

***ADC Solutions Auto LLC, Petitioner v.
The Noco Company, Patent Owner***

IPR2024-00577

IPR2024-00671



United States Patent No. 11,447,023

United States Patent No. 11,584,243

Patent Owner's Demonstrative Exhibits

May 29, 2025

U.S. Patent Nos. 11,447,023 & 11,584,243

(12) **United States Patent**
Nook et al.

(10) **Patent No.:** US 11,447,023 B2
(45) **Date of Patent:** Sep. 20, 2022

(54) **PORTABLE VEHICLE BATTERY JUMP
START APPARATUS WITH SAFETY
PROTECTION AND JUMPER CABLE
DEVICE THEREOF**

(58) **Field of Classification Search**
CPC B60L 53/14; H02J 7/342; H02J 7/0047;
H02J 7/0034; H02J 7/0029; H02J 1/122;
H02J 7/00; H02J 7/0048; H02J 2310/46
(Continued)

(12) **United States Patent**
Nook et al.

(10) **Patent No.:** US 11,584,243 B2
(45) **Date of Patent:** *Feb. 21, 2023

(54) **JUMP STARTING DEVICE WITH USB**

(71) Applicant: **THE NOCO COMPANY**, Glenwillow,
OH (US)

(72) Inventors: **Jonathan Lewis Nook**, Gates Mills,
OH (US); **William Knight Nook**,
Shaker Heights, OH (US); **James**
Richard Stanfield, Glendale, AZ (US);
Derek Michael Underhill, Tempe, AZ
(US)

(73) Assignee: **The NOCO Company**, Glenwillow,
OH (US)

(*) Notice: Subject to any disclaimer, the term of this

(52) **U.S. CL.**
CPC **B60L 53/14** (2019.02); **H02J 1/122**
(2020.01); **H02J 7/0029** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC B60L 53/14; H02J 7/342; H02J 7/0047;
H02J 7/0034; H02J 7/0029; H02J 1/122;
(Continued)

(56) **References Cited**
U.S. PATENT DOCUMENTS
3,085,187 A 4/1963 Godshalk
3,105,183 A 9/1963 Hysler et al.
(Continued)

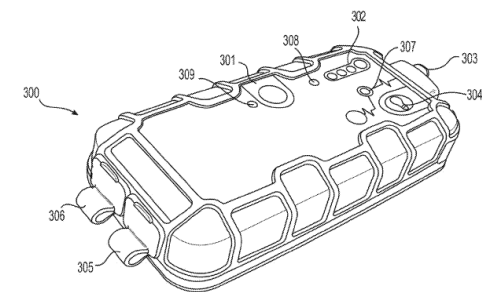


FIG. 3

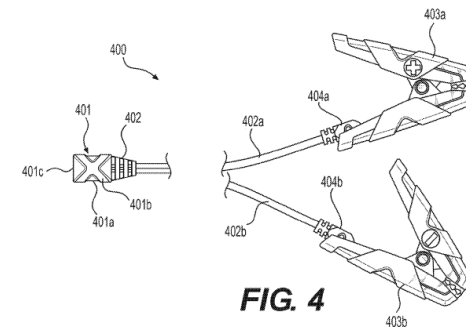


FIG. 4

Ex. 1001 (IPR2024-00577)

Ex. 1001 (IPR2024-00671)

DEMONSTRATIVE
EXHIBIT - NOT EVIDENCE

Instituted Grounds

I. IPR2024-00577 (PATENT 11,447,023)

- Ground 1: Claims 1, 32, 38, 39, 47, 52, and 54 over Richardson in view of Zhao
- Ground 2: Claims 1, 32, 38, 39, 47, 52, and 54 over Yu in view of Paparrizos

II. IPR2024-00671 (PATENT 11,584,243)

- Ground 1: Claims 1 and 2 over Richardson in view of Zhao
- Ground 2: Claims 15, 17, 18, 51, 54, and 57 over Richardson in view of Zhao and Dao
- Ground 3: Claims 1, 2, 15, 17, 18, and 57 over Yu in view of Paparrizos
- Ground 4: Claims 15, 17, 18, 51, 54, and 57 over Yu in view of Paparrizos and Dao

Paper 8 (IPR2024-00577)

Paper 7 (IPR2024-00671)

U.S. Patent Nos. 11,447,023

Independent Claim 1

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

a power supply;

a positive polarity battery terminal connector configured for connecting the jump starting apparatus to the positive polarity battery terminal of the depleted or discharged battery;

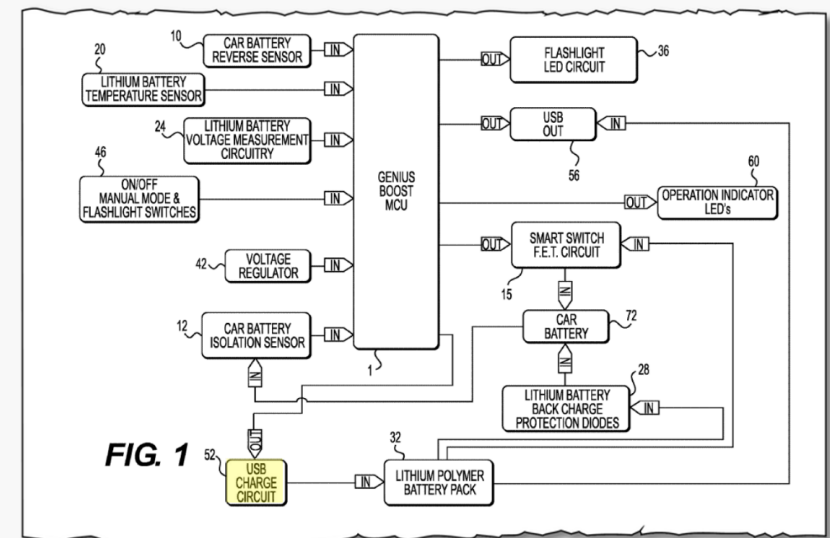
a negative polarity battery terminal connector configured for connecting the jump starting apparatus to the negative polarity battery terminal of the depleted or discharged battery;

a power switch or circuit configured to turn on power from the power supply to the positive and negative polarity battery terminal connectors;

a control system or circuit connected to and controlling the power switch, the control system or circuit configured to detect whether the positive and negative polarity battery terminal connectors have a correct polarity connection with the positive and negative polarity battery terminals of the depleted or discharged battery prior to turning on the power switch or circuit;

a USB input circuit connected to the power supply, the USB input circuit comprising a DC/DC converter, the USB input circuit configured for converting power from a USB power source to increase power voltage to the power supply; and

