

**UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD**

SHENZHEN FBTECH ELECTRONICS LTD AND
SHENZHEN LITIME TECHNOLOGY CO., LTD
Petitioners

v.

LITHIUMHUB TECHNOLOGIES, LLC,
Patent Owner

United States Patent No.: 9,954,207

“LITHIUM BATTERY WITH SOLID STATE SWITCH”

**PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 9,954,207
UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. §§ 42.100 *et seq.***

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LIST OF EXHIBITS

Exhibit	Description
Ex. 1001	U.S. Patent No. 9,954,207
Ex. 1002	Declaration of Louis Hruska
Ex. 1003	<i>Curriculum Vitae</i> of Louis Hruska
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Ex. 1005	File History of U.S. Pat. No. 9,412,994
Ex. 1006	Order No. 14 CONSTRUING CLAIM TERMS in ITC Investigation No. 337-TA-1421
Ex. 1007	U.S. Patent Publication No. 2013/0101874 (“Pevear”)
Ex. 1008	File History of U.S. Provisional Application No. 61/266,724 (“Pevear Provisional”)
Ex. 1009	“World Debut: Starter Battery in Lithium-Ion Technology,” dated November 23, 2009 (“Porsche”) (available at: https://www.porsche.com/usa/aboutporsche/pressreleases/pag/?id=2009-11-23-02)
Ex. 1010	“Porsche Develops Lighter Lithium Ion Starter Battery for 911 Models; Costs \$3k”, Nate Martinez, Motortrend, dated November 23, 2009 (available at: https://www.motortrend.com/news/porsche-develops-lighter-lithium-ion-starter-battery-for-911-models-costs-3k-5985/)
Ex. 1011	“Porsche Offers New Lightweight Lithium-Ion Battery in 911, Boxster Models “, Steve Diehlman, Motortrend, dated November 24, 2009 (available at: https://www.motortrend.com/news/porsche-offers-new-lightweight-lithiumion-battery-in-911-boxster-models-1962/)
Ex. 1012	U.S. Patent Publication No. 2007/0145944 (“Poff”)

Ex. 1013	U.S. Patent No. 4,166,241 (“Grant”)
Ex. 1014	WIPO International Publication No. 2012/074548 (“Koebler”)
Ex. 1015	Declaration of June Ann Munford

I. INTRODUCTION

Shenzhen Fbtech Electronics Ltd. (“Fbtech”) and Shenzhen LiTime Technology Co., Ltd. (“LiTime”), collectively “Petitioners,” petition for IPR under 35 U.S.C. §§ 311-319 and 37 C.F.R. § 42 of claims 1-21 of U.S. Patent No. 9,954,207 (“the ’207 Patent” or Ex. 1001), which is assigned to LithiumHub Technologies, LLC (“PO”). Petitioners request cancellation of these claims.

II. MANDATORY NOTICES (§ 42.8)

A. Real Party-in-Interest (37 C.F.R. § 42.8(b)(1))

Fbtech and LiTime are real parties-in-interest. No unnamed entity is funding, controlling, or directing the Petition.

B. Related Matters (37 C.F.R. § 42.8(b)(2))

1. Related International Trade Commission Investigation

PO, together with LithiumHub, LLC and Martin Koebler, filed a Complaint with the International Trade Commission (“ITC”) on September 12, 2024 alleging infringement of claims 1-10 and 12-20 of the ’207 Patent. However, in expert reports on infringement served on March 14, 2025, PO’s expert did not chart claims 5-7 and 15-17. The Complaint also alleged infringement of claims 1, 4-9, 11-16, and 18-23 of related U.S. Pat. No. 9,412,994 (“the ’994 Patent”). The ITC instituted Investigation No. 337-TA-1421 on October 16, 2024. The ITC Investigation is ongoing and Petitioners are two of numerous respondents in the ITC Investigation.

