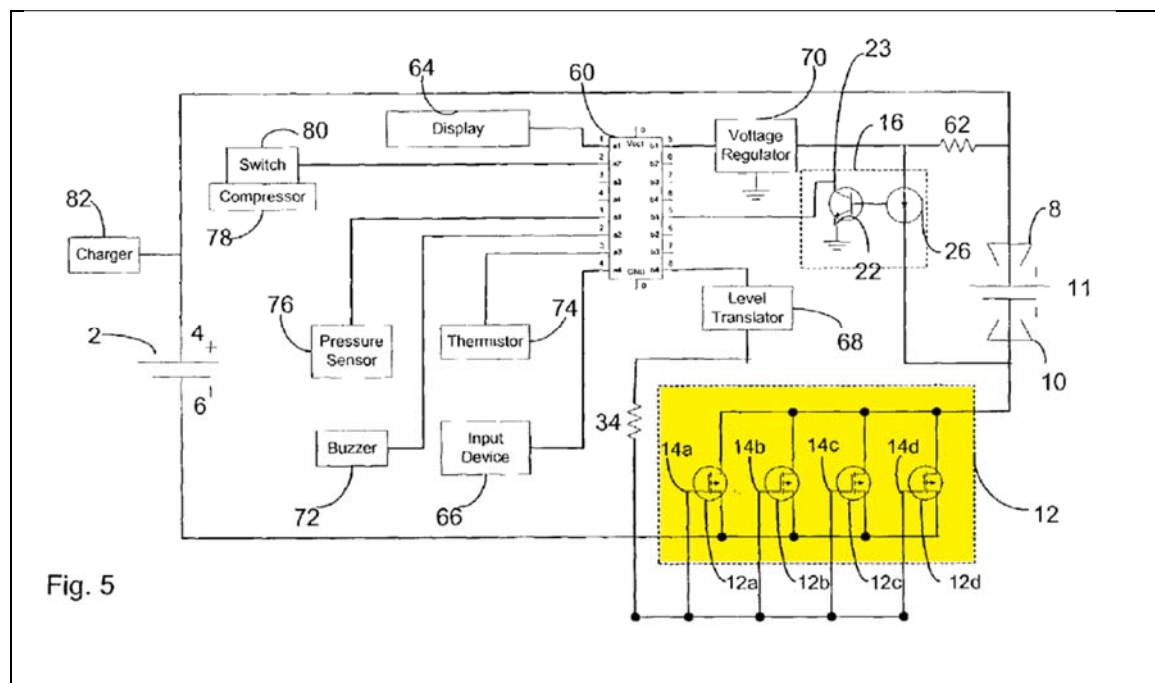
170. Further, a POSITA would have been motivated to combine *Richardson* and *Tracey* to provide further back-flow protection between the vehicle battery and jump starter battery in *Richardson*'s system. *Richardson* and *Tracey* are in the same field of endeavor, namely jump starter circuits that include protections against unsafe conditions such as reverse polarity connections and improper battery conditions. Further, as evidenced by *Tracey*, it was well known in the field that reverse current flow from a vehicle battery to a jump starter battery can cause unsafe conditions, especially when the vehicle battery has a higher voltage than that for which the jump starter is intended (*i.e.*, an abnormal load). The combination of *Tracey*'s back-flow protection circuit 125 with *Richardson*'s jump starter circuit would therefore have had the predictable result of protecting against unsafe conditions caused by connecting the jump starter to a vehicle with an abnormally high voltage load.

**I. Ground 7: *Richardson* in view of *Krieger* renders claims 3-7, 19, and 20 obvious under 35 U.S.C. § 103**

***i.* Claims 3-7**

171. Dependent claims 3-7 each recite limitations relating to the configuration of the switching circuitry recited in independent claim 1 as including MOSFETs. As explained above, the use of MOSFETs for a switching circuit in the configurations recited in these dependent claims is a basic power engineering design

choice that would have been obvious to a POSITA based on common knowledge in the field. *See* above at Sections VII.F.iii-vii. To the extent, however, that Patent Owner argues that these limitations are somehow more than trivial design choices, they would have been further obvious in view of the teachings of *Krieger*.



