

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Title: PORTABLE BACKUP CHARGER

DECLARATION OF DR. GARY L. WOODS

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I, Dr. Gary L. Woods, declare as follows:

I. INTRODUCTION

1. I have been retained as a technical expert by counsel on behalf of Shenzhen Xinxing E-commerce Co., Ltd. (“Petitioner” or “SXE”). I understand that Petitioner is requesting that the Patent Trial and Appeal Board institute an *inter partes* review (“IPR”) proceeding with respect to U.S. Patent No. 9,643,506 (“the ’506 patent,” which is EX1001 in this proceeding).

2. I have been asked to provide my independent analysis of the ’506 patent in light of certain prior art publications, and I have done so based on my personal knowledge and experience. As detailed below (and demonstrated in my CV attached here), I am familiar with the technology described in the ’506 patent, and I am also familiar with the knowledge of a person of ordinary skill in the art with respect to this technology both as of the filing date of the ’506 Patent (April 29, 2016) and as of the earliest alleged priority date of the ’506 patent (December 9, 2011).

3. I am not, and never have been, an employee of Petitioner. I received no compensation for this declaration beyond my normal hourly compensation based on my time actually spent analyzing the ’506 patent, the prior art publications cited below, and various issues related thereto. I will not receive any added compensation based on the outcome of any IPR or other proceeding involving the ’506 patent.

II. QUALIFICATIONS

4. In formulating independent analysis of the '506 patent, I have relied on my knowledge, training, and experience in the relevant field, which I have summarized below.

5. I have over 25 years of professional experience working with electronic circuit design. I have been involved in designing compact or mobile electronic devices and battery-charging circuits since at least 2008. Further, I have authored numerous published technical papers in the general area of electronics and opto-electronics, and I am a named inventor on at least 16 U.S. Patents.

6. Since 2008, I have been employed as a Professor in the Practice in the Department of Electrical and Computer Engineering at Rice University in Houston, Texas. Since 2020, my title has been Distinguished Professor in the Practice. Before that, I worked as a postdoctoral fellow at the University of California, Santa Barbara (1996-1998); at Intel Corporation (1998-2000); at Spectralane Inc. (2000-2002); at Optonics (later Credence Systems Corp.) (2003-2006); and as an independent consultant (2006-present). In the summers of 1988 and 1989 I worked at Texas Instruments.

7. My educational background includes undergraduate degrees in Physics and Electrical Engineering from Rice University in 1988 and an MS (1991) and Ph.D. (1997) in Applied Physics from Stanford University. At Stanford, I held a

National Science Foundation Graduate Research Fellowship.

8. I am familiar with patents as an inventor and as an employee having significant input into the patent strategies of at least two companies. I also have provided introductory lectures and assignments on patents to my students at Rice, and I have provided general patent advice to several startup companies that have been launched by Rice graduates.

9. With regard to electronic charger devices specifically, I have worked on a number of design projects at Rice in this field. Many of them were year-long capstone design projects, where I was the technical mentor on the project. I have worked on projects involving charging cellphones with supercapacitors and with human-powered generators, and harvesting energy from a shock absorber. I and my students, working with the City of Houston, have developed an off-the-grid flood-water sensor that runs on solar power plus rechargeable batteries. Additionally, other projects have incorporated the design of wireless charging devices, including wireless power delivery for transcutaneous charging of biomedical implants and wireless powering of a CO₂ sensor for the International Space Station.

10. In my educational activities, I regularly teach a laboratory course that includes the design of charging-related circuits such as switching voltage converters and inductive power transceivers. I have developed safety guidelines for students who incorporate batteries into their projects. For the last 7 years or more, I have been

the faculty sponsor of the Rice Electric Vehicle Club (REV). The REV Club's work includes the use of rechargeable lithium-ion batteries and the power output from those batteries, which must be managed carefully.

11. Additional details about my employment history, fields of expertise, and publications are included in my curriculum vitae (attached as Appendix A).

III. LEGAL PRINCIPLES

12. In forming my analysis and conclusions expressed in this declaration, I have applied the legal principles described in the following paragraphs, which were provided to me by counsel for the Petitioner.

A. Anticipation

13. I have been informed that a patent claim is unpatentable as anticipated under 35 U.S.C. § 102 if each and every element of a claim is found either explicitly or inherently in a single prior art reference. Under the principles of inherency, if the prior art necessarily functions in accordance with, or necessarily includes the claimed elements, it anticipates.

B. Obviousness

14. I have been informed that a patent claim is invalid as "obvious" in light of one or more prior art references if it would have been obvious to a person of ordinary skill in the art at the time of the alleged invention ("POSITA"), taking into account (1) the scope and content of the prior art, (2) the differences between the

prior art and the claims, (3) the level of ordinary skill in the art, and (4) any so called “secondary considerations” of non-obviousness, which include: (i) “long felt need” for the claimed invention, (ii) commercial success attributable to the claimed invention, (iii) unexpected results of the claimed invention, and (iv) “copying” of the claimed invention by others. I have been informed that the test for obviousness is not whether the features of a secondary reference may be “bodily incorporated” into the structure of the primary reference,” but rather whether a POSITA would have been motivated to combine the teachings of the prior art references to achieve the claimed invention.

15. Regarding the timeframe in ¶14 above (“at the time of the alleged invention”), while I do not know the exact date that the alleged invention of the ’506 patent was made, I do know that the ’506 patent’s earliest claimed priority date is December 9, 2011. For purposes of my obviousness analysis in Grounds 1A-2B (Sections VIII-XIII), I have applied a date of December 9, 2011 as the date of the alleged invention, although in many cases the same analysis would hold true even if the date of the alleged invention were earlier. Note, however, that my analysis in Ground 3A-E (Section XIV-XVIII) is based on my analysis that some or all claims of the ’506 patent are not entitled to its earliest claimed priority date for the reasons explained below, so I have applied the filing date of April 29, 2016 as the date of the alleged invention for purposes of Ground 3A-E.

16. I have been informed that a claim can be obvious in light of a single prior art reference or multiple prior art references. To be obvious in light of a single prior art reference or multiple prior art references, there must be a reason that would have prompted a POSITA to modify or supplement the single prior art reference, or to combine two or more references, in a manner that provides the elements of the claimed invention. This reason may come from a teaching, suggestion, or motivation to combine, or may come from the reference(s) themselves, the knowledge or “common sense” of a POSITA, or from the nature of the problem to be solved, and this reason may be explicit or implicit from the prior art as a whole. I have been informed that, under the law, the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. I also understand it is improper to rely on hindsight in making the obviousness determination.

IV. PERSON OF ORDINARY SKILL IN THE ART

17. Based on my knowledge and experience in the field and my review of the '506 patent and its file history, I believe that a POSITA would have had at least a Bachelor's of Science in electrical engineering or physics and at least two years of experience in circuit design for portable electronics. Such experience could be obtained through research and study in a graduate program or through employment in industry. I base this opinion on my experience collaborating with, consulting, and

managing teams of engineers and technicians working on circuit design for portable electronics, including designs for power supply devices. Accordingly, my analysis and conclusions expressed herein are based on the perspective of a POSITA having this level of knowledge and skill. My education, technical expertise and personal knowledge discussed in Section II demonstrate that I meet or exceed the qualifications of a POSITA.

V. MATERIALS CONSIDERED

18. My analysis in this declaration is based on my knowledge and experience with the design of electrical devices, including batteries and chargers. Based on my above-described qualifications in Section II, the Patent Trial and Appeal Board should consider me to be an expert in the field. Also, based on my experiences detailed above, I understand and know of the capabilities of persons of ordinary skill in this field. While the technologies associated with these devices from my earlier experiences were substantially more sophisticated than the technology described in the '506 patent, the underlying circuit components and safety concerns are overlapping.

19. As part of my independent analysis for this declaration, I have considered the following: the '506 patent (EX1001) and its prosecution history (EX1002); the background knowledge/technologies that were commonly known to persons of ordinary skill regarding the design of electrical charger devices; my own

knowledge and experience gained from my work in the field; my experience in teaching and advising others in this field; and my experience working with others involved in this field. In addition to EX1001 and EX1002, I have analyzed the following publications and materials:

EX1004	Continuation-in-part Parent App. No. 14/298,986
EX1005	Chinese Pub. No. CN102005796A to Chen
EX1006	Certified English Translation of Chinese Pub. No. CN102005796A (“Chen”)
EX1007	U.S. Patent No. 7,279,640 (“White”)
EX1008	U.S. Publication No. 2010/0301800 (“Inskeep”)
EX1009	U.S. Patent No. 4,969,834 (“Johnson”)
EX1010	U.S. Publication No. 2012/0068662 (“Durando”)
EX1011	U.S. Patent No. 7,348,101 (“Gozdz”)
EX1012	PCT Publication No. WO2016/003471 (“Nook”)
EX1013	U.S. Publication No. 2016/0072329 (“Miller”)
EX1014	U.S. Publication No. 2009/0218988 (“Richardson”)
EX1015	U.S. Patent No. 6,404,168 (“Shoji”)
EX1016	<i>Shenzhen Carku Technology Co., Ltd. v. Shenzhen Xinxexing E-commerce Co., Ltd.</i> , Case No. 1-22-cv-03403 (NDIL), Document 1 (Complaint), June 29, 2022
EX1017	<i>Shenzhen Carku Technology Co., Ltd. v. Shenzhen Xinxexing E-commerce Co., Ltd.</i> , Case No. 1-22-cv-03403 (NDIL), Document 19 (Service by Publication), October 4, 2023
EX1018	PCT Publication No. WO2013/082982 (“predecessor PCT”)
EX1019	Chinese Pub. No. CN102496985A (“predecessor Chinese application”)
EX1020	U.S. Publication No. 2007/0285049 (“Krieger”)
EX1021	U.S. Publication No. 2009/0230783 (“Weed”)
EX1022	U.S. Publication No. 2010/0102772 (“Smith”)
EX1023	PCT Publication No. WO2012/075769A1 (“Chen PCT”)

20. Note that my citations to non-patent literature throughout this declaration, if any, reference the absolute page number added to the exhibit (as

opposed to the original pagination of the document). For patent literature, I have used the column/line numbers or paragraph numbers (if included in the document). All emphasis (bold/italics/underline) in any quoted text has been added except where noted.

21. Although this declaration refers to selected portions of the cited references, it should be understood that these are examples, and that one of ordinary skill in the art would have viewed the references cited herein in their entirety and in combination with other references cited herein or cited within the references themselves. The references used in this declaration, therefore, should be viewed as being incorporated herein in their entireties.

VI. THE '506 PATENT

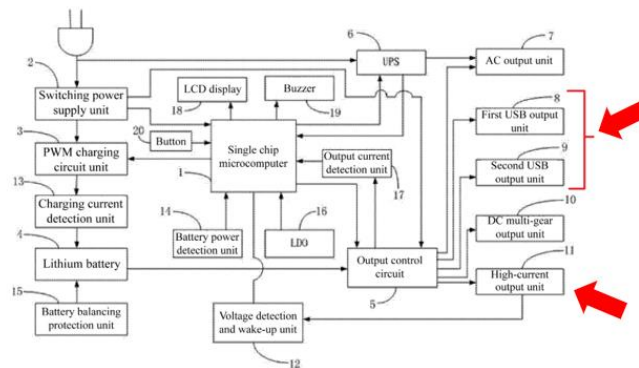
A. Background of the Technology

22. I provide an overview of various background references herein. These references generally show that the various components and functionalities that make up the '506 patent's system were well known to a POSITA before the earliest alleged priority date of the '506 patent.

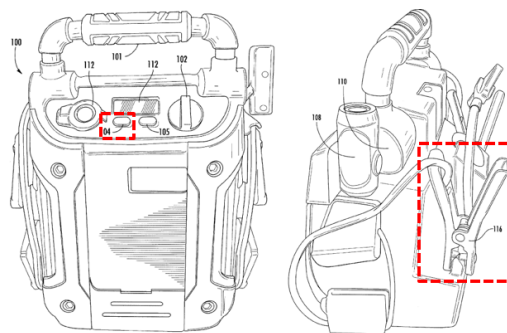
1. Conventional Portable Charger Devices Capable of Both USB Power Supply and Jumpstarting Vehicles

23. Long before 2011, there were a variety of portable charger devices that were equipped to provide jumpstarting current to car batteries while also providing

optional auxiliary power for charging other mobile electronics. Indeed, the Chen reference analyzed below highlights the common use of a mobile charger device that can output a first charging current to “USB” connections and a second “high-current” to a car battery for vehicle ignition:



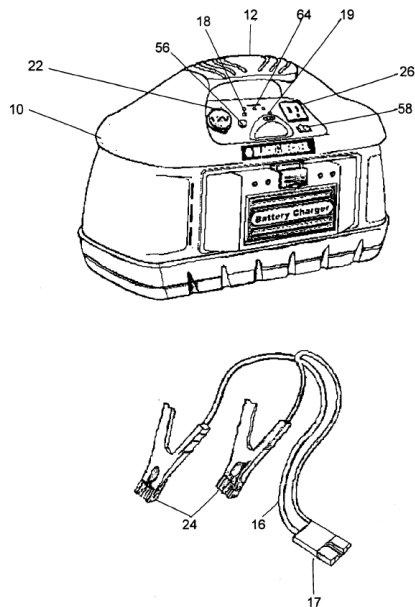
EX1006, [0022], [0025]-[0026], FIG. 1.¹ Similarly, the Inskeep reference detailed below also demonstrates a portable charger device that provides both a USB output port and conventional jumper cables:



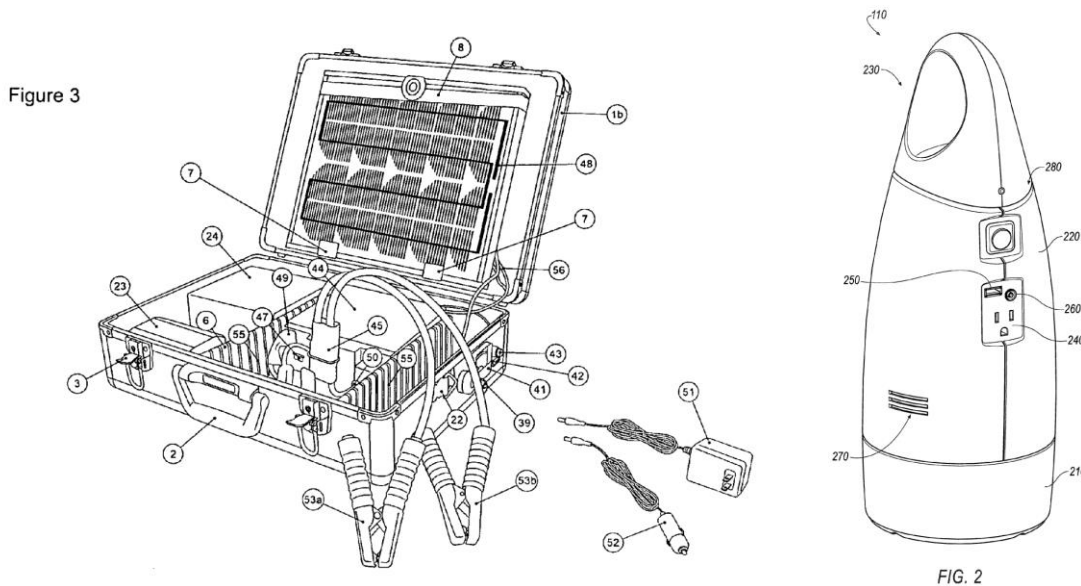
¹ The English translation of Chen (EX1006) includes corresponding paragraph numbering to the Chinese publication of Chen (EX1005), and I cite to the English translation here. Chen’s Chinese patent application was also filed as a PCT application. See EX1023, 1 and 13-19.

EX1008, FIGS. 4 and 6, [0002], [0007]-[0010], [0024]-[0025], [0027]-[0028].

24. And even beyond the Chen and Inskip devices that I analyze in detail below, these types of portable charger devices were widely known and described in other publications too. For example, United States Patent Publication No. 2007/0285049 (“Krieger”) is one among many examples of a portable battery charger with a built-in battery for jumpstarting a vehicle battery. EX1020, [0013], [0016] (“adapted to provide DC power for a variety of applications” as well as “be used to provide jumpstarting power for vehicles such as cars, RVs, and the like”). The “variety of applications” contemplated by Krieger include, among other things, a USB port. EX1020, [0014]. Krieger also demonstrates the traditional use of a jumper cable harness with a plug at one end for mating with the portable charger device:



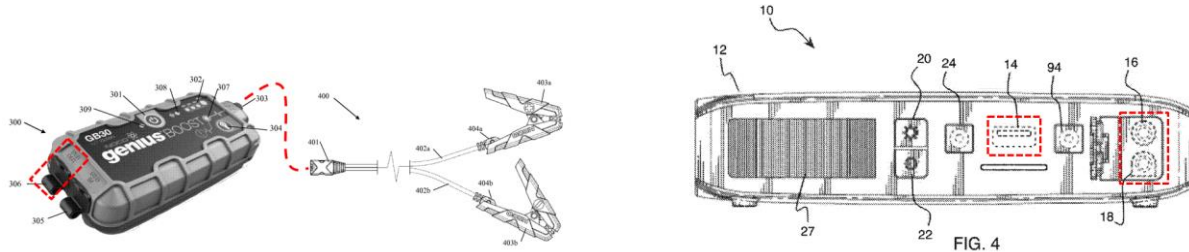
EX1020, FIG. 1. Other traditional examples of such portable charger devices capable of outputting both to a standard USB port and to a vehicle battery include United States Patent Publication Nos. 2009/0230783 (“Weed”) and 2010/0102772 (“Smith”):



EX1021, FIG. 3, [0007], [0017]-[0019]; EX1022, FIG. 2, [0014]-[0016], [0024], [0026]. In other words, such portable charger devices were ubiquitous before December 2011.

25. Moreover, before the April 29, 2016 filing date of the '506 patent, these types of portable charger devices were often provided in smaller form factors, yet they still provided the beneficial options of outputting to a USB port (e.g. for charging smartphones) or to car jumper cables (e.g. for jumpstarting a vehicle

engine). Both the Nook reference and the Miller reference (analyzed in detail below) corroborate that such devices were prevalent before 2016:



EX1012, FIGS. 3-4 (annotated), 4-6 (“handheld battery booster”), 10 (“USB output”), 11 (“jumper cable device”); EX1013, FIG. 4 (annotated), [0012]-[0013], [0039], [0050]-[0057].

2. The USB Standard And Power Provided From Conventional USB Ports

26. Many of the portable charger devices analyzed in this Declaration describe standard Universal Serial Bus (USB) outputs for charging low-power devices, such as cell phones and other mobile electronics. Again, before 2011, the use of such USB ports (and the typical USB cables for connection thereto) was ubiquitous on many types of devices, including portable charger devices (detailed below), computers (into which “thumb drives” or cables for phones, printers, cameras, etc. would be plugged), wall plugs/power adapters, etc. Before the time of the earliest alleged priority date of the ’506 patent (December 2011), a POSITA would have understood that these “USB” output ports were provided in accordance with the USB standard, which supported high-speed data transfer and also the ability

to charge small or mobile devices at 5 Volts DC/500 milliAmps. Again, this was a ubiquitous standard, and traditional mobile phones and other mobile electronics relied on the USB standard/USB connections for power supply at the time. This fact is corroborated, for example, both in the Krieger reference and the Smith reference (cited above). EX1020, [0014], EX1022, [0024]. For instance, Krieger confirms this traditional understanding of what was meant by a USB output port in a portable charger device:

For example, USB port 18 may be provided on the housing 10. The USB port 18 may be used to provide a USB power supply. In one embodiment, a voltage regulator optionally included may convert DC input power, for example from the battery 20, into a USB compatible 5V/500 mA DC power output.

EX1020, [0014]. Similarly, Smith confirms that:

The USB specification provides a 5 VDC supply on a single pair of wires from which connected USB devices may draw power. The specification provides for no more than 5.25 V and no less than 4.75 V (5V+5%) between the positive and negative bus power lines. Initially, a device is only allowed to draw 100 mA. It may request more current from the upstream device in units of 2mA up to a maximum of 500 mA.

EX1022, [0024]. In other words, the USB standard and its use with USB ports for power supply of mobile devices was widely known before December 2011. Indeed, even subsequent versions of the USB standard provided a maximum current of less than 1.5 Amps for such USB ports—a far lower

current than the high-current outputs used for jumpstarting a conventional car battery.

3. Traditional Use of Over-Current Protection When Jumpstarting A Vehicle

27. As was conventional, jumpstarting a car engine often required a 12-volt battery to momentarily supply a few hundred amps. The battery in this case is delivering a few horsepower at most. However, if the battery is shorted out, for instance by a user accidentally touching the positive and negative ends of jumper cables together or a short circuit developing in the depleted car battery, then the current could rise to many kiloamps. In the case of a short, much of the energy stored in the battery can be released in the matter of a few seconds or less. The total energy stored in a typical 40 amp-hour car battery may be in the range 1.8 megajoules, and releasing this much energy in a short amount of time was known to cause significant safety hazards, most notably fires or even, in the case of the now-ubiquitous lithium-ion battery, destructive thermal runaway. *See* EX1007, 2:51-54; EX1009, 4:36-65 EX1017, [0007].

28. Thus, before 2011, the importance of protecting against a short circuit or other overcurrent condition was known to be exceedingly important, especially when dealing with batteries capable of delivering a few hundred amps. In jumpstarting a car, some known scenarios of short circuits include: connecting the jumper

cables with the wrong polarity, shorting out the car's battery or the backup battery pack by touching the jumper-cable terminals together, or connecting to a damaged battery that has an effective short circuit. *See* EX1006, [0025]; EX1008, [0025] and [0035]; EX1007, 2:51-54; EX1009, 4:36-65 EX1017, [0007]. As detailed below, there were a variety of conventional options for protecting against such over-current conditions.

B. Description of the '506 Patent (EX1001)

29. The '506 patent relates to a portable backup charger having an internal lithium-based battery pack and circuitry to output a first DC current (e.g., USB output to charge “mobile phones”) or a second high instantaneous current (e.g., for jumpstarting a vehicle). EX1001, 3:36-4:7, 4:39-47; 5:30-45. The charger includes first and second “protection circuits” 107 and 111, which are depicted in FIG. 1:

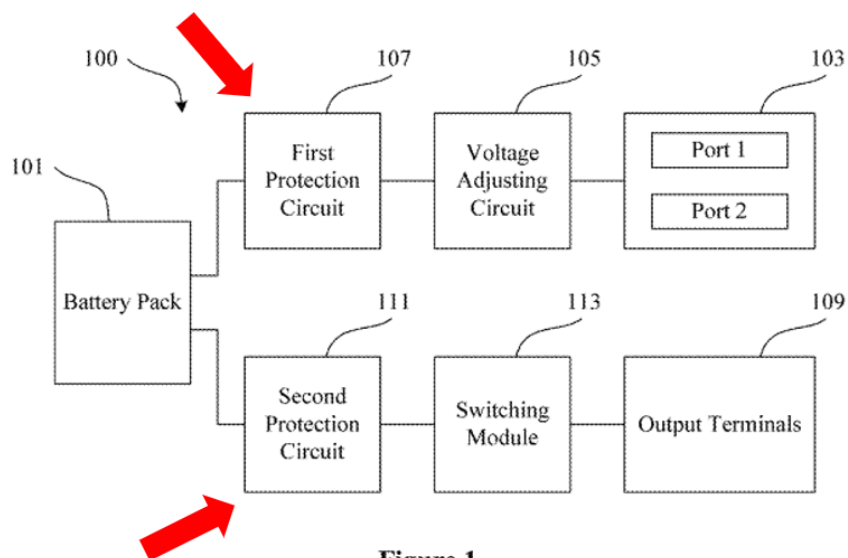


Figure 1

Id., FIG. 1; 1:52-57.

30. The preferred embodiment of the second protection circuit “111” is merely a simple fuse. *Id.*, 6:14-21 (“a fuse”). It was a conventional fuse used in its traditional manner—positioned to along the jump-starter current path to the vehicle so as to cut off current in the event of a “short-circuit[]” or “mis-operation.” *Id.*

31. The preferred embodiment of the first protection circuit “107” includes a “relay or MOS switch” that is connected “between the battery pack 101 and the output ports 103” to cut off output power to the ports 103 (e.g., USB ports). *Id.*, 5:5-17. For example, the first protection circuit 107 might be configured to cut off current to the ports 103 if a voltage across the battery pack “exceed[s] a predefined voltage” or “[u]pon detection of an excess current flowing through the output ports 103.” *Id.*, 5:3-29.

C. The Prosecution History of the ’506 Patent

32. The ’506 patent issued from an application filed on April 29, 2016, and the majority of the specification text and figures were entirely new compared to its “continuation-in-part” parent application. *Compare* EX1001, 1:32-33, 1:39-2:7, 3:8-11, 3:27-30, 3:36-7:29, 8:10-12, FIGS. 1-2 and 8-11, *with* EX1004 (lacking all of these previously cited text and figures).

33. The examination of the ’506 patent was seemingly short. All claims 1-33 were allowed less than a year after the April 2016 filing date, and the Examiner

included a statement in the Notice of Allowance that “the prior art of record” does not disclose “the circuit configuration and a first protection circuit and second protection circuit as claimed.” EX1002, 145. This reason about the prior art “of record” was made even though no prior art publications were cited by the Patent Owner during examination of the ’506 patent and no prior art reference was cited in any office action during examination of the ’506 patent. I note that no prior art of record is listed on the face of the ’506 patent. EX1001, cover.

34. Also, I note that on the same date that claims 1-33 were filed in the application, the Patent Owner admitted in the application data sheet that the “AIA” provisions apply because at least one claim of the claimed invention has a later “effective filing date” (not the earlier priority date of December 9, 2011):

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

EX1002, 22. As explained below, I agree that the claimed invention set forth in at least claims 1-3, 6-10, 21-23, and 26 has a later “effective filing date.”

D. The Issued Claims of the ’506 Patent

35. The ’506 patent issued with the same 33 claims that were originally filed on April 29, 2016. The following chart provides a listing of the claim elements

in claims 1-33 (I refer to this claim element notation throughout my Declaration below):

Claim Element	Language
[1.P]	1. A portable backup charger, comprising:
[1.1]	a battery pack having at least one battery cell;
[1.2]	at least one output port coupled to the battery pack, wherein the battery pack is configured to output a first current through one or more output ports of the at least one output port in a first operating mode;
[1.3]	a pair of output terminals coupled to the battery pack and having a current path to the battery pack different from that of the at least one output port to the battery pack, wherein the battery pack is configured to output a second current capable of starting a vehicle engine through the pair of output terminals in a second operating mode, wherein the second current is higher than the first current;
[1.4]	a first protection circuit coupled to the battery pack and configured to protect the battery pack when the battery pack is working in the first operating mode; and
[1.5]	a second protection circuit coupled to the battery pack and configured to prevent overcurrent condition of the second current when the battery pack is working in the second operating mode.
[2]	The portable backup charger of claim 1, wherein when the first protection circuit is configured to prevent overcurrent condition of the first current, and overcharge and overdischarge condition of the battery pack.
[3]	3. The portable backup charger of claim 1, wherein the battery pack is further configured to work in a third operating mode for outputting the first current and the second current simultaneously, and in the third operating mode both the first protection circuit and the second protection circuit are active.

Claim Element	Language
[4]	4. The portable backup charger of claim 1, wherein the second protection circuit comprises a fuse.
[5]	5. The portable backup charger of claim 4, wherein the fuse has a rating current of 150 to 250 A.
[6]	6. The portable backup charger of claim 1, further comprising a pair of connecting wires for detachably coupling the pair of output terminals with the battery pack, each connecting wire having a clamp for clamping an electrode of an external vehicle battery.
[7]	7. The portable backup charger of claim 6, wherein the second protection circuit is built into at least one of the pair of connecting wires.
[8]	8. The portable backup charger of claim 6, wherein the pair of connecting wires comprises a reverse connection-proof plug.
[9]	9. The portable backup charger of claim 1, further comprising a switching module operable to switch on or off the second current from the battery pack.
[10]	10. The portable backup charger of claim 9, wherein the switching module is further configured to prohibit the outputting of the second current after a predetermined time period has passed.
[11]	11. The portable backup charger of claim 1, further comprising at least one voltage adjusting circuit, each voltage adjusting circuit being coupled between the battery pack and one of the at least one output port and configured to elevate or reduce an output voltage of the battery pack to a predetermined voltage at the respective output port.
[12]	12. The portable back up charger of claim 1, wherein the first current is of 0.5 to 10 A.
[13]	13. The portable backup charger of claim 1, wherein the second current is of 100 to 400 A.

Claim Element	Language
[14]	14. The portable backup charger of claim 1, further comprising a controller configured to control the operating mode of the battery pack.
[15]	15. The portable backup charger of claim 1, wherein the discharge rate of the battery pack is in a range of 20 c to 70 c.
[16]	16. The portable backup charger of claim 1, wherein the at least one output port comprises a universal serial bus (USB) port.
[17]	17. The portable backup charger of claim 1, wherein the at least one output port comprises an output port of a rating voltage of 12V.
[18]	18. The portable backup charger of claim 1, wherein the at least one output port comprises an output port of a rating voltage of 19V.
[19]	19. The portable backup charger of claim 1, wherein the at least one battery cell is lithium based battery cell.
[20]	20. The portable backup charger of claim 1, wherein the pair of output terminals is detachably coupled to the battery pack.
[21.P]	21. A portable backup charger, comprising:
[21.1]	a battery pack having at least one battery cell;
[21.2]	a first current path through which a first current is output by the battery pack when it is working in a first operating mode;
[21.3]	a second current path through which a second current capable of starting a vehicle engine is output by the battery pack when it is working in a second operating mode, wherein the second current is higher than the first current;
[21.4]	a first protection circuit coupled to the battery pack and configured to protect the battery pack when it is working in the first operating mode; and

Claim Element	Language
[21.5]	a second protection circuit coupled in the second current path and configured to prevent overcurrent condition of the second current when it is working in the second operating mode.
[22]	22. The portable backup charger of claim 21, wherein the first protection circuit is configured to prevent overcurrent condition of the first current, and overcharge and overdischarge condition of the battery pack.
[23]	23. The portable backup charger of claim 21, wherein the battery pack is further configured to work in a third operating mode for outputting the first current and the second current simultaneously, and in the third operating mode both the first protection circuit and the second protection circuit are active.
[24]	24. The portable backup charger of claim 21, wherein the second protection circuit comprises a fuse having a rating current of 150 to 250 A.
[25.1]	25. The portable backup charger of claim 21, further comprising: a pair of connecting wires for detachably coupling the battery pack with the vehicle engine to allow the second current flow through the second current path;
[25.2]	wherein the second protection circuit is built into at least one of the pair of connecting wires.
[26]	26. The portable backup charger of claim 21, further comprising a switching module operable to switch on or off the second current path.
[27]	27. The portable backup charger of claim 21, wherein the second current is of 100 to 400 A.
[28]	28. The portable backup charger of claim 21, further comprising a controller configured to control the operating mode of the battery pack.
[29]	29. The portable backup charger of claim 21, wherein the discharge rate of the battery pack is in a range of 20 c to 70 c.

Claim Element	Language
[30]	30. The portable backup charger of claim 21, wherein the at least one output port comprises a universal serial bus (USB) port.
[31]	31. The portable backup charger of claim 21, wherein the at least one output port comprises an output port of a rating voltage of 12V.
[32]	32. The portable backup charger of claim 21, wherein the at least one output port comprises an output port of a rating voltage of 19V.
[33]	33. The portable backup charger of claim 21, wherein the at least one battery cell is lithium based battery cell.