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



Ex. 1001 (IPR2024-00577)

U.S. Patent Nos. 11,584,243

Independent Claim 1

1. A jump starting device for boosting or charging a depleted or discharged battery having a positive battery terminal and a negative battery terminal, the jump starting device comprising:

a power supply;

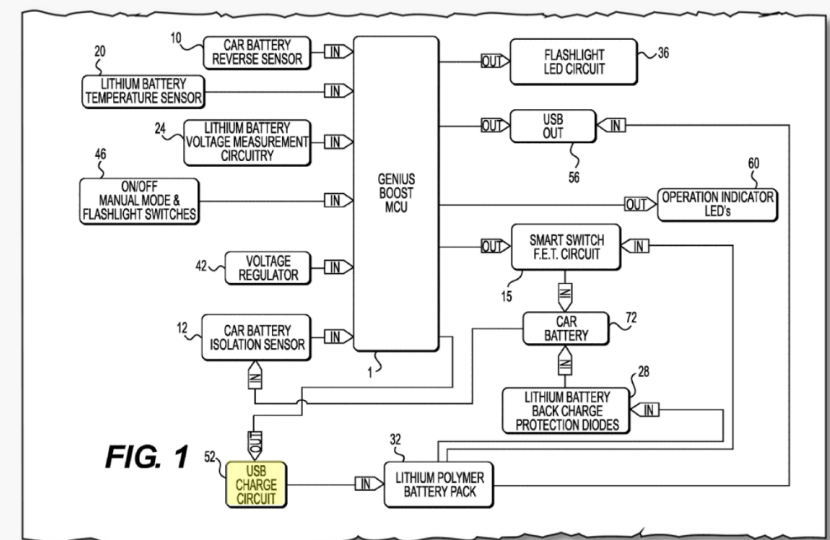
a positive battery connector for electrically connecting the jump starting device to the positive battery terminal of the depleted or discharged battery;

a negative battery connector for electrically connecting the jump starting device to the negative battery terminal of the depleted or discharged battery;

a power switch or switch circuit connected in circuit with the power supply and the positive and negative battery connectors, the power switch or switch circuit configured to switch power on from the power supply to boost or charge the depleted or discharged battery when connected between the positive and negative battery connectors;

a USB input connector; and

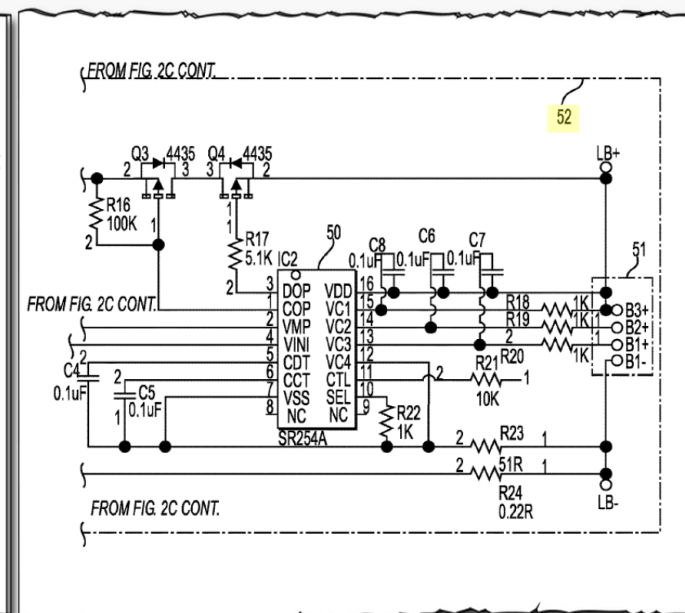
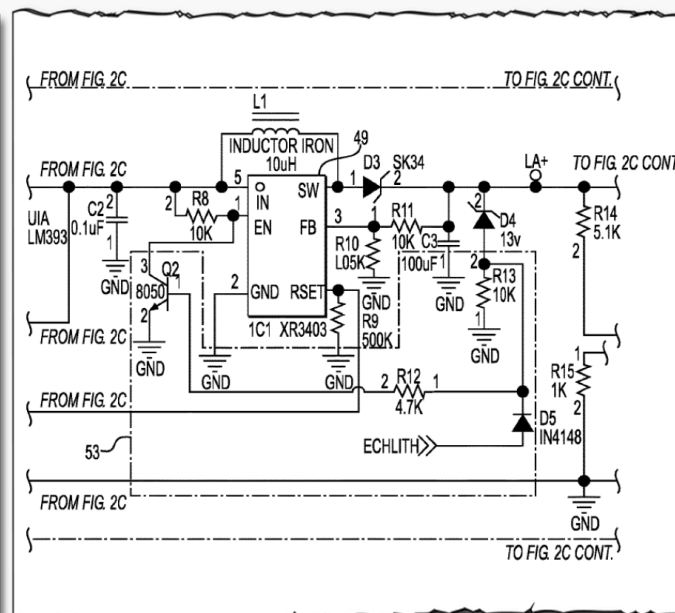
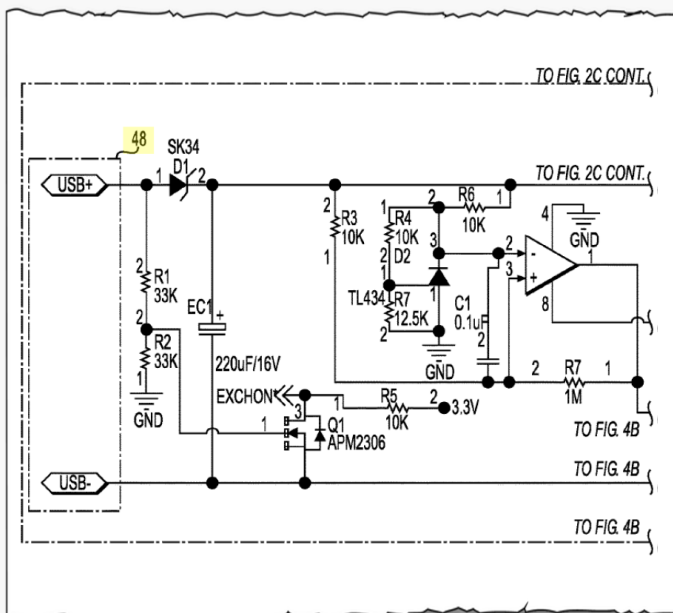
a USB charge circuit electrically connecting the USB input connector to the power supply, the USB charge circuit comprising a DC-DC converter configured to upconvert voltage from the USB input connector to the power supply.