*Ex. 1005, Fig. 5 (with highlighting added).*

173. Further, a POSITA would easily have been motivated to utilize a MOSFET-based switching circuit, as disclosed in *Krieger*, in place of the contact relay disclosed in *Richardson*. Both *Krieger* and *Richardson* are directed to vehicle jump starter circuits, and both address the same problem of using a processor-

controlled switching circuit to prevent jump starting when a fault is detected, such as a disconnected battery or reverse polarity connection. *See, e.g.*, Ex. 1004 ¶ [0007] and Ex. 1005 ¶ [0016]. For this same purpose, *Richardson* utilizes a relay-based switching circuit (*see* Ex. 1004, Fig. 2C) and *Krieger* utilizes a MOSFET-based switching circuit (*see* Ex. 1005, Fig. 5). But the POSITA would have understood, based on common knowledge in the field, that MOSFETs were, and continue to be, the most common choice for switches in power circuitry. The POSITA would have further understood that a MOSFET-based power switch is advantageous over a relay-based switching circuit at least because of a) smaller size, b) the ability to control the rate of increase of load current, and c) physical ruggedness and reliability. The POSITA would therefore have been motivated to substitute a MOSFET-based switching circuit, as disclosed in *Krieger*, for the contact relay 34 in *Richardson* to provide the predictable result of improving product reliability while providing the advantages of smaller size and control of load current.

**ii. Claims 19 and 20**

174. Dependent claim 19 depends from claim 1 and further recites “wherein the at least one switch switches a negative voltage.” Similarly, claim 20 depends from claim 1 and further recites “wherein the at least one switch is connected to a negative battery terminal.” As explained above, it would have been a trivial design choice to connect the contact relay 34 of *Richardson* to the negative battery terminal,

instead of the positive battery terminal. *See* above at Sections VII.F.xvii and xviii. To the extent, however, that Patent Owner argues that these limitations are somehow more than trivial design choices, they would have been further obvious in view of the teachings of *Krieger*.

175. As explained above in Sections VII.C.xii and xiii, the limitations of dependent claims 19 and 20 are disclosed by *Krieger*, which discloses a MOSFET-based switch that is “electrically connected to the negative terminal 6 of the boosting battery 2.” *See* Ex. 1005 ¶ [0032]. For the same reasons as explained above for dependent claims 3-7, a POSITA would have been motivated to utilize the MOSFET-based switch of *Krieger* in place of the contact relay 34 of *Richardson*. In doing so, the POSITA would have been further motivated to connect the switch to the negative battery terminal, as taught by *Krieger*, because: (i) n-channel MOSFETs are preferred over p-channel MOSFETs, (ii) n-channel MOSFETs need positive gate voltages (relative to their source terminals), and (iii) positive gate voltages are readily available when the source terminals are connected to the negative battery terminal. Such an arrangement provides a simplified electrical connection.

**J. Ground 8. *Richardson* in view of *Krieger* and *Baxter* renders claim 8 obvious under 35 U.S.C. § 103**

176. Claim 8 depends from claim 6 and further recites, “wherein the plurality of MOSFETs are connected in a series-parallel topology.” As explained above,

claim 6 would have been obvious over *Richardson* in view of *Krieger*. See above at Section VII.H.i. Further, as explained above at Section VII.D, to the extent that *Krieger* may not expressly disclose that the switch may be implemented using MOSFETs connected in a series-parallel topology, this would have been obvious to a POSITA in view of *Baxter*. See above at Section VII.D. A POSITA would have been motivated to combine *Richardson* and *Krieger* for at least the same reasons detailed above at Section VII.H.i, and the POSITA would have been further motivated to combine *Richardson* and *Krieger* with *Baxter* for at least the same reasons detailed above at Section VII.D.

## **VIII. CONCLUSION**

177. For at least the above reasons, it is my opinion that claims 1-24 of the '077 Patent are unpatentable.

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

By:  \_\_\_\_\_

Jonathan R. Wood, Ph.D.

Date: June 30, 2022