E. The '506 Patent's Priority Date

36. I have been asked to compare the specification of the '506 patent (filed on April 29, 2016) to the different specification of its predecessor patent applications listed in the priority claims (e.g., U.S. application Ser. No. 14/298,986 (EX1004), International Application No. PCT/CN2012/083793 (EX1018), and Chinese Patent Application No. 201110409190.9 (EX1019)). As noted above (§32), all of the predecessor applications are lacking FIGS. 1-2 and 8-11 (and the associated description) that were newly presented in the '506 patent. *Compare* EX1001, 1:32-33, 1:39-2:7, 3:8-11, 3:27-30, 3:36-7:29, 8:10-12, FIGS. 1-2 and 8-11, *with* EX1004 (lacking all of these previously cited text and figures); *see also* EX1018, 10-15 (similarly lacking those figures newly added into the '506 patent filing); EX1019, 6-11 (similarly lacking those figures newly added into the '506 patent filing). Based

upon my review of these documents, it is clear that a majority of the text and a majority of the figures in the '506 patent were newly added into the continuation-in-part application filed on April 29, 2016 and were absent from the earlier predecessor applications.

37. These facts described in the preceding paragraph are consistent with the Patent Owner's statement to the Patent Office that the "AIA" provisions apply to the claims of the '506 patent—particularly, because the Patent Owner was acknowledging that a claim to the claimed invention has a later "effective filing date" (not the earlier priority date of December 9, 2011). See EX1002, 22.

38. I have been asked to analyze which claims of the '506 patent recite elements that were absent from the predecessor applications and instead are described in the newly added text/drawings filed on April 29, 2016. *Supra*, ¶32. The following chart summarizes my analysis of which claim elements contain this new subject matter:

Claim Element	Lack of disclosure in earlier parent application (EX1004)	New matter in '506 patent (EX1001)
[1.2] – “output a first current [singular] through ... <i>ports</i> [plural]”	This earlier specification does not mention a “port” structure at all, and never expresses that one “current” [singular] is output through “ports” [plural]. Original FIG. 1 depicts only one generic output arrow, which is not described as having a “port”	Newly added FIG. 1 filed on April 29, 2016 depicts two “ports” (“Port 1” and “Port 2”). The newly added text at col. 1:43-44, 4:39-42, and 5:4-5 teaches one current is output

Claim Element	Lack of disclosure in earlier parent application (EX1004)	New matter in '506 patent (EX1001)
	structure, for each current (19V, 12V, 5V). <i>See</i> EX1004, FIG. 1 and [0023].	through “ports” [plural].
[1.4] – first protection circuit limited to “ <i>when the battery pack is working in the first operating mode</i> ”	This earlier specification illustrates a charge-discharge protection circuit 11 and includes only a sentence of text stating that the “circuit 11” operates “for overcurrent or overload protection” for the “purpose of ensuring safety in the process of charging or discharging the set of batteries” ([0025]), but the text of the specification does not match the schematics shown in FIGS. 2-5. The text describes that the “MCU circuit” is “connected to the output ends” of the low-voltage DC outputs (receives feedback from the DC outputs as shown in FIGS. 2-5), but there is no explanation in the text of how the charge-discharge protection circuit “11” interacts with MCU circuit “7” to cause protection when the battery pack is working in the first operating mode. <i>Compare</i> EX1004, FIG. 1, <i>with</i> FIGS. 2-5.	Newly added FIG. 1 filed on April 29, 2016 illustrates a first protection circuit “107” that is connected between the battery pack 101 and the first current “ports 103.” <i>See</i> EX1001, Fig. 1. The newly added text in column 5 expresses that this particular circuit 107 protects the battery pack “when the current is output through the output ports.” <i>Id.</i> , 5:1-5.
[2] - first protection circuit configured to prevent “overcharge <i>and</i>	This earlier specification mentions the “circuit 11” for “overcurrent <i>or</i> overload protection” (EX1004, [0025]). For the same reasons mentioned	The newly added text in column 5 contemplates the new circuit 107 “to protect overcurrent condition”

Claim Element	Lack of disclosure in earlier parent application (EX1004)	New matter in '506 patent (EX1001)
overdischarge condition”	above the analysis of Element [1.4], the text of the specification does not match the schematics shown in FIGS. 2-5.	and “may <i>also</i> be used to protect overcharge condition.” EX1001, 5:18-29.
[3] – outputting the first and second currents “simultaneously”	No description.	The newly added text in column 5 contemplates for the first time a “third” mode to output current “simultaneously” through the ports 103 and the terminals 109. EX1001, 5:58-61.
[6] – pair of output terminals “detachably” couple with the battery pack	This earlier specification does not describe “detachment” of the “output terminals” <i>from the battery pack 1</i>. The specification mentions the “wires,” but it never teaches that those wires are used to somehow “detachably” couple the output terminals with the battery pack 1. In claim 6, the claimed “output terminals” are recited as being distinct from the “clamps” of the “connecting wires.” I note here that claim 6 is different than claim 25 because (in claim 25) the claimed “detachable” coupling is with the “vehicle engine,” not with the output terminals.	The newly added text in column 5 expressly states for the first time that the pair of output terminals “may be detachably coupled to the battery pack 101.” Also, the newly added text in column 6 contemplates for the first time that the “connecting wires” can “detachably couple” the pair of output terminals to the battery pack 101. EX1001, 5:44-45; 6:22-37.
[7] – depends	Refer to analysis of [6] above.	Refer to analysis of [6]

Claim Element	Lack of disclosure in earlier parent application (EX1004)	New matter in '506 patent (EX1001)
from 6		above.
[8] – depends from 6	Refer to analysis of [6] above.	Refer to analysis of [6] above.
[9] – “switching module” for the second current	No description.	The new FIG. 1 depicts a “switching module 113.” EX1001, Fig. 1. Also, the newly added text in column 6 expresses for the first time a “switching module 113” that is operable to “switch on or off” the current through the output terminals. <i>Id.</i> , 6:53-7:22.
[10] – depends from 9	Refer to analysis of [9] above. Furthermore, there is no description of switching based on a “predetermined time period.”	Refer to analysis of [9] above.
[21.4] – first protection circuit limited to protecting the battery pack “ <i>when it is working in the first operating mode</i> ”	Refer to analysis of [1.4] above.	Refer to analysis of [1.4] above.
[22] - first protection circuit configured to	Refer to analysis of [2] above.	Refer to analysis of [2] above.

Claim Element	Lack of disclosure in earlier parent application (EX1004)	New matter in '506 patent (EX1001)
prevent “overcharge <i>and</i> overdischarge condition”		
[23] – outputting the first and second currents “simultaneously”	Refer to analysis of [3] above.	Refer to analysis of [3] above.
[26] – “switching module” for the second current path	Refer to analysis of [9] above.	Refer to analysis of [9] above.

39. I note that this chart above refers to the disclosure lacking from the predecessor U.S. application (EX1004), but my review of the earlier PCT application (1018) and Chinese application (EX1019) reveals the same shortcomings. *Supra*, ¶32; EX1018, 10-15 (similarly lacking those figures newly added into the '506 patent filing); EX1019, 6-11 (similarly lacking those figures newly added into the '506 patent filing).

40. Based upon my knowledge and experience in this field and my review of the '506 patent and its predecessor applications, it is clear that *at least* each of claims 1-3, 6-10, 21-23, and 26 recite new matter that was added when the “continuation-in-part” application was filed on April 29, 2016.

VII. CLAIM CONSTRUCTION

41. I understand that, for purposes of my analysis in this *inter partes* review proceeding, the terms appearing in the patent claims should be interpreted according to their “ordinary and customary meaning,” which is often referred to as the *Phillips* standard. In determining the ordinary and customary meaning, I understand that the words of a claim are first given their plain meaning that those words would have had to a person of ordinary skill in the art at the time of the alleged invention. I also understand that the structure of the claims, the specification, and file history may be used to better construe a claim. Moreover, I understand that even treatises and dictionaries may be used, albeit under limited circumstances, to determine the meaning attributed by a person of ordinary skill in the art to a claim term.

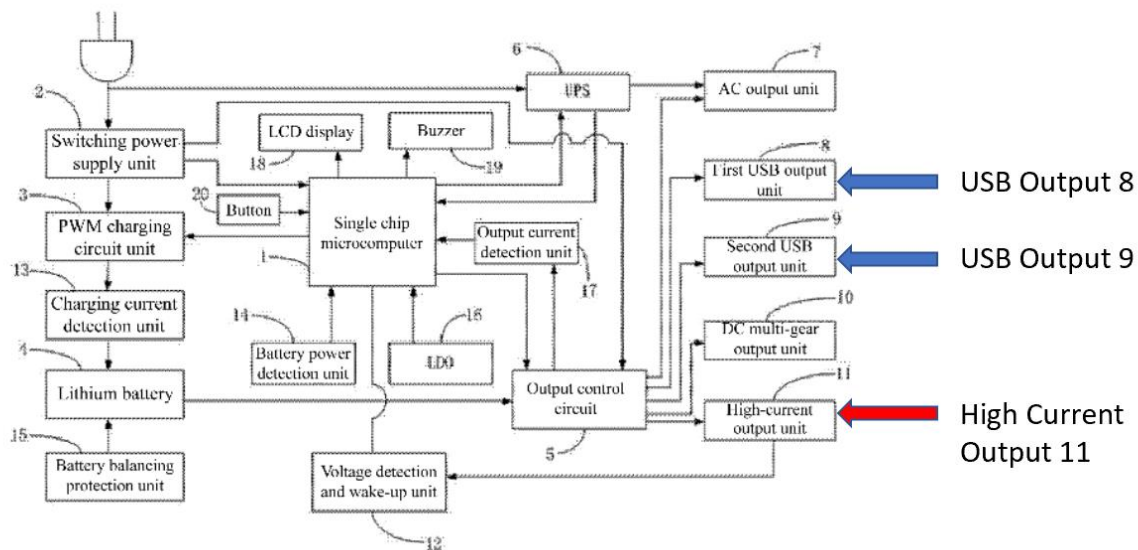
42. Here, I have reviewed the claims of the ’506 patent addressed in this proceeding. For purposes of addressing the anticipation and obviousness issues in this proceeding, the claim elements include straightforward language and are readily understandable according to their ordinary and customary meaning—without the need to inject specialized definitions or substitute terminology. As demonstrated below, there is a significant overlap between the preferred embodiment of the ’506 patent and those prior art devices/predictable combinations set forth in the IPR Grounds here. This overlap is evident when using the ordinary and customary meanings of terms in the claims. For purposes of comparing the claim elements with

the prior art, it is not necessary to resort to definitions or substitute terminology when assessing the Grounds below.

VIII. ANALYSIS OF CHEN (Ground 1A)

Chen (EX1005 ; translation at EX1006)

43. Much like the '506 patent, Chen teaches a mobile charger device in which a lithium battery pack can output a first charging current to “USB” connections and a second charging current to a “car battery” for vehicle ignition:



EX1006, [0022], [0025]-[0026], FIG. 1. Particularly, Chen describes “a mobile power supply” that includes “a single-chip microcomputer, an output control circuit, a lithium battery, and a high-current instantaneous output module.” EX1006, [0004]; [0002]-[0003]. Included in its disclosures, Chen teaches “an AC output module, a DC output module, and a high-current instantaneous output module (car ignition module).” EX1006, [0022]. Further, the “output control circuit” connects separately

to the “single chip microcomputer” and “lithium battery” to control current flow from the lithium battery along different paths to low-current outputs (e.g. “USB” connections) and high-current outputs (e.g. 200A to a “car battery”) loads. EX1006, [0023]-[0026]; *see* [0011]-[0014].

44. Chen teaches that the mobile charger device “not only ensures the output of high current [for the car battery/car ignition], but also ensures that the lithium battery will not be damaged.” EX1006, [0013]-[0014]. The “high voltage control unit” that controls high current also contains a voltage detection unit and wake up unit. EX1006, [0023]. These features can determine if a load (e.g., the car battery) has been attached to the high-current output, measure the voltage on the attached load, and commence the flow of current to the load through the high current circuit. EX1006, [0023]-[0024].

45. When a vehicle’s battery is connected to the mobile power supply, the “wake” signal is activated, turning on the “single-chip microcomputer.” If the voltage of the vehicle’s battery is too low, then the microprocessor closes switch “relay K1” so that high current is supplied to the vehicle’s battery. The voltage of the vehicle’s battery is detected by “detection resistors R38 and R41.” Once the vehicle engine is started and the voltage of the vehicle’s battery has returned to the normal operating range, the high-current switch “relay K1” is turned off to prevent further charging of the vehicle’s battery. EX1006, [0025], [0013]-[0014], FIG. 4. Output-

current limiting and short-circuit protection is provided by resistors R1-R6 as shown in Fig. 4.

46. Thus, Chen teaches a protection circuit that operates when operating in the jumpstart mode to output high current to the car battery—beneficially achieving “high-current output protection, output short-circuit prevention control, automatic identification of connected cars, and automatic shutdown after ignition” to protect the internal lithium battery 4 and the car battery connected to the system. EX1006, [0025].

47. In another mode, Chen provides a lower current through a DC output connection (e.g., to supply power to mobile devices). For example, a DC voltage is output through the “DC multi-gear output unit” which can be selected by the user from among the choices of 5 V, 8.4 V, 9.5 V, 12 V, 16 V, 19 V and 24V. EX1006, [0026], FIG.1, 5, 6. Chen teaches output current protection, which in this case is accomplished by measuring the ground-return current from the corresponding output port and feeding that signal back to the single-chip microcomputer through op-amp U3B. *Id.* In addition to the DC multi-gear output unit, Chen’s mobile charger device can provide the lower-current, standard 5V output to one or more USB connections. EX1006, [0026], [0011], FIGS. 1 and 7. The schematics appear to show the overcurrent protection is accomplished by measuring the ground-return current from the two USB ports and feeding that information back to the single-chip

microcomputer. Chen's method of measuring the output current is used here as well: by means of the op-amp on the left-hand side of FIG. 7. The part is labeled "U3A", consistent with the fact that the op-amp "U3B" is explicitly used in measuring the current from the DC multi-gear output port. EX1006, [0026], FIG., 5, 6.

48. Accordingly, in this mode where Chen's device provides lower current through a USB output or the DC multi-gear output, Chen's protection circuit provides "an output power limit control to automatically prevent the output from being overloaded for a long time." EX1006, [0026].

Claim 1

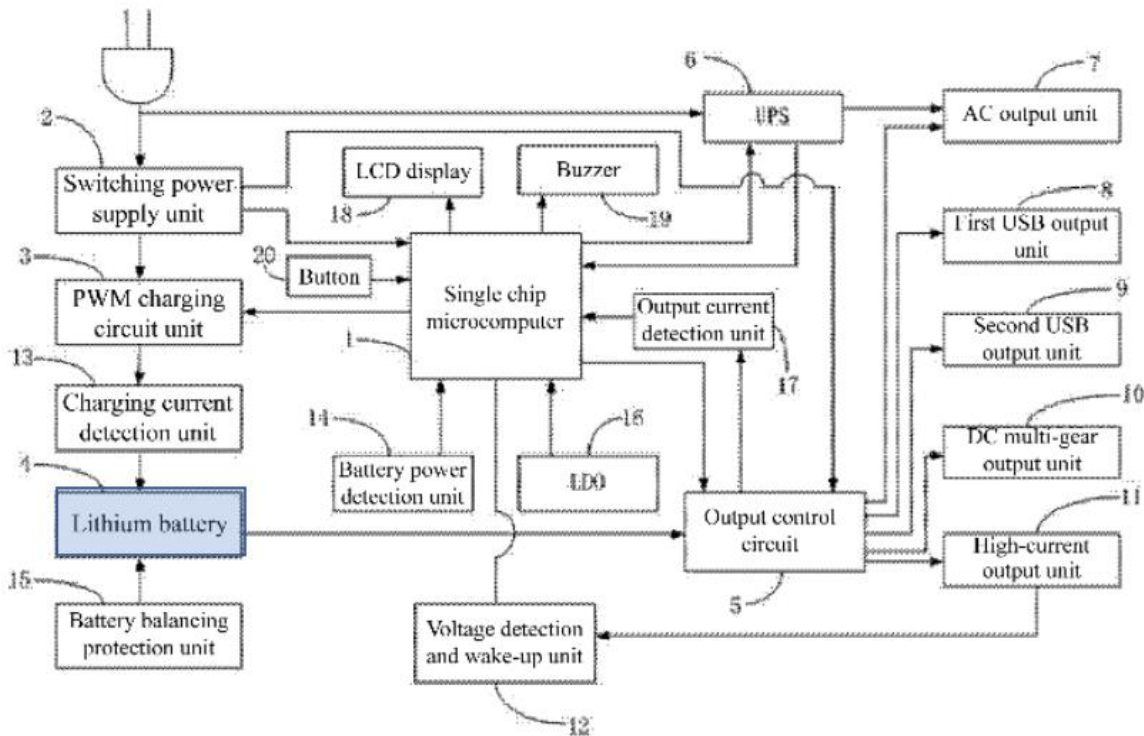
Element [1.P]: A portable backup charger, comprising.

49. To the extent this preamble is treated as a claim limitation, Chen discloses a portable backup charger. For example, Chen is entitled "MOBILE POWER SUPPLY AND CONTROL METHOD THEREFOR" and discloses "a mobile power supply." EX1006, [0004]. Thus, Chen's "mobile power supply" acts as a portable backup charger. EX1006, [0003]-[0004], [0011], [0022]-[0026], FIG. 1. For example, Chen explains that such a mobile power supply is useful "as a backup emergency power supply at home, or as a backup power supply for mobile devices when going out." EX1006, [0034].

Element [1.1]: a battery pack having at least one battery cell;

50. Chen describes a battery pack having at least one battery cell. Chen

expressly teaches “a lithium battery” to serve as a battery pack having at least one battery cell—namely, to provide power to any of a high-current output for jumpstarting a vehicle, “USB” outputs, and a “DC multi-gear unit.” EX1006, [0004], [0011], [0014], [0022]-[0023], [0025]-[0026].

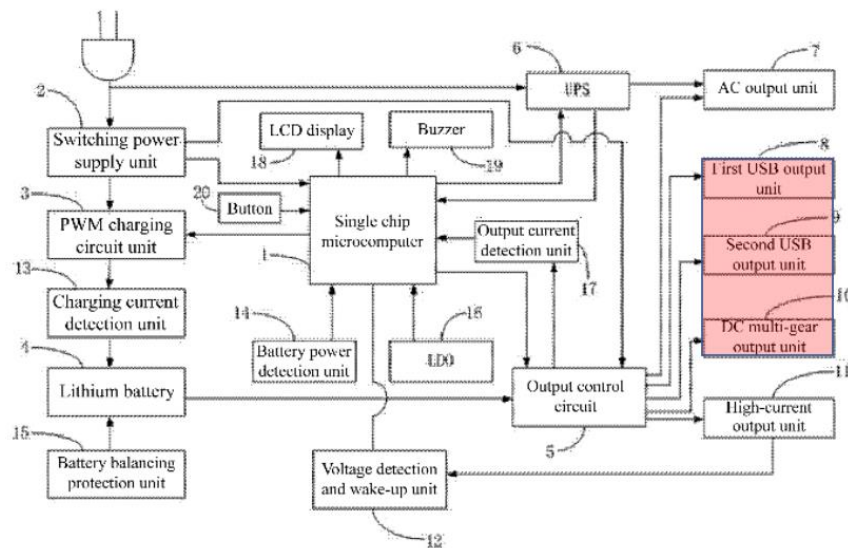


EX1006, Fig. 1 (annotated).

Element [1.2]: at least one output port coupled to the battery pack, wherein the battery pack is configured to output a first current through one or more output ports of the at least one output port in a first operating mode;

51. Chen describes at least one output port coupled to the battery pack, wherein the battery pack is configured to output a first current through one or more output ports of the at least one output port in a first operating mode. In particular,

Chen teaches “the mobile power supply further includes a DC power output module connected to the output control circuit 5” that “includes in its outputs a first USB output unit 8, a second USB output unit 9 and a DC multi-gear output unit 10, and the first USB output unit 8, the second USB output unit 9 and the DC multi-gear output unit 10 are separately connected to the output control circuit 5.” EX1006, [0026].



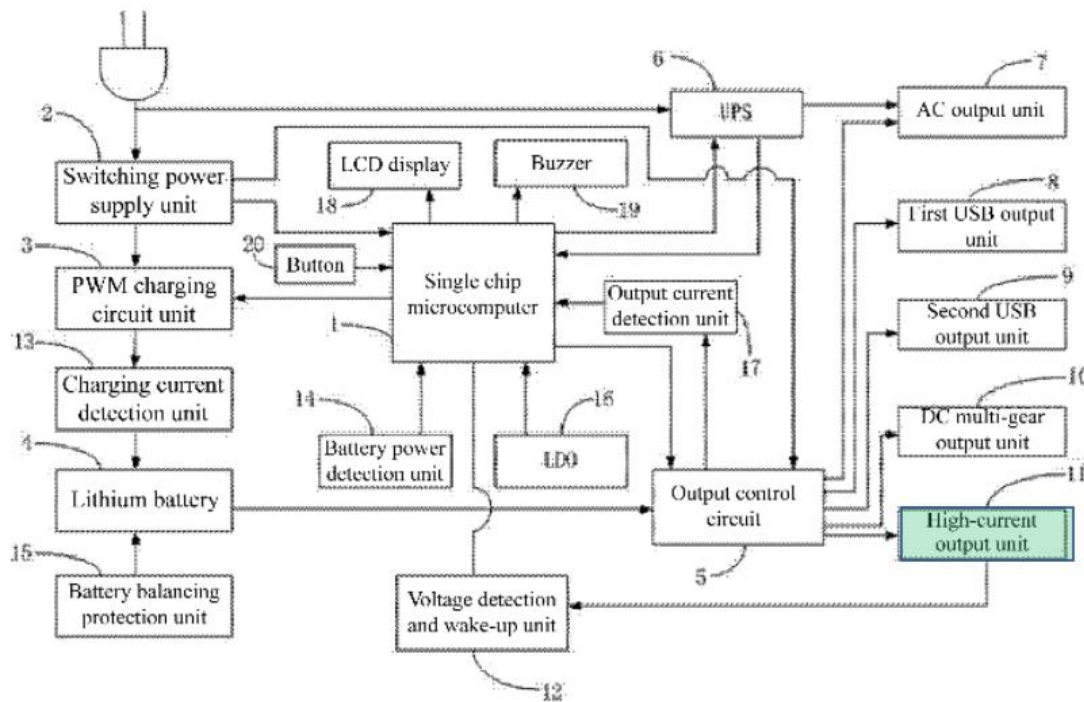
EX1006, Fig. 1 (annotated).

52. Based on Chen’s teaching above and its express disclosure that the device should act as “a backup power supply for mobile devices” ([0034]), a POSITA would have plainly recognized that Chen’s disclosed “USB output units” provided ordinary USB ports, for example, for connection with traditional USB

cables/connectors for such “mobile devices” ([0034]). Chen explains that the output control circuit 5 (FIG. 1, reproduced above) ensures the one or more output ports are configured to operate at a first current (e.g., the USB output 8 or 9 will provide a standard USB current) during a first mode of operation. EX1006, [0026]; FIGS. 5-7 (“buck output,” “boost output,” and “USB buck output” as described in [0019]-[0021] and [0026]).

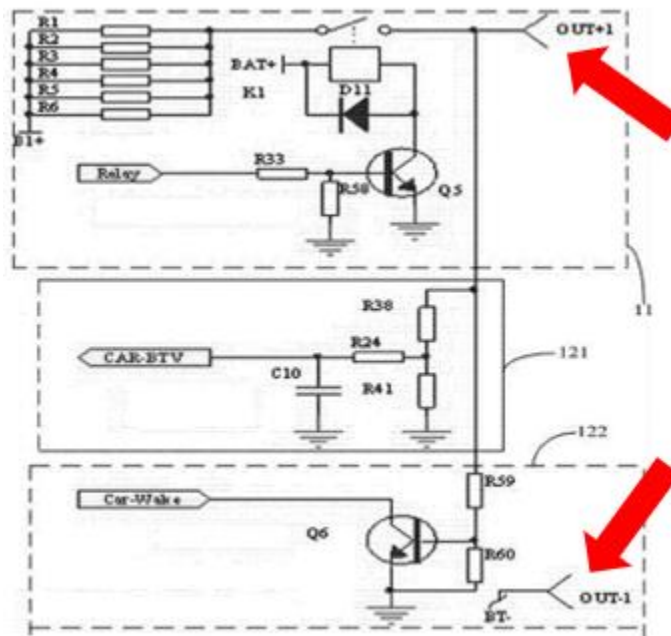
Element [1.3]: a pair of output terminals coupled to the battery pack and having a current path to the battery pack different from that of the at least one output port to the battery pack, wherein the battery pack is configured to output a second current capable of starting a vehicle engine through the pair of output terminals in a second operating mode, wherein the second current is higher than the first current;

53. Chen describes the claimed pair of output terminals and the functionality recited in this Element [1.3]. For example, Chen teaches that, “when the car battery is connected to the high-current output unit 11, the wake-up unit 122 notifies the single-chip microcomputer 1 that the car battery has been connected, the single-chip microcomputer 1 controls the high-current output unit 11 to instantly output a high current for ignition, and then a battery voltage is detected by means of the electrical device voltage detection unit 121.” EX1006, [0025].



EX1006, FIG. 1 (annotated)

54. Chen expressly teaches that the high-current output unit 11 “is configured to be connected to an electrical device,” and then further confirms that the electrical device “is a car battery,” thereby indicating that the high-current output unit 11 includes positive and negative terminals for such connection to a conventional car battery. EX1006, [0023] and [0025]. Indeed, Chen’s FIG. 4 depicts the conventional “+” and “-” output connectors for connection with a car battery:

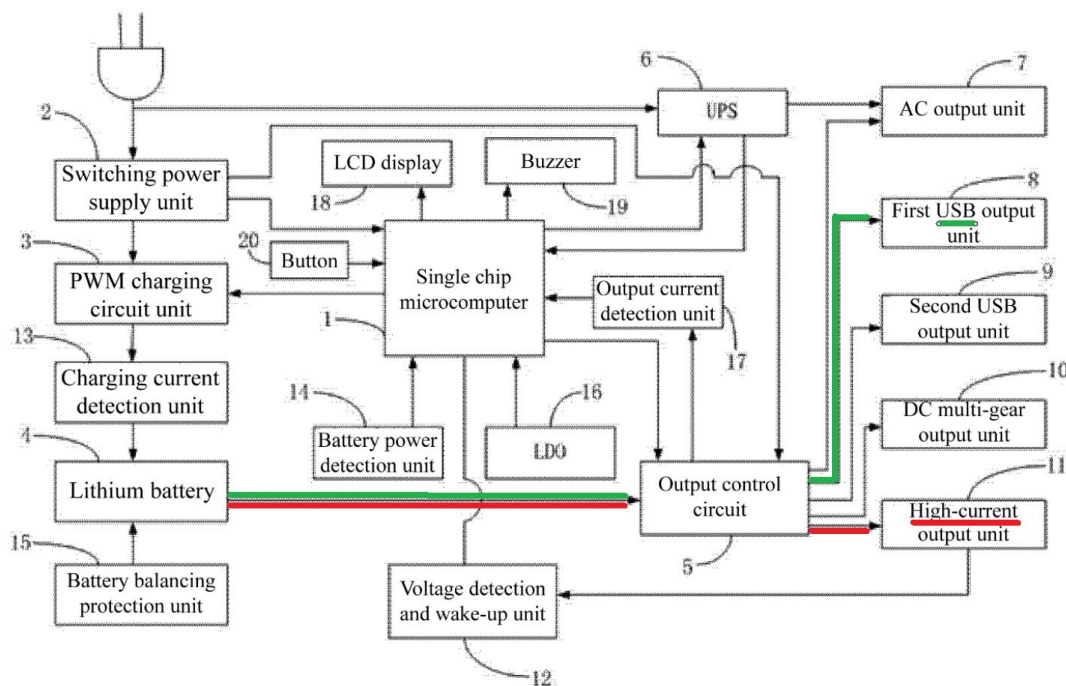


EX1006, FIG. 4 (annotated). Based on Chen's teaching here, a POSITA would have readily understood that Chen expressly teaches the pair of output terminals as recited in this Element.

55. Even if Chen did not expressly disclose this Element, the claimed paired of output terminals would have been necessarily present in Chen's device in order to accomplish the particular functions detailed in Chen. For instance, Chen teaches that the high-current output unit 11 "is configured to be connected to an electrical device," which is then explicitly described as a conventional "car battery." EX1006, [0023] and [0025]. In doing so, this output unit 11 would have necessarily included a positive terminal and negative terminal for the electrical connection to the corresponding positive terminal and negative terminal (or other current return

terminal) of a car battery. Such positive and negative output terminals would have been required to “output a high current for ignition” function and for the detection functionality of Chen’s “wake-up unit 122.” EX1006, [0025].

56. Next, Chen discloses that the output terminals have a current path to the battery pack that is different from that of the output ports of the USB/DC multi-gear connections. Indeed, not only are the different current paths shown schematically in FIG. 7 (USB buck output to first and second USB ports) and FIG. 4 (high-current path to output terminals through resistors R1-R6 and relay K1), this fact is plainly depicted in FIG. 1:



EX1006; FIG.1 (annotated), [0024]-[0025], [0026] (“separately connected to the output control circuit 5”).

57. Also, for reasons that I previously cited above (*supra* Section VI.A.2-3), the second current (e.g., output from Chen’s “high-current output unit 11” to the car battery) is higher than the first current (to the lower DC current to Chen’s “USB” connectors/DC multi-gear output for providing backup power to conventional mobile devices). First, Chen expressly labels the second current as a “high-current” output ([0022]-[0025]), and then Chen states that the second current is “200A, which is sufficient for most household cars.” EX1006, [0025]. Based on Chen’s teaching here, a POSITA would have readily recognized that the “200A” current is hundreds of times greater than the first current that is output to Chen’s “USB” outputs 8 and 9, which would have provided the ordinary low DC current according to the ubiquitous “USB” standard (5V/0.5A). EX1006, [0026], [0034] (lower DC current for “backup power supply for mobile devices”); FIG. 7 (USB buck output); *supra* Section VI.A.2-3 (confirming the standard for such USB power supply).

Element [1.4]: a first protection circuit coupled to the battery pack and configured to protect the battery pack when the battery pack is working in the first operating mode; and

58. Chen discloses a first protection circuit coupled to the battery pack and configured to protect the battery pack when the battery pack is working in the first operating mode. For example, Chen teaches a first protection circuit coupled to the internal battery 4 that operates in the first mode (DC current to USB outputs/multi-gear output). The multi-gear output (labeled “DCOUT1” in Fig. 6), supplied by DC-

DC converters in Figs. 5-6, is capable of providing DC voltages of 5V, 8.4V, and 9.5V (by means of the buck converter circuitry connected to U4 in Fig. 5) and of providing DC voltages of 12V, 16V, 19V, and 24V (by means of the boost converter circuitry connected to U9 in Fig. 6). The protection circuit for the DC multi-gear output is enabled by the current-sense circuitry around U3B. (“U3B and D12 form an output power limit control to automatically prevent the output from being overloaded for a long time and damage the machine.” EX 1006[0026]).

59. Similarly, the 5V USB outputs (“USB1” and “USB2” in Fig. 7) are supplied by the buck converter circuitry connected to U1 and U5, respectively. Overcurrent protection is enabled by the current-sense circuitry connected to op-amp U3A in FIG. 7. EX1006, [0026].