2. Related Litigation

PO, together with LithiumHub, LLC, asserted claims 1 and 12 of the '207 Patent against Fbtech in 5:2024cv00133 (E.D. Tex.) and LiTime in 5:2024cv00134 (E.D. Tex.) (“copending litigation”). PO and LithiumHub, LLC also asserted claims 1 and 14 of the '994 Patent against different parties in 5:2024cv00136 (E.D. Tex.), 5:2024cv00136 (E.D. Tex.), 5:2024cv00137 (E.D. Tex.), and 7:2024cv00220 (W.D. Tex.). In each case against Petitioners and other parties, PO and LithiumHub LLC also assert 1 and 14 of the '994 Patent. All cases have been stayed pending final disposition of the ITC Investigation.

C. Lead and Back-Up Counsel (37 C.F.R. § 42.8(b)(3))

Petitioners provide the following designation of counsel.

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D. Service Information

This Petition is being served by Federal Express to the correspondence address of record for the '207 Patent, Ralph H. Dougherty, 1235 Avalon Place, Matthews, NC 28104. Petitioners consent to electronic service at the addresses provided above for lead and back-up counsel.

III. STANDING (37 C.F.R. § 42.104(A))

Petitioners certify that the '207 Patent is eligible for, and Petitioners are not barred or estopped from requesting, IPR. Petitioners were served with a Complaint asserting infringement of the '207 Patent on or after September 12, 2024. Neither Petitioners nor any other real party-in-interest or privy was served with a complaint

asserting infringement of the '207 Patent before that date, or has initiated a civil action challenging the '207 Patent's validity.

IV. GROUNDS (37 C.F.R. § 42.22 AND 37 C.F.R. § 42.104(B))

The Petitioners request IPR of claims 1-21 as unpatentable under §§ 102 and 103:

Ground	Prior Art	Basis	Claims Challenged
Ground 1	Pevear, Poff, and Porsche	103	1-10 and 12-20
Ground 2	Pevear, Poff, Porsche, and Grant	103	11 and 21
Ground 3	Koebler	102	1-10 and 12-20

Pevear, Poff, and Porsche were not considered by the Examiner during the '207 Patent's prosecution. The publication of the U.S. National Phase Entry of Koebler was cited in a rejection. The rejection was overcome after PO noted that Koebler was a publication of a priority application and thus allegedly disqualified from being considered as prior art as discussed in § V(B). As explained in § V(C), the Examiner erred by assuming the '207 Patent claims were entitled to an earlier effective filing date.

Grant was cited during prosecution for reciting various limitations related to cables. However, the decision of the Examiner to allow the claims was based on the circuit configuration as discussed in § V(B). Neither the Examiner during

prosecution nor Petitioners in this Petition cite Grant for the disclosure of the circuit configuration. Therefore, the prior art grounds presented herein are not cumulative to grounds deemed by the Examiner to substantively lack merit.

§ VI(E)-(G) specify how the prior art renders the Claims unpatentable. The Declaration of technical expert, Louis Hruska, is attached in support (Ex. 1002: ¶¶1-165) and Mr. Hruska's credentials are established in his CV (Ex. 1003).

V. THE '207 PATENT

The Claim Listing Appendix provides a listing of Challenged Claims 1-21.

A. Priority Claims

The '207 Patent was filed on March 13, 2015, as a continuation-in-part of U.S. Patent Application No. 13/989,273, filed May 23, 2013, which is a U.S. National Phase Entry of WIPO International Application No. PCT/US2011/001937 (Ex. 1005: pp. 187-214), filed November 28, 2011, and also claims priority to U.S. Provisional Application No. 61/458,657 (Ex. 1005: pp. 141-163), filed November 29, 2010, and U.S. Provisional Application No. 61/463,736 (Ex. 1005: pp. 168-186), filed February 22, 2011.