Ex. 1001 (IPR2024-00671)

The '023 & '243 Patents Provide Complete Diagrams of the USB Input/Charge Circuits

“The USB charge circuit **52** allows the internal lithium battery pack **32** to be charged using a standard USB charger.”



DEMONSTRATIVE
EXHIBIT - NOT EVIDENCE

Ex. 1001 (IPR2024-00577)

Ex. 1001 (IPR2024-00671)

PROCEDURAL HISTORY OF USB CHARGING CLAIMS

- **ITC:** Final Determination finding insufficient evidence that a POSITA would have had reason to add Zhao's USB charging path to Richardson. [See, Inv. No. 337-TA-1359, Final Initial Determination at 267; PO Resp. ('023), p. 34]
- **IPR2020-00944:** In challenge to related Patent No. 9,007,015 ('015 Patent), PTAB found "a USB charging port configured to provide charging power from an external power source to said internal power supply [of a jump starting apparatus]" to be NOT unpatentable.
- **Fed Circuit Appeal Nos. 2022-1646, 202-1741 (Feb. 2024):** Federal Circuit upheld patentability of "USB charging port" limitations in claim 11 of related '015 Patent.
- **PTO:** Allowed '023 and '243 Patents over Richardson and Yu

PATENTABILITY

The Petition Misrepresents How a POSITA Would Have Viewed Jump Starters and USB at the Time of Filing

A POSITA Would Not Have Modified Richardson to Add USB Charging

The Petition Fails to Establish How to Combine Richardson and Zhao

A POSITA Would Not Have Modified Yu to Add USB Charging

The Petition Fails to Establish How to Combine Yu and Paparrizos

Neither Yu Nor Paparrizos Disclose a DC-DC Converter That is Turned On and Off by a Microprocessor ('023, Claims 32, 52)

PATENTABILITY

The Petition Misrepresents How a POSITA Would Have Viewed Jump Starters and USB at the Time of Filing

A POSITA Would Not Have Modified Richardson to Add USB Charging

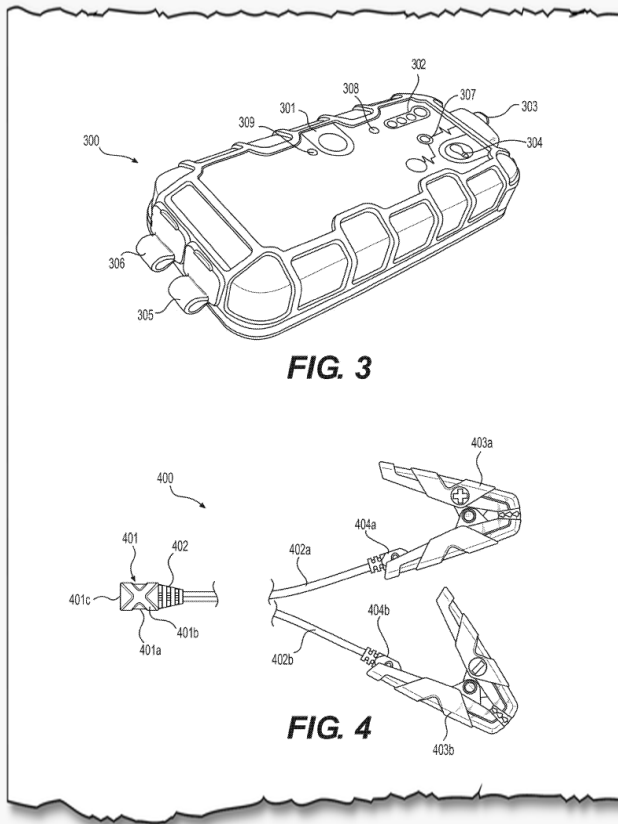
The Petition Fails to Establish How to Combine Richardson and Zhao

A POSITA Would Not Have Modified Yu to Add USB Charging

The Petition Fails to Establish How to Combine Yu and Paparrizos

Neither Yu Nor Paparrizos Disclose a DC-DC Converter That is Turned On and Off by a Microprocessor ('023, Claims 32, 52)

The Petition Misrepresents How a POSITA Would Have Viewed Jump Starters and USB at the Time of Filing



“[a]t the heart o the handheld battery booster is a lithium polymer battery pack 32, which stores sufficient energy to jump start a vehicle engine serves by a conventional 12 volt lead-acid or valve regulated lead-acid battery.” [‘023 patent , 4:5-9]

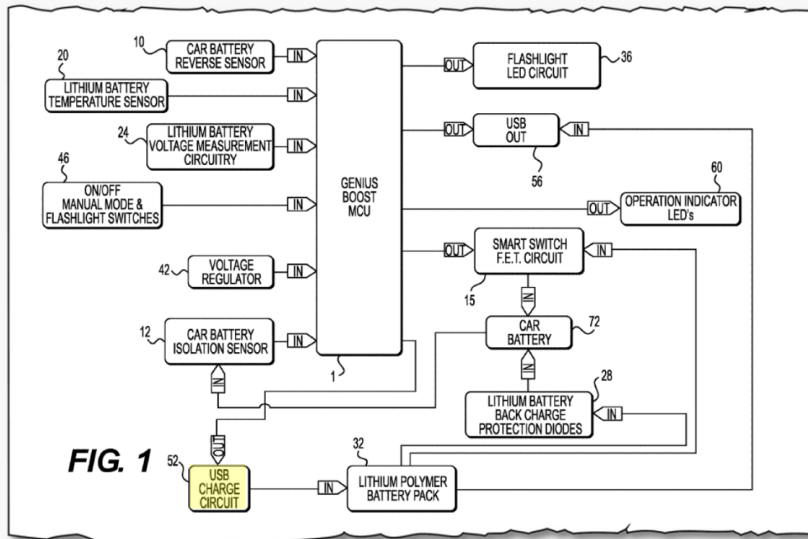
“USB charge circuit 52 converts power from any USB charger power source, charge voltage and current for charging the lithium battery pack 32.” [‘023 patent, 5:15-17]

“One of the key performance metrics for a jump starter device is the maximum current it can supply for the duration needed to jump start an engine (approximately 20-50 ms).” [Ex. 2011, para. 70] “These aforementioned factors necessitate that the battery cells (and thus the battery pack) of a jump starter have a substantially larger nominal capacity than would otherwise be needed in most other electronic applications, which generally require substantially lower peak current.” [*Id.*, para. 73].