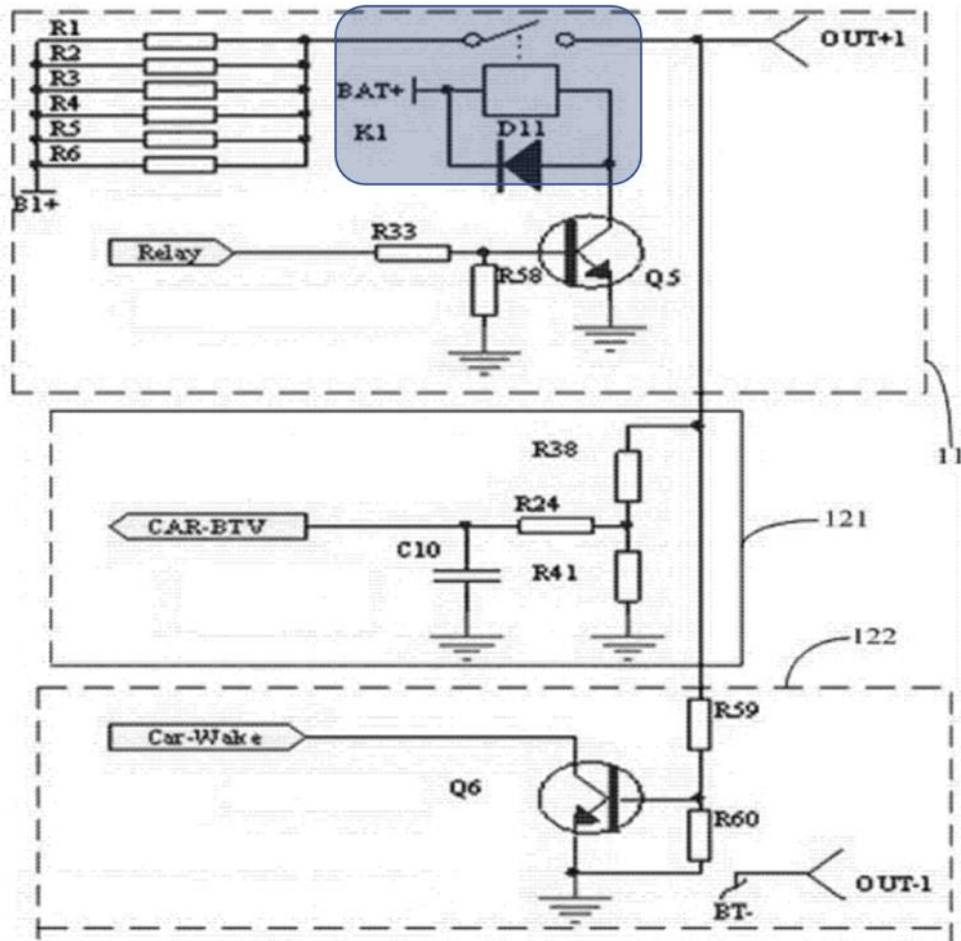
60. All of the above-described converters and protection circuits are powered from the “BAT+” terminal, as can be seen in Figs. 5-7. Accordingly, based on Chen’s teaching in connection with FIGS. 5-7, Chen provides a circuit configured to protect Chen’s internal battery 4 from an overcurrent condition through the USB outputs 8, 9 and the multi-gear output 10 that might otherwise cause “damage” to Chen’s battery and other electronics. EX1006, [0026].

Element [1.5]: a second protection circuit coupled to the battery pack and configured to prevent overcurrent condition of the second current when the battery pack is working in the second operating mode.

61. Chen discloses a second protection circuit coupled to the battery pack

and configured to prevent overcurrent condition of the second current when the battery pack is working in the second operating mode. For example, Chen discloses a second protection circuit coupled to the internal battery 4 that operates in the second mode (high-current output to the car battery) “to automatically turn off” the output current and thereby “prevent long-term high-current output from damaging the lithium battery 4.” EX1006, [0025], [0035], FIG. 4; *supra* ¶¶43-48.

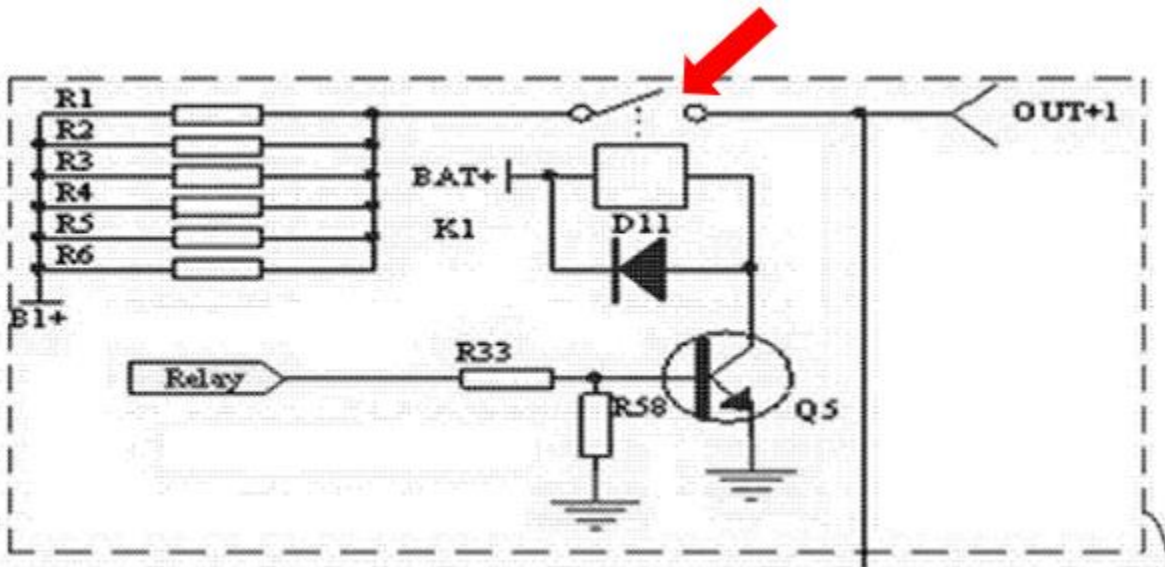
62. As shown in FIG. 4 (reproduced below), which depicts the circuit diagram of the “high-current instantaneous output module” ([0018]), the second protection circuit is connected to the battery (“BAT+”) and includes at least a “relay” circuit to controllably turn the jumpstart current off/on. *Id.* Chen teaches “[w]hen the battery voltage returns to normal, the relay K1 is automatically turned off to prevent long-term high-current output from damaging the lithium battery 4” while operating in its “ignition output” mode of operation. EX1006, [0026]; *supra* ¶¶43-48.



EX1006, Fig. 4 (annotated).

Element [9]: The portable backup charger of claim 1, further comprising a switching module operable to switch on or off the second current from the battery pack.

63. Chen discloses a switching module operable to switch on or off the second current from the battery pack. EX1006, Fig. 4. For example, the relay K1 (which interacts with the microcontroller U2 in Chen's Fig. 2) provides a switching module:



EX1006, FIG. 4, [0025] (“to instantly output high current for ignition” and “automatic shutdown after ignition”); [0013]-[0014]. Chen teaches that this electronic switch is part of the “relay K1” (refer to my analysis of Element [1.5] above) that turns on and off, respectively, to dictate current flow from the lithium battery to the car battery. EX1006, [0025], [0035] (“relay K1 to engage”).

64. Additionally, Chen discloses that manually “[s]witching of all functions” is performed using a “button 20” connected to the “microcontroller 1.” EX1006, [0031]; FIG. 1. In particular, Chen describes a “cycle” of the various output current options can be performed by pressing the button 20 switch in a cycle from AC Output→first USB output→second USB output→DC multi-gear output→high-current instantaneous output→AC Output. *Id.* Accordingly, the button 20 acting with the microcomputer 1 switches on and off the second current

by activating/deactivating the high-current instantaneous output 11. *Id.*

Element [11]: The portable backup charger of claim 1, further comprising at least one voltage adjusting circuit, each voltage adjusting circuit being coupled between the battery pack and one of the at least one output port and configured to elevate or reduce an output voltage of the battery pack to a predetermined voltage at the respective output port.

65. Chen describes a voltage adjusting circuit coupled between the battery pack and one of the at least one output port and configured to elevate or reduce an output voltage of the battery pack to a predetermined voltage at the respective output port. For example, Chen teaches the claimed voltage adjusting circuit in connection with FIGS. 5-7, which together provide the “DC boost and buck output control circuits” and the “USB buck output” circuit for the USB output 8, 9 and DC multi-gear output 10. EX1006, [0026], [0019]-[0021], FIGS. 5-7. These voltage adjusting circuits are coupled between Chen’s lithium battery 4 and the output ports 8, 9, and 10 so that “[t]he DC buck output control circuit completes buck outputs of 5 V, 8.4 V, and 9.5 V,” “[t]he DC boost output control and current detection circuit, and the circuit completes boost outputs of 12 V, 16 V, 19 V and 24 V,” and together they “complete the multi-gear voltage output of DC 5 V, 8.4 V, 9.5 V, 12 V, 16 V, 19 V and 24V.” EX1006, [0026], FIGS. 5-7.

Element [12]: The portable back up charger of claim 1, wherein the first current is of 0.5 to 10 A.

66. Chen describes that the first current is in the range of 0.5 to 10 A. For

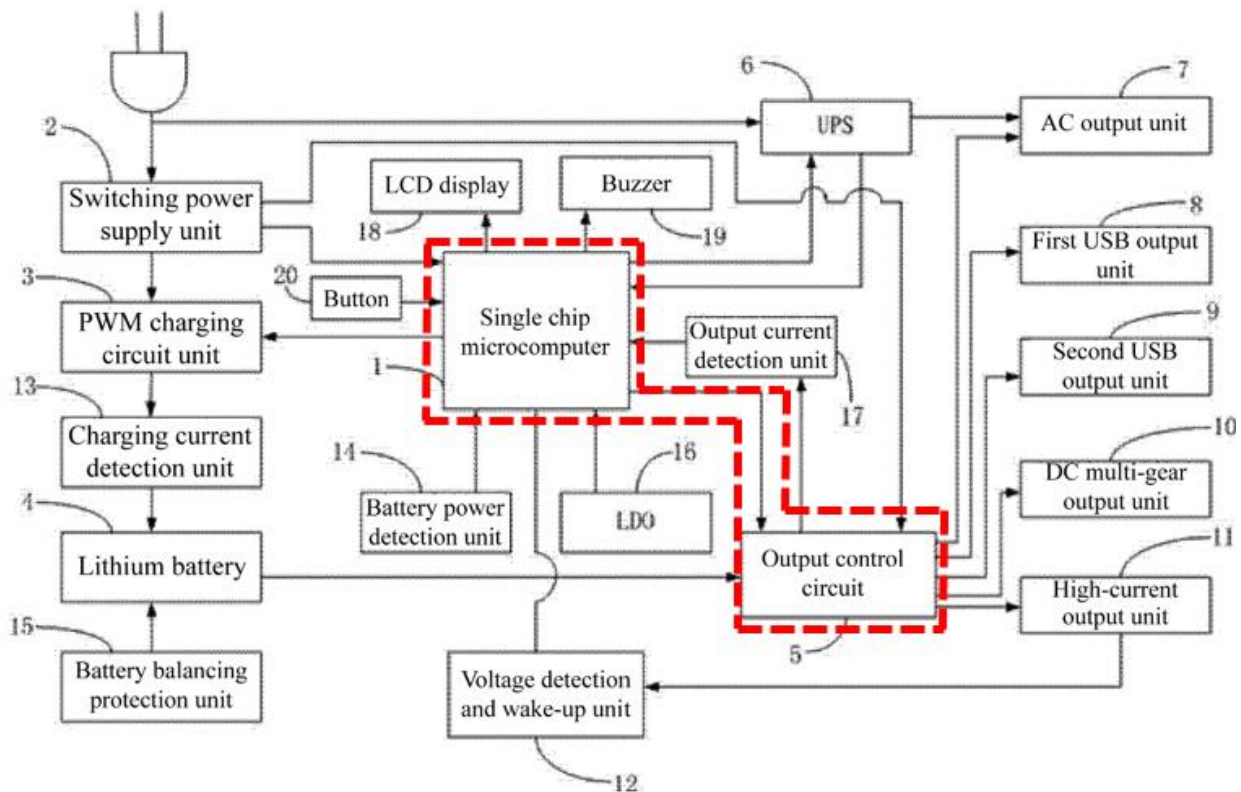
example, Chen teaches two of the outputs are conventional “USB” outputs, which is consistent with Chen’s teaching of providing “backup power supply for mobile devices.” EX1006, [0026] and [0034]. The evidence here confirms that Chen’s teaching for such conventional “USB” outputs is a straightforward teaching for an output in accordance the USB standard (5V/0.5A output), thereby providing the first current amount in the range of 0.5 to 10 A. EX1006, [0026], [0021] (“USB buck output”), FIG. 7; *supra*, Section VI.A.2 (describing the USB standard at the time).

Element [13]: The portable backup charger of claim 1, wherein the second current is of 100 to 400 A.

67. Chen describes that the second current is in the range of 100 to 400 A. For example, Chen teaches the second current from the ignition output interface 111 is “200 A” so that it can be used to jumpstart “most household cars.” EX1006, [0025].

Element [14]: The portable backup charger of claim 1, further comprising a controller configured to control the operating mode of the battery pack.

68. Chen discloses a controller configured to control the operating mode of the battery pack. For example, Chen teaches a controller that includes at least the “output control unit 5” in connection with the “microcomputer 1”:



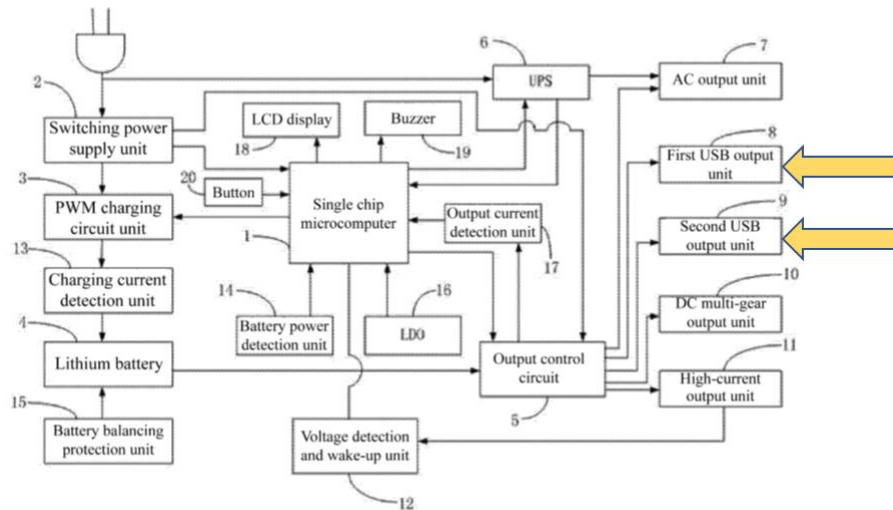
EX1006, Fig. 1 (annotated)

69. The “output control unit 5” and “microcomputer 1” cooperate to determine whether to output current to any of the ignition output circuit, DC outlet, or USB outlet. EX1006, [0023] (“connected to the single-chip microcomputer 1”), [0025] (“separately connected to the output control circuit 5”), [0028], [0031] (“cyclic switching of various functions” by button 20 connected to microcomputer 1), [0035], FIG. 1.

Element [16]: The portable backup charger of claim 1, wherein the at least one output port comprises a universal serial bus (USB) port.

70. Chen discloses that the output port comprises a universal serial bus (USB) port. For example, Chen describes a “USB output unit 8” and “USB output

unit 9” that each provide current to a USB port. EX1006, [0026]; *see also* EX1006, [0029], Figs. 1-2, 7.



EX1006, FIG. 1 (annotated)

71. As described above for Element [1.2], Chen FIG. 7 discloses USB ports. *Supra*, ¶¶51-52; EX1006, FIG. 7 (USB1 and USB2). This is consistent with a traditional USB port/cable connection when acting “as a backup power supply for mobile devices.” EX1006, [0034] and [0026].

Element [17]: The portable backup charger of claim 1, wherein the at least one output port comprises an output port of a rating voltage of 12V.

72. Chen discloses that the output port comprises a rating voltage of 12V. For example, Chen teaches the DC multi-gear output port 10 as provides a DC current output with a rating voltage of “12V.” EX1006, [0026], [0034].

Element [18]: The portable backup charger of claim 1, wherein the at least one

output port comprises an output port of a rating voltage of 19V.

73. Chen discloses that the output port comprises a rating voltage of 19V. For example, Chen teaches the DC multi-gear output port 10 as provides a DC current output with a rating voltage of “19V.” EX1006, [0026], [0034]. (“output current detection”).

Element [19]: The portable backup charger of claim 1, wherein the at least one battery cell is lithium based battery cell.

74. Chen discloses that the battery cell is lithium-based battery cell. For example, Chen teaches that the internal battery 4 is a “lithium” battery. EX1006, [0023]; *see also* EX1006, [0004], [0014], [0025], [0027]-[0029], [0031], Figs. 1-2.

Claim 21

Element [21.P]: A portable backup charger, comprising.

75. As previously detailed in my analysis of Element [1.P], to the extent this preamble is treated as a claim limitation, Chen discloses a portable backup charger. For example, Chen discloses “a mobile power supply” that acts as a portable backup charger, including its functionality as “a backup power supply for mobile devices when going out.”. EX1006, [0003]-[0004] and [0034]; *see also* [0011], [0022]-[0026], FIG. 1; *supra* Section VIII, Analysis of Element [1.P].

Element [21.1]: a battery pack having at least one battery cell;

76. As previously detailed in my analysis of Element [1.1], Chen discloses a battery pack having at least one battery cell. EX1006, [0004], [0011], [0014],

[0022]-[0023], [0025]-[0026]; *supra* Section VIII, Analysis of Element [1.1].

Element [21.2]: a first current path through which a first current is output by the battery pack when it is working in a first operating mode;

77. As previously detailed in my analysis of Element [1.2], Chen discloses a first current path through which a first current is output by the battery pack when it is working in a first operating mode. EX1006, [0026], [0034] (“a backup power supply for mobile devices”), FIGS. 1 and 5-7; *supra* Section VIII, Analysis of Element [1.2].

Element [21.3]: a second current path through which a second current capable of starting a vehicle engine is output by the battery pack when it is working in a second operating mode, wherein the second current is higher than the first current;

78. As previously detailed in my analysis of Element [1.3], Chen discloses a second current path through which a second current capable of starting a vehicle engine is output by the battery pack when it is working in a second operating mode, wherein the second current is higher than the first current. EX1006; [0022]-[0025], [0026], [0034], FIG. 1-4-7; *supra* Section VIII, Analysis of Element [1.3].

Element [21.4]: a first protection circuit coupled to the battery pack and configured to protect the battery pack when it is working in the first operating mode; and

79. As previously detailed in my analysis of Element [1.4], Chen discloses a first protection circuit coupled to the battery pack and configured to protect the battery pack when it is working in the first operating mode. EX1006, [0026], FIGS.

5-7; *supra* Section VIII, Analysis of Element [1.4].

Element [21.5]: a second protection circuit coupled in the second current path and configured to prevent overcurrent condition of the second current when it is working in the second operating mode.

80. As previously detailed in my analysis of Element [1.5], Chen discloses a second protection circuit coupled in the second current path and configured to prevent overcurrent condition of the second current when it is working in the second operating mode. EX1006, [0025], [0035], FIG. 4; *supra* Section VIII, Analysis of Element [1.5].

Element [26]: The portable backup charger of claim 21, further comprising a switching module operable to switch on or off the second current path.

81. As previously detailed in my analysis of Element [9], Chen discloses a switching module operable to switch on or off the second current path. *Supra* Section VIII, Analysis of Element [9].

Element [27]: The portable backup charger of claim 21, wherein the second current is of 100 to 400 A.

82. As previously detailed in my analysis of Element [13], Chen discloses that the second current is in the range of 100 to 400 A. *Supra* Section VIII, Analysis of Element [13].

Element [28]: The portable backup charger of claim 21, further comprising a controller configured to control the operating mode of the battery pack.

83. As previously detailed in my analysis of Element [14], Chen discloses a controller configured to control the operating mode of the battery pack. *Supra*

Section VIII, Analysis of Element [14].

Element [30]: The portable backup charger of claim 21, wherein the at least one output port comprises a universal serial bus (USB) port.

84. As previously detailed in my analysis of Element [16], Chen discloses at least one output port comprises a universal serial bus (USB) port. *Supra* Section VIII, Analysis of Element [16].

Element [31]: The portable backup charger of claim 21, wherein the at least one output port comprises an output port of a rating voltage of 12V.

85. As previously detailed in my analysis of Element [17], Chen discloses at least one output port comprises an output port of a rating voltage of 12V. *Supra* Section VIII, Analysis of Element [17].

Element [32]: The portable backup charger of claim 21, wherein the at least one output port comprises an output port of a rating voltage of 19V.

86. As previously detailed in my analysis of Element [18], Chen discloses at least one output port comprises an output port of a rating voltage of 19V. *Supra* Section VIII, Analysis of Element [18].

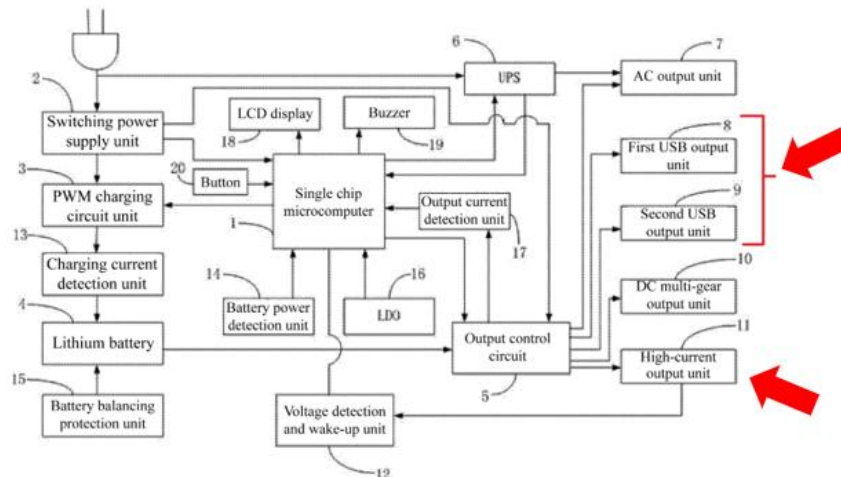
Element [33]: The portable backup charger of claim 21, wherein the at least one battery cell is lithium based battery cell.

87. As previously detailed in my analysis of Element [19], Chen discloses at least one battery cell is a lithium-based battery cell. *Supra* Section VIII, Analysis of Element [19].

IX. ANALYSIS OF CHEN AND WHITE (Ground 1B)

Chen (EX1005; translation at EX1006)

88. As I previously address the Chen reference in my analysis of Ground 1A above, Chen teaches a mobile charger device in which a lithium battery pack can output a first charging current to “USB” connections and a second charging current to a “car battery” for vehicle ignition:



EX1006, [0022], [0025]-[0026], FIG. 1. Chen explains that the high-current output unit 11 is configured to connect with “car battery” to deliver the “200A” current for jumpstarting the car battery. EX1006, [0025], FIG. 4.

White (EX1007)

89. White, like Chen, also describes a technology that includes an electrical connection to a depleted vehicle battery. EX1007, 1:65-67 (“for jump starting a second vehicle”), 2:22-26, 2:55-3:41; EX1006, [0025] (“the car battery is connected to the high-current output unit 11”). White adds a teaching beyond Chen because

Chen does not expressly detail the physical aspects of traditional cables/clamps for engaging with the car battery. White plainly describes a conventional option for such a structure and several known benefits achieved by such an option.

90. In particular, White describes the common option in which a jumper cable harness includes battery clamps at one end (for connecting with positive/negative terminals of the depleted battery) and a “keyed” connector at the other end (for connection with the power supply battery):

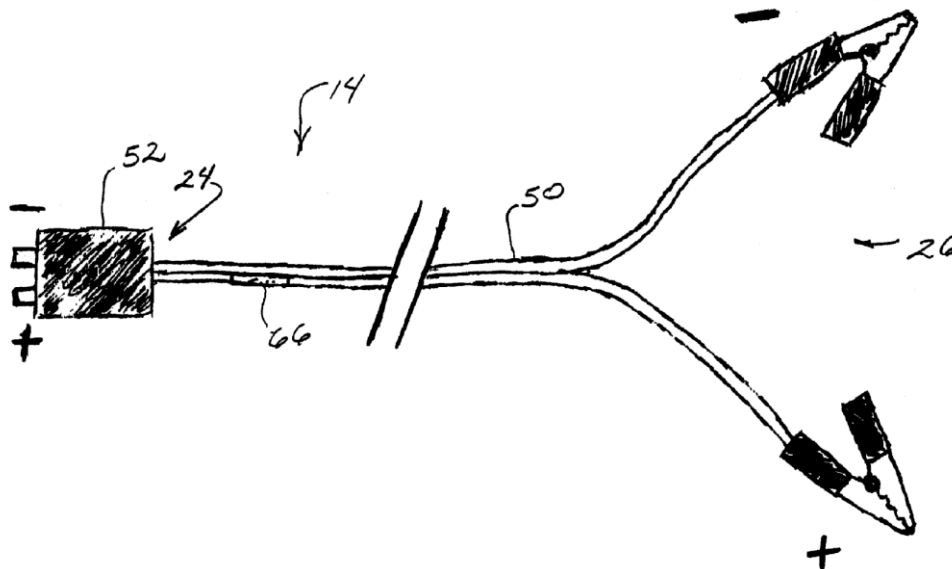


FIG. 9

EX1007, FIG. 9, 2:55-3:16, 2:46-47 (“keyed”).

91. White explains the useful benefit of using such a “keyed” connector plug 24 “to ensure proper polarity” in the connection between the power supply battery and the car battery. EX1007, 2:43-51. Moreover, White suggests the added safety option of including a “fuse” along a jumper cable wire to prevent damage in

the event of a short circuit or other overcurrent condition. EX1007, 3:25-27 (“fuse 66”), 2:51-54 (suggesting that such a fuse along the jumper cable path can “prevent damage” to either of the batteries and to the jumper cable harness itself); FIG. 9 (depicting fuse “66” along a wire of the jumper cable).

Predictable Combination of Chen and White

92. Based upon my knowledge and experience in this field and my review of Chen and White, it is clear that a POSITA would have been motivated to implement Chen to include White’s suggestion (a jumper cable harness equipped with polarity-protection connector at one end and a fuse along a jumper cable wire) to achieve known benefits at the time. At a high level, Chen discloses a mobile power supply configured to connect with a depleted car battery (EX1006, [0025], FIGS. 1 and 4), and White suggests an improvement for accomplishing the physical connection with a depleted car battery along with advantages from such an improvement. There are several rationales that would have prompted the POSITA to pursue this Chen-White combination. I provide an exemplary discussion of various reasons below, each of which independently supports the predictability and advantages of the combination.

93. **The first reason** a POSITA would have been prompted to implement Chen in a manner that includes White’s suggestion (a jumper cable harness equipped with polarity-protection connector at one end and a fuse along a jumper cable) is to

advantageously reduce the likelihood of damage to Chen's power supply battery and other electrical components. As previously described, Chen teaches that its high-current output unit 11 should be electrically connected with the car battery for purposes of delivering 200A (EX1006, [0025]), which is indeed a high current, and White's suggested improvement would have added the additional safety features of a fuse for overcurrent protection and a keyed plug to reduce the chance of mis-connection.

94. Firstly, implementing Chen with a jumper cable harness according to White's suggestions would have predictably achieved the benefit of a safety fuse along a jumper cable to promptly cutoff current in the event of a short circuit or other over current condition during the jumpstart process. Yet again, White expressly suggest this benefit. EX1007, 2:51-55 ("to prevent damage" to the car battery, the wiring harness, and the host power supply), 3:25-27 ("fuse 66"), FIG. 9 (fuse "66" along positive wire between the connector and the clamp).

95. Secondly, the improved connection using a jumper cable harness equipped with polarity-protection connector (to releasably connect Chen's the high-current output unit 11 with the car battery) would have provided the additional benefit of "ensur[ing] proper polarity" in the connection between Chen's battery 4 and the car battery. In fact, White expressly suggests this particular benefit. EX1007, 2:45-51 ("thereby preventing electrical damage" to the car battery and the

host power supply).

96. Both of these added layers of protection (§§88-91 above) would have improved safety and damage prevention beyond the microcontroller-actuated relay K1 of Chen. EX1006, [0025] (the relay K1 acting after “the battery voltage returns to normal”). For instance, in the predictable combination, the jumper cable wire extending between Chen’s device and the car battery would have included the safety fuse (as suggested by White), and in the event of a short circuit in the high-current path (a short in the car battery, a short at or near the clamps, etc.) or other overcurrent condition arising before the car battery is successfully jumpstarted and returns to normal, the safety fuse would promptly cut off the high-current flow before significant damage to Chen’s battery, the car battery, and the jumper cable harness itself. By implementing this traditional option of a fuse along the jumper cable wire, the predictable combination would have ensured an instant safety/protective response to an abnormal/unexpected operating condition of overcurrent.

97. **The second reason** a POSITA would have been motivated to implement Chen in a manner that includes White’s suggestion (a jumper cable harness equipped with polarity-protection connector at one end and a fuse along a jumper cable) is to achieve simplified maintenance/repair of the mobile power supply device. A circuit breaker/fuse in the jumper cable itself would have been recognized as easier to reset/replace than electronics internal to the portable charging

system.

98. Based upon knowledge and experience in this field and my review of the relatively straightforward and predictable structures in Chen and White, it is clear that a POSITA would have possessed the level of skill to implement this combination given the technologies of Chen and White—with a reasonable expectation of success in achieving this combination in the manner describe above. That is, both references are directed to technology for connecting with/jumpstarting a car battery (EX1007, 1:65-67, 2:22-26, 2:55-3:41; EX1006, [0025]). As I have explained throughout this declaration, the state of the art for such jumpstarting equipment was relatively advanced by the time of the '506 patent (and even long before 2011). Again, the specific technologies applied in Chen and White were common—a portable charger device with USB output units to charge mobile devices and with a high-current output unit to jumpstart a vehicle; improved safety cables/removable plugs for jumper cables. *Supra*, ¶¶88-91. These were well within a POSITA's knowledge and skill level at the relevant time.

Claim 1

Element [1.P]: A portable backup charger, comprising.

99. As previously detailed in my Ground 1 analysis of Element [1.P], to the extent this preamble is treated as a claim limitation, Chen discloses a portable backup charger. For example, Chen discloses “a mobile power supply” that acts as a

portable backup charger, including its functionality as “a backup power supply for mobile devices when going out.”. EX1006, [0003]-[0004] and [0034]; *see also* [0011], [0022]-[0026], FIG. 1; *supra* Section VIII, Analysis of Element [1.P]].

Element [1.1]: a battery pack having at least one battery cell;

100. As previously detailed in my Ground 1 analysis of Element [1.1], Chen discloses a battery pack having at least one battery cell. EX1006, [0004], [0011], [0014], [0022]-[0023], [0025]-[0026]; *supra* Section VIII, Analysis of Element [1.1].

Element [1.2]: at least one output port coupled to the battery pack, wherein the battery pack is configured to output a first current through one or more output ports of the at least one output port in a first operating mode;

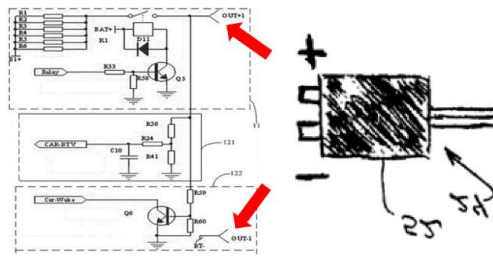
101. As previously detailed in my Ground 1 analysis of Element [1.2], Chen discloses at least one output port coupled to the battery pack, wherein the battery pack is configured to output a first current through one or more output ports of the at least one output port in a first operating mode. EX1006, [0026] (“a first USB output unit 8, a second USB output unit 9 and a DC multi-gear output unit 10”), [0034] (“a backup power supply for mobile devices”), FIGS. 1 and 5-7; *supra* Section VIII, Analysis of Element [1.2].