B. Prosecution History

In an Office Action dated January 4, 2017, the Examiner rejected claims 1-10 and 12-20 under 35 U.S.C. § 102(a)(1) as being anticipated by U.S. Patent Publication No. 2013/0241498 ("the '498 publication") and claims 11 and 21 under

35 U.S.C. § 103 as being unpatentable over the '498 publication in view of Grant. The '498 publication is the publication of the National Phase Entry of the PCT application published as Koebler. In the § 103 rejection, Grant was only cited for features related to cables, cable housings, and the contents of cable housing whereas the '498 publication was relied upon for disclosing all other limitations. Ex. 1004: pp. 203-206.

In a response filed March 27, 2017, the applicant argued that the '498 publication was removed as a reference because it was the publication of a priority application. Ex. 1004: p. 136. In the response, the applicant relied upon the alleged disqualification of the '498 publication and did not submit any specific arguments concerning the cable teachings of Grant. Ex. 1004: p. 136.

In an Office Action dated June 13, 2017, the Examiner indicated that applicant's arguments concerning the disqualification of the '498 publication were persuasive. Ex. 1004: pp. 109-110. The Examiner further rejected the claims under § 103 in a series of different rejections. Ex. 1004: 100-109. Grant was cited in combination with newly applied references against claims 11 and 21 for the same teachings as it was relied upon in the Office Action dated January 4, 2017. To overcome the rejection, applicant amended each of independent claims 1, 12, and 21 to recite a solid state switching apparatus "comprising a plurality of pairs of solid state switches with one pair of solid state switches connected in a parallel

configuration to another pair of solid state switches, each switch having a source and a drain, the switches of a pair of solid state switches being configured such that either the drains of the switches are connected or the sources of the switches are connected, and said parallel configuration being connected with one or more cells between the positive and negative terminals.” Ex. 1004: pp. 47-52. No specific arguments were submitted by the applicant concerning Grant. In a Notice of Allowance dated February 8, 2018, the Examiner provided the following reasons for allowance: “The prior art of record does not explicitly teach or suggest a battery pack which includes a battery pack with at least one lithium based rechargeable cell and a solid state switching apparatus comprising a plurality of pairs of switches connected in parallel with each other, and that either one of the drains or source of the switches are connected to the one or more cells.” Ex. 1004: p. 32. Notably, the Office’s rationale for allowing the application was predicated on the circuit configuration, not the cable-related teachings of Grant.

C. The Priority Date of the ’207 Patent Claims

Independent claims 1 and 12 recite a “total discharging amount of each lithium-based cell in the battery pack is from 3 Ah to 2000 Ah, and charging voltage per one cell is 2.0 to 4.2 V.” Independent claim 1 further specifies the recited battery pack is for use “in a 6 volt to 48 volt operating system” and independent claim 12 specifies the recited deep cycle battery is “in a 6 volt to 800 volt operating system.”

None of the priority applications provides adequate written description support for the entire breadth of these ranges. Independent claim 21 recites “a pair of cables each cable having a cable housing in which it is situated; one end of each cable being provided with and connected to a respective terminal clamp, the opposite end of each cable having a connector for connecting to said battery pack.” None of the priority applications provides adequate written description support for these limitations.

For example, there is no support in any of the priority applications for a total discharging amount of 2000 Ah, a charging voltage of 2.0 V per cell, or an operating system voltage of 6 V. Accordingly, the effective filing date of claims 1-21 is March 13, 2015. Koebler was published on June 7, 2012, more than one year prior to this effective filing date. Accordingly, Koebler is prior art under at least AIA 35 U.S.C. § 102(a)(1) and none of the exceptions under AIA 35 U.S.C. § 102(b) are applicable. Petitioners submit that the Examiner committed a clear error. On this point, Petitioners note that paragraph [0001] of the application as filed explicitly describes the application as “a Continuation-in-part of US Patent Application No. 13/989,273.” Ex. 1004: p. 267. By definition, a continuation-in-part application can include “new matter” relative to the priority application. In this case, that new matter is clearly recited in each independent claim of the ’207 patent.