“[u]nlike digital multimeters, pocket calculators, cellphones, or other small consumer electronic devices that Petitioner uses in its prior art examples, the high-power functionality of jump starters requires such devices to have large-capacity battery packs. **Because of this, vehicle jump starters are more equivalent to those of electric lawnmowers, snowblowers, and other high-power cordless tools.**” [Ex. 2011, para. 84]

DEMONSTRATIVE
EXHIBIT - NOT EVIDENCE

The Petition Misrepresents How a POSITA Would Have Viewed Jump Starters and USB at the Time of Filing



“... charging the jump starter with the USB input would be 4 to 8 times slower than using a barrel connector, which I felt would be a significant negative in the eyes of consumers... Based on the above, I concluded that incorporating a USB charging input would be detrimental to the Boost jump starter. Despite my concerns and conclusions described above, Mr. Nook felt that a USB charging input would be a highly desirable feature of a lithium ion battery jump starter and, accordingly, insisted that we incorporate one into the design of the Boost jump starter. In other words, Mr. Nook had the foresight to realize that the consumer benefit of providing a USB charging input to a lithium ion vehicle jump starter outweighed several sound engineering and other reasons that counseled against doing so.” [Ex. 1046, Declaration of Inventor Rick Stanfield, pp. 4-5]

“Because of the high capacity batteries required in a jump starter, it is my opinion that a PHOSITA would not have considered 2014-era USB to be a viable charging solution.” [Ex. 2011, para. 83]

DEMONSTRATIVE
EXHIBIT - NOT EVIDENCE

No Prior Art Reference Suggests USB Charging of a High-Power Device

- [Zhao \(US 9,391,467\)](#) – Step-up battery charging system for devices having small-capacity batteries under 8.4V. [See, Ex. 1006, 4:39-41; PO Response ('023), p. 26]
- [Paparrizos \(US 9,219,372\)](#) – Charging system for “[c]omputer tablets and other mobile devices, such as mobile phones, digital SLR cameras, video recorders, audio devices, and so on...” [Ex. 1009, 1:9-26; PO Response ('023), p. 40]
- [CN 202512152U](#) – Digital multimeter device with a 9V internal battery. [See, Ex. 1019, paras. 4-5; Petition ('023), p. 48]
- [CN 201226449Y](#) – Boost circuit for charging low-power electronic devices from a computer’s USB port. [See, Ex. 1021, pg. 4; Petition ('023), p. 48]
- [US 2013/0285596](#) – Charging system for “portable computing devices, such as laptops, tables, and smart phones.” [See, Ex. 1016, para. [0001]; Petition ('023), pp. 48-49]
- [US 9,035,599](#) – Charge control circuit for a mobile electronic device “such as a digital video camera.” [See, Ex. 1017, 1:16-17, 30-33; Petition ('023), p. 49]

The Petition Misrepresents How a POSITA Would Have Viewed Jump Starters and USB at the Time of Filing

- The massive peak current requirement for vehicle jump starters requires very high-capacity internal battery cells.
- A POSITA would have recognized that a high-power charging energy source was required to maintain a reasonable charging time.
- A POSITA would have recognized that boost converting adds to charging inefficiencies.
- A POSITA would not have considered 2014-era USB to be a viable charging solution for high-capacity batteries.
- The Petition focuses only on charging voltage differences, and fails to recognize the differences between charging a consumer electronic device and a high-power, high-capacity battery for a jump starter.

PATENTABILITY

The Petition Misrepresents How a POSITA Would Have Viewed Jump Starters and USB at the Time of Filing

A POSITA Would Not Have Modified Richardson to Add USB Charging

The Petition Fails to Establish How to Combine Richardson and Zhao

A POSITA Would Not Have Modified Yu to Add USB Charging

The Petition Fails to Establish How to Combine Yu and Paparrizos

Neither Yu Nor Paparrizos Disclose a DC-DC Converter That is Turned On and Off by a Microprocessor ('023, Claims 32, 52)

Richardson Discloses a Heavy-Duty Commercial Jump Starter

(19) **United States**

(12) **Patent Application Publication** (10) Pub. No.: US 2013/0154543 A1
Richardson et al. (43) Pub. Date: Jun. 20, 2013

(54) METHOD AND APPARATUS FOR PROVIDING SUPPLEMENTAL POWER TO AN ENGINE

(60) Provisional application No. 61/018,715, filed on Jan. 3, 2008.

(71) Applicants: **Francis D. Richardson**, Eudora, KS (US); **Richard L. Henderson**, Leawood, KS (US); **John A. Fox**, Eudora, KS (US); **Russell W. Sherwood**, Olathe, KS (US)

Publication Classification

(51) **Int. Cl.**
H02J 7/00 (2006.01)

(52) **U.S. CL.**
CPC **H02J 7/007** (2013.01)
USPC **320/104; 320/136; 320/134; 320/109**

(72) Inventors: **Francis D. Richardson**, Eudora, KS (US); **Richard L. Henderson**, Leawood, KS (US); **John A. Fox**, Eudora, KS (US); **Russell W. Sherwood**, Olathe, KS (US)

(57) ABSTRACT

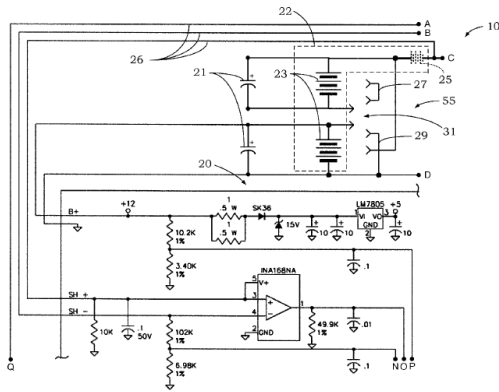
A method and apparatus provides supplemental power to an engine. The method and apparatus includes a pair of conductive leads for connecting the supplemental power to an engine electrical system, one or more batteries connected in parallel with one or more capacitors, a relay connected to the conductive leads, a shunt cable connecting the batteries and capacitors to the relay and a processor for controlling the relay to selectively apply electrical power to the engine electrical system. The method and apparatus includes safety features to reduce the risk of injury to the operator and damage to the apparatus and/or engine electrical system.

(21) Appl. No.: 13/768,534

(22) Filed: **Feb. 15, 2013**

Related U.S. Application Data

(63) Continuation-in-part of application No. 12/436,562, filed on May 6, 2009, which is a continuation-in-part of application No. 12/330,875, filed on Dec. 9, 2008, now abandoned.



[0005] ...Batteries in motor vehicles are capable of producing from 2,500 to more than 45,000 watts of power.