Element [1.3]: a pair of output terminals coupled to the battery pack and having a current path to the battery pack different from that of the at least one output port to the battery pack, wherein the battery pack is configured to output a second current capable of starting a vehicle engine through the pair of output terminals in a second operating mode, wherein the second current is higher than the first

current;

102. As previously detailed in my Ground 1 analysis of Element [1.3], Chen discloses that the battery pack is configured to output a second current capable of starting a vehicle engine through the pair of output terminals in a second operating mode, wherein the second current is higher than the first current. EX1006; [0022]-[0025], [0026], [0034], FIG. 1-4 and 7; *supra* Section VIII, Analysis of Element [1.3]. However, even if Chen did not expressly detail the “pair of output terminals,” the predictable Chen-White combination would have provided the recited pair of output terminals. *Supra*, ¶¶88-98; EX1007, FIG. 9, 2:45-51.

103. As I previously explained, the Chen-White combination would have implemented White’s suggestion for a jumper cable harness to releasably mate with Chen’s high-current output unit 11, which would provide a physical structure for accomplishing Chen’s goal of connecting with a “car battery” (EX1006, [0025]) while also achieving the added benefits articulated above. *Supra*, ¶¶88-98. In this predictable combination, the jumper cable harness equipped with a polarity-protection connector at one end would have included a pair of output terminals to removably mate with a complementary connector along the output terminal 11 (as suggested by White):



EX1006, FIG. 4 (annotated); EX1007, FIG. 9 (cropped and rotated, showing the positive and negative terminals), 2:45-51 (connectors to mate with one another).²

In fact, the resulting combination provides two pairs of output terminals used in the high-current path for jumpstarting the car battery because White's illustration also indicates that the other end of each jumper cable wire also provided an electrical terminal connection outputting to a corresponding clamp:

² To be clear, my analysis does not rely upon a bodily incorporation of White's structure into Chen's structure. Rather, as articulated above, I considered what a POSITA would have recognized from White's suggestions and whether a POSITA would have been motivated to combine Chen and White in the manner articulated above.

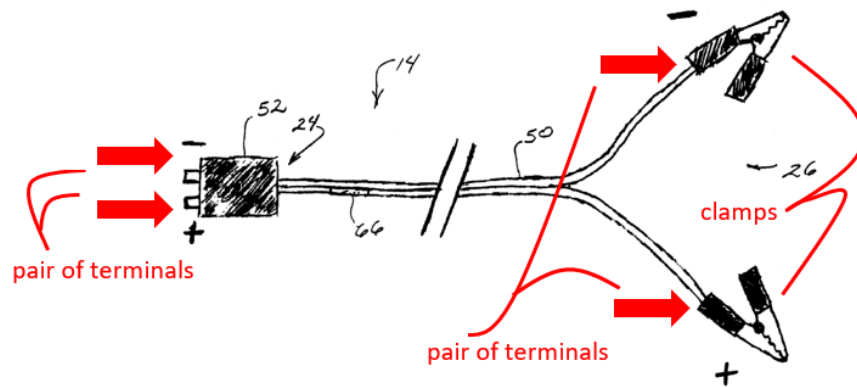


FIG. 9

EX1007, FIG. 9 (annotated). Thus, regardless of which pair of output terminals is considered, the Chen-White combination would have provided the pair of output terminals as recited in this Element.

104. And finally, for the same reasons as previously explained in Ground 1, the high-current path through the pair of terminals and battery would have been different from the lower-current path to Chen's USB/multi-gear ports. *Supra* Section VIII, Analysis of Element [1.3] (annotating Chen's FIG. 1).

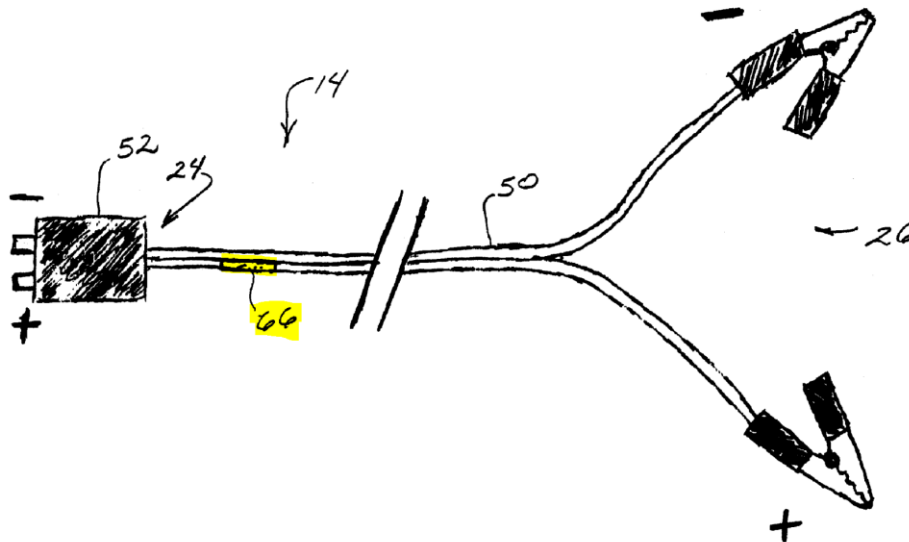
Element [1.4]: a first protection circuit coupled to the battery pack and configured to protect the battery pack when the battery pack is working in the first operating mode; and

105. As previously detailed in my Ground 1 analysis of Element [1.4], Chen discloses a first protection circuit coupled to the battery pack and configured to protect the battery pack when the battery pack is working in the first operating mode. EX1006, [0026], FIGS. 5-7; *supra* Section VIII, Analysis of Element [1.4].

Element [1.5]: a second protection circuit coupled to the battery pack and configured to prevent overcurrent condition of the second current when the

battery pack is working in the second operating mode.

106. I previously explained why Chen discloses a second protection circuit to prevent overcurrent condition of the second current. EX1006, [0025], [0035], FIG. 4; *supra* Section VIII, Analysis of Element [1.5]. However, even if Chen did not expressly disclose the “second protection circuit,” the predictable Chen-White combination provides the claimed second protection circuit coupled to the battery pack and configured to prevent overcurrent condition of the second current when the battery pack is working in the second operating mode. *Supra*, ¶¶88-98; EX1007, 3:25-27, FIG. 9. Again, as I previously noted, White suggests the option of implementing a “fuse 66” along a jumper cable wire of a traditional wiring harness (“extension portion 14”) to provide added safety and protective benefits:



EX1007, Fig. 9 (annotated), 3:25-27; 2:51-55; *supra*, ¶¶88-98. For the reasons

articulated above, a POSITA would have been motivated to implement Chen's device using White's suggested benefits (a second protection circuit including a fuse along a wire of a jumper cable harness), which would have provided the claimed second protection circuit while also providing a conventional structure for Chen's goal of connecting with a "car battery" (EX1006, [0025]). *Supra*, ¶¶88-98.

Element [2]: The portable backup charger of claim 1, wherein when the first protection circuit is configured to prevent overcurrent condition of the first current, and overcharge and overdischarge condition of the battery pack.

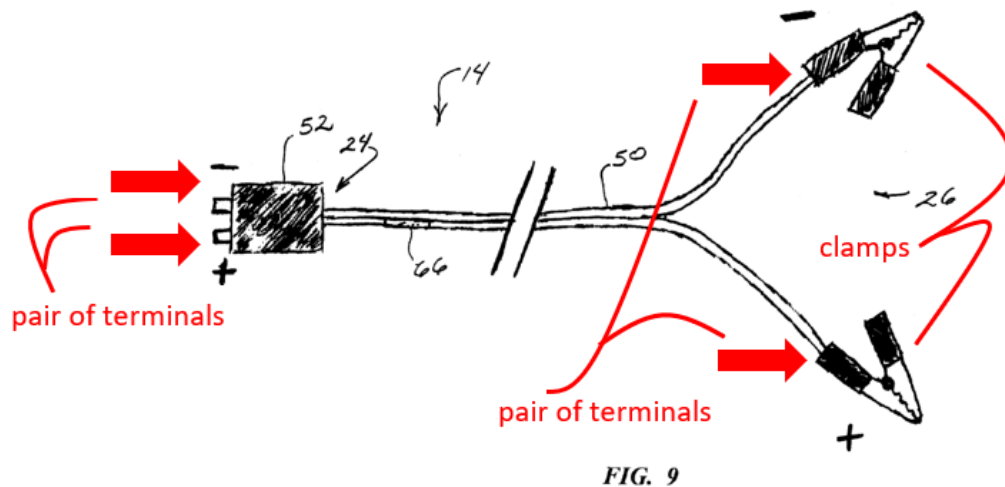
107. The Chen-White combination provides this Element. Again, Chen describes the "first protection circuit" recited in claim 1 (refer to my analysis of Element [1.4] (citing to EX1006, [0026])), and Chen expressly suggests the benefits of also "prevent[ing] overcharge and over-discharge" for purposes of "increas[ing] the service life of the lithium battery 4." Notably, Chen teaches that these circuit elements—the "output power limit control" for the USB output units ([0025]) and the charging management ([0029] ("to prevent overcharge and over-discharge"))—are all interconnected with the "single chip microcomputer 1." EX1006, FIG. 1, [0026], [0029]. Accordingly, based upon my knowledge and experience in this field and my review of Chen's teaching regarding the interconnectivity with the microcomputer 1, a POSITA would have been motivated to implement the first protection circuit in a conventional form factor of a battery management circuit subsystem (especially a board) that included all of the "output power limit control"

([0025]) and the charging management circuit ([0029] (“to prevent overcharge and over-discharge”) so as to provide the simplified assembly/compact size of for Chen’s desired “mobile” charger device. EX1006, [0003]-[0004].

Element [6]: The portable backup charger of claim 1, further comprising a pair of connecting wires for detachably coupling the pair of output terminals with the battery pack, each connecting wire having a clamp for clamping an electrode of an external vehicle battery.

108. As previously detailed in my analysis of Elements [1.3] and [1.5] in this Ground, the Chen-White combination provides a pair of connecting wires for detachably coupling the pair of output terminals with the battery pack, each connecting wire having a clamp for clamping an electrode of an external vehicle battery. *Supra* Section VIII, Analysis of Element [1.3] (citing to EX1006 at FIG. 4 and EX1007 at FIG. 9 (showing the positive and negative terminals) and 2:45-51) and [1.5] (citing to EX1007, 3:25-27, FIG. 9). As I previously noted, the Chen-White combination would have implemented White’s suggestion for a jumper cable harness to releasably mate with Chen’s high-current output unit 11, which would provide a physical structure for accomplishing Chen’s goal of connecting with a “car battery” (EX1006, [0025]) while also achieving the added benefits articulated above. *Supra*, ¶¶88-98. In this predictable combination, the jumper cable harness would have included a pair of output terminals to removably mate with a complementary connector along the output terminal 11 (as suggested by White) and another pair of

output terminals at the other end of the connecting wires (the jumper cable wires) at the terminal connection with the corresponding clamp:



EX1007, FIG. 9 (annotated), 2:45-51 (connectors to mate with one another). Thus, in the resulting combination, these pairs of output terminals are detachably coupled to Chen's internal lithium battery 4. EX1006, FIG. 1 (battery 4 and output unit 11); EX1007, FIG. 9, 2:45-51.

Element [7]: The portable backup charger of claim 6, wherein the second protection circuit is built into at least one of the pair of connecting wires.

109. As previously detailed in my analysis of Element [1.5] in this Ground, the second protection circuit of the Chen-White combination includes a fuse that is built into one of the jumper cable wires. *Supra* Section VIII, Analysis of Element [1.5] (citing to EX1007, 3:25-27, FIG. 9). Again, as I previously noted, White suggests the option of implementing a “fuse 66” along the jumper cable wire to provide the added safety and protective benefits articulated above. *Supra*, ¶¶88-98.

Element [8]: The portable backup charger of claim 6, wherein the pair of connecting wires comprises a reverse connection-proof plug.

110. As previously detailed in my analysis of Elements [1.3] and [1.5] in this Ground, the Chen-White combination provides a pair of connecting wires including a reverse connection-proof plug. *Supra* Section VIII, Analysis of Elements [1.3] and [1.5] (citing to EX1007, 2:45-51 (suggesting the “keyed” connection for the mating plugs), FIG. 9 (depicting the “keyed” plug to prevent reverse connection); *supra*, ¶¶88-98.

Element [9]: The portable backup charger of claim 1, further comprising a switching module operable to switch on or off the second current from the battery pack.

111. As previously detailed in my Ground 1 analysis of Element [9], Chen discloses a switching module operable to switch on or off the second current from the battery pack. EX1006, FIG. 4 (“switch” structure in relay K1), [0025], [0035]; *see also* FIG. 1 and [0031] (“button 20” connected to the “microcontroller 1”); *supra* Section VIII, Analysis of Element [9].

Element [11]: The portable backup charger of claim 1, further comprising at least one voltage adjusting circuit, each voltage adjusting circuit being coupled between the battery pack and one of the at least one output port and configured to elevate or reduce an output voltage of the battery pack to a predetermined voltage at the respective output port.

112. As previously detailed in my Ground 1 analysis of Element [11], Chen discloses at least one voltage adjusting circuit, each voltage adjusting circuit being coupled between the battery pack and one of the at least one output port and

configured to elevate or reduce an output voltage of the battery pack to a predetermined voltage at the respective output port. EX1006, FIGS. 5-7, [0026], [0019]-[0021]; *supra* Section VIII, Analysis of Element [11].

Element [12]: The portable back up charger of claim 1, wherein the first current is of 0.5 to 10 A.

113. As previously detailed in my Ground 1 analysis of Element [12], Chen teaches conventional “USB” output units 8 and 9, which plainly discloses or suggests that the first current is within the range 0.5 to 10 A. EX1006, [0026], [0034] (providing “backup power supply for mobile devices”), [0021] (conventional “USB buck output”), FIG. 7; *supra* Section VIII, Analysis of Element [12].

Element [13]: The portable backup charger of claim 1, wherein the second current is of 100 to 400 A.

114. As previously detailed in my Ground 1 analysis of Element [13], Chen describes that the second current is in the range of 100 to 400 A. For example, Chen teaches the second current from the ignition output interface 111 is “200 A” so that it can be used to jumpstart “most household cars.” EX1006, [0025]; *supra* Section VIII, Analysis of Element [13].

Element [14]: The portable backup charger of claim 1, further comprising a controller configured to control the operating mode of the battery pack.

115. As previously detailed in my Ground 1 analysis of Element [14], Chen describes a controller configured to control the operating mode of the battery pack. EX1006, FIG. 1 (“output control unit 5” in connection with the “microcomputer 1”),

[0023] (“connected to the single-chip microcomputer 1”), [0025] (“separately connected to the output control circuit 5”), [0028], [0031] (“cyclic switching of various functions” by button 20 connected to microcomputer 1), [0035]; *supra* Section VIII, Analysis of Element [14].

Element [16]: The portable backup charger of claim 1, wherein the at least one output port comprises a universal serial bus (USB) port.

116. As previously detailed in my Ground 1 analysis of Element [16], Chen discloses that the output port comprises a universal serial bus (USB) port. EX1006, [0026] (“USB” output units), [0029], FIGS. 1-2, 7 (“USB 1” and “USB 2” connector); *supra* Section VIII, Analysis of Element [16].

Element [17]: The portable backup charger of claim 1, wherein the at least one output port comprises an output port of a rating voltage of 12V.

117. As previously detailed in my Ground 1 analysis of Element [17], Chen discloses that the output port comprises a rating voltage of 12V. EX1006, [0026] (“12V”), [0034]; *supra* Section VIII, Analysis of Element [17].

Element [18]: The portable backup charger of claim 1, wherein the at least one output port comprises an output port of a rating voltage of 19V.

118. As previously detailed in my Ground 1 analysis of Element [18], Chen discloses that the output port comprises a rating voltage of 19V. EX1006, [0026] (“19V”), [0034]; *supra* Section VIII, Analysis of Element [18].

Element [19]: The portable backup charger of claim 1, wherein the at least one battery cell is lithium based battery cell.

119. As previously detailed in my Ground 1 analysis of Element [19], Chen discloses that the battery cell is lithium based battery cell. EX1006, [0023]; *see also* EX1006, [0004], [0014], [0025], [0027]-[0029], [0031], FIGS. 1-2; *supra* Section VIII, Analysis of Element [19].

Element [20]: The portable backup charger of claim 1, wherein the pair of output terminals is detachably coupled to the battery pack.

120. As previously detailed in my analysis of Elements [1.3], [1.5], and [6] in this Ground, the Chen-White combination provides the pair of output terminals detachably coupled to the battery pack. *Supra* Section VIII, Analysis of Element [1.3] (citing to EX1006 at FIG. 4 and EX1007 at FIG. 9 (showing the positive and negative terminals) and 2:45-51), Element [1.5] (citing to EX1007, 3:25-27, FIG. 9), and Element [6] (same). Again, as I previously noted, the Chen-White combination would have included a jumper cable harness having a pair of output terminals to removably mate with a complementary connector along Chen's high-current output unit 11 (as suggested by White) and another pair of output terminals at the other end of the connecting wires (the jumper cable wires) at the terminal connection with the corresponding clamp. *Supra* Section VIII, Analysis of Elements [1.3] and [6]. For the reasons I explained above, each of these pairs of output terminals are detachably coupled to Chen's lithium battery 4. *Id.*

Claim 21

Element [21.P]: A portable backup charger, comprising.

121. As previously detailed in my Ground 1 analysis of Element [1.P], to the extent this preamble is treated as a claim limitation, Chen discloses a portable backup charger. EX1006, [0003]-[0004] and [0034]; *see also* [0011], [0022]-[0026], FIG. 1; *supra* Section VIII, Analysis of Elements [1.P] and [21.P].

Element [21.1]: a battery pack having at least one battery cell;

122. As previously detailed in my Ground 1 analysis of Element [1.1], Chen discloses a battery pack having at least one battery cell. EX1006, [0004], [0011], [0014], [0022]-[0023], [0025]-[0026]; *supra* Section VIII, Analysis of Elements [1.1] and [21.1].

Element [21.2]: a first current path through which a first current is output by the battery pack when it is working in a first operating mode;

123. As previously detailed in my Ground 1 analysis of Element [1.2], Chen discloses a first current path through which a first current is output by the battery pack when it is working in a first operating mode. EX1006, [0026] (“USB” output connections), [0034] (“a backup power supply for mobile devices”), FIGS. 1 and 5-7; *supra* Section VIII, Analysis of Elements [1.2] and [21.2].

Element [21.3]: a second current path through which a second current capable of starting a vehicle engine is output by the battery pack when it is working in a second operating mode, wherein the second current is higher than the first current;

124. As previously detailed in my Ground 1A analysis of Element [21.3],

Chen discloses the claimed second current path capable of starting a vehicle engine. EX1006; [0022]-[0025] (“200A” current), [0026], [0034], FIG. 1-4 and 7; *supra* Section VIII, Analysis of Elements [1.3] and [21.3]. However, even if Chen did not expressly detail the “second current path,” the predictable Chen-White combination would have provided such a second current path through which a second current capable of starting a vehicle engine is output by the battery pack when it is working in a second operating mode, wherein the second current is higher than the first current. *Supra*, ¶¶88-98; EX1007, FIG. 9, 2:45-51. The Chen-White combination would have implemented White’s suggestion for a jumper cable harness to releasably mate with Chen’s high-current output unit 11, which would provide a physical structure for accomplishing Chen’s goal of connecting with a “car battery” (EX1006, [0025]) while also achieving the added benefits articulated above. *Supra*, ¶¶88-98; EX1007, FIG. 9, 2:45-51 (connectors to mate with one another).³ Thus, the Chen-White combination would have provided the second current path from

³ As stated above, my analysis does not rely upon a bodily incorporation of White’s structure into Chen’s structure. Rather, I considered what a POSITA would have recognized from White’s suggested improvements and whether a POSITA would have been motivated to combine Chen and White in the manner articulated above.

Chen's battery 4, through the high-current output unit 4, through the suggested jumper cable harness, and to car battery for starting the vehicle engine as recited in this Element. *Supra* Section VIII, Analysis of Elements [1.3] and [6]. And finally, for the same reasons as previously explained in Ground 1, this second (high-current path) though through the high-current output unit 4 and the suggested jumper cable harness would have been different from the first (lower-current) path to Chen's USB/multi-gear ports. *Supra* Section IX, Analysis of Element [1.3] (annotating Chen's FIG. 1).

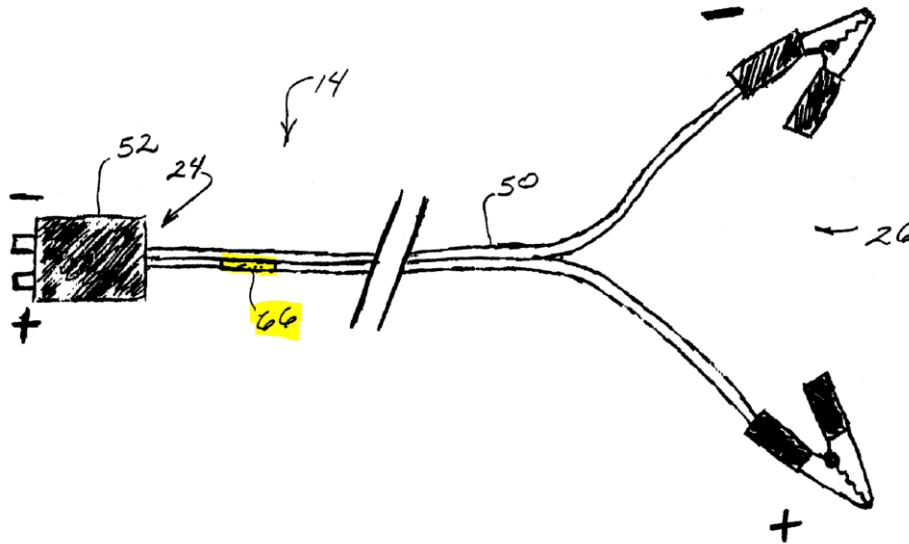
Element [21.4]: a first protection circuit coupled to the battery pack and configured to protect the battery pack when it is working in the first operating mode; and

125. As previously detailed in my Ground 1A analysis of Element [1.4], Chen discloses a first protection circuit coupled to the battery pack and configured to protect the battery pack when it is working in the first operating mode. EX1006, [0026], FIGS. 5-7; *supra* Section VIII, Analysis of Elements [1.4] and [21.4].

Element [21.5]: a second protection circuit coupled in the second current path and configured to prevent overcurrent condition of the second current when it is working in the second operating mode.

126. I previously explained why Chen discloses a second protection circuit to prevent overcurrent condition of the second current. EX1006, [0025], [0035], FIG. 4; *supra* Section VIII, Analysis of Elements [1.5] and [21.5]. However, even if Chen did not expressly disclose the "second protection circuit," the predictable

Chen-White combination provides the claimed second protection circuit coupled in the second current path and configured to prevent overcurrent condition of the second current when it is working in the second operating mode. *Supra*, ¶¶88-98; EX1007, 3:25-27, FIG. 9. As I previously noted, White suggests the option of implementing a “fuse 66” along a jumper cable wire of a traditional wiring harness (“extension portion 14”) to provide added safety and protective benefits:



EX1007, Fig. 9 (annotated), 3:25-27; 2:51-55; *supra*, ¶¶88-98. For the reasons articulated above, a POSITA would have been motivated to implement Chen’s device using White’s suggested benefits (a second protection circuit including a fuse along a wire of a jumper cable harness), which would have provided the claimed second protection circuit while also providing a conventional structure for Chen’s goal of connecting with a “car battery” (EX1006, [0025]). *Supra*, ¶¶88-98.

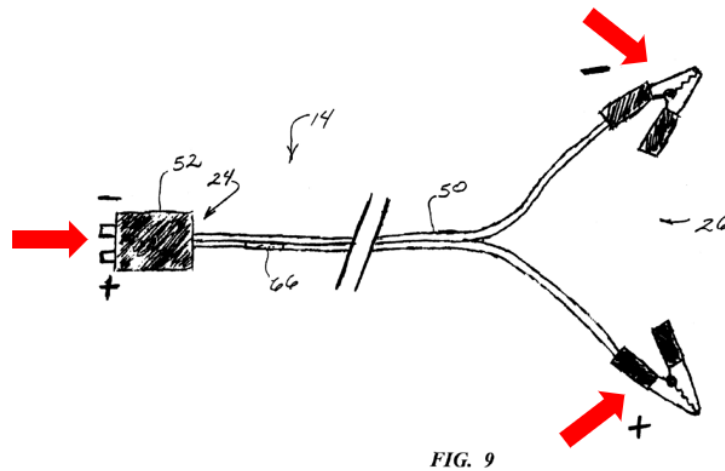
Element [22]: The portable backup charger of claim 21, wherein the first protection circuit is configured to prevent overcurrent condition of the first current, and overcharge and overdischarge condition of the battery pack.

127. As previously detailed in my analysis of Element [2] in this Ground, the Chen-White combination discloses or suggests that the first protection circuit is configured to prevent overcurrent condition of the first current, and overcharge and overdischarge condition of the battery pack. *Supra* Section IX, Analysis of [2].

Element [25.1]: The portable backup charger of claim 21, further comprising: a pair of connecting wires for detachably coupling the battery pack with the vehicle engine to allow the second current flow through the second current path.

128. As previously detailed in my analysis of Elements [1.3] and [6] in this Ground, the Chen-White combination provides a pair of connecting wires for detachably coupling the battery pack with the vehicle engine to allow the second current flow through the second current path. *Supra* Section IX, Analysis of Element [1.3] (citing to EX1006 at FIG. 4 and EX1007 at FIG. 9) and Element [6] (citing to EX1007, FIG. 9, 3:25-27, 2:45-51). As I previously noted, the Chen-White combination would have implemented White's suggestion for a jumper cable harness to releasably mate with Chen's high-current output unit 11, which would provide a physical structure for accomplishing Chen's goal of connecting with a "car battery" (EX1006, [0025]) while also achieving the added benefits articulated above. *Supra*, ¶¶88-98. In this predictable combination, the jumper cable harness would have included the jumper cable harness with the polarity-protection connector at one

end and jumper cable wires leading to conventional battery clamps at the other end:



EX1007, FIG. 9 (annotated), 2:45-51 (connectors to mate with one another). Thus, in the resulting combination, the connecting wires would have been used to detachably couple Chen's battery 4 with the vehicle engine to allow the jumpstarting current (Chen's "200A") to flow through the second current path. EX1006, FIG. 1 (battery 4 and output unit 11); EX1007, FIG. 9, 2:45-51.

Element [25.2]: wherein the second protection circuit is built into at least one of the pair of connecting wires.

129. As previously detailed in my analysis of Elements [21.5] and [7] in this Ground, the second protection circuit of the Chen-White combination includes a fuse that is built into one of the jumper cable wires. *Supra* Section IX, Analysis of Element [21.5] (citing to EX1007, 3:25-27, FIG. 9). Again, as I previously noted, White suggests the option of implementing a "fuse 66" along the jumper cable wire to provide the added safety and protective benefits articulated above. *Supra*, ¶¶88-

98.

Element [26]: The portable backup charger of claim 21, further comprising a switching module operable to switch on or off the second current path.

130. As previously detailed in my Ground 1 analysis of Elements [9] and [26], Chen discloses a switching module operable to switch on or off the second current path. EX1006, FIG. 4 (“switch” structure in relay K1), [0025], [0035]; see also FIG. 1 and [0031] (“button 20” connected to the “microcontroller 1”); *supra* Section IX, Analysis of Element [9].

Element [27]: The portable backup charger of claim 21, wherein the second current is of 100 to 400 A.

131. As previously detailed in my Ground 1 analysis of Elements [13] and [27], Chen describes that the second current is in the range of 100 to 400 A. For example, Chen teaches the second current from the ignition output interface 111 is “200 A” so that it can be used to jumpstart “most household cars.” EX1006, [0025]; *supra* Section IX, Analysis of Element [13].

Element [28]: The portable backup charger of claim 21, further comprising a controller configured to control the operating mode of the battery pack.

132. As previously detailed in my Ground 1 analysis of Elements [14] and [28], Chen discloses a controller configured to control the operating mode of the battery pack. EX1006, FIG. 1 (“output control unit 5” in connection with the “microcomputer 1”), [0023] (“connected to the single-chip microcomputer 1”), [0025] (“separately connected to the output control circuit 5”), [0028], [0031]

(“cyclic switching of various functions” by button 20 connected to microcomputer 1), [0035]; *supra* Section IX, Analysis of Element [14].

Element [30]: The portable backup charger of claim 21, wherein the at least one output port comprises a universal serial bus (USB) port.

133. As previously detailed in my Ground 1 analysis of Elements [16] and [30], Chen discloses that the output port comprises a universal serial bus (USB) port. EX1006, [0026] (“USB” output units), [0029], FIGS. 1-2, 7 (“USB 1” and “USB 2” connector); *supra* Section IX, Analysis of Element [16].

Element [31]: The portable backup charger of claim 21, wherein the at least one output port comprises an output port of a rating voltage of 12V.

134. As previously detailed in my Ground 1 analysis of Elements [17] and [31], Chen discloses at least one output port comprises an output port of a rating voltage of 12V. 12V. EX1006, [0026] (“12V”), [0034]; *supra* Section IX, Analysis of Element [17].

Element [32]: The portable backup charger of claim 21, wherein the at least one output port comprises an output port of a rating voltage of 19V.

135. As previously detailed in my Ground 1 analysis of Elements [18] and [32], Chen discloses at least one output port comprises an output port of a rating voltage of 19V. EX1006, [0026] (“19V”), [0034]; *supra* Section VIII, Analysis of Elements [18] and [32].

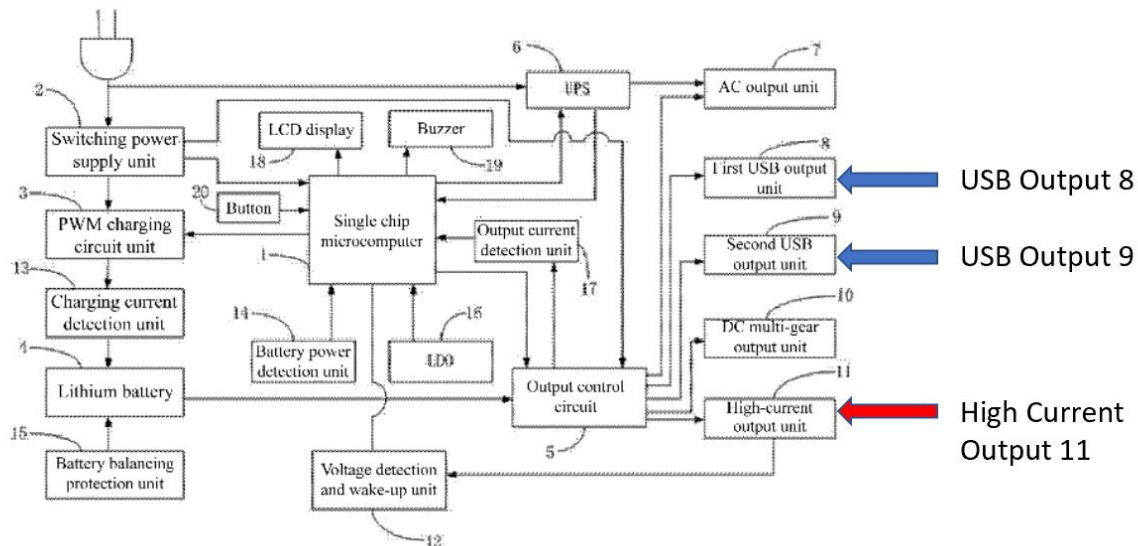
Element [33]: The portable backup charger of claim 21, wherein the at least one battery cell is lithium based battery cell.