D. Specification

The specification discloses a common battery housing containing cells with positive and negative ends connected in series within the housing, and the housing having positive and negative terminals. The specification discloses that solid state devices with connected sources or drains “allows current to flow in one direction but not the other with an internal diode.” Ex. 1001: 2:35-50. The specification further discloses that “solid state switches in parallel” are used “to increase the current capabilities.” Ex. 1001: 9:35-36.

VI. DETAILED REASONS FOR RELIEF

There is at least a reasonable likelihood that the Petitioners will prevail with respect to at least one of the Claims, as they are unpatentable under §§ 102 and/or 103.

A. Claim Construction

Generally, the terms should receive their respective plain and ordinary meaning as understood by a person having ordinary skill in the art under *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005). In the related ITC proceeding, an order construing certain claim terms issued on February 21, 2025. Ex. 1006. This order adopted the definition discussed below in § VI(B) concerning the level of ordinary skill in the art.

B. Level of Ordinary Skill

A person of ordinary skill in the art (“POSITA”) on or before March 13, 2015, would have a Bachelor of Science degree in electrical engineering or an equivalent degree, and two or more years of engineering experience in the design of rechargeable Lithium-ion batteries as well as at least some experience in the design of battery management systems for such batteries an advanced degree in electrical engineering or an equivalent field of study, such as a Masters or doctorate, may be substituted for the required experience further education could also suffice in lieu of experience in the field or further experience in the field could substitute for formal education. Ex. 1002: ¶¶13-14. A POSITA is presumed to have knowledge of all relevant prior art, and would thus have been familiar with each of the references cited herein, as well as the background knowledge in the art, and the full range of teachings they contain.

C. Summary of Cited Prior Art

1. U.S. Patent Publication No. 2013/0101874 (“Pevear”)

Pevear (Ex. 1007) published on April 25, 2013. Pevear is a National Phase Entry of PCT Application No. PCT/US10/59127, filed December 6, 2010, and claims priority to U.S. Provisional Application No. 61/266,724, filed December 4, 2009 (“the Pevear Provisional;” Ex. 1008: pp. 4-18 and 23-74. Pevear is prior art under AIA 35 U.S.C. § 102(a)(1) if the effective filing date of the claims is March

13, 2015 as discussed in § V(C), or under pre-AIA 35 U.S.C. § 102(e) if the challenged claims of the '207 Patent are entitled to an earlier effective filing date.

The critical reference date of a U.S. patent application publication under pre-AIA § 102(e) may be the filing date of a relied upon provisional application if the disclosure relied upon finds support in the provisional application and at least one of the claims in the U.S. patent application publication is supported by the written description of the provisional application. *Amgen Inc. v. Sanofi*, 872 F.3d 1367, 1380 (Fed. Cir. 2017). Pevear's reference date under § 102(e) is December 4, 2009. The chart below explains where support for each claim of Pevear finds support in the Pevear Provisional.

Pevear Claim Element	Pevear Provisional Support (Ex. 1008)
1. A battery system comprising:	Ex. 1008: p. 5, ¶[0012]: "An automotive battery consists of [...]"
a battery housing with first and second voltage output terminals;	Ex. 1008: p. 6, ¶[0013]: "FIG. 1 shows an automotive battery 100 with a outer case 110, a negative terminal 102 and a positive terminal 104, and a LIN (Local Interconnect Network) management interface 106. Case 110 is molded, and lead-free terminals 102 and 104 are insert-molded in place into the case . The case consists of a top cover that includes the terminals, and an enclosure base."