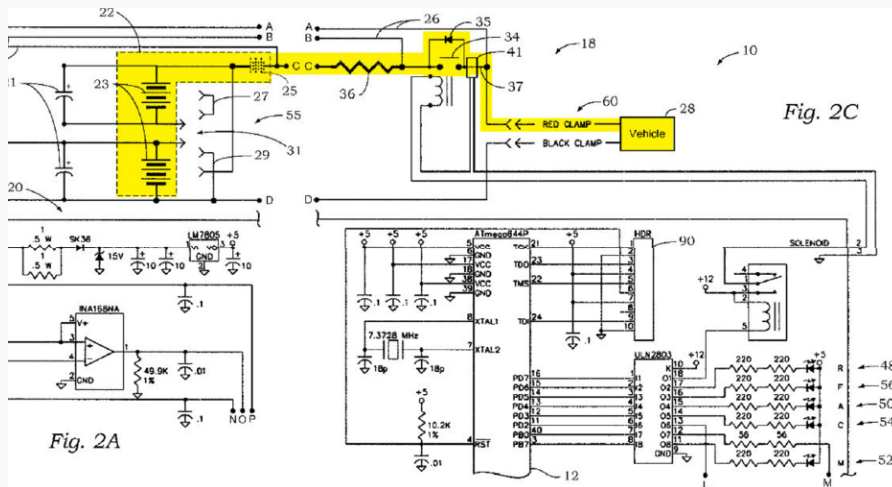
[0034] ...The jump starter 10 may be configured for 12, 18, 24, 30, 36, 42 or 48 volts, for example, using a selector jumper 55. For example, if the batteries 23 are both 12-volt batteries, the system may be configured for 12- or 24-volt operation.

93. Richardson contemplates a battery pack with a capacity that is at least four times larger than that of a standard 12 volt vehicle charger... In fact, the commercial embodiment of Richardson is roughly the size of a suitcase and had wheels so that a user could roll it from vehicle to vehicle.

Ex. 2011 ('023), para. 93

Ex. 1005, paras. [0005], [0034];
PO Response ('023), pp. 28-30
PO Response ('243), pp. 28-31

Richardson is Designed for Rapid Recharging



Zhao is a Step-Up Charger for Low Power Devices.

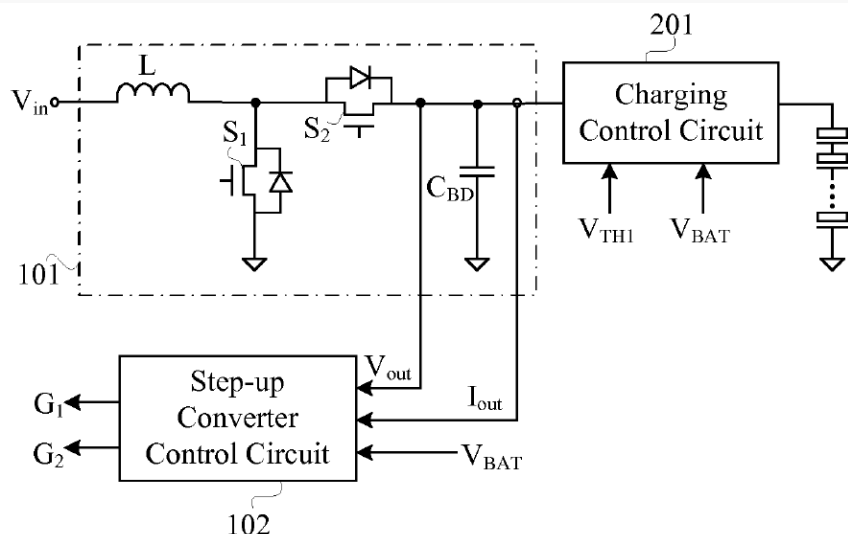


FIG. 1

When battery voltage V_{BAT} is greater than threshold voltage V_{TH1} , comparator 303 can output a high level signal to fully turn on power transistor Q_1 . In this case, the output signal of power stage circuit 101 can directly charge the battery device. When battery voltage V_{BAT} is greater than threshold voltage V_{TH1} but less than final voltage V_{CV} (e.g., final voltage V_{CV} can be about 8.4V if two lithium batteries are connected in series), step-up converter control circuit 102 can maintain output current I_{out} at a predetermined operating current...

Ex. 1006, 4:34-46, Fig. 1

PO Response ('023), pp. 25-27

PO Response ('243), pp. 25-27

A POSITA Would Not Have Modified Richardson to Add USB Charging

- The Petition fails to consider the actual system of Richardson, which is a non-traditional, heavy-duty jump starter
- A POSITA would not have considered the low-voltage, low-power charger of Zhao for jump starting vehicle batteries up to 48V
- A POSITA would not have considered Zhao's system suitable for rapid recharging a high-capacity battery ("in about 1 to 5 minutes")
- Richardson's only charging method is from the vehicle battery

PATENTABILITY

The Petition Misrepresents How a POSITA Would Have Viewed Jump Starters and USB at the Time of Filing

A POSITA Would Not Have Modified Richardson to Add USB Charging

The Petition Fails to Establish How to Combine Richardson and Zhao

A POSITA Would Not Have Modified Yu to Add USB Charging

The Petition Fails to Establish How to Combine Yu and Paparrizos

Neither Yu Nor Paparrizos Disclose a DC-DC Converter That is Turned On and Off by a Microprocessor ('023, Claims 32, 52)

The Petition Fails to Establish How to Combine Richardson and Zhao

A PHOSITA would have been motivated to modify the design of Richardson's jump starter to either (1) replace the existing charging circuitry with Zhao's step-up charging system and connect the output to Richardson's jump starter batteries or (2) add Zhao's step-up charging system and connect the output to Richardson's jump starter batteries as an additional and alternatively [sic] pathway for charging the jump starter batteries.

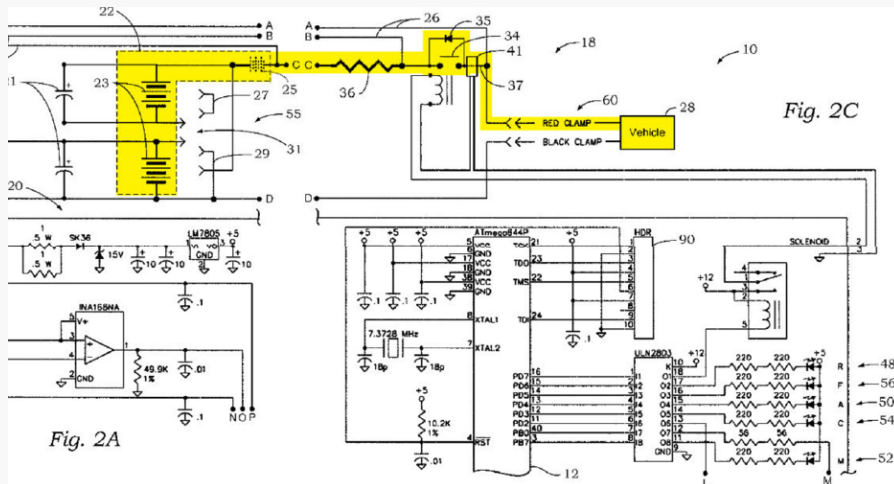
Petition ('023), p. 45

Petition ('243), p. 36

The Petition Fails to Establish How to Combine Richardson and Zhao

A PHOSITA would have been motivated to modify the design of Richardson's jump starter to either (1) replace the existing charging circuitry with Zhao's step-up charging system and connect the output to Richardson's jump starter batteries or (2) add Zhao's step-up charging system and connect the output to Richardson's jump starter batteries as an additional and alternatively [sic] pathway for charging the jump starter batteries.