136. As previously detailed in my Ground 1A analysis of Elements [19] and [33], Chen discloses at least one battery cell is lithium based battery cell. EX1006, [0023]; *see also* EX1006, [0004], [0014], [0025], [0027]-[0029], [0031], FIGS. 1-2; *supra* Section VIII, Analysis of Elements [19] and [33].

X. ANALYSIS OF CHEN AND RICHARDSON (Ground 1C)

Chen (EX1005; translation at EX1006)

137. As I previously address the Chen reference in my analysis of Ground 1A above, Chen teaches a mobile charger device in which a lithium battery pack can output a first charging current to “USB” connections and a second charging current to a “car battery” for vehicle ignition:



EX1006, [0022], [0025]-[0026], FIG. 1. Chen explains that the high-current output unit 11 is configured to connect with “car battery” to deliver the “200A” current for jumpstarting the car battery. EX1006, [0025], FIG. 4.

Richardson (EX1014)

138. Richardson, like Chen, also describes technologies for a portable power source that can jumpstart a vehicle engine. EX1014, [0002], [0007]; EX1007, [0025]. Richardson suggests the conventional practice of monitoring the time that the jumpstarting current is output and cutting off the jumpstarting current if the time limit is exceeded. EX1014, [0037]. In particular, Richardson suggests cutting off the current after “500 ms” for a “preset maximum” and outputting an “Over MAX” error, and also suggests cutting off the jumpstarting current if the jumpstarting current exceeds a different (lower) threshold amperage for an extended “predetermined period of time such as 15 seconds”:

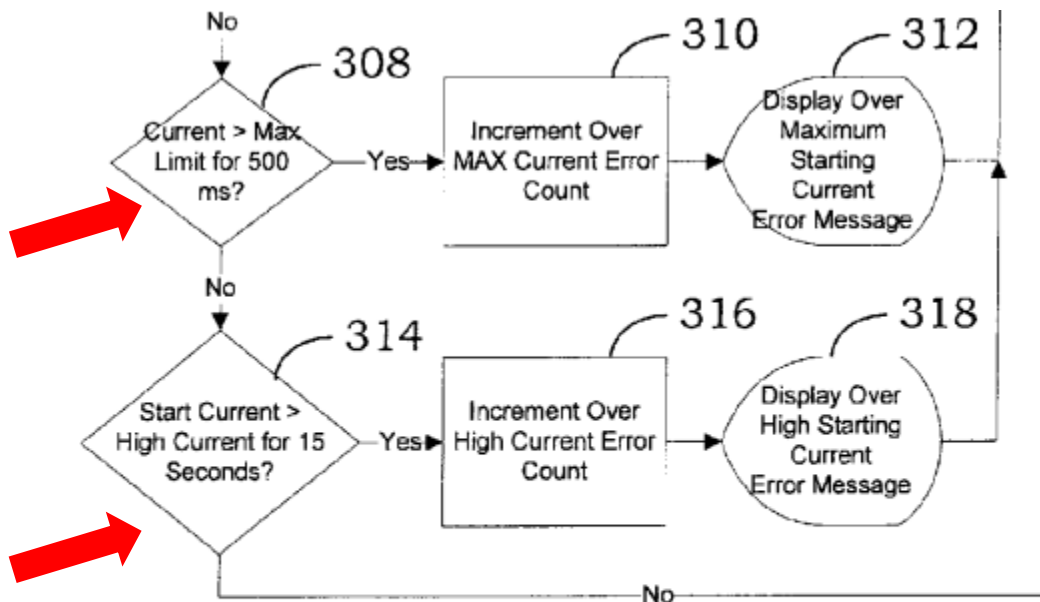
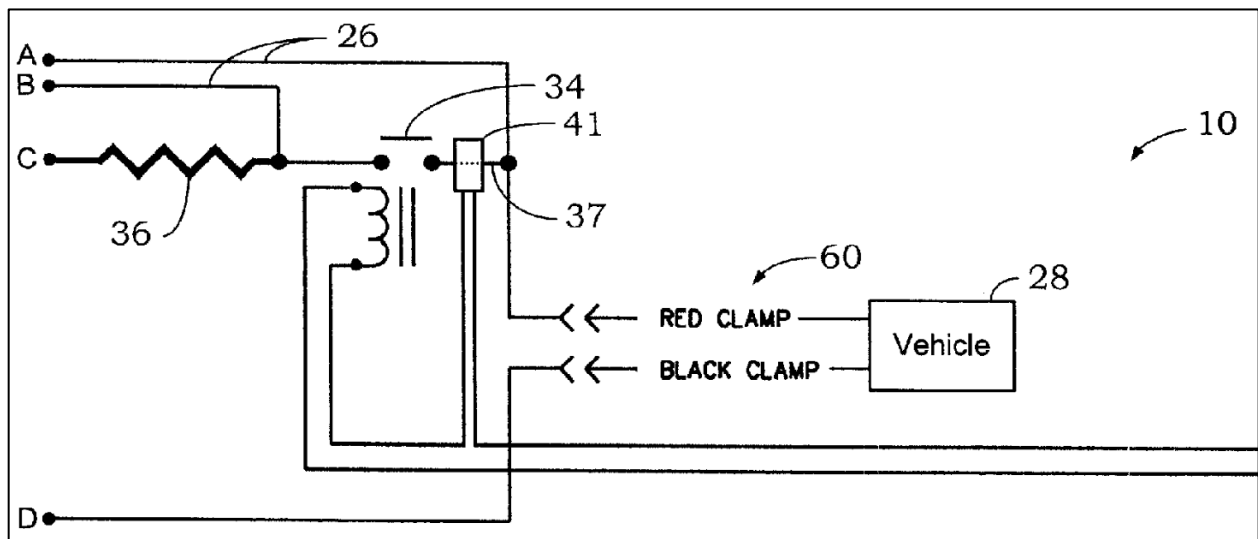


Fig. 7

EX1014, FIG. 7 (annotated, cropped); [0037]. Richardson explains that monitoring the jumpstarting current output through the cable can prevent an “overheating condition” in the car battery, which “may result in fire.” EX1017, [0007].

Predictable Combination of Chen and Richardson

139. As I previously noted in my analysis of Element [9] (Ground 1A), Chen teaches the use of a “relay” to cut off the jumpstarting current when the car battery returns to a normal voltage. Additionally, a POSITA would have been motivated to implement Chen’s relay K1 (Ground 1A, Element [9]) in accordance with Richardson’s suggested safety monitoring/time limits to avoid damage or critical exhaustion of the internal lithium battery—especially for the scenario in which the car battery does not immediately return to a normal voltage. For example, a POSITA would have been prompted to implement Chen’s relay so that the switching module ceased the jumpstarting current after a predetermined time period (as suggested by Richardson), which would avoid the unsafe scenario of the high-amperage current being output over an extended time period, thereby preserving the internal lithium battery and avoiding an overheating condition (e.g., at the connection or in the car battery).



EX1014, FIG. 2B (excerpt).

Element [10]: The portable backup charger of claim 9, wherein the switching module is further configured to prohibit the outputting of the second current after a predetermined time period has passed.

140. The predictable Chen-Richardson combination would have implemented Chen to provide a switching module in accordance with Richardson's suggestion—namely, to cut off the jumpstarting current after a predetermined period of time. EX1014, [0037] (suggesting a shorter/max-current limit of “500 ms” and also suggesting a moderate time limit of “15 seconds” for a different (lower) threshold amperage), FIG. 7.

XI. ANALYSIS OF CHEN AND GOZDZ (Ground 1D)

Chen (EX1005; translation at EX1006)

141. As I previously address the Chen reference in my analysis of Ground 1A above, Chen teaches a mobile charger device in which a lithium battery pack can

and exhibiting low capacity and discharge power loss after numerous high-rate charge and discharge cycles.” *Id.*

Predictable Combination of Chen and Gozdz

143. As I previously noted in my analysis of Element [9] (Ground 1A), Chen teaches the use of a lithium battery in its mobile power supply. EX1006, FIG. 1, [0022]-[0026]. Gozdz suggests the improved capabilities of lithium-ion batteries known in the prior art at the time. Here, a POSITA would have been motivated to implement the Chen’s device in a manner that employs the improved lithium-ion battery technology (including the discharge rate of “20C,” as suggested by Gozdz) so that the internal battery is “capable of repeated, safe, and stable charge and discharge at exceptionally high rates” while also being “inexpensive to make” and “having high energy and power capacity.” EX1008, 2:52-3:7, 9:54-61, 10:12-14.

Element [15]: The portable backup charger of claim 1, wherein the discharge rate of the battery pack is in a range of 20 c to 70 c.

144. The predictable Chen-Gozdz combination would have implemented Chen to provide a lithium-ion battery in accordance with Richardson’s suggestion, thereby providing the discharge rate of “20C”—the known capability confirmed by Gozdz. EX1014, 2:52-3:7 (“repeated, safe, and stable charge and discharge at exceptionally high rates”).

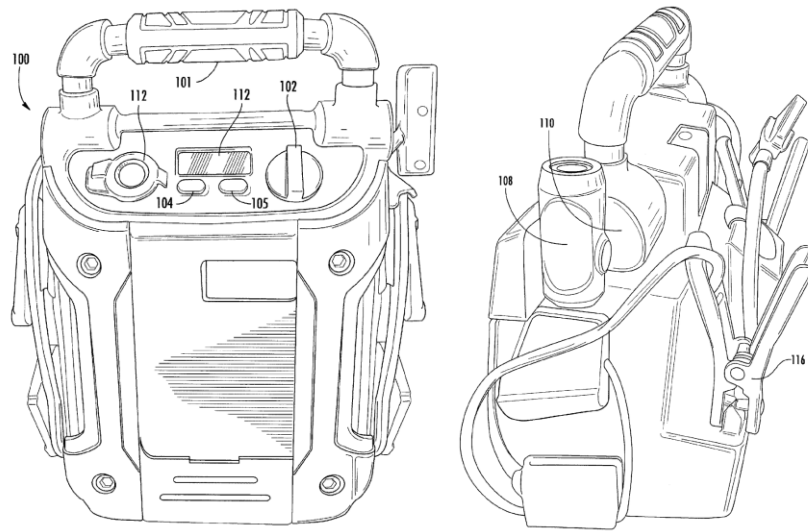
Element [29]: The portable backup charger of claim 21, wherein the discharge rate of the battery pack is in a range of 20 c to 70 c.

145. As explained above, the predictable Chen-Gozdz combination would have implemented Chen to provide a lithium-ion battery with the discharge rate of “20C,” in accordance with Gozdz’s suggestion. EX1014, 2:52-3:7 (“repeated, safe, and stable charge and discharge at exceptionally high rates”).

XII. ANALYSIS OF INSKEEP AND JOHNSON (Ground 2A)

Inskeep (EX1008)

146. Like the ’506 patent, Inskeep discloses “[a] multi-purpose battery jump starter” used “for boosting the power of a battery for use in jump starting an internal combustion engine.” EX1008, [0002], [0007]-[0010], [0024]-[0025], [0027]-[0028]. Inskeep also provides a USB port and a DC port for low-current power supply to compatible devices. EX1008, [0025]; *see also* [0008], [0027], [0034]. Therefore, Inskeep discloses the conventional use of a portable charger device that provides a first current path for supplying power to USB-connected devices (or 12V DC devices) and a second (higher-current) path for jumpstarting a vehicle via jumper cables:



EX1008, FIGS. 4 and 6, [0025].

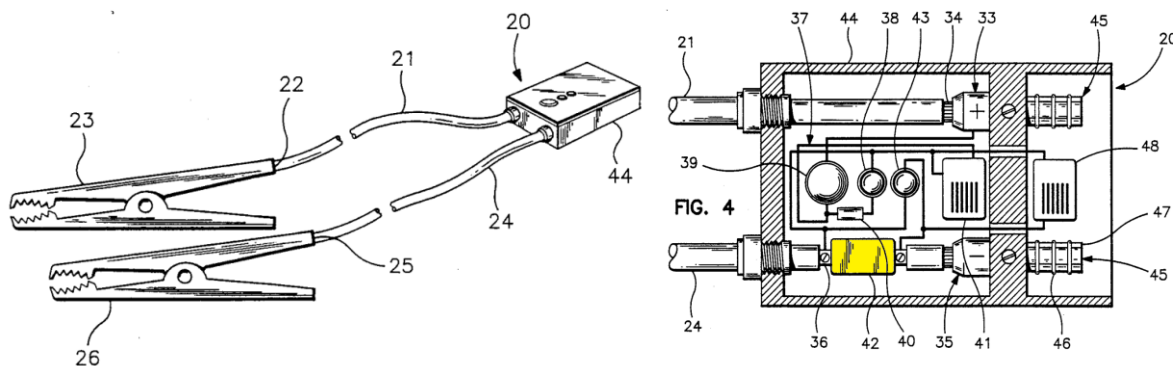
147. On the low-current DC path (e.g., through the USB port) Inskeep demonstrates and describes a traditional protection circuit—a “low voltage protection circuit”—to protect the circuit from short circuits or other conditions that cause a voltage drop when operating in the first mode to supply the low-current power. EX1008, [0032], cl. 3, FIG. 3. The low voltage protection circuit should “prevent operation of the USB port at voltages below 5 volts.” EX1008, [0032]. Inskeep further teaches that the 12V DC power port includes a protection circuit having a fuse “F2,” which cuts off current in the event of an overcurrent condition through that low-current path. EX1008, FIG. 3 (“F2” at the DC output port).

148. In the current path for jumpstarting, Inskeep teaches the system should be equipped with a second, different protection circuit that cuts off the jumpstarting current after a 5-second period—achieving “500A instantaneous-on, 5 seconds 300

A-off.” EX1008, [0025], FIG. 3. Further, Inskeep discusses a reverse polarity protected coupler to protect against the situation where “the cables are attached improperly so that a reverse polarity might accrue, for example attaching a negative connector to the positive terminal of a battery.” EX1008, [0028], [0035], FIG. 3.

Johnson (EX1009)

149. Johnson is in the same technological space as Inskeep in that both references describe a jumper cable connection to a car battery. EX1009, 1:6-13; EX1008, [0002]. Although Inskeep does not expressly describe the mechanical details of how the jumper cables attach to Inskeep’s “terminal block” ([0028]), Johnson details the common practice of using a jumper cable wiring harness having a removable connector at one end with improved safety/protection features built therein:



EX1009, FIG. 8 (cropped), FIG. 4 (annotated to highlight circuit breaker/fuse 42 built into the wiring harness), 4:36-65, 1:44-48, 2:20-29, 5:54-64. For example,

Johnson teaches such a wiring harness can advantageously include a “thermally-activated circuit breaker” (effectively a resettable fuse that does not need to be replaced after its activation) that cuts off the jumpstarting current in the unsafe event where “the battery of the vehicle being assisted has developed an internal short circuit.” EX1009, 4:36-65. Johnson also suggests such a removable harness can be used to provide a beneficial “press-to-test” option that allows the user an opportunity to test the harness-to-car battery connection before joining the connector plug (at the other end of the harness) to complete the jumpstarting circuit. EX1009, 4:3-18; 5:7-8 and 6:2-5 (describing “male alignment boss” and “female slot” for mutual alignment).

Predictable Combination of Inskip and Johnson

150. A POSITA would have been motivated to implement Inskip in a predictable manner that employs Johnson’s suggested benefits for a jumper cable harness device that provides additional safety and electronic protection advantages. Indeed, multiple reasons would have prompted a POSITA to implement such a combination.

151. First, a POSITA would have known that implementing Inskip’s portable charger device to include a jumper cable harness having a circuit breaker/resettable fuse built into the cables (as suggested by Johnson) would provide improved user safety. Indeed, Johnson expressly suggests that such a protection

circuit having a circuit breaker/fuse in the jumper cable harness can prevent unsafe delivery of jumpstarting current when the car battery “has developed an internal short circuit” (e.g., during the jumpstarting process) and would further enhance user safety by emitting a light/alarm at the harness connector for the end user to know that “[t]he battery may need replacement and it would be dangerous to continue attempting to charge such a battery.” EX1009, 4:36-65.

152. Additionally, a POSITA would have been motivated to implement Inskeep in a predictable manner that employs Johnson’s suggestion for a jumper cable harness device (having a circuit breaker/resettable fuse built into the cables) to advantageously add a layer of protection against electric damage to the portable charger device (and the internal battery therein). EX1009, 4:36-49 (“interrupts the flow of current”). Inskeep’s FIG. 3 does not identify a fuse in the high-current path to the jumper cables, so a fuse in the cable would have predictably provided an improved safety factor. Further, this predictable modification would have advantageously used the circuit breaker/resettable fuse (external to the portable charger housing) to cutoff the overcurrent/short circuit condition before electrical damage is imparted to the internal battery and electronics.

153. Third, a POSITA would have been motivated to implement this Inskeep-Johnson combination because, in accordance with Johnson’s suggestion, the jumper cable harness device could be connected to a car battery to

advantageously provide an opportunity for the “press-to-test” feature (e.g., testing the polarity of the connection *before* connecting the connector plug to Inskeep’s portable charger device), which would have added a further layer of protection against electrical damage to the internal battery. EX1009, 4:3-35 (“interrupts the flow of current”).

154. For example, in such a predictable combination based on Inskeep’s disclosure, a POSITA would have simply included a circuit breaker such as provided by Johnson so that, in the event the charging cables of Inskeep were improperly attached and an excessive current were detected, the circuit breaker would open, interrupting the flow of electricity to the cables, and therefore protect the vehicle battery and the charging system from damage. This response would in turn decrease the likelihood of potential damage to the jumper cable harness and to the depleted battery (*e.g.*, in the event of a short circuit or other overcurrent flow through the jumper cables). By installing the circuit breaker in the circuitry that attaches the charging cables to the system’s battery, the system ensures an instant response to the abnormal operating condition of overcurrent.

155. Fourth, the POSITA would have been motivated to modify Inskeep’s charger device to include a removable jumper cable harness (as suggested by Johnson) to provide more convenient and simpler maintenance and repair. In particular, to the extent the resulting system is exposed to an overcurrent condition

and the circuit breaker is tripped (preventing the aforementioned damage), the user would have the opportunity to advantageously reset the circuit breaker of an external cable harness prior to the next use without the need to access or repair the internal electronics/battery of the portable charger device. Or, even if the overcurrent condition damage to the protection circuit of jumper cable harness (while protecting the internal battery/electronics), the user would have the opportunity to more easily replace the circuit breaker (or the external harness itself) without the need to access or repair the internal electronics/battery of the portable charger device.

156. Finally, both Inskeep and Johnson are directed to vehicle battery charging systems for similar types of vehicles, and the evidence here confirms that a POSITA would have been sufficiently skilled to implement such a combination given the predictable mechanical/electrical components and the relatively advanced state of the art at the time. Accordingly, for the reasons articulated above, a POSITA would have had a reasonable expectation of success in effectuating the Inskeep-Johnson combination in the manner described below.

Element [1.P]: A portable backup charger, comprising:

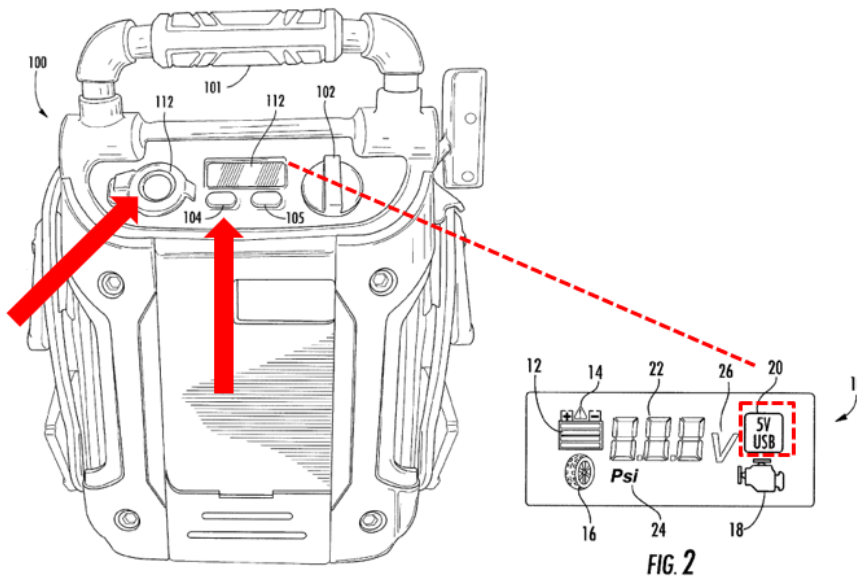
157. Even if the preamble is treated as a limitation, Inskeep describes “[a] multi-purpose battery jump starter” that provides “a portable battery booster for jump starting an engine.” EX1008, [0002]; *see also* [0007]-[0010], [0024]-[0025], [0027]-[0028], FIGS. 4-6.

Element [1.1]: a battery pack having at least one battery cell;

158. Inskeep describes the recited structure/functionality of Element [1.1]. For example, Inskeep discloses “[a] rechargeable internal battery.” EX1008, [0026]-[0027], [0029], [0032], Abst., Fig. 3.

Element [1.2]: at least one output port coupled to the battery pack, wherein the battery pack is configured to output a first current through one or more output ports of the at least one output port in a first operating mode;

159. Inskeep describes the recited structure/functionality of Element [1.2]. For example, Inskeep expressly teaches that each of a “USB power port” and a “DC power port” are connected to the internal battery, each of which provide the recited first operating mode used for outputting the low-current DC power to compatible devices. EX1008, [0025], [0027], [0032], [0034], FIGS. 3-4; *see also id.*, [0002], [0007]-[0008], [0010], [0024]. For example, the portable charger device includes a conventional “USB” port to supply power to receive a USB charger cable for a mobile device and a DC 12V power supply for mating with a charger cable having “a conventional cigarette style plug”:

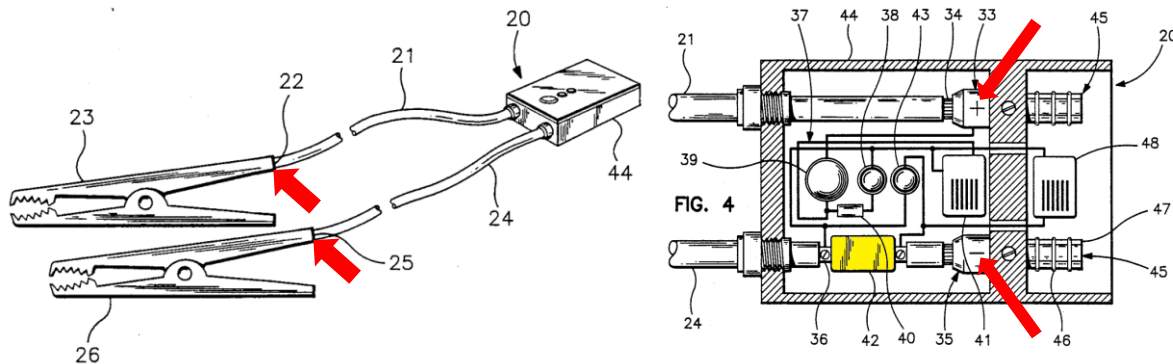


EX1008, FIGS 2 and 4 (annotated); [0025], [0027], [0032], [0034]. These accessories are, among other things, connected to the battery pack and set to operate at certain standard voltages to “further provide a device that can be used in an emergency when a loss of power occurs.” EX1008, [0025], FIG. 3. For example, the DC outlet is set for “12 DC power” and the USB port provides power in accordance with the USB standard (“5 volt level”). EX1008, [0025], [0032].

Element [1.3]: a pair of output terminals coupled to the battery pack and having a current path to the battery pack different from that of the at least one output port to the battery pack, wherein the battery pack is configured to output a second current capable of starting a vehicle engine through the pair of output terminals in a second operating mode, wherein the second current is higher than the first current;

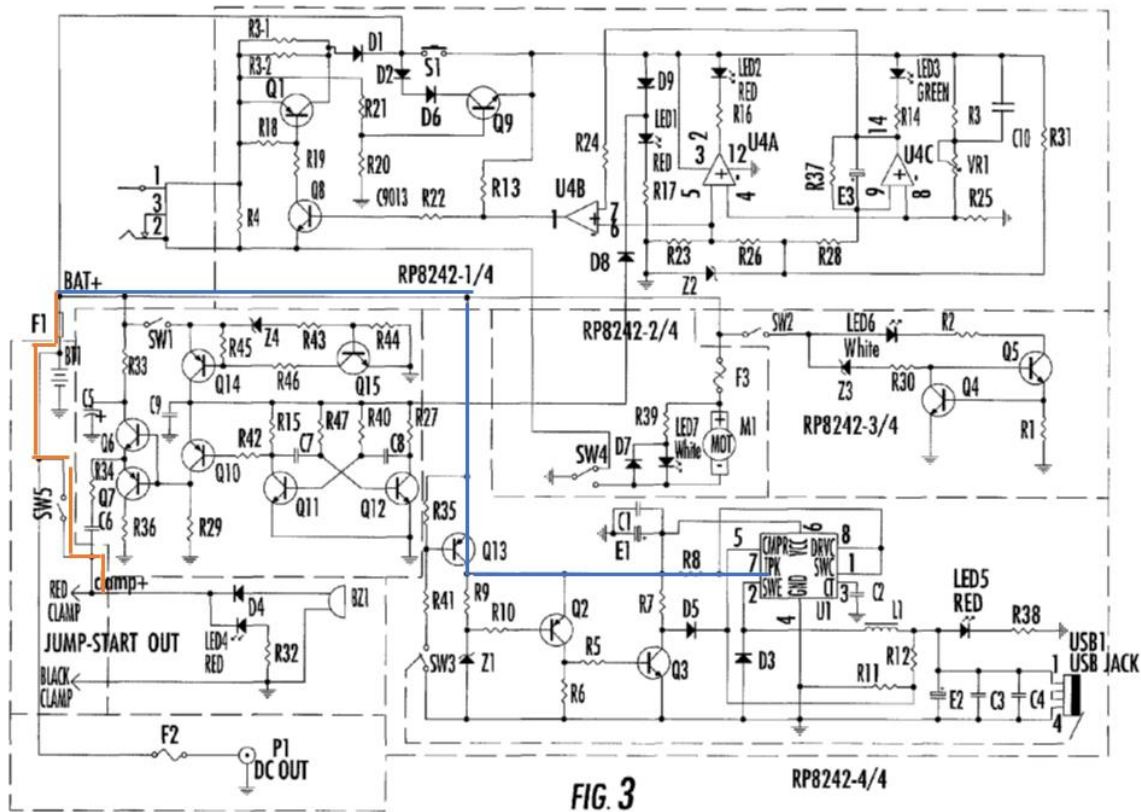
160. The predictable Inskeep-Johnson combination provides the recited structure/functionality of Element [1.3]. First, both Inskeep and Johnson teach the use of jumper cable connections to the car battery, thereby teaching the use of

positive and negative output terminals to provide the high-current path for jumpstarting a vehicle engine. EX1008, [0028]; EX1009, 1:6-13, 4:36-65, 5:54-64. Inskeep mentions that jumper cables can “connect” to “the terminal block” of Inskeep’s device ([0028]) without expressly detailing the mechanical details of such connection, yet Johnson suggests the common practice of using a jumper cable wiring harness having a removable connector at one end with improved safety/protection features built therein. EX1009, 4:3-65, 1:44-48, 2:20-29, 5:54-64. In the resulting combination (articulated above), the jumper cable harness would have included a first pair of output terminals at the keyed connector (as suggested by Johnson), and another pair of output terminals the other end of the jumper cable wires at the output junctions into the corresponding clamps:



EX1009, FIG. 8 (cropped, annotated), FIG. 4 (annotated).

161. Regarding the “different” current path, Inskeep teaches the jumpstarting current path should be different than the lower-current path to the USB port 104 and the DC port 112:



EX1008, FIG. 3 (annotated), FIGS. 4-6 (showing the low-current ports 104 and 112 are different from the jumper cable path). Also, based on the Inskeep teaching, the second current (to the jumper cables) is higher than the first current (to either of Inskeep's "USB" port 104 or 12V cigarette-plug port output 122). Indeed, Inskeep teaches the second current path should output "500A instantaneous-on, 5 seconds 300 A-off, 12 VDC" (EX1008, [0025]). This jumpstarting current is significantly greater than the first current that is output to Inskeep's USB port 104 that output according to the traditional "USB" standard (5V/0.5A) and furthermore indicates an amperage far exceeding Inskeep's normal "conventional cigarette style plug" of the

12V DC output 112. Inskeep teaches in Fig. 3 that this 12V output port P1 is protected by a fuse “F2.” EX1009, [0032], [0034]; FIG. 3.

Element [1.4]: a first protection circuit coupled to the battery pack and configured to protect the battery pack when the battery pack is working in the first operating mode; and

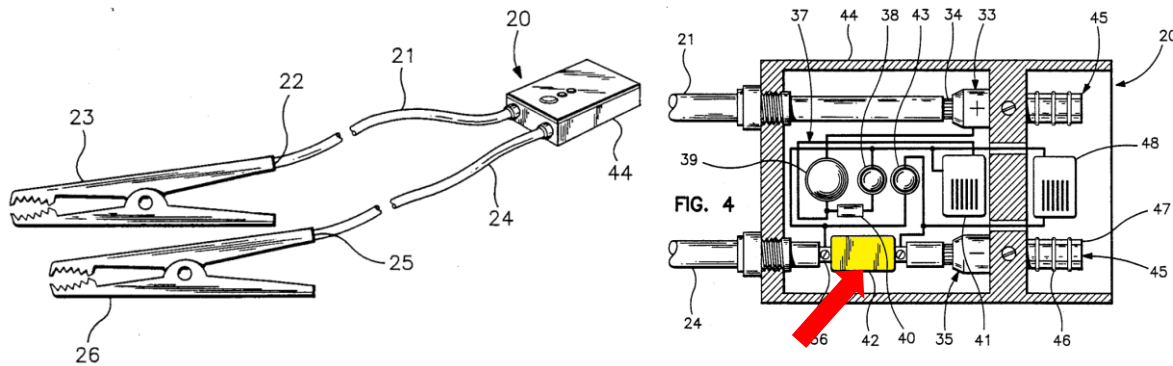
162. Inskeep describes the recited structure/functionality of Element [1.4]. In a first example, Inskeep discloses a “low voltage protection circuit” responsible for cutting off current to the USB port when voltage drops below a predetermined setpoint. EX1008, [0032] (“prevent operation of the USB port at voltages below 5 volts”). This protects the internal battery/circuitry against a short circuit or other conditions that might cause a voltage drop when operating in the first mode to supply the USB power. EX1008, [0032], cl. 3, FIG. 3. In a second example, Inskeep teaches that the 12V DC power port 112 includes a protection circuit having a fuse “F2,” which would cutoff current and protect the internal battery in the event of a short circuit/overcurrent condition through the port 112. EX1008, FIG. 3 (“F2” at the DC output port), [0034] (“coupling of 12V accessories”).

Element [1.5]: a second protection circuit coupled to the battery pack and configured to prevent overcurrent condition of the second current when the battery pack is working in the second operating mode.

163. The predictable Inskeep-Johnson combination provides the recited structure/functionality of Element [1.5]. First, Inskeep teaches that the second current path (jumpstarting current) should be implementing with a protection circuit

with specific cutoff limit at “5 seconds” to avoid overextending jumpstarting current delivery—namely, “500A instantaneous-on, 5 seconds 300 A-off, 12 VDC”—thereby protecting both the internal battery and the car battery from overcurrent/overheating. EX1008, [0025].

164. Second, even if this Element is not expressly disclosed by Inskeep, the predictable Inskeep-Johnson combination would have provided the claimed second protection circuit. Again, the Inskeep-Johnson combination would have implemented Inskeep in a predictable manner that employs Johnson’s suggestion for a jumper cable harness device (having a circuit breaker/resettable fuse built therein) to advantageously achieve the multiple known benefits articulated above:



EX1009, FIG. 8 (cropped, annotated), FIG. 4 (annotated). Thus, the resulting combination would have provided a second protection circuit to cut off the jumpstarting current in the event of an overcurrent condition (e.g., when “the battery of the vehicle being assisted has developed an internal short circuit”). EX1009, 4:36-49.