a plurality of rechargeable battery cells within the battery housing and having first and second voltage terminals;	Ex. 1008: p.4, ¶[0003]: “A rechargeable battery may be used in terrain, marine, or aeronautic vehicles in various applications. One application is as a starter battery to drive the starter motor of the vehicle. Starter battery applications may require high electrical currents to drive the starter motor, and the ability to be recharged from the vehicle's alternator. Most current automotive starter batteries are of lead acid construction. However, lithium-ion (Li-Ion) batteries may be used instead of lead acid batteries. Li-Ion batteries can provide improved power-to-weight ratios, longer cycle lives, and environmental benefits due to the lack of lead.” Ex. 1008: p. 5, ¶[0012]: “[...]an assembly of cell subassemblies, each containing prismatic Li-Ion battery cells, where the cells are electrically connected to the other cells in the module to form the battery.”
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a power management system for generating an external control signal and an internal control signal based upon monitored operating parameters of the plurality of rechargeable battery cells, said external control signal for controlling an external power source and/or an external load, said power management system forming an integral part of the battery system; and	Ex. 1008: p. 5, ¶[0012]: “The battery has an integrated power management system that provides passive (through control of components external to the battery) and active (through internal controls) protection against over-charge, over-discharge, over-temperature, and over-current.” Ex. 1008: p. 8, ¶[0020]: “Power management system 400 communicates directly or indirectly to the automobile's alternator to passively control the amount of charge current to the battery. In this manner, the battery pack is able to optimize the amount of current flow to passively control the battery's state of charge. This is accomplished by the power management system internally monitoring the voltage, current, temperature, and other relevant parameters of the system. Microprocessor 402 processes this information to determine appropriate charging parameters, and then communicates to and/or controls the alternator to increase or decrease the amount of charge current into the battery pack.” Ex. 1008: p. 8, ¶[0021]: “Power management system 400 communicates with the automobile's body/load controller to control the amount of discharge current to passively control the battery's state of charge. In this manner, the battery pack is able to optimize the amount of current flow to passively control the battery's state of charge. This is also accomplished by the power management system internally monitoring the voltage, current, temperature, and other relevant parameters of the system.”
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	Ex. 1008: p. 9, ¶[0022]: “In addition to the above passive control of the battery's state by controlling the battery's external power sources and loads, power management system 400 also detects and actively prevents excessive current flow through the battery, in order to actively control the state of charge of the battery. Microprocessor 402 internally monitors the voltage, current, temperature, and other relevant parameters of the system. Microprocessor 402 uses this information to control a very high power cutoff switch (described below) to actively control the flow of current through the battery pack.”
a cutoff switch circuit within the battery housing and for making and breaking a conductive path between the first voltage terminal of the plurality of battery cells and the first voltage output terminal of the battery housing in response the internal control signal from the battery management system.	Ex. 1008: p. 9, ¶[0023]: “As part of performing the above functions, the microprocessor 402 is configured to control and monitor a cutoff component 322 that can be used to selectively connect or disconnect the battery from the load(s) connected to its terminals. Cutoff component 322 provides over- voltage, under-voltage, over-current and over-temperature protection. The cutoff component 322 is effectively a bi-directional switch that can be used to control whether the cells in battery cell assembly 320 are electrically connected to the terminals for charging, and separately control this connection for discharging. The cutoff component may also be configured to be a uni-directional switch, used only to control battery charging.
2. The battery system of claim 1, wherein the battery cells are lithium ion cells.	Ex. 1008: p. 5, ¶[0012]: “An automotive battery consists of an assembly of cell subassemblies, each containing prismatic Li-Ion battery cells, where the cells are electrically connected to the other cells in the module to form the battery.”