Petition ('023), p. 45; Petition ('243), p. 36



[0055] Referring to FIGS. 1 and 2, a diode 35 may be connected across the contact 34 to charge the capacitors 21 and jump starter batteries 22 from the vehicle charging system 28. The charging system of the vehicle may be used to charge the capacitors 21 and jump starter batteries 22... This allows the capacitors 21 and jump starter batteries 22 to be fully recharged in about 1 to 5 minutes and can therefore start many vehicles in a row without becoming discharged.... This is very useful when starting fleets of vehicles with dead batteries.

DEMONSTRATIVE
EXHIBIT - NOT EVIDENCE

The Petition Fails to Establish How to Combine Richardson and Zhao

A PHOSITA would have been motivated to modify the design of Richardson's jump starter to either (1) replace the existing charging circuitry with Zhao's step-up charging system and connect the output to Richardson's jump starter batteries or (2) add Zhao's step-up charging system and connect the output to Richardson's jump starter batteries as an additional and alternatively [sic] pathway for charging the jump starter batteries.

Petition ('023), p. 45

Petition ('243), p. 36

The Petition Fails to Establish How to Combine Richardson and Zhao

~~A PHOSITA would have been motivated to modify the design of Richardson's jump starter to either (1) replace the existing charging circuitry with Zhao's step-up charging system and connect the output to Richardson's jump starter batteries or (2) add Zhao's step-up charging system and connect the output to Richardson's jump starter batteries as an additional an alternatively [sic] pathway for charging the jump starter batteries.~~

Richardson

[0034] ...The jump starter 10 may be configured for 12, 18, 24, 30, 36, 42 or 48 volts, for example, using a selector jumper 55. For example, if the batteries 23 are both 12-volt batteries, the system may be configured for 12- or 24-volt operation.

Zhao

When battery voltage V_{BAT} is greater than threshold voltage V_{TH1} , comparator 303 can output a high level signal to fully turn on power transistor Q_1 . In this case, the output signal of power stage circuit 101 can directly charge the battery device. When battery voltage V_{BAT} is greater than threshold voltage V_{TH1} but less than final voltage V_{CV} (e.g., final voltage V_{CV} can be about 8.4V if two lithium batteries are connected in series)...

DEMONSTRATIVE
EXHIBIT - NOT EVIDENCE

23

Ex. 1005, para. [0034]; Ex. 1006, 4:34-41;
PO Response ('023), pp. 35-38; PO Response ('243), pp. 35-39

JONES
DAY

The Petition Fails to Establish How to Combine Richardson and Zhao

- Richardson is a heavy-duty jump starter (12V-48V) that is unsuitable for USB charging
- Richardson emphasizes the importance of rapid recharging which could not have been achieved with USB charging
- Richardson discloses no charging circuitry other than charging from the vehicle battery
- The Petition fails to demonstrate *how* to incorporate Zhao's low-power charging system into Richardson's high-power jump starter
- The Petition fails to demonstrate that Zhao's step-up converter is compatible with Richardson's high-power jump starter

PATENTABILITY

The Petition Misrepresents How a POSITA Would Have Viewed Jump Starters and USB at the Time of Filing

A POSITA Would Not Have Modified Richardson to Add USB Charging

The Petition Fails to Establish How to Combine Richardson and Zhao

A POSITA Would Not Have Modified Yu to Add USB Charging

The Petition Fails to Establish How to Combine Yu and Paparrizos

Neither Yu Nor Paparrizos Disclose a DC-DC Converter That is Turned On and Off by a Microprocessor ('023, Claims 32, 52)

Paparrizos is a Step-Up Charger for Low Power Devices.

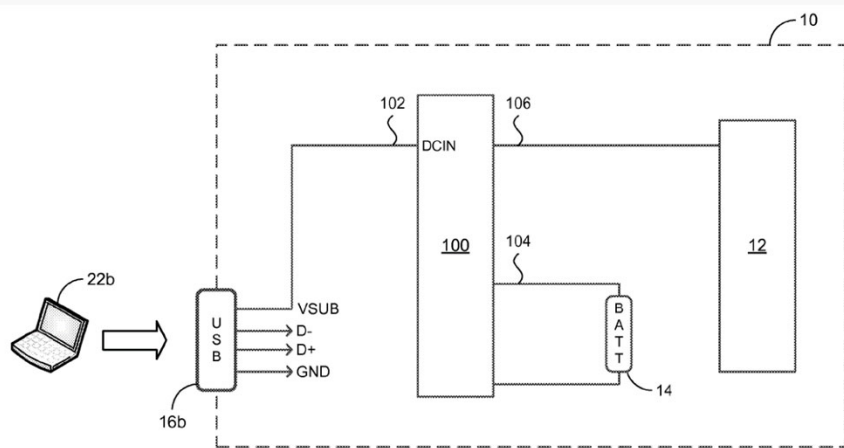


Fig. 1B

FIG. 1 shows a high level block diagram of an electronic device 10 that incorporates a battery charging circuit 100 in accordance with the present disclosure. For example, the electronic device 10 may be a smartphone, personal data assistant, portable computer, computing tablet, digital imaging devices, audio devices, and so on.