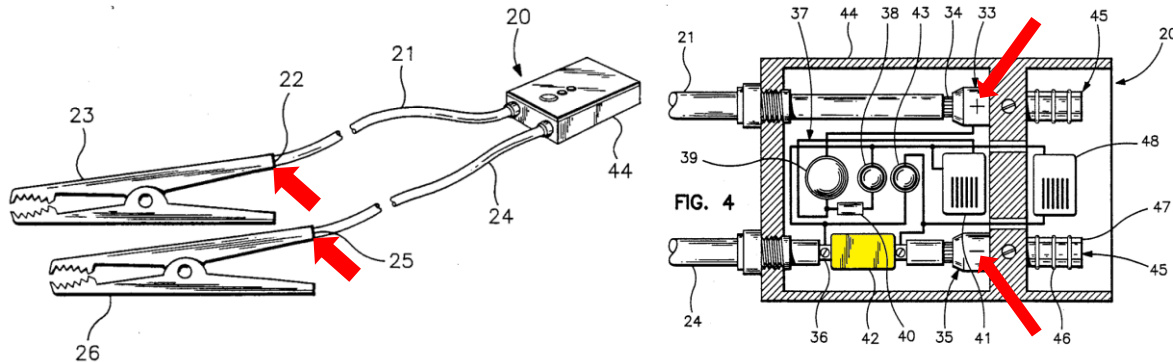
Element [3]: The portable backup charger of claim 1, wherein the battery pack is further configured to work in a third operating mode for outputting the first current and the second current simultaneously, and in the third operating mode both the first protection circuit and the second protection circuit are active.

165. The Inskip-Johnson combination provides the structure/functionality of Element [3]. For example, Inskip discloses or suggests for the device to provide “multiple functions” to achieve “safe starting of a vehicle battery, *and further provide* a device that can be used in an emergency when a loss of power occurs.” EX1008, [0025]; [0027] (describing FIG. 2’s display of both the “engine icon 18” (depicted “when the jump starter circuit is activated”) and the “USB icon 20” (depicted “when the USB port is available for use’’)). Additionally, Inskip FIG. 3 shows that the “USB JACK” is connected to the battery power supply in parallel with the jumpstarting output (“JUMP-START OUT”), so operating both the USB output and the jump starter would predictably output their respective power supply at the same time (e.g., the USB connection continues to charge a mobile device while the user proceeds with the jumpstarting process).

Element [6]: The portable backup charger of claim 1, further comprising a pair of connecting wires for detachably coupling the pair of output terminals with the battery pack, each connecting wire having a clamp for clamping an electrode of an external vehicle battery.

166. The Inskip-Johnson combination provides the structure/functionality of Element [6]. As previously described in Elements [1.3] and [1.5], in the predictable combination, the jumper cable harness would have included a pair of

output terminals at the removable connector (as suggested by Johnson) and another pair of output terminals at the other end of the jumper cables wires for the terminal connections with the clamps:



EX1009, FIG. 8 (cropped, annotated), FIG. 4 (annotated), 5:7-8 and 6:2-6 (suggesting mating connector structures). Accordingly, in the resulting combination, these pairs of output terminals of the jumper cable harness are all detachably coupled to Inskeep's internal battery (via removal of the connector), and the jumper cable harness further provides the traditional clamps for connecting with the car battery. *Supra*, Section XII, Analysis of Elements [1.3] and [1.5].

Element [7]: The portable backup charger of claim 6, wherein the second protection circuit is built into at least one of the pair of connecting wires.

167. The Inskeep-Johnson combination provides the structure/functionality of Element [7]. As previously described, Johnson plainly suggests the second protection circuit having the “thermally activated circuit breaker 42” built into one of the harness wires. EX1009, 4:36-65, FIG. 4.

Element [8]: The portable backup charger of claim 6, wherein the pair of

connecting wires comprises a reverse connection-proof plug.

168. The Inskip-Johnson combination provides the structure/functionality of Element [7]. As previously described, Johnson teaches that the connector (FIG. 4) should have a “male alignment boss” that mates with a corresponding slot to prevent a reverse-polarity connection. EX1009, FIG. 4, 5:7-8 and 6:2-6 (“mutual alignment”), FIGS. 2 and 7.

Element [9]: The portable backup charger of claim 1, further comprising a switching module operable to switch on or off the second current from the battery pack.

169. Inskip discloses the recited structure/functionality of Element [9]. In a first example, Inskip teaches the “control system determines positioning of a switch” that is used to switch on or off the second mode (for jumpstarting current):

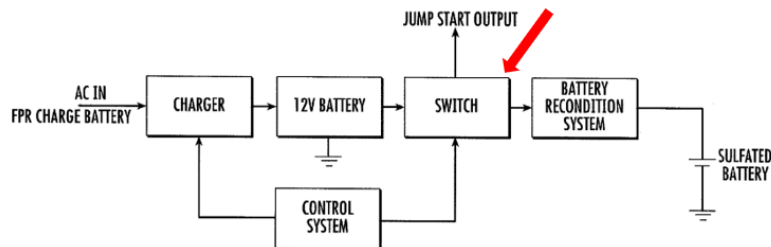
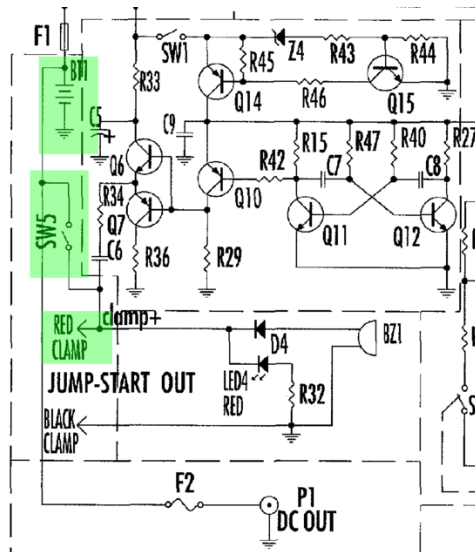


FIG. 1

EX1008, FIG. 1, [0026], [0030] (“switch SW1”), [0031] (“switch 105”), cl. 1 (“battery switching means”). This is shown more clearly in Inskip’s FIG. 3, where switch SW5 optionally connects the battery to the jump-starting terminal “RED CLAMP”:



Element [10]: The portable backup charger of claim 9, wherein the switching module is further configured to prohibit the outputting of the second current after a predetermined time period has passed.

170. Inskeep discloses the recited structure/functionality of Element [10].

Inskeep teaches that the jumpstarting current should be automatically switched off after “5 seconds.” EX1008, [0025] (“5 seconds 300A-off, 12 VDC”), FIG. 3.

Element [11]: The portable backup charger of claim 1, further comprising at least one voltage adjusting circuit, each voltage adjusting circuit being coupled between the battery pack and one of the at least one output port and configured to elevate or reduce an output voltage of the battery pack to a predetermined voltage at the respective output port.

171. Inskeep discloses the recited structure/functionality of Element [11].

For example, Inskeep teaches the “USB” output port is connected with a voltage adjusting circuit so that “a 5 volt level is maintained” at the USB output while the internal battery has a voltage of about 12V. EX1008, [0032], [0027] (“voltage of

the battery is greater than 12.8V”), FIG. 3 (“U1” as well as “C3” and “C4”).

Element [12]: The portable back up charger of claim 1, wherein the first current is of 0.5 to 10 A.

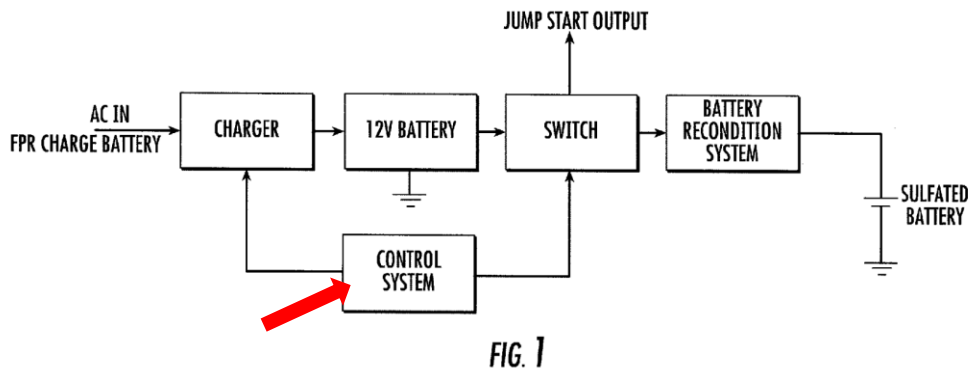
172. Inskeep teaches or suggests the recited structure/functionality of Element [12]. For example, Inskeep teaches the conventional “USB” port, and the evidence here confirms this was a straightforward teaching for an output in accordance with the USB standard (5V/0.5A output). EX1008, [0025], [0032], FIG. 3 (“USB jack”).

Element [13]: The portable backup charger of claim 1, wherein the second current is of 100 to 400 A.

173. Inskeep describes the recited structure/functionality of Element [13]. Inskeep teaches the second current in the range of 300A during the preferred output of “500A instantaneous-on, 5 seconds 300 A-off, 12 VDC” for jumpstarting the vehicle. EX1008, [0025].

Element [14]: The portable backup charger of claim 1, further comprising a controller configured to control the operating mode of the battery pack.

174. Inskeep discloses the recited structure/functionality of Element [14]. Inskeep teaches a “control system” that is responsible for switching the operating mode of the portable charger device:



EX1008, FIG. 1 (annotated), [0026], [0031]-[0035], FIG. 3.

Element [16]: *The portable backup charger of claim 1, wherein the at least one output port comprises a universal serial bus (USB) port.*

175. Inskeep discloses the recited structure/functionality of Element [16] because it teaches the “USB power port 104.” EX1008, [0025], [0027], [0032], FIGS. 3-4.

Element [17]: *The portable backup charger of claim 1, wherein the at least one output port comprises an output port of a rating voltage of 12V.*

176. Inskeep and Johnson describe the recited structure/functionality of Element [17] because Inskeep teaches that a “DC power port 112” is a “12V” outlet to power 12V accessories. EX1008, [0034], FIGS. 3-4, [0025].

Element [20]: *The portable backup charger of claim 1, wherein the pair of output terminals is detachably coupled to the battery pack.*

177. The Inskeep-Johnson combination provides the structure/functionality of Element [20]. As previously described in Elements [1.3], [1.5], and [6] above, each of the pairs of output terminals of the jumper cable harness is detachably coupled to Inskeep’s internal battery (via removal of the harness connector):

Element [21.P]: A portable backup charger, comprising:

Element [21.1]: *a battery pack having at least one battery cell;*

Element [21.2]: a first current path through which a first current is output by the battery pack when it is working in a first operating mode;

Element [21.3]: a second current path through which a second current capable of starting a vehicle engine is output by the battery pack when it is working in a second operating mode, wherein the second current is higher than the first current;

181. *Supra* Section XII, Analysis of the Inskeep-Johnson Combination at Element [1.3].

Element [21.4]: a first protection circuit coupled to the battery pack and configured to protect the battery pack when it is working in the first operating mode; and

182. *Supra* Section XII, Analysis of Inskeep at Element [1.4].

Element [21.5]: a second protection circuit coupled in the second current path and

configured to prevent overcurrent condition of the second current when it is working in the second operating mode.

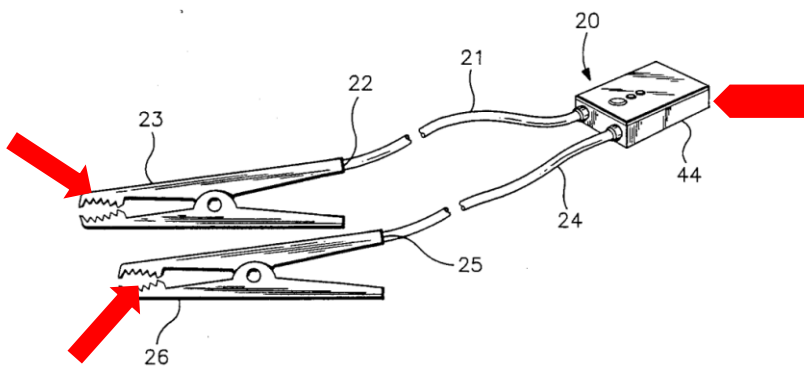
183. *Supra* Section XII, Analysis of the Inskip-Johnson Combination at Element [1.5].

Element [23]: The portable backup charger of claim 21, wherein the battery pack is further configured to work in a third operating mode for outputting the first current and the second current simultaneously, and in the third operating mode both the first protection circuit and the second protection circuit are active.

184. *Supra* Section XII, Analysis of Inskip at Element [3].

Element [25.1]: The portable backup charger of claim 21, further comprising: a pair of connecting wires for detachably coupling the battery pack with the vehicle engine to allow the second current flow through the second current path;

185. The Inskip-Johnson combination provides the structure/functionality of Element [25.1]. As previously described in Element [1.5], the predictable combination would have included the jumper cable harness equipped with removable connector at one end and a pair of battery clamps at the other end:

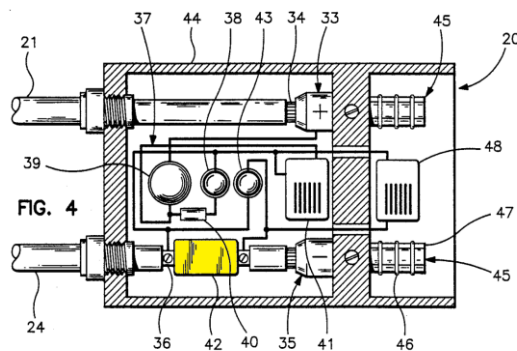


EX1009, FIG. 8 (cropped, annotated). Accordingly, Inskip's internal battery would have been detachably coupled to the vehicle battery via the conventional clamps of

the jumper cable harness and via the removable connector. *Supra*, Section XII, Analysis of Element [1.5].

Element [25.2]: wherein the second protection circuit is built into at least one of the pair of connecting wires.

186. Also as previously described in Element [1.5], the predictable combination would have included the jumper cable harness equipped with the circuit breaker/resettable fuse of the second protection circuit along one of the jumper cable wires:



EX1009, FIG. 4 (annotated), 4:36-65; *supra*, Section XII, Analysis of Element [1.5].

Element [26]: The portable backup charger of claim 21, further comprising a switching module operable to switch on or off the second current path.

187. *Supra* Section XII, Analysis of Inskeep at Element [9].

Element [27]: The portable backup charger of claim 21, wherein the second current is of 100 to 400 A.

188. *Supra* Section XII, Analysis of Inskeep at Element [13].

Element [28]: The portable backup charger of claim 21, wherein the second current is of 100 to 400 A.

189. *Supra* Section XII, Analysis of Inskeep at Element [14].

Element [30]: The portable backup charger of claim 21, wherein the at least one output port comprises a universal serial bus (USB) port.

190. *Supra* Section XII, Analysis of Inskeep at Element [16].

Element [31]: The portable backup charger of claim 21, wherein the at least one output port comprises an output port of a rating voltage of 12V.

191. *Supra* Section, XII, Analysis of Inskeep at Element [17].

XIII. ANALYSIS OF INSKEEP IN VIEW OF JOHNSON AND DURANDO (Ground 2B)

Durando (EX1010) and Predictable Combination of Inskeep-Johnson- Durando

192. Much like the '506 patent, Durando discloses a “[a] portable battery booster,” and Durando expressly suggests the common use and known benefits of lithium-based battery cells for such devices. EX1010, [0008], [0016], [0020]. The evidence here confirms a POSITA would have been motivated to implement the Inskeep-Johnson combination (articulated above in Ground 2A) utilizing lithium-based battery cells (as suggested by Durando) in order to achieve any or all of the Durando’s stated advantages of “fast charging, small size, and high performance.” EX1008, [0008]. Additionally, by the relatively late time frame leading up to December 2011, the evidence here confirms that a POSITA would have implemented such an improvement (lithium-based battery cells as suggested by Durando) to provide a portable charger device having a longer useful life when subjected to repeated recharges.

Element [19]: The portable backup charger of claim 1, wherein the at least one battery cell is lithium based battery cell.

193. The Inskeep-Johnson-Durando combination provides the recited structure/functionality of Element [19]. Here, the combination would have implemented Durando’s suggestion for using “one or more batteries having the type of primary lithium-metal, rechargeable lithium-ion, and/or lithium polymer” in a portable charger device (like that of Inskeep) so as to achieve the advantages articulated above. EX1010, [0008], [0016].

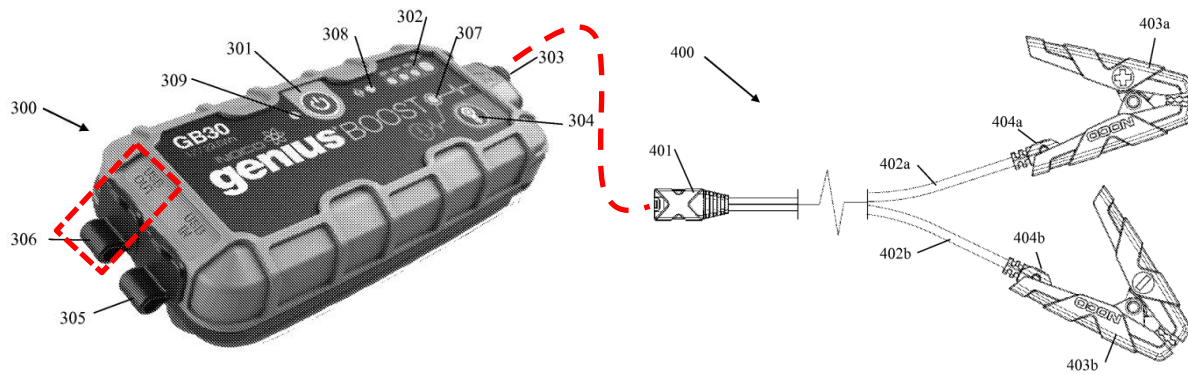
Element [33]: The portable backup charger of claim 21, wherein the at least one battery cell is lithium based battery cell.

194. *Supra* Section XIII, Analysis of Inskeep-Johnson-Durando at Element [19].

XIV. ANALYSIS OF NOOK (Ground 3A)

Nook (EX1020)

195. Nook discloses “[a] handheld device” having an internal lithium-based battery that supplies power to a “USB” port for charging smartphones and to a “jumper cable” harness for jump starting a vehicle engine:



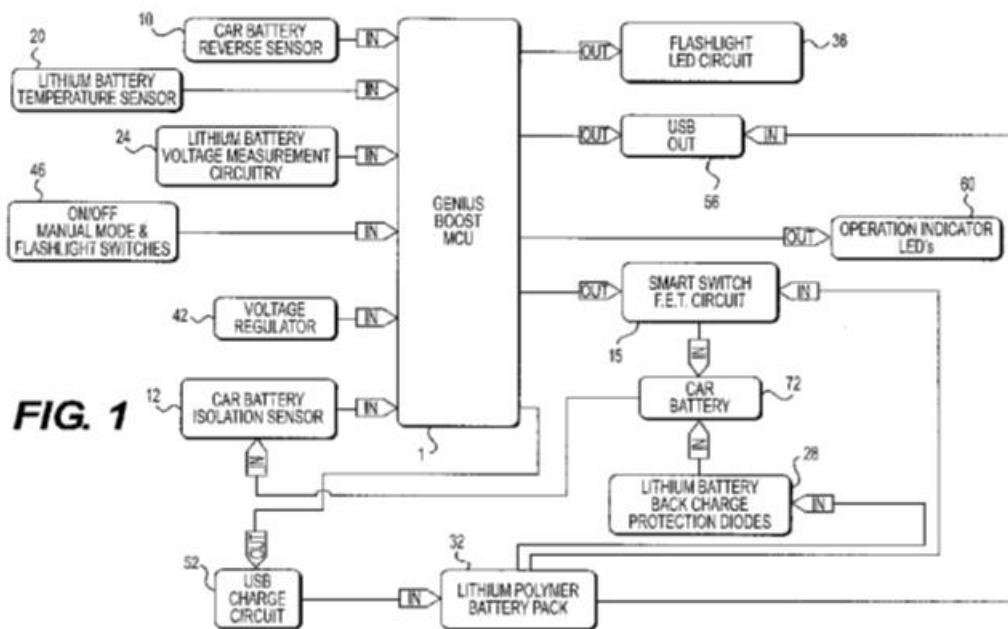
EX1012, FIGS. 3-4 (annotated), 4-6 (“handheld battery booster”), 10 (“USB output”), 11 (“jumper cable device”).⁴ Nook was filed before (and published months before) Patent Owner added the new matter into the April 29, 2016 application, which I explained above in Section VI.D-E above.

196. As shown below, Nook shows that it was common—before April 2016—for portable charger devices to include features such as “a lithium polymer battery pack 32,” a “programmable microcontroller unit (MCU) 1,” a “car battery reverse sensor 10,” a “car battery isolation sensor 12,” a “smart switch FET circuit 15,” a “USB charge circuit 52,” a “USB output 56,” and “lithium battery back-charge protection diodes 28.” EX1012, 6-7, FIG. 1.

197. The lithium polymer battery pack 32 is disclosed to, among other things, provide “11.1V, 2666Ah (8000Ah at 3.7V, 29.6Wh).” EX1012, 6. The

⁴ Note: citations to EX1012 refer to the exhibit page number, which is one greater than Nook’s original page numbering.

provided “[c]ontinuous discharge current is 25C (or 200 amps), and burst discharge current is 50C (or 400 amps).” *Id.* The programmable microcontroller unit 1 is designed to “control outputs” as well as “provide several inputs” to ensure proper operation of the jumper battery apparatus. EX1012, 6. When a receiving battery is connected to the apparatus, smart switch FET circuit 15 aligns the circuitry to provide power to the receiving battery. *Id.* In the event the jumper terminals are improperly affixed to a receiving battery, reverse battery sensor 10 will detect the improper connection, sending a signal to prevent sending current from the lithium battery to the connected battery. EX1012, 6-7. And if current attempts to flow from the receiving battery to the lithium battery improperly, lithium battery back-charge protection diodes are in the circuit to prevent damaging the lithium battery. EX1012, 7.

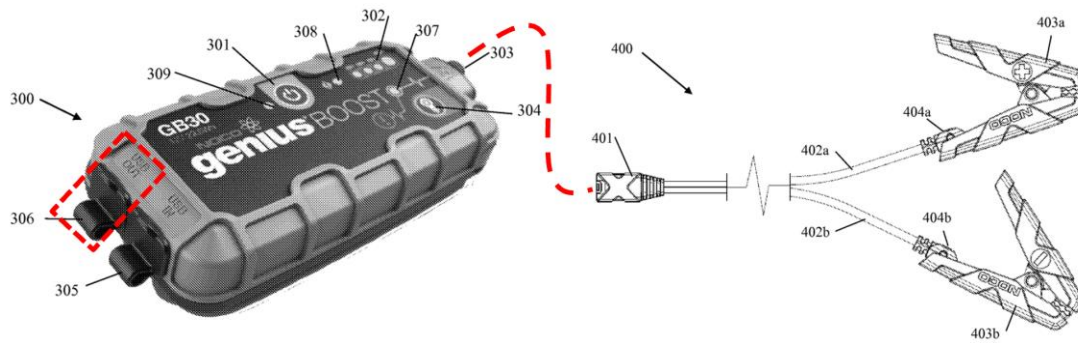


EX1012, Fig. 1.

Anticipation by Nook

Element [1.P]: A portable backup charger, comprising:

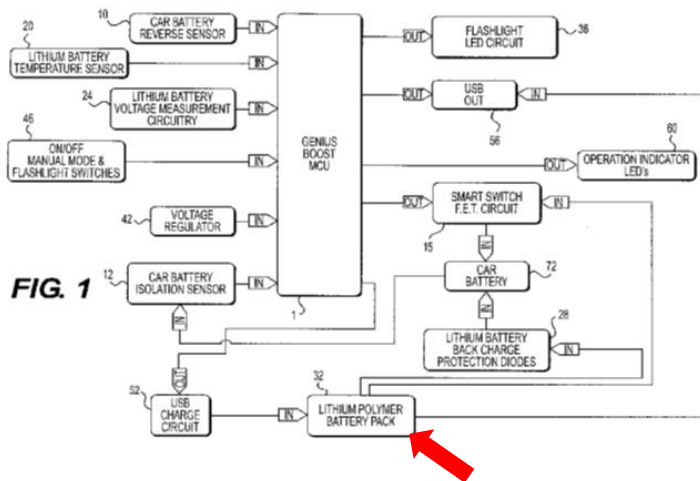
198. Even if the preamble is treated as a limitation (which Petitioner does not concede), Nook describes Element [1.P]. For example, Nook discloses “[a] handheld device for jump starting a vehicle engine”:



EX1012, FIGS. 3-4 (annotated), 7-9. Nook teaches that the handheld device is “a mobile power supply” that provides power through a “high current output unit” that is capable of providing a current to a “car battery.” EX1012, 7, 9.

Element [1.1]: a battery pack having at least one battery cell;

199. Nook describes the recited structure/functionality of Element [1.1]. For example, Nook discloses “a lithium polymer battery pack 32”:

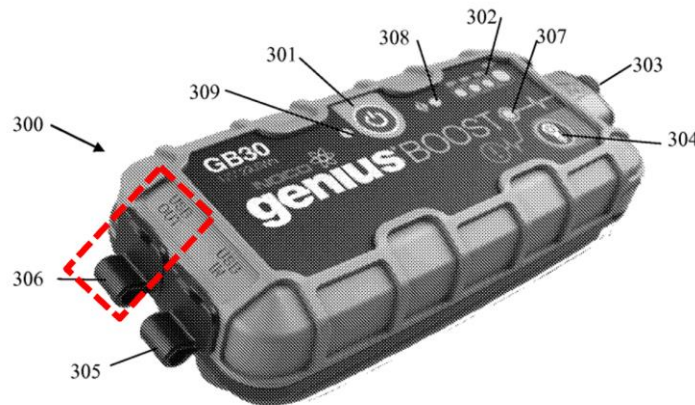


EX1012, FIG. 1 (annotated), 6-8.

Element [1.2]: at least one output port coupled to the battery pack, wherein the battery pack is configured to output a first current through one or more output

ports of the at least one output port in a first operating mode;

200. Nook describes the recited structure/functionality of Element [1.2]. For example, Nook discloses a “USB output 56” configured to output a standard USB current through a “standard USB connector 58” in a first operating mode for “charging portable electronic devices such as smartphones.” EX1012, 11, 8. Nook depicts the traditional rectangular port for the “USB out” to connect with an ordinary USB-compatible cable:

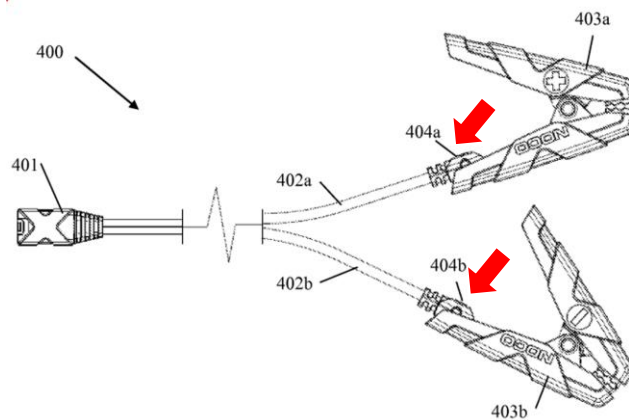


EX1012, FIG. 3 (annotated).

Element [1.3]: a pair of output terminals coupled to the battery pack and having a current path to the battery pack different from that of the at least one output port to the battery pack, wherein the battery pack is configured to output a second current capable of starting a vehicle engine through the pair of output terminals in a second operating mode, wherein the second current is higher than the first current;

201. Nook describes the recited structure/functionality of Element [1.3]. For example, Nook discloses a jumper cable harness 400 having a pair of “terminals 404a and 404b” at the output junction from the positive/negative cables to the clamps

403a and 403b:



EX1012, FIG. 4 (annotated), 12, 5-6 (“positive and negative polarity outputs”).

202. Nook further discloses that the battery pack 32 is configured to output the claimed second current through the pair of output terminals of the jumper cable device 400. EX1012, 67 (“to jump start a vehicle engine”), 9 (“thereby connecting lithium battery pack to the jumper terminals”); 11 (“battery terminal clamps”). Also, Nook teaches that the second current (for jumpstarting) is “200A” or a burst average of “400A” (EX1012, 7), which is hundreds of times higher than the first current from Nook’s “standard USB connector” (EX1012, 11) used to charge smartphones according to the ubiquitous USB standard (5V/0.5A). EX1012, 7, 11, FIG. 2C (“56” and “58”).

Element [1.4]: a first protection circuit coupled to the battery pack and configured to protect the battery pack when the battery pack is working in the first operating mode; and

203. Nook describes the recited structure/functionality of Element [1.4]. For

example, Nook discloses a protection circuit that includes “[c]ontrol circuit 57 from the microcontroller 1” that “allows the USB output 56 to be turned on and off by software control to prevent the internal lithium battery getting too low in capacity.” EX1012, 1011 (referring to FIG. 2C). Thus, based on Nook’s teaching, in the event the battery’s state of charge falls below a threshold while the USB output is operating (e.g., for charging a “smartphone”), the protection circuit will cut off the first current to protect the lithium battery from critical-level exhaustion. EX1012, 11.

Element [1.5]: a second protection circuit coupled to the battery pack and configured to prevent overcurrent condition of the second current when the battery pack is working in the second operating mode.

204. Nook describes the recited structure/functionality of Element [1.5]. Indeed, Nook discloses at least three examples of the claimed second protection circuit as recited in this Element. In a first example, Nook teaches that a reverse battery sensor 10 and battery isolation sensor 12 interact with the microcontroller unit 1 (“MCU”) to achieve a protection circuit that can detect unsafe conditions and prevent an overcurrent condition between the lithium battery pack to the jumper terminals—“thus prevent[ing] sparking/short circuiting of the lithium battery pack.” EX1012, 8-9, FIGS. 1-2A (MCU “1” and circuit elements “10” and “12”). In particular, the MCU 1 can receive input from the isolation sensor 12 to confirm “there is a good (e.g. chargeable battery) connected to the output terminals” (Ex1012, 7), and the reverse battery sensor 10 to indicate whether the jumper cables

have connected to the battery terminals “with the correct polarity” (EX1012, 9). Based on these inputs, the MCU 1 “can determine when it is safe to turn on the smart switch FET 15” and, if not, “the MCU 1 can keep the smart switch FET 15 from being turned on” (thereby preventing an overcurrent condition of the jumpstarting current). EX1012, 9.

205. In a second example, Nook teaches that a temperature sensor 20 interacts with the MCU 1 to achieve a protection circuit that cuts off the jumpstarting current to prevent overheating from an “overextended current draw during jump starting.” EX1012, 7-8, FIGS. 1-2A (MCU “1” and circuit element “20”). In particular, the temperature sensor 20 provides feedback to the MCU 1 to signal when the lithium battery temperature is overheating (e.g., from “overextended” current), and the MCU will then “not allow jumpstarting, adding safety to the design.” EX1012, 10.