3. The battery system of claim 1, wherein the cutoff switch comprises a plurality of metal-oxide semiconductor field effect transistors (MOSFETs).	Ex. 1008: p. 9, ¶[0024]: “Cutoff component 322 includes two groups of parallel MOSFET devices, each of which the power management system 400 operates as a single, uni-directional switch to selectively allow or disallow current flow to the battery depending on whether the MOSFETs are switched to an ON or OFF state.”
4. The battery system of claim 3, wherein the plurality of MOSFETs are arranged as groups of parallel MOSFETs.	Ex. 1008: p. 10, ¶[0025] and p. 16, FIG. 4: “Each MOSFET is electrically connected in parallel with the other MOSFETs within its group, with its drain and source terminals oriented so that when the MOSFET is in an ON state, current is allowed to flow to charge/discharge the battery. The gate terminals of each MOSFET in a group are connected together to effect a single switching control. The two groups of parallel MOSFETs are electrically connected in series with each other and in series with the battery cells within the battery.”
5. The battery system of claim 3, wherein the plurality of MOSFETs include a first group of MOSFETs connected in parallel with each other and a second group of MOSFETs connected in parallel with each other and wherein the first group is connected in series with the second group.	Ex. 1008: p. 10, ¶[0025] and p. 16, FIG. 4: “Each MOSFET is electrically connected in parallel with the other MOSFETs within its group, with its drain and source terminals oriented so that when the MOSFET is in an ON state, current is allowed to flow to charge/discharge the battery. The gate terminals of each MOSFET in a group are connected together to effect a single switching control. The two groups of parallel MOSFETs are electrically connected in series with each other and in series with the battery cells within the battery.”

6. The battery system of claim 3, further comprising a busbar in electrical communication with the plurality of rechargeable battery cells and the plurality of MOSFETs.	Ex. 1008: p. 6, ¶[0014] and p. 14, FIG. 2: “The individual battery cells are electrically connected in parallel and/or series by busbars (described in the Related Application) which connect the cells to one another and to the terminals of the battery. One such busbar 208 is shown in FIG. 2 connecting one respective terminal of each of four different battery cells together. Busbar 208 also connects the four terminals to positive terminal 104.” Ex. 1008: p. 12, ¶[0033] and p. 18, FIG. 6: “The MOSFET devices are chosen in part so that the drain and source terminals are on opposite sides of the device, with each attached to a respective one of the conductors of the busbar 610 or 612.”
7. The battery system of claim 3, further comprising a shunt resistor in electrical communication with the plurality of MOSFETs.	Ex. 1008: p. 10, ¶[0027] and p. 16, FIG. 4: “Cutoff component 322 can provide an indication of the current flow through the component (and thus of the current through the battery) in one of two ways. First, the voltage across a shunt resistor 436 of known resistance can be used to provide a voltage signal proportional to the current, as is shown in FIG. 4.”
8. The battery system of claim 3, further comprising a temperature sensor in thermal communication with the MOSFETs.	Ex. 1008: p. 10, ¶[0028]: “This is accomplished by using temperature measuring devices 438 packaged in close thermal proximity to the MOSFET devices, which are themselves packaged in close thermal proximity to each other.”
9. The battery system of claim 1, wherein the battery is an automotive battery.	Ex. 1008: p. 4, ¶[0002]: “The present invention relates to automotive batteries and scalable architectures for manufacturing automotive batteries.”

10. The method of claim 9, wherein the external power source comprises an alternator.	Ex. 1008: p. 8, ¶[0020]: “Power management system 400 communicates directly or indirectly to the automobile's alternator to passively control the amount of charge current to the battery.”
11. The battery system of claim 1, wherein the battery is a telecommunications battery.	Ex. 1008: p. 12, ¶[0034]: “The cutoff component and/or power management system may also be used separately from the battery. Systems of multiple batteries that use just a single series cutoff component and/or power management system may also be used, for example, in telecom applications.”
12. A method for operating a battery system comprising:	Ex. 1008: p. 5, ¶[0012]: “The battery has an integrated power management system that provides passive (through control of components external to the battery) and active (through internal controls) protection against over-charge, over-discharge, over-temperature, and over-current. The battery also includes a scalable battery cutoff component controlled by the power management system.”