Yu Already Contemplated USB Charging and Boost Conversion

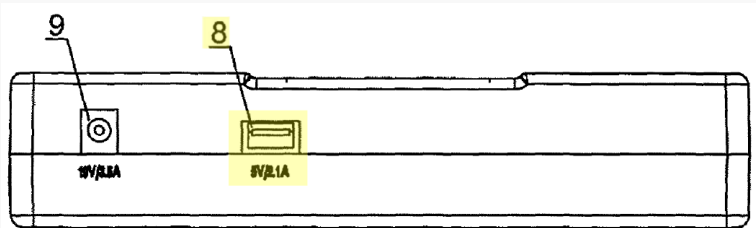


Fig. 7

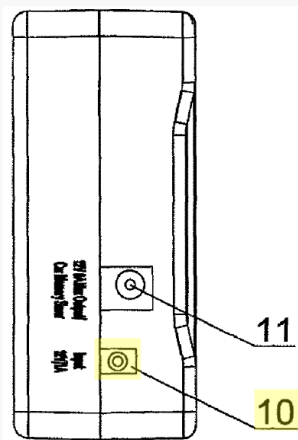


Fig. 9

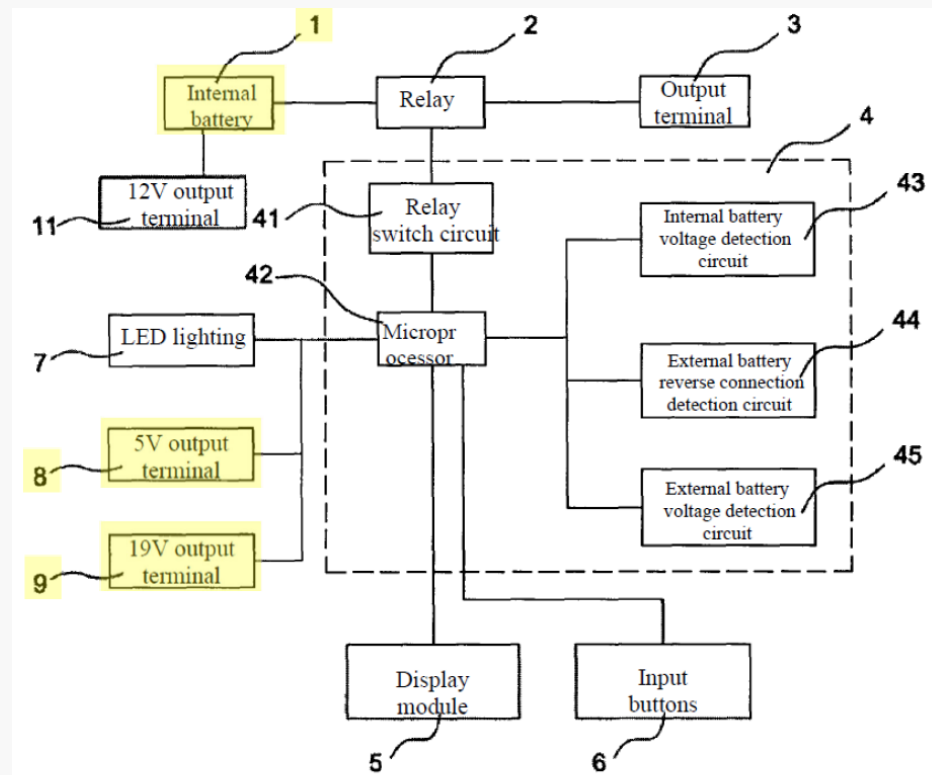


Fig. 1

Ex. 1008, Figs. 1, 7, 9;
PO Response ('023), pp. 41-46;
PO Response ('243), pp. 42-47

DEMONSTRATIVE
EXHIBIT - NOT EVIDENCE

PATENTABILITY

The Petition Misrepresents How a POSITA Would Have Viewed Jump Starters and USB at the Time of Filing

A POSITA Would Not Have Modified Richardson to Add USB Charging

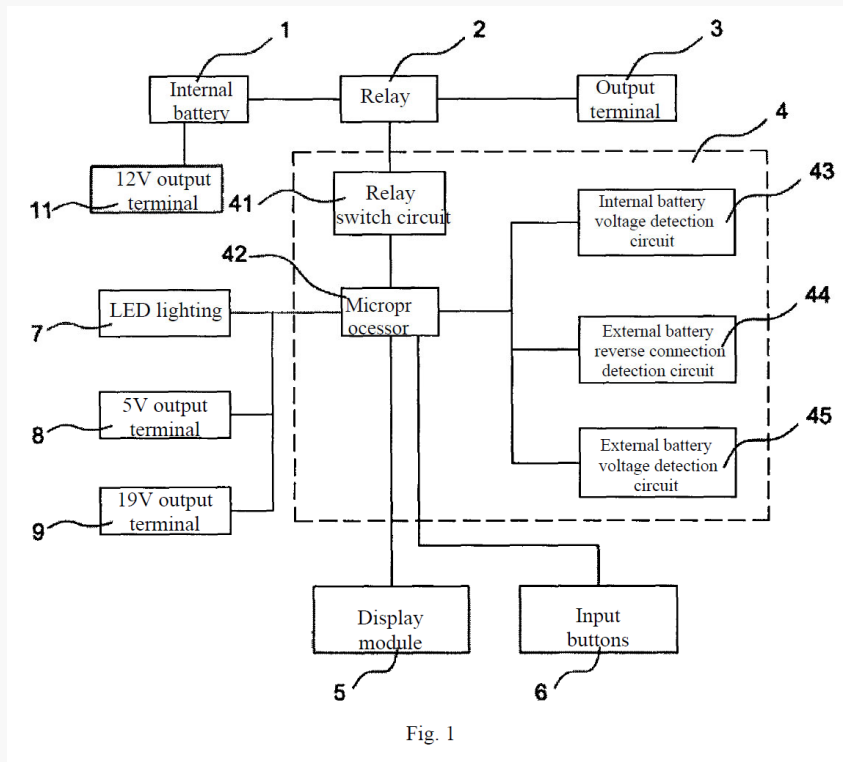
The Petition Fails to Establish How to Combine Richardson and Zhao

A POSITA Would Not Have Modified Yu to Add USB Charging

The Petition Fails to Establish How to Combine Yu and Paparrizos

Neither Yu Nor Paparrizos Disclose a DC-DC Converter That is Turned On and Off by a Microprocessor ('023, Claims 32, 52)