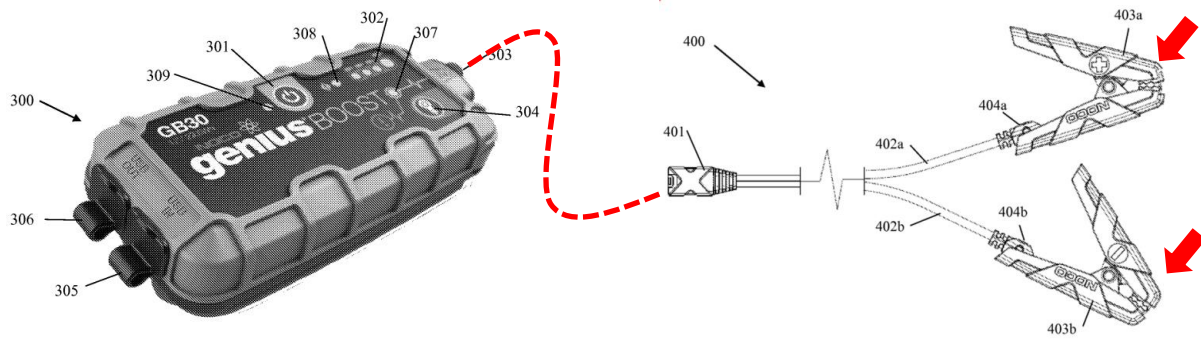
206. In a third example, Nook teaches a protection circuit that includes a set of “charge protection diodes 28” that operate during the jumpstarting process to prevent a reverse current back toward the “internal lithium battery.” EX1012, 10, FIGS. 1 and 2B. As such, even if the car’s alternator generated an excess voltage/current, this protection circuit prevents any overcurrent “from the car battery to the internal lithium battery.” EX1012, 10 (“it cannot back-charge (and thereby damage) the internal lithium battery”).

Element [2]: The portable backup charger of claim 1, wherein when the first protection circuit is configured to prevent overcurrent condition of the first current, and overcharge and overdischarge condition of the battery pack.

207. Nook describes the recited structure/functionality of Element [2]. For example, Nook discloses “[i]n this way, the microcontroller software can turn the charge off if the battery voltage is measured to be too high by the A/D input 22.” EX1012, 10. Nook further discloses that “[a]dditional safety is provided for helping to eliminate overcharge to the internal lithium battery using a lithium battery charge controller 50 that provides charge balance to the internal lithium battery cells 51.” *Id.* Finally, Nook discloses that “[t]his controller also provides safety redundancy for eliminating over discharge of the internal lithium battery.” *Id.*

Element [6]: The portable backup charger of claim 1, further comprising a pair of connecting wires for detachably coupling the pair of output terminals with the battery pack, each connecting wire having a clamp for clamping an electrode of an external vehicle battery.

208. Nook describes the recited structure/functionality of Element [6] for the same reasons previously described in Element [1.3]. In particular, Nook teaches that a jumper cable device 400 (FIG. 4) provides the claimed pair of connecting wires. EX1012, 12, FIG. 4. Nook explains that the device 400 detachably couples the pair of “terminals 404a and 404b” (at the output junction from the positive/negative cables to the clamps 403a and 403b) with the internal battery via the removable plug 401:



EX1012, FIGS. 3-4 (annotated), 12 (“to plug into 12 volt output port 303”), 5-6. As shown above, the device 400 includes battery clamps 403a-403b. EX1012, FIGS. 4, 12.

Element [8]: The portable backup charger of claim 6, wherein the pair of connecting wires comprises a reverse connection-proof plug.

209. Nook describes the recited structure/functionality of Element [8]. Nook discloses “[t]he port 303 and plug 401 may be dimensioned so that the plug 401 will only fit into the port 303 in a specific orientation, thus ensuring that clamp 403a will correspond to positive polarity, and clamp 403b will correspond to negative polarity, as indicated thereon.” EX1012, 11.

Element [9]: The portable backup charger of claim 1, further comprising a switching module operable to switch on or off the second current from the battery pack.

210. Nook describes the recited structure/functionality of Element [9]. In a first example, Nook describes “a smart switch FET circuit 15” that “electrically switches the handheld battery booster lithium battery to the vehicle's electric system

only when the vehicle battery is determined by the MCU 1 to be present.” EX1012, 7, FIGS. 1 and 2B (switch “15”). In a second example, Nook discloses “301 is a power on switch . . .” and “307 is a ‘boost on’ indicator showing that power is being provided to the 12V output port.” EX1012, 11, 10 (“main power on switch 46”), FIGS. 2A and 3.

Element [10]: The portable backup charger of claim 9, wherein the switching module is further configured to prohibit the outputting of the second current after a predetermined time period has passed.

211. Nook describes the recited structure/functionality of Element [10]. Nook discloses MCU software also includes “a timer” is configured to turn off the power after “a predefined period of time.” EX1012, 9-10.

Element [11]: The portable backup charger of claim 1, further comprising at least one voltage adjusting circuit, each voltage adjusting circuit being coupled between the battery pack and one of the at least one output port and configured to elevate or reduce an output voltage of the battery pack to a predetermined voltage at the respective output port.

212. Nook describes the recited structure/functionality of Element [11]. Nook discloses “[t]he main voltage regulator circuit 42 is designed to convert internal lithium battery voltage to a regulated 3.3 volts.” EX1012, 9. Additionally or alternatively, Nook teaches that USB output 56 acts as a “portable charger for charging smartphones” (EX1012, 8) via the “standard USB connectors 58” (EX1012, 11) thereby adjusting the voltage of the internal battery voltage “11.1V” (EX1012, 7) down to the USB standard (5V) using the conventional USB buck

circuit in FIG. 2C.

Element [12]: The portable back up charger of claim 1, wherein the first current is of 0.5 to 10 A.

213. Nook describes the recited structure/functionality of Element [12]. Nook discloses the “USB output” and the “standard USB connector,” which are disclosed to provide power to “other portable devices such as smartphones, tablets, music players, etc.” EX1012, 11, FIG. 3. The evidence here confirms that Nook’s teaching for such conventional “USB” outputs is a straightforward teaching for an output in accordance the USB standard (5V/0.5A), thereby providing the first current amount in the range of 0.5 to 10 A.

Element [13]: The portable backup charger of claim 1, wherein the second current is of 100 to 400 A.

214. Nook describes the recited structure/functionality of Element [13]. Nook discloses that the discharge rate is “25C (or 200 amps), and burst discharge current is 50C (or 400 amps).” EX1012, 7.

Element [14]: The portable backup charger of claim 1, further comprising a controller configured to control the operating mode of the battery pack.

215. Nook describes the recited structure/functionality of Element [14]. Nook discloses that the MCU 1 “controls outputs” of the handheld device. EX1012, 7. For example, the MCU 1 interacts with the “smart FET switch 15” to switch “the handheld battery booster lithium battery to the vehicle’s electric system only when the vehicle battery is determined by the MCU 1 to be present.” EX1012, 7.

Element [15]: The portable backup charger of claim 1, wherein the discharge rate of the battery pack is in a range of 20 c to 70 c.

216. Nook describes the recited structure/functionality of Element [15]. Nook discloses the preferred discharge rate of “25C” and a burst discharge current of “50C.” EX1012, 7.

Element [16]: The portable backup charger of claim 1, wherein the at least one output port comprises a universal serial bus (USB) port.

217. Nook describes the recited structure/functionality of Element [16]. Nook depicts the USB port in FIG. 3 and teaches that “USB output 56 provides a USB portable charger for charging smartphones, tablets, and other rechargeable electronic devices.” EX1012, 8, 11, FIG. 3.

Element [19]: The portable backup charger of claim 1, wherein the at least one battery cell is lithium based battery cell.

218. Nook describes the recited structure/functionality of Element [19]. Nook teaches “lithium power battery pack 32” that provides power to the booster module for providing power to a vehicle battery or other outlets. EX1012, 6; *see also* EX1012, 6-7, FIG. 1.

Element [20]: The portable backup charger of claim 1, wherein the pair of output terminals is detachably coupled to the battery pack.

219. Nook describes the recited structure/functionality of Element [20] for the same reasons previously described in Elements [1.3] and [6]. *Supra* Section XIV, analysis of Nook at Elements [1.3] and [6] (citing to Nook’s FIG. 4 and p. 12).

Element [21.P]: A portable backup charger, comprising:

220. *Supra* Section XIV, analysis of Nook at Element [1.P].

Element [21.1]: a battery pack having at least one battery cell;

221. *Supra* Section XIV, analysis of Nook at Element [1.1].

Element [21.2]: a first current path through which a first current is output by the battery pack when it is working in a first operating mode;

222. *Supra* Section XIV, analysis of Nook at Element [1.2].

Element [21.3]: a second current path through which a second current capable of starting a vehicle engine is output by the battery pack when it is working in a second operating mode, wherein the second current is higher than the first current;

223. *Supra* Section XIV, analysis of Nook at Element [1.3].

Element [21.4]: a first protection circuit coupled to the battery pack and configured to protect the battery pack when it is working in the first operating mode; and

224. *Supra* Section XIV, analysis of Nook at Element [1.4].

Element [21.5]: a second protection circuit coupled in the second current path and configured to prevent overcurrent condition of the second current when it is working in the second operating mode.

225. *Supra* Section XIV, analysis of Nook at Element [1.5].

Element [22]: The portable backup charger of claim 21, wherein the first protection circuit is configured to prevent overcurrent condition of the first current, and overcharge and overdischarge condition of the battery pack.

226. *Supra* Section XIV, analysis of Nook at Element [2].

Element [26]: The portable backup charger of claim 21, further comprising a switching module operable to switch on or off the second current path.

227. *Supra* Section XIV, analysis of Nook at Element [9].

Element [27]: The portable backup charger of claim 21, wherein the second current is of 100 to 400 A.

228. *Supra* Section XIV, analysis of Nook at Element [13].

Element [28]: The portable backup charger of claim 21, further comprising a controller configured to control the operating mode of the battery pack.

229. *Supra* Section XIV, analysis of Nook at Element [14].

Element [29]: The portable backup charger of claim 21, wherein the discharge rate of the battery pack is in a range of 20 c to 70 c.

230. *Supra* Section XIV, analysis of Nook at Element [15].

Element [30]: The portable backup charger of claim 21, wherein the at least one output port comprises a universal serial bus (USB) port.

231. *Supra* Section XIV, analysis of Nook at Element [16].

Element [33]: The portable backup charger of claim 21, wherein the at least one battery cell is lithium based battery cell.

232. *Supra* Section XIV, analysis of Nook at Element [16].

XV. ANALYSIS OF NOOK AND WHITE (Ground 3B)

Predictable Combination of Nook and White

233. A POSITA would have been motivated to implement Nook's device (articulated above in Ground 3A) with a fuse along one of the jumper cable wires (as suggested by White) to provide added safety and protection benefits known at the time. First, White expressly suggests that such a fuse along the jumper cable can advantageously "prevent damage to the wiring harness" and the host (power supply

battery) in the event of a short-circuit or overcurrent condition, and a POSITA would have been motivated to provide similar protection to both Nook's wiring harness 400 and Nook's power supply battery. EX1007, 2:51-54, FIG. 8 (fuse "48"), FIG. 9 (fuse "66"), EX1012, FIG. 4. Second, White also teaches that such a fuse along the jumper cable can advantageously "prevent damage" to the car battery ("the load") if the wiring harness experiences an overcurrent condition during the jump starting process, which would have been provided for added safety for the end user (e.g., avoiding battery heating/explosion/damage). EX1007, 2:51-54.

Element [1.P]: A portable backup charger, comprising:

234. *Supra* Section XIV, analysis of Nook at Element [1.P].

Element [1.1]: a battery pack having at least one battery cell;

235. *Supra* Section XIV, analysis of Nook at Element [1.1].

Element [1.2]: at least one output port coupled to the battery pack, wherein the battery pack is configured to output a first current through one or more output ports of the at least one output port in a first operating mode;

236. *Supra* Section XIV, analysis of Nook at Element [1.2].

Element [1.3]: a pair of output terminals coupled to the battery pack and having a current path to the battery pack different from that of the at least one output port to the battery pack, wherein the battery pack is configured to output a second current capable of starting a vehicle engine through the pair of output terminals in a second operating mode, wherein the second current is higher than the first current;

237. *Supra* Section XIV, analysis of Nook at Element [1.3].

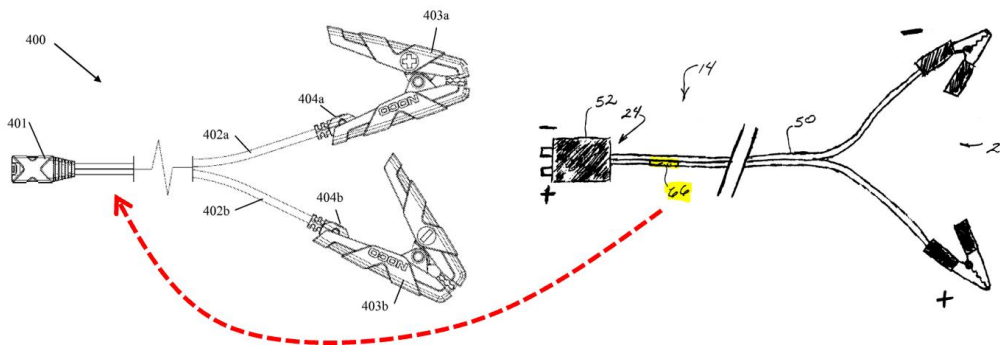
Element [1.4]: a first protection circuit coupled to the battery pack and configured

to protect the battery pack when the battery pack is working in the first operating mode; and

238. *Supra* Section XIV, analysis of Nook at Element [1.4].

Element [1.5]: a second protection circuit coupled to the battery pack and configured to prevent overcurrent condition of the second current when the battery pack is working in the second operating mode.

239. Even if Nook did not expressly disclose the “second protection circuit” (which it does as detailed above), the predictable Nook-White combination provides this Element. As previously described, White suggests the use of a “fuse” incorporated along a jumper cable wire of a traditional wiring harness (“extension portion 14”) to protect against overcurrent:



EX1007, Fig. 9 (annotated), 3:25-27; 2:51-55 (“to prevent damage”). Here, the Nook-White combination would have modified Nook’s jumper cable harness to include a fuse (as suggested by White) to achieve the added safety/protection benefits articulated above.

Element [2]: circuit is configured to prevent overcurrent condition of the first current, and overcharge and overdischarge condition of the battery pack.

240. *Supra* Section XIV, analysis of Nook at Element [2].

Element [6]: The portable backup charger of claim 1, further comprising a pair of connecting wires for detachably coupling the pair of output terminals with the battery pack, each connecting wire having a clamp for clamping an electrode of an external vehicle battery.

241. *Supra* Section XIV, analysis of Nook at Element [6].

Element [7]: The portable backup charger of claim 6, wherein the second protection circuit is built into at least one of the pair of connecting wires.

242. The Nook-White combination provides this Element for the same reasons described in Element [1.5] above. *Supra* Section XIV, Element [1.5].

Element [8]: The portable backup charger of claim 6, wherein the pair of connecting wires comprises a reverse connection-proof plug.

243. *Supra* Section XIV, analysis of Nook at Element [8].

Element [9]: The portable backup charger of claim 1, further comprising a switching module operable to switch on or off the second current from the battery pack.

244. *Supra* Section XIV, analysis of Nook at Element [9].

Element [10]: The portable backup charger of claim 9, wherein the switching module is further configured to prohibit the outputting of the second current after a predetermined time period has passed.

245. *Supra* Section XIV, analysis of Nook at Element [10].

Element [11]: The portable backup charger of claim 1, further comprising at least one voltage adjusting circuit, each voltage adjusting circuit being coupled between the battery pack and one of the at least one output port and configured to elevate or reduce an output voltage of the battery pack to a predetermined voltage at the respective output port.

246. *Supra* Section XIV, analysis of Nook at Element [11].

Element [12]: The portable back up charger of claim 1, wherein the first current is of 0.5 to 10 A.

247. *Supra* Section XIV, analysis of Nook at Element [12].

Element [13]: The portable backup charger of claim 1, wherein the second current is of 100 to 400 A.

248. *Supra* Section XIV, analysis of Nook at Element [13].

Element [14]: The portable backup charger of claim 1, further comprising a controller configured to control the operating mode of the battery pack.

249. *Supra* Section XIV, analysis of Nook at Element [14].

Element [15]: The portable backup charger of claim 1, wherein the discharge rate of the battery pack is in a range of 20 c to 70 c.

250. *Supra* Section XIV, analysis of Nook at Element [15].

Element [16]: The portable backup charger of claim 1, The portable backup charger of claim 1, wherein the at least one output port comprises a universal serial bus (USB) port.

251. *Supra* Section XIV, analysis of Nook at Element [16].

Element [19]: The portable backup charger of claim 1, wherein the at least one battery cell is lithium based battery cell.

252. *Supra* Section XIV, analysis of Nook at Element [19].

Element [20]: The portable backup charger of claim 1, wherein the pair of output terminals is detachably coupled to the battery pack.

253. *Supra* Section XIV, analysis of Nook at Element [20].

Element [21.P]: A portable backup charger, comprising:

254. *Supra* Section XIV, analysis of Nook at Element [1.P] and [21.P].

Element [21.1]: a battery pack having at least one battery cell;

255. *Supra* Section XIV, analysis of Nook at Element [1.1] and [21.1].

Element [21.2]: a first current path through which a first current is output by the battery pack when it is working in a first operating mode;

256. *Supra* Section XIV, analysis of Nook at Element [1.2] and [21.2].

Element [21.3]: a second current path through which a second current capable of starting a vehicle engine is output by the battery pack when it is working in a second operating mode, wherein the second current is higher than the first current;

257. *Supra* Section XIV, analysis of Nook at Element [1.3] and [21.3].

Element [21.4]: a first protection circuit coupled to the battery pack and configured to protect the battery pack when it is working in the first operating mode; and

258. *Supra* Section XIV, analysis of Nook at Element [1.4] and [21.4].

Element [21.5]: a second protection circuit coupled in the second current path and configured to prevent overcurrent condition of the second current when it is working in the second operating mode.

259. For the reasons articulated above in Element [1.5], the predictable Chen-White combination would have provided the claimed second protection circuit including a fuse along the jumper cable to achieve the added safety/protection benefits. *Supra*, Section XIV, Nook-White combination at Element [1.5];

Element [22]: The portable backup charger of claim 21, wherein the first protection circuit is configured to prevent overcurrent condition of the first current, and overcharge and overdischarge condition of the battery pack..

260. *Supra* Section XIV, analysis of Nook at Element [2] and [22].

Element [25.1]: The portable backup charger of claim 21, further comprising: a pair of connecting wires for detachably coupling the battery pack with the vehicle engine to allow the second current flow through the second current path;

261. *Supra* Section XIV, analysis of Nook at Element [1.3] and [6] (citing

Nook's FIG. 4).

Element [25.2]: wherein the second protection circuit is built into at least one of the pair of connecting wires.

262. For the reasons articulated above, the predictable Chen-White combination would have provided the claimed second protection circuit including a fuse along the jumper cable to achieve the added safety/protection benefits. *Supra*, Section XIV, Nook-White combination at Elements [1.5] and [7];

Element [26]: The portable backup charger of claim 21, further comprising a switching module operable to switch on or off the second current path.

263. *Supra* Section XIV, analysis of Nook at Element [9] and [26].

Element [27]: The portable backup charger of claim 21, wherein the second current is of 100 to 400 A.

264. *Supra* Section XIV, analysis of Nook at Element [13] and [27].

Element [28]: The portable backup charger of claim 21, further comprising a controller configured to control the operating mode of the battery pack.

265. *Supra* Section XIV, analysis of Nook at Element [14] and [28].

Element [29]: The portable backup charger of claim 1, wherein the discharge rate of the battery pack is in a range of 20 c to 70 c.

266. *Supra* Section XIV, analysis of Nook at Element [15] and [29].

Element [30]: The portable backup charger of claim 21, wherein the at least one output port comprises a universal serial bus (USB) port.

267. *Supra* Section XIV, analysis of Nook at Element [16] and [30].

Element [33]: The portable backup charger of claim 21, wherein the at least one battery cell is lithium based battery cell.

268. *Supra* Section XIV, analysis of Nook at Element [19] and [33].

XVI. ANALYSIS OF NOOK AND MILLER (Ground 3C)

Miller (EX1013) and Predictable Combination of Nook and Miller

269. Miller is similar to Nook in that they both describe portable power source for jumpstarting a vehicle and for outputting to USB-connected devices. EX1013, [0013], [0015]-[0018], FIGS. 2-4; EX1012, 6-8, FIGS. 3-4. Miller suggests the conventional practice of charging various devices (“including jump starting a car battery” and “charging laptop computers and a variety of electronic devices”) “either individually *or simultaneously*.” EX1013, [0012]-[0013] (“that improves upon conventional power chargers”). The evidence here confirms that a POSITA would have been motivated to implement Nook’s device (Ground 3A) to provide the conventional “simultaneous” (third) option for supply power to *both* the USB port and the jumper cable harness (as suggested by Miller) to advantageously continue powering the user’s smartphone during the jump starting process (both of which were essential in emergency situations where the smartphone might be needed for contacting emergency services). EX1013, [0012]-[0013], [0039], [0050]-[0057] (“as well as”).

Element [3]: The portable backup charger of claim 1, wherein the battery pack is further configured to work in a third operating mode for outputting the first current and the second current simultaneously, and in the third operating mode both the first protection circuit and the second protection circuit are active.

270. The predictable Nook-Miller combination would have implemented

Nook to provide the option of a “simultaneous” (third) mode of operation, as suggested by Miller, to achieve the known benefits articulated above. EX1013, [0052], [0037], FIG. 8.

Element [23]: The portable backup charger of claim 21, wherein the battery pack is further configured to work in a third operating mode for outputting the first current and the second current simultaneously, and in the third operating mode both the first protection circuit and the second protection circuit are active.

271. *Supra* analysis of Nook-Miller at Element [3].

XVII. ANALYSIS OF NOOK AND RICHARDSON (Ground 3D)

Predictable Combination of Nook and Richardson

272. Richardson is akin to Nook in that they both describe portable power source for starting a vehicle engine. EX1014, [0002], [0007]; EX1012, 6-8, FIGS. 3-4. Richardson suggests the conventional practice of monitoring the time that the jumpstarting current is output and cutting off the jumpstarting current if the time limit is exceeded. EX1014, [0037] (“500 ms” or “15 seconds”), FIG. 8, [0007].

273. A POSITA would have been motivated to implement Nook’s device (articulated above in Ground 3A) so that the switching module ceases the jumpstarting current after a predetermined time period (as suggested by Richardson) to provide an added safety layer that to prevent an “overheating condition” in the car battery. EX1014, [0007]. Additionally, a POSITA would have been motivated to implement Nook’s device such that the switching module ceases the jumpstarting current after a predetermined time period (as suggested by Richardson) to

advantageously avoid over-exhaustion of the internal lithium battery capacity due to jumpstarting current over an extended time period.

Element [10]: The portable backup charger of claim 9, wherein the switching module is further configured to prohibit the outputting of the second current after a predetermined time period has passed.

274. Even if Nook did not expressly disclose this Element (which it does), the predictable Nook-Richardson combination would have implemented Nook to provide a switching module in accordance with Richardson's suggestion to cut off the jumpstarting current after a predetermined period of time. EX1014, [0037], FIG. 8.

XVIII. ANALYSIS OF NOOK AND SHOJI (Ground 3E)

Shoji (EX1015)

275. Shoji and Nook both described a portable charger device for powering mobile electronic devices. EX1015, 1:52-61, 4:62-5:7, 6:6-29, FIGS. 1-3. Shoji further suggests the conventional practice of providing multiple DC output options beyond the low-voltage 5V option, such as high-voltage outputs of "12V, 15V, and 19V" to recharge a variety of "portable devices." EX1015, 5:2-5:7, 6:6-29. The evidence here confirms that a POSITA would have been motivated to implement Nook's device (Ground 3A) so as to include additional DC output options (such as one or more of the high-voltage outputs of "12V, 15V, and 19V," as suggested by Shoji) for advantageously allowing connections with a wider variety of "portable

devices such as a notebook PC, cellular phone, or PDAs,” for beneficially allowing recharging of “two or more portable devices at the same time,” and for avoiding a need to carry “different auxiliary batteries for different portable devices.” EX1015, 5:2-5:7, 6:6-29.

Element [17]: The portable backup charger of claim 1, wherein the at least one output port comprises an output port of a rating voltage of 12V.

276. As described above, the predictable Nook-Shoji combination provides the claimed output port of a rating voltage of 12V. EX1015, 5:2-5:7.

Element [18]: The portable backup charger of claim 1, wherein the at least one output port comprises an output port of a rating voltage of 19V.

277. As described above, the predictable Nook-Shoji combination provides the claimed output port of a rating voltage of 19V. EX1015, 5:2-5:7.

Element [31]: The portable backup charger of claim 21, wherein the at least one output port comprises an output port of a rating voltage of 12V.

278. As described above, the predictable Nook-Shoji combination provides the claimed output port of a rating voltage of 19V. EX1015, 5:2-5:7.

Element [32]: The portable backup charger of claim 21, wherein the at least one output port comprises an output port of a rating voltage of 19V.

279. As described above, the predictable Nook-Shoji combination provides the claimed output port of a rating voltage of 19V. EX1015, 5:2-5:7.

XIX. OVERVIEW OF CONCLUSIONS FORMED

280. This declaration explains the conclusions that I have formed based on

my independent analysis. To summarize those conclusions:

- Based upon my knowledge and experience, and my review of the materials listed above, I believe that Claims 1, 9, 11-14, 16-19, 21, 26-28, and 30-33 of the '506 patent are anticipated by Chen (EX1005; translation at EX1006). *See supra*, Ground 1A.
- Based upon my knowledge and experience, and my review of the materials listed above, I believe that Claims 1-2, 6-9, 11-14, 16-22, 25-28, and 30-33 of the '506 patent are rendered obvious by Chen in view of White (EX1007). *See supra*, Ground 1B.
- Based upon my knowledge and experience, and my review of the materials listed above, I believe that Claim 10 of the '506 patent is rendered obvious by Chen in view of White and Richardson (EX1014). *See supra*, Ground 1C.
- Based upon my knowledge and experience, and my review of the materials listed above, I believe that Claims 15 and 29 of the '506 patent are rendered obvious by Chen in view of White and Gozdz (EX1011). *See supra*, Ground 1D.
- Based upon my knowledge and experience, and my review of the materials listed above, I believe that Claims 1, 3, 6-14, 16-17, 20-21, 23, 25-28, and 30-31 of the '506 patent are rendered obvious by Inskeep (EX1008) in view of Johnson (EX1009). *See supra*, Ground 2A.
- Based upon my knowledge and experience, and my review of the materials listed above, I believe that Claims 19 and 33 of the '506 patent are rendered obvious by Inskeep in view of Johnson and Durando (EX1010). *See supra*, Ground 2B.
- Based upon my knowledge and experience, and my review of the

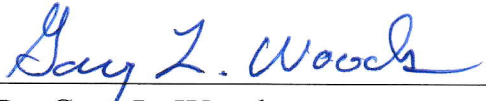
materials listed above, I believe that Claims 1, 2, 6, 8-16, 19-22, 26-30, and 33 of the '506 patent are anticipated by Nook (EX1005). *See supra*, Ground 3A.

- Based upon my knowledge and experience, and my review of the materials listed above, I believe that Claims 1, 2, 6-16, 19-22, 25-30, and 33 of the '506 patent are rendered obvious by Nook in view of White. *See supra*, Ground 3B.
- Based upon my knowledge and experience, and my review of the materials listed above, I believe that Claims 3 and 23 of the '506 patent are rendered obvious by Nook in view of Miller (EX1013). *See supra*, Ground 3C.
- Based upon my knowledge and experience, and my review of the materials listed above, I believe that Claim 10 of the '506 patent is rendered obvious by Nook in view of Richardson. *See supra*, Ground 3D.
- Based upon my knowledge and experience, and my review of the materials listed above, I believe that Claims 17-18 and 31-32 of the '506 patent are rendered obvious by Nook in view of Shoji (EX1015). *See supra*, Ground 3E.

XX. CONCLUSION

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

Executed this 21 day of November, 2023.



Dr. Gary L. Woods

APPENDIX A

Gary L. Woods *Curriculum Vitae*

Updated Nov. 2023

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Houston TX 77005
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Education

Stanford University: Ph.D. Applied Physics, 1997 (M.S. 1991)

Advisor: Prof. Martin M. Fejer

National Science Foundation Graduate Fellowship

Dissertation title: *Nonlinear Optical Waveguide Devices Utilizing Intersubband Transitions in III-V Semiconductor Quantum Wells*

Rice University: BSEE & BA Physics, *cum laude*, 1988

Fulfilled requirements for BS in Physics. Phi Beta Kappa, Eta Kappa Nu, Tau Beta Pi, more; George R. Brown Forensics Society, debate team captain; National Merit Scholar; Sid Richardson College Fellow & Athenian Award.

Employment

2008-present: *Professor in the Practice in Computer Technology*, Dept. of Electrical & Computer Engineering, Rice University, Houston, TX. (*Distinguished Professor in the Practice* since 2020).

2006-present: *Consultant*, specializing in debug of integrated circuits and design of optical and electronic systems; Sunnyvale, CA and Houston, TX.

2003-2006: *Senior Scientist*, Credence Systems Corp., Diagnostics and Characterization Group, Sunnyvale, CA (originally Optonics Inc., acquired by Credence in 2003).

2000-2002: *Chief Technical Officer & co-founder*, Spectralane, Inc., Santa Clara, CA

1998-2000: *Senior Researcher*, Intel Corp., Santa Clara, CA

1996-1998: *Postdoctoral Fellow*, University of California, ECE Dept. & Quest Center, Santa Barbara, CA

1988-1989 *Member of Technical Staff*, Texas Instruments Corp. Dallas, TX (summers)

1987 *Undergraduate research asst.*, Rice University ECE dept. Houston, TX (summer)

1985-1986 *Computer programmer*, US Dept. of Energy, Bartlesville, OK (summers)

1984 *Computer operator*, Phillips Petroleum Company, Bartlesville, OK (summer)

Summary of consulting in court cases

- Netlist, Inc. vs. Micron Technology, Inc. *et al.*, Federal District Court, Eastern District of Texas. Case # 2:22-cv-203-JRG-RSP, filed June 10, 2022.
 - Patent case, pending.
 - Wrote reports supporting Defendants' position.
- Helanea Smith vs. William Q. Williams *et al.*, Case No. 2021-36623, 281st Judicial District, Harris County, Texas.
 - Tort case, pending
 - Performed analyses of wireless communication for plaintiff.

- Ten related PTAB IPR cases involving Scramoge Technology, Ltd, vs. Samsung and Google, among others. 2021-2022. Cases settled. I wrote declarations supporting IPRs. I likely would have been a testifying expert.
 - Google LLC et al v. Scramoge Technology Limited PTAB-IPR2022-00683, US Patent No. 7,825,537
 - Google LLC f/k/a Google Inc. et al v. Scramoge Technology Limited PTAB-IPR2022-00643, US Patent No. 10,193,392
 - Samsung Electronics Co., Ltd. et al v. Scramoge Technology Limited PTAB-IPR2022-00653, US Patent No. 10,199,876,
 - Samsung Electronics Co., Ltd. et al v. Scramoge Technology Limited PTAB-IPR2022-00636, US Patent No. 9,490,652
 - Google LLC v. Scramoge Technology Limited PTAB-IPR2022-00603, US Patent No. 10,804,740
 - Samsung Electronics Co., Ltd. et al v. Scramoge Technology Ltd. PTAB-IPR2022-00478, U.S. Patent No. 10,367,370
 - Samsung Electronics Co., Ltd. et al v. Scramoge Technology Limited PTAB-IPR2022-00385, U.S. Patent No. 9,843,21
 - Samsung Electronics Co., Ltd. et al v. Scramoge Technology Limited PTAB-IPR2022-00284, U.S. Patent No. 9,997,962
 - Samsung Electronics Co., Ltd. et al v. Scramoge Technology Limited PTAB-IPR2022-00241, U.S. Patent No. 9,825,482
 - Samsung Electronics Co., Ltd. et al v. Scramoge Technology Limited PTAB-IPR2022-00185, U.S. Patent No. 10,424,941
- Hamamatsu vs. Semicaps, Federal District Court, Northern District of California, case #17-cv-03440-DMR, Filed June 14, 2017.
 - Patent case, settled.
 - Worked for plaintiff Semicaps. Wrote reports on infringement and invalidity.
 - If case had gone to trial, I likely would have been a testifying expert.
- Hamamatsu vs. Semicaps; PTAB IPR2017-02110 & IPR2017-02112; both filed 09/15/2017
 - PTAB IPR cases; both decided in favor of Semicaps.
 - I worked for the respondents in 2018-2019 and wrote declarations concerning prior art and opposing the petitioners' expert's opinions to support patent validity. I did not testify.
- Nokia vs. Apple; International Trade Commission. Case # 337-TA-1039; Filed 01/27/2017(?). The case ended up settling.
 - Patent case
 - I worked for the defendants in 2017. If the case had continued to a hearing at the ITC I likely would have been a testifying expert.
- NFC Technology, LLC. Vs. Samsung Electronics Co.; Ltd. et al., Federal District Court, Eastern District of Texas; Case # 2:15-cv-283; Filed 2/26/2015. Case ended up settling.
 - Patent case
 - I worked for the defendants in 2015 & 2016. I provided advice on prior art, claim construction, infringement analysis, etc. I likely would have been a non-testifying expert had the case made it to trial.
- X6D Limited vs. Volfoni, Inc. Federal District Court, Central District of California; Case # CV10-09583 MMM, Filed 9/23/2011. I do not know the outcome of this case.
 - Patent case.
 - I worked for the plaintiffs in 2011 and 2012 and prepared an expert report. I would have been the testifying expert if the case had made it to trial.
- X6D Limited; X6D USA Inc.; and XpanD, Inc. vs. Li-Tek Corporation Company et al., Defendants; Federal District Court, Central District of California; Case #10-cv-02327-GHK-PJW. Filed 3/30/2010. I do not know the outcome of this case.
 - Trade secret and patent case.
 - I worked for the plaintiffs in 2011-2012 and prepared expert reports. I would have been the testifying expert if the case had made it to trial

Educational programs & university courses taught

1. “Senior Design Lab” (Elec 494), ECE Dept., Rice University. AY2009-present. Yearlong 2-3 credit “capstone” course for all graduating seniors. Mentored approx. 10 senior teams each year. Co-created interdisciplinary “collaborative capstone” course across ECE, BioEngineering and Mechanical Engineering. Many senior teams won state, national, and international awards in areas ranging from electrical engineering to global health. Every project in my course, every year, has had a working prototype by spring. My teams have won numerous national and international awards.
2. “Introduction to Physical Electronics” (Elec 305), ECE Dept., Rice University. F’08, F’09, F’10; S’11-S’19. A 3-credit junior-level lecture course on semiconductor devices (FETs, ICs, BJTs, etc.), transmission lines, and antennas. The course was consistently ranked among the best ECE courses by Rice ECE undergrads.
3. “Fundamentals of Electrical Engineering II Lab” (Elec 244), ECE Dept., Rice University, S’15, S’20. New laboratory course for sophomores covering basics of circuits (RLC, discrete transistors, opamps, PWM, class D amplifiers, control with digital hardware in the loop.). After lockdown, distributed parts kits & scope dongles to enable circuit construction by students at home.
4. “Electronic Measurement Systems” (Elec 243), ECE Dept., Rice University, S’20, S’22, S’23. Co-taught. A circuits course for non-majors, a core course for sophomores in the Dept. of BioEngineering at Rice. Developed and administrated new lab assignments.
5. “Photonics Measurements” (Elec 364), ECE Dept., Rice University, S’22, S’23. Developed and taught a laboratory-based course covering lasers, optics, spectroscopy, electro-optics, and microscopy. Course based on graduate level text *Building Electro-Optical Systems* by Hobbs.
6. “Basic Electronics” (F’19), a 3-hour workshop on introductory electronics taught to about 100 engineering freshmen. Developed from scratch and funded with an internal grant. Equipment purchased includes ADALM2k USB dongle which now supports general activities in the Oshman Engineering Design Kitchen (OEDK).
7. “Fundamentals of Electrical Engineering I Laboratory” (Elec 240), ECE Dept., Rice University, F’18, F’20-F’23. A one credit course companion to the core Elec 241 Fundamentals of EE course. Adapted from the MOOC which I helped to develop (see below.)
8. “Survey of Engineering Disciplines” (Engi 150), ECE Dept., Rice University, F’16. A one-credit seminar for freshmen to expose them to types of careers open to engineers.
9. “Introduction to Embedded Programming” (Elec 497), ECE Dept., Rice University, S’13, S’14, F’14, F’15, F’16. F’17. Zero/one-credit course on microcontroller programming in C and PCB design for senior design teams without an ECE student. Developed “Escape Platform” embedded programming PCB and software base for teaching purposes.
10. “Fundamentals of Electrical Engineering Laboratory”, Massive Open Online Course (MOOC) offered through Coursera, Spring ’14. Assisted with development of laboratory assignments and parts kit. This was one of the first MOOCs ever to offer a laboratory component through a parts kit purchased separately by enrollees.
11. “Fundamentals of Electrical Engineering II Lab” (Elec 242), ECE Dept., Rice University, S’14. Developed a stand-alone set of laboratory exercises for the 4-credit course. Spun out as a separate course (Elec 244) in Spring ’15.
12. “Analog Circuits Lab” (Elec 342), ECE Dept., Rice University, S’09, S’10, F’11. Developed a new 4-credit lab course on intermediate analog circuits (amplifiers, FETs & BJTs, small signal models, feedback, audio power amplifiers, PCB design.) Course culminated in design and construction of audio power and amplifier on a PCB.
13. “Project Management and Professional Issues” (Elec 394), ECE Dept., Rice University, S’10, S’11, S’12. 2-credit course on project management, career choices, professional interactions, and intellectual property.

14. "Semiconductor device physics in 4 hours," an original half-day lecture course covering device physics from p-n junctions through FETs. Presented at Credence Systems Corp., Feb. 2007.
15. "Design Debug," an original 3-day lecture + laboratory course on techniques for debug of IC designs, offered through Semitracks, Inc. Presented at U.S. Dept. of Defense, June 2007. See <http://www.semitracks.com/courses/design/design-debug.php>

Honors

- *George R. Brown Award for Superior Teaching*, April 2016 & April 2019. Awarded annually to the top 10 instructors out of about 600 at Rice University, based on input from recent students.
- *George R. Brown Award for Superior Teaching*, April 2018 & April 2021. Finalist (one of top 25 but not one of top 10).
- *Hudspeth Award*, April 2019. Awarded by Rice Office of Student Activities to the top advisors of student clubs.

Rice academic service and responsibilities

- *Member of ECE undergraduate committee* 2008-present, Chair AY20-21. Inputs on curricular changes and ABET readiness. Developed new senior design (capstone) course structure. Developed new curricular structure to support Vertically Integrated Projects (VIP).
- *Member, Faculty Committee Engineering Design Minor*, 2016 – present. Oversight of policies supporting the new Engineering Design Minor.
- *Faculty Sponsor, Rice Electric Vehicle Club*, 2016-present. Starting in AY '18-'19 I made the REV part of my Vertically Integrated Projects (VIP) team. They successfully completed the Shell Eco Marathon course for the first time in about 5 years.
- *Academic advisor, Engineering Design Minor*, 2016-present. Advised students pursuing or considering the Engineering Design Minor.
- *School of Engineering Curriculum Review Committee*, F'18-present. (Chair AY 2018, '19, '20-23). Reviewed proposed courses within SoE for credit-worthiness. As Chair, tried to convince 7 tenured/tenure-track faculty members to perform a 30-minute task using only constant hectoring and guilt as motivators.
- *Coordinator of Vertically Integrated Projects in ECE Dept.*, 2014-present. Developed course content for VIP projects. VIP projects involved about 10-12 undergrads along with grad students, postdocs and PIs. Program is currently being expanded to 5 departments in two schools.
- *ECE Undergraduate academic advising*, 2008-present. Responsibility for curricular and career advice for about 1/3 of Rice ECE majors.
- *Oversight of ECE undergraduate teaching lab*, 2014-present. Developed and drove implementation of plan to update and modernize equipment in the lab where core circuits courses are taught for all ECE majors and non-majors.
- *Chair of ECE undergraduate awards committee*, 2013-2014 -- responsibility for nominating students for Rice awards.
- *Divisional Advisor* for Sid Richardson (residential) College, 2010-2019; for Duncan (residential) College, 2019-2020, McMurtry (residential) College, 2021-present. Responsibility for advising Freshmen and Sophomores majoring in any Engineering discipline.
- *First-Year Mentor and Faculty Associate*, Sid Richardson (residential) College, 2009-2019; for Duncan (residential) College, F'19-present. Social interactions with students, informal advising of individuals, occasional meetings with freshman groups, frequent lunches, etc.

- *Mentoring of Freshman design teams*, AY 2010-11 -present. Mentored 1-2 freshman design teams in Engi 120 (Intro to Engineering Design) course in all but one semester.
- *OEDK “office hours”* – 2014-’2019 For 2-3 weeks before the Engineering Design Showcase in April each year, I made myself available from 10PM- 12AM nearly every evening to provide assistance with electronic design & troubleshooting for any team. Since COVID much of this advising has been remote.

Grants and awards

1. G. Woods, F. Li, D. Subramanian, L. Duenas-Osorio, “Scalable and Robust Prototype of Sensor Network for Real-Time Street-Level Flood Measurement”, Houston Solutions Lab grant, \$73K, AY 2018-19.
2. G. Woods, R. Ramos, L.Yu, , “Creating a Curricular Scaffolding Structure to Evaluate and Enhance Performance of Vertically Integrated Projects,” Rice University Quality Enhancement Program on the Scaffolding Experiential Inquiry and Research in the Curriculum, \$30K, AY 2018-19.
3. G. Woods, R. Simar, “Enhancing Experiential Learning in Design of Electronics”, Rice University Quality Enhancement Program on the Scaffolding Experiential Inquiry and Research in the Curriculum, \$30K, AY 2017-18.
4. G. Woods, “Freshman Seminar -- Survey of Engineering Disciplines,” Rice University Excellence in Engineering Education grant, \$7K, AY 2016-17.
5. G. Woods, “Integrated Electronics Ecosystem for the OEDK”, Rice University Brown Foundation Teaching Grant, \$5K, 2016.
6. B. Aazhang, J. Cavallaro, G.L. Woods, on sub-award via Georgia Tech from Helmsley Foundation for establishing Vertically Integrated Projects among members of the international VIP Consortium. Jan 2014-present. Amount due to Rice is about \$130,000 over 3 years.
7. J. Cavallaro, G.L. Woods, National Space Grant Foundation Award # Xhab 2014-03, "SpaceRing: A Versatile, Scalable Power-Generation and Cooling System For Deep-Space Habitats", (co-PI). \$20,000.
8. J. Kono, G. Woods, R. Vaitai, (co-PI) “RAMSES: Repetitive advanced magnet for student experiments and science international senior design project,” Rice Faculty Initiatives Fund, 2013, \$20,000.
9. G.L. Woods, M.K. O’Malley, Z.M. Oden, (PI) “Course Module on Embedded Electronics Systems for Multidisciplinary Senior Design Projects”, Rice University Brown Foundation Teaching Grant, 2012, \$5000
10. G.L. Woods, K. Kelly, “Vivid Demonstrations of Concepts in Physical Electronics,” Rice University Brown Foundation Teaching Grant, 2011, \$4000.
11. F. Koushanfar, S. Reda, G.L. Woods, “Algorithmic Techniques for Post-Silicon Characterization Using Infrared Emissions” (co-PI). NSF #1116858, \$260,000, 2011-2014

Other activities

Member of Technical Advisory Board and co-founder, 2009-present: InView Technology Corp., Austin TX. Advisor to startup company seeking to commercialize compressive-sensing technology developed at Rice for the application of non-visible camera systems. Developed an analog optoelectronic front end with 100x performance improvement over commercial systems.

Consultant, 2006-present.

- Advising semiconductor companies on optical probing related to debugging integrated circuits. Several successful “debug wins,” helping to accelerate product-launch dates.
- Expert legal consultant in several federal patent cases (district court, PTAB, and ITC) in fields such as RF, circuits, PCB design, and optoelectronics

Publications & Patents

Journal Articles

1. G. Timothy Noe, G. Timothy Noe, Ikufumi Katayama, Fumiya Katsutani, James J. Allred, Jeffrey A. Horowitz, David M. Sullivan, Qi Zhang, Fumiya Sekiguchi, Gary L. Woods, Matthias C. Hoffmann, Hiroyuki Nojiri, Jun Takeda, and Junichiro Kono, "Single-shot terahertz time-domain spectroscopy in pulsed high magnetic fields," *Optics Express*, vol. 24 (26), p. 30328 (2016).
2. G. Timothy Noe, Qi Zhang, Joseph Lee, Eiji Kato, Gary L. Woods, Hiroyuki Nojiri, and Junichiro Kono, "Rapid scanning terahertz time-domain magnetospectroscopy with a table-top repetitive pulsed magnet," *Applied Optics* vol. 53 (26), p. 5850 (2014).
3. G.T. Noe II, H. Nojiri, J. Lee, G.L. Woods, J. Léotin, J. Kono, "A table-top, repetitive pulsed magnet for nonlinear and ultrafast spectroscopy in high magnetic fields up to 30T", *Review of Scientific Instruments* vol. 84 (12) p. 123906, 2013.
4. D.T. Morris, C.L. Pint, R. S. Arvidson, A. Lüttge, R.H. Hauge, A.A. Belyanin, G.L. Woods, J. Kono, "Midinfrared third-harmonic generation from macroscopically aligned ultralong single-wall carbon nanotubes," *Phys. Rev. B* vol. 87 (16), p.161405, 2013.
5. Z. M. Oden, M. K. O'Malley, G. Woods, T. Kraft, B. Burke, "Outcomes of Recent Efforts at Rice University to Incorporate Entrepreneurship Concepts into Interdisciplinary Capstone Design," *International Journal of Engineering Education*, vol. 28, no 2., pp.1-5, 2012.
6. U. Kindereit, G. Woods, J. Tian, U. Kerst, R. Leihkauf, and C. Boit, "Quantitative Investigation of Laser Beam Modulation in Electrically Active Devices as Used in Laser Voltage Probing," *IEEE Transactions on Device and Materials Reliability*, vol. 7, pp. 19-30, 2007.
7. J. Y. Liao, G. L. Woods, and H. L. Marks, "Rapid diagnostics of ASIC circuit marginalities using dynamic laser stimulation," *IEEE Transactions on Device and Materials Reliability*, vol. 6, pp. 9-16, 2006.
8. G. L. Woods, P. Papaparaskeva, M. Shtaif, I. Brener, and D. A. Pitt, "Reduction of Cross-Phase Modulation-Induced Impairments in Long-Haul WDM Telecommunication Systems Via Spectral Inversion," *IEEE Photonics Technology Letters*, vol. 16, pp. 677-9, 2004.
9. A. Imamoglu, H. Schmidt, G. Woods, and M. Deutsch, "Strongly interacting photons in a nonlinear cavity," *Physical Review Letters*, vol. 79, pp. 1467-70, 1997.
10. H. C. Chui, G. L. Woods, M. M. Fejer, E. L. Martinet, and J. S. Harris, Jr. "Tunable mid-infrared generation by difference frequency mixing of diode laser wavelengths in Intersubband InGaAs/AlAs quantum wells," *Applied Physics Letters*, vol. 66, pp. 265-7, 1995.
11. E. L. Martinet, H. C. Chui, G. L. Woods, M. M. Fejer, J. S. Harris, Jr., C. A. Rella, B. A. Richman, and H. A. Schwettman, "Short wavelength (5.36-1.85 μm) nonlinear spectroscopy of coupled InGaAs/AlAs Intersubband quantum wells," *Applied Physics Letters*, vol. 65, pp. 2630-2, 1994.
12. H. C. Chui, E. L. Martinet, G. L. Woods, M. M. Fejer, J. S. Harris, Jr., C. A. Rella, B. I. Richman, and H. A. Schwettman, "Doubly resonant second harmonic generation of 2.0 μm light in coupled InGaAs/AlAs quantum wells," *Applied Physics Letters*, vol. 64, pp. 3365-7, 1994.
13. H. C. Chui, E. L. Martinet, G. L. Woods, M. M. Fejer, J. S. Harris, Jr., C. A. Rella, B. I. Richman, and H. A. Schwettman, "Doubly resonant second harmonic generation of 2.0 μm light in coupled InGaAs/ AlGaAs quantum wells," *Applied Physics Letters*, vol. 64, 1994.
14. L. Gordon, G. L. Woods, R. C. Eckardt, R. R. Route, R. S. Feigelson, M. M. Fejer, and R. Byer, "Diffusion-bonded stacked GaAs for quasiphase-matched second-harmonic generation of a carbon dioxide laser," *Electronics Letters*, vol. 29, pp. 1942-4, 1993.

Conference papers and presentations

1. Z.M. Oden, E. Richardson, G. Woods, A. Dick, M. O'Malley, "A model for a successful collaborative capstone design course," paper P-Th-670, *Biomedical Engineering Society Annual Meeting*, 2014.
2. G.T. Noe II, Q. Zhang, J. Lee, E. Kato, H. Nojiri, G. Woods, J. Kono, "Terahertz Time-Domain Magnetosectroscopy using a Table-Top Repetitive Pulsed Magnet", *CLEO:QELS_Fundamental Science*, 2014.
3. A.M. Andalcio, P. Breen, L.A. Hendricks, T.J. Sarkar, G.T. Noe, G.L. Woods, J. Kono, and J. Leotin, "Compact single-shot terahertz time-domain spectroscopy system for magneto-optics with a mini-coil pulsed magnet," *International Conference on Infrared, Millimeter and Terahertz Waves (IRMMW-THz) Conference*, 2013.
4. K. Dev, G. Woods, S. Reda, "High-throughput TSV testing and characterization for 3D integration using thermal mapping," in *Design Automation Conference*, 2013.
5. G.T. Noe II, H. Nojiri, J. Leotin, G. Woods, A. Belyanin, and J. Kono, "Superfluorescence from a Dense Electron-Hole Plasma in Pulsed High Magnetic Fields" in *CLEO:QELS_Fundamental Science*, 2013.
6. S. Su, J. Kerwin, S. Crowe, J. Cavallaro, G.L. Woods, "Teaching embedded programming to electrical engineers, BioEngineers, and mechanical engineers via the escape platform," in *Interdisciplinary Engineering Design Education Conference (IEDEC)*, 2013.
7. D.T. Morris, G.L. Woods, J. Kono, C.L. Pint, R.H. Hauge, "Second Harmonic Generation in Highly Aligned Carbon Nanotubes on GaAs," American Physical Society Meeting Abstracts, p.28015, 2011.
8. T. Sun, G. Woods, K.F. Kelly, "Compressive imaging applied to infrared-based semiconductor failure analysis," *International Conference on Infrared, Millimeter and Terahertz Waves (IRMMW-THz) Conference*, 2011.
9. Z.M. Oden, M.K. O'Malley, G.L. Woods, T.M. Volz, "Work in progress- Implementing and evaluating efforts to engage interdisciplinary teams to solve real-world design challenges," in *Frontiers in Education (FIE)*, 2011.
10. A. N. Nowroz, G. Woods, and S. Reda, "Improved Post-Silicon Power Modeling Using AC Lock-In Techniques," in *Design Automation Conference 2011*.
11. T. Sun, G. L. Woods, M.F. Duarte, K. Kelly, C. Li, and Y. Zhang, "OBIC Measurements without Lasers or Raster Scanning based on Compressive Sensing," in *Proceedings of International Symposium on Testing and Failure Analysis (ISTFA)*, 2009. Outstanding Paper Award ISTFA 2009.
12. U. Kindereit, G. Woods, J. Tian, U. Kerst, and C. Boit, "Investigation of Laser Voltage Probing Signals in CMOS Transistors," in *International Reliability Physics Symposium (IRPS)*, 2007, pp. 526-33.
13. G. L. Woods, "High Bandwidth Probing of Internal Nodes in Operating ICs," in *Pacific Northwest Conference on Test (BAST)*, Bodega Bay, CA, 2006.
14. Q. Wang, Z. Mai, K. Tan Pik, J. Lam, G. Woods, B. Cain, D. Brown, and L. Ross, "Backside Fault Isolation Technique in 0.13- μ m and 90nm Product Prototyping," in *Physical and Failure Analysis of Integrated Circuits (IPFA)*, Singapore, 2006, pp. 125-8.
15. R. Wampler, P.-K. Ong, R. Billings, D. Meehl, and G. L. Woods, "Dramatic Reduction in Optical Probing Time Via Test-Loop Compaction (TLC) of ATPG-Generated Test Loops," in *IEEE Semiconductor Debug and Diagnosis Workshop (SDD)*, Santa Clara, CA, 2006.
16. S. Kasapi and G. L. Woods, "Voltage Noise and Jitter Measurement using Time-Resolved Emission," in *International Symposium on Testing and Failure Analysis (ISTFA)*, Santa Clara, CA, 2006.

17. G. L. Woods, B. Cain, R. Herlein, A. Syed, and T. Namura, "Analog Circuit Failure Analysis Using Time-Resolved Emission," in *International Symposium on Testing and Failure Analysis (ISTFA)*, Austin, TX, 2005.
18. G. L. Woods, "Solving Design Marginality with GlobalScan," in *Credence Technical Forum*, Santa Clara, CA, 2005.
19. G. L. Woods, "Combining ATPG with in-chip probing to dramatically shorten debug time," in *Cadence Designer Network CDNLive*, Santa Clara, CA, 2005.
20. K. Sanchez, R. Desplats, F. Beaudoin, P. Perdu, J. P. Roux, G. Woods, and D. Lewis, "Dynamic Laser Delay Variation Mapping (DVM) Implementations and Applications," in *European Symposium on Reliability and Failure Analysis (ESREF)*, Bordeaux, France, 2005.
21. K. Sanchez, R. Desplats, F. Beaudoin, P. Perdu, S. Dudit, G. Woods, and D. Lewis, "Dynamic Laser Delay Variation Mapping (DVM) Implementations and Applications," in *International Symposium for Testing and Failure Analysis (ISTFA)*, Santa Clara, CA, 2005.
22. K. Sanchez, R. Desplats, F. Beaudoin, P. Perdu, D. Lewis, P. Vedagarbha, and G. Woods, "Delay variation mapping induced by dynamic laser stimulation," in *International Reliability Physics Symposium (IRPS)*, 2005, pp. 305-11.
23. J. Y. Liao, C. Xiaoding, H. L. Marks, C. Nishizaki, G. L. Woods, P. Vedagarbha, and N. Nataraj, "Rapid diagnostics of an ASIC IP block using dynamic laser scanning," in *Physical and Failure Analysis of Integrated Circuits (IPFA)*, 2005, pp. 27-31.
24. J. Liao, X. Chen, H. Marks, and G. L. Woods, "Localization of marginal circuits for yield diagnostics utilizing a dynamic laser stimulation probing system," in *European Symposium on Reliability and Failure Analysis (ESREF)*, Bordeaux, France, 2005.
25. G. Woods, H. Koike, P. Vedagarbha, K. Wilsher, K. Sanchez, and R. Desplats, "Laser-Induced Timing Alteration in Integrated Circuits," in *LSI Test Symposium*, Osaka, Japan, 2004.
26. G. L. Woods, P. Papaparaskeva, I. Brener, D. A. Pitt, and M. Shtaiif, "Reduction of self- and cross-phase modulation-induced impairments in long-haul WDM telecommunication systems via spectral inversion," in *Optical Fiber Communication Conference*, 2004.
27. G. L. Woods and S. Kasapi, "Spectrally- and temporally-resolved dynamic emission from CMOS ICs," in *Lasers and Electro-Optics Society, (LEOS)*, 2003, pp. 598-9 vol.2.
28. G. Woods and S. Kasapi, "Spectrally- and Temporally-Resolved Dynamic Emission from CMOS ICs," in *IEEE Lasers and Electro-Optics Society Annual Meeting*, 2003, pp. 598-9.
29. J. S. Vickers, R. Ispasoiu, D. Cotton, J. Frank, B. Lee, G. Woods, and S. Kasapi, "Time-Resolved Photon Counting System Based on a Geiger-Mode APD and Solid Immersion Lens," in *LSI Test Symposium*, Osaka, Japan, 2003.
30. S. Rusu, S. Seidel, G. Woods, D. Grannes, H. Muljono, J. Rowlette, and K. Petrosky, "Backside infrared probing for static voltage drop and dynamic timing measurements," in *International Solid-State Circuits Conference*, 2001, pp. 276-7, 454.
31. G. L. Woods, T. M. Eiles, and V. Rao, "Time-resolved emission measurements for speedpath debug," in *Intel Research & Development Conference*, Sacramento, CA, 2000.
32. G. L. Woods, "Silicon Backside emission measurements," (*invited talk*), in *Infrared Emission Users' Group Conference*, Half Moon Bay, Ca, 2000.
33. T. Eiles, G. Woods, and V. Rao, "Optical probing of flip-chip-packaged microprocessors," in *International Solid State Circuits Conference*, San Francisco, CA, 2000, pp. 220-1.
34. T. M. Eiles, G. L. Woods, and V. Rao, "Optical Probing of VLSI IC's from the silicon backside," in *25th International Symposium for Testing and Failure Analysis*, Santa Clara, CA, 1999.

35. G. L. Woods, "Nonlinear optical devices based on intersubband transitions in III-V quantum wells" (*invited talk*) in *American Physical Society Annual Meeting*, San Jose, CA, 1996.
36. E. L. Martinet, G. L. Woods, H. C. Chui, J. S. Harris, Jr., M. M. Fejer, C. A. Rella, and B. A. Richman, "Phase-resolved nonlinear spectroscopy of InGaAs/AlGaAs asymmetric quantum wells in the mid-infrared (3-11 μm)," in *International Quantum Electronics Conference*, Anaheim, CA, 1994.
37. E. L. Martinet, G. L. Woods, H. C. Chui, J. S. Harris, Jr., C. A. Rella, B. A. Richman, and M. M. Fejer, "Free-electron laser nonlinear spectroscopy of doubly resonant (5.5-3.0 μm and 4.1-2.1 μm) InGaAs/ AlGaAs asymmetric quantum wells," in *Quantum well and superlattice physics V*, Los Angeles, CA USA, 1994, pp. 331-41.
38. E. L. Martinet, G. L. Woods, H. C. Chui, M. M. Fejer, and J. S. Harris, Jr., "Phase-resolved second harmonic generation in InGaAs/AlGaAs quantum wells," in *7th International Conference on Superlattices, Microstructures, and Microdevices*, Banff, Alberta, Canada, 1994.
39. H. C. Chui, G. L. Woods, M. M. Fejer, E. L. Martinet, and J. S. Harris, Jr., "Tunable mid-infrared generation by mixing of near-infrared wavelengths in intersubband quantum wells," in *Lasers and Electro-Optics Society Annual Meeting, 1994. LEOS '94 Conference Proceedings. IEEE*, 1994, pp. 175-6 vol.1.

Magazine article

1. P. Vedagarbha, G. Woods, H. Koike, and K. Sanchez, "Laser-Induced Debug and Failure Analysis," *cover story* of *Semiconductor International*, Dec. 2004.

U.S. Patents Issued

1. Kelly, Kevin F.; Baraniuk, Richard G.; Woods, Gary; Sun, Ting; Turner, Matthew, "Apparatus and method for compressive imaging and sensing through multiplexed modulation via spinning disks," USA Patent #9521306B2, Issued 2016.
2. G.L. Woods, J.M. Tidman, "Adaptively filtering compressive imaging measurements to attenuate noise," USA Patent #8,717,463, Issued 2014
3. K.F. Kelly, G.L. Woods, L. McMackin, R.F. Bridge, J.M. Tidman, D.E. Hewitt, "Dynamic range optimization in a compressive imaging system," USA Patent #8,634,009, Issued 2014.
4. M.L. Villafana, M. DiBattista, G. Woods, "Techniques employing light-emitting circuits," USA Patent #8,451,009, Issued 2013.
5. S. Kasapi, K. Wilsher, G. Woods, W. Lo, R. Ispasoiu, N. Nataraj, Boiadjieva, N. , "Apparatus and method for probing integrated circuits using laser illumination", USA Patent # 7,616,312; Issued 2009.
6. G. Woods, S. Kasapi, K. Wilsher, "Method and apparatus for measuring high-bandwidth electrical signals using modulation in an optical probing system", USA Patent #7,450,245; Issued 2008.
7. H. Suri and G. Woods, "System and method for determining probing locations on IC", USA Patent # 7,243,039; Issued 2007.
8. R. H. Livengood, P. Winer, G. Woods, and M. DiBattista, "Method and apparatus for controlling material removal from semiconductor substrate using induced current endpointing", USA Patent # 7,232,526; Issued 2007.
9. G. L. Woods and S. Kasapi, "Apparatus and method for determining voltage using optical observation", USA Patent # 7,012,537; Issued 2006.
10. R. H. Livengood, P. Winer, G. Woods, and M. DiBattista, "Method and apparatus for controlling material removal from a semiconductor substrate using induced current endpointing", USA Patent # 6,780,658; Issued 2004.

11. S. B. Samaan, P. Madland, and G. L. Woods, "Device and method for probing instantaneous high-speed local supply voltage fluctuation in VLSI integrated circuits using IR emissions", USA Patent # 6,737,880; Issued 2004
12. S. Rusu, H. Muljono, G. L. Woods, J. A. Rowlette, and D. J. Grannes, "Method and apparatus to measure statistical variation of electrical signal phase in integrated circuits using time-correlated photon counting", USA Patent # 6,596,980; Issued 2003.
13. S. G. Seidel, T. M. Eiles, G. L. Woods, S. Rusu, and D. J. Grannes, "Semiconductor die manufacture method to limit a voltage drop on a power plane thereof by noninvasively measuring voltages on a power plane", Patent # 6,519,744; Issued 2003.
14. R. H. Livengood, P. Winer, G. Woods, and M. DiBattista, "Method and apparatus for controlling material removal from a semiconductor substrate using induced current endpointing", USA Patent # 6,579,732; Issued 2003.
15. D. A. Pitt, K. A. Sigg, J. Tian, and G. L. Woods, "Optical amplifier using wavelength converter", USA Patent # 6,501,597; Issued 2002.
16. R. H. Livengood, P. Winer, G. Woods, and M. DiBattista, "Method and apparatus for controlling material removal from a semiconductor substrate using induced current endpointing", USA Patent # 6,355,494; Issued 2002.

Graduate-student supervision

1. Technical advice and service on MS thesis committee of Adam Samaniego, a student in the group of Prof. Ashok Veeraraghavan at Rice University, 2013-14.
2. Darius Morris, a student in the group of Prof. Jun Kono in ECE Dept. at Rice University. 2011-2012.
3. Hands-on supervision of experimental research of Ulrike Kindereit, a doctoral student in the group of Professor Christian Boit at TU-Berlin, 2005-2006. (See publication list).

Summary of capstone teams

- Primary faculty advisor or technical mentor for >100 capstone teams (~75% with grading + technical responsibility, ~25% with significant technical mentorship) in the yearlong collaborative capstone (senior design) course. Of all the teams, ~40% were interdisciplinary (not counting double majors).
- Sponsors/ Customers (approx.) more than: Research 26, Students 13, Industry 23, External collaborators 27, Other 23
- Results: ~8 teams with conference/ journal publications or patents; ~8 with clinical trials or deployments; ~6 commercializations; ~10 Vertically Integrated Projects; numerous awards at university, national, and international levels.
- More than 20 projects involving rechargeable batteries, recharging circuits, or wireless power transmission.