The Petition Fails to Establish How to Combine Yu and Paparrizos



DEMONSTRATIVE
EXHIBIT - NOT EVIDENCE

29

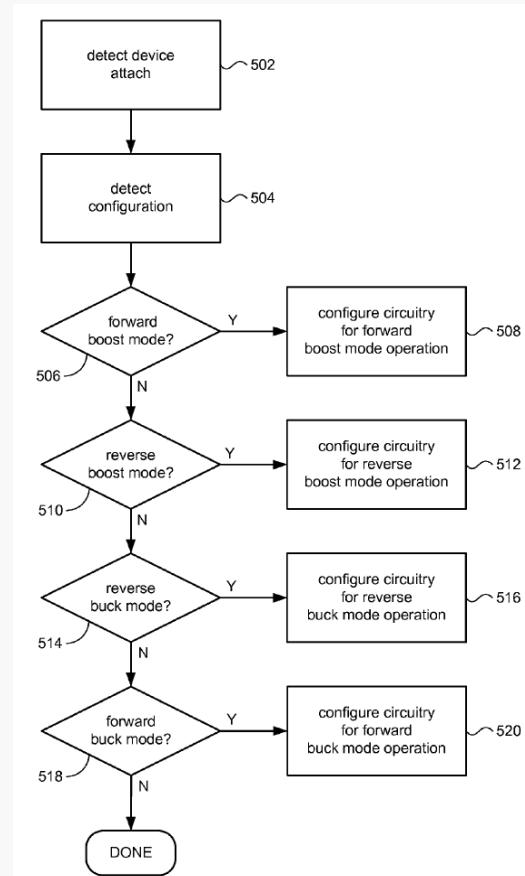


Fig. 5

Ex. 1008 (Yu), Fig. 1;
Ex. 1009 (Paparrizos), Fig. 5;
PO Response ('023), pp. 46-47;
PO Response ('243), pp. 47-48

PATENTABILITY

The Petition Misrepresents How a POSITA Would Have Viewed Jump Starters and USB at the Time of Filing

A POSITA Would Not Have Modified Richardson to Add USB Charging

The Petition Fails to Establish How to Combine Richardson and Zhao

A POSITA Would Not Have Modified Yu to Add USB Charging

The Petition Fails to Establish How to Combine Yu and Paparrizos

Neither Yu Nor Paparrizos Disclose a DC-DC Converter That is Turned On and Off by a Microprocessor ('023, Claims 32, 52)

U.S. Patent Nos. 11,447,023

Claims 32 and 52

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

a power supply;

a positive polarity battery terminal connector configured for connecting the jump starting apparatus to the positive polarity battery terminal of the depleted or discharged battery;

a negative polarity battery terminal connector configured for connecting the jump starting apparatus to the negative polarity battery terminal of the depleted or discharged battery;

a power switch or circuit configured to turn on power from the power supply to the positive and negative polarity battery terminal connectors;

a control system or circuit connected to and controlling the power switch, the control system or circuit configured to detect whether the positive and negative polarity battery terminal connectors have a correct polarity connection with the positive and negative polarity battery terminals of the depleted or discharged battery prior to turning on the power switch or circuit;

a USB input circuit connected to the power supply, the USB input circuit comprising a DC/DC converter, the USB input circuit configured for converting power from a USB power source to increase power voltage to the power supply; and

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

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

U.S. Patent Nos. 11,447,023

Claims 32 and 52

52. A jump starting apparatus configured for boosting or charging a depleted or discharged battery having a positive polarity battery terminal and a negative polarity battery terminal, the jump starting apparatus comprising

a power supply;

a positive polarity battery terminal connector configured for connecting the jump starting apparatus to the positive polarity battery terminal of the depleted or discharged battery;

a negative polarity battery terminal connector configured for connecting the jump starting apparatus to the negative polarity battery terminal of the depleted or discharged battery;

a power switch or circuit configured to turn on power from the power supply to the positive and negative polarity battery terminal connectors;

a control system or circuit connected to and controlling the power switch, the control system or circuit comprising a microcontroller, the control system or circuit configured to detect whether the positive and negative polarity battery terminal connectors have a correct or incorrect polarity connection with the positive and negative polarity battery terminals of the depleted or discharged battery prior to turning on the power switch;

a USB input connector configured for removably connecting to a USB power source and providing power input from the USB power source to the USB input connector; and

a USB input circuit connecting the USB input connector to the power supply, the USB input circuit comprising a DC/DC converter, the USB input circuit configured for converting power from the USB power source to increase power voltage to the power supply,

wherein the DC-DC converter can be turned on and off by an output from the microcontroller.

Neither Yu Nor Paparrizos Disclose a DC-DC Converter That is Turned On and Off by a Microprocessor

Figure 5 of Paparrizos discloses a “workflow” which a PHOSITA would understand to be best implemented by a microprocessor... Additionally, a PHOSITA would understand a microprocessor would be one of the most effective, reliable, and cost-effective choices for implementing control of the ON/OFF state of the buck boost circuit 212. EX1009, FIG. 6; EX1003, ¶167.

Petition (‘023), pp. 69-70.

operation mode	PWM module 312a	PWM module 312b	HS1	LS1	HS2	LS2	boot cap refresh signal 314a	boot cap refresh signal 314b
forward boost conversion	HI	duty ₁₁	ON	OFF	switching	switching	LO	LO
reverse buck conversion	HI	duty ₁₂	ON	OFF	switching	switching	LO	LO
forward buck conversion	duty ₁₃	HI	switching	switching	ON	OFF	LO	LO
reverse boost conversion	duty ₁₄	HI	switching	switching	ON	OFF	LO	LO

Fig. 6

Neither Yu Nor Paparrizos Disclose a DC-DC Converter That is Turned On and Off by a Microprocessor

Figure 5 of Paparrizos discloses a “workflow” which a PHOSITA would understand to be best implemented by a microprocessor... Additionally, a PHOSITA would understand a microprocessor would be one of the most effective, reliable, and cost-effective choices for implementing control of the ON/OFF state of the buck boost circuit 212. EX1009, FIG. 6; EX1003, ¶167.

Petition (‘023), p. 45

ON

ON

ON

ON

operation mode	PWM module 312a	PWM module 312b	HS1	LS1	HS2	LS2	boot cap refresh signal 314a	boot cap refresh signal 314b
forward boost conversion	HI	duty ₁₁	ON	OFF	switching	switching	LO	LO
reverse buck conversion	HI	duty ₁₂	ON	OFF	switching	switching	LO	LO
forward buck conversion	duty ₁₃	HI	switching	switching	ON	OFF	LO	LO
reverse boost conversion	duty ₁₄	HI	switching	switching	ON	OFF	LO	LO

Fig. 6

DEMONSTRATIVE
EXHIBIT - NOT EVIDENCE

Petitioner's Reply Calculations Are Improper

- Petitioner's charging time calculations only correspond to the energy lost through a **single** jump-start attempt
- The calculations also do not account for:
 - The charging cycle being used, including input power variations in the charging cycle
 - The initial charge level of the portable jump starter battery
 - Energy losses during charging of the jump starter battery
 - Battery temperature during the jump-start attempt
 - The starting charge level of the vehicle battery
 - Variations in output current and voltage during the jump-start attempt