monitoring operating parameters of a plurality of rechargeable battery cells within a battery housing;	Ex. 1008: p. 8, ¶[0020]: “This is accomplished by the power management system internally monitoring the voltage, current, temperature, and other relevant parameters of the system.” Ex. 1008: p. 8-9, ¶ [0021]: “This is also accomplished by the power management system internally monitoring the voltage, current, temperature, and other relevant parameters of the system.” Ex. 1008: p. 9, ¶[0022]: “Microprocessor 402 internally monitors the voltage, current, temperature, and other relevant parameters of the system.” Ex. 1008: p. 6, ¶[0013]: “FIG. 1 shows an automotive battery 100 with a outer case 110, a negative terminal 102 and a positive terminal 104, and a LIN (Local Interconnect Network) management interface 106.” Ex. 1008: p. 5, ¶[0012]: “[...]an assembly of cell subassemblies, each containing prismatic Li-Ion battery cells, where the cells are electrically connected to the other cells in the module to form the battery.” Ex. 1008: p. 16, FIG. 4.
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generating an external control signal and an internal control signal based upon the monitored operating parameters of a plurality of rechargeable battery cells, said external control signal for controlling an external power source and/or an external load; and	Ex. 1008: p. 5, ¶[0012]: “The battery has an integrated power management system that provides passive (through control of components external to the battery) and active (through internal controls) protection against over-charge, over-discharge, over-temperature, and over-current.” Ex. 1008: p. 8, ¶[0020]: “Power management system 400 communicates directly or indirectly to the automobile's alternator to passively control the amount of charge current to the battery. In this manner, the battery pack is able to optimize the amount of current flow to passively control the battery's state of charge. This is accomplished by the power management system internally monitoring the voltage, current, temperature, and other relevant parameters of the system. Microprocessor 402 processes this information to determine appropriate charging parameters, and then communicates to and/or controls the alternator to increase or decrease the amount of charge current into the battery pack.” Ex. 1008: p. 8-9, ¶[0021]: “Power management system 400 communicates with the automobile's body/load controller to control the amount of discharge current to passively control the battery's state of charge. In this manner, the battery pack is able to optimize the amount of current flow to passively control the battery's state of charge. This is also accomplished by the power management system internally monitoring the voltage, current, temperature, and other relevant parameters of the system.”
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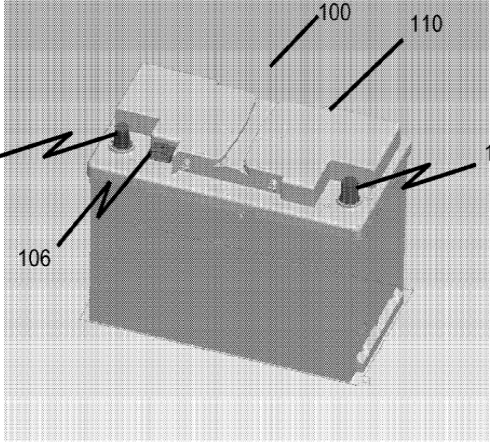
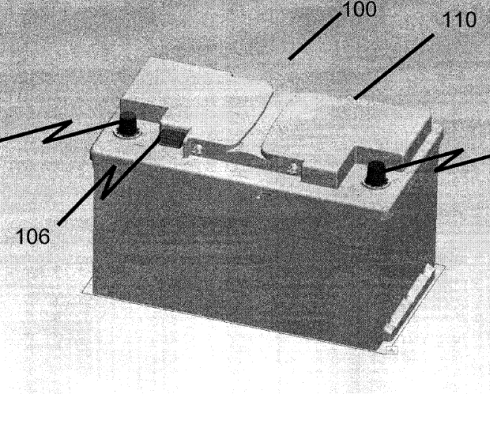
making or breaking a conductive path between the first voltage terminal of the plurality of battery cells and the first voltage output terminal of the battery housing in response to the internal control signal.	Ex. 1008: p. 9, ¶[0022]: “In addition to the above passive control of the battery's state by controlling the battery's external power sources and loads, power management system 400 also detects and actively prevents excessive current flow through the battery, in order to actively control the state of charge of the battery. Microprocessor 402 internally monitors the voltage, current, temperature, and other relevant parameters of the system. Microprocessor 402 uses this information to control a very high power cutoff switch (described below) to actively control the flow of current through the battery pack.”
13. The method for operating a battery system of claim 12, wherein the operating parameters comprise voltage across a shunt resistor within the battery housing.	Ex. 1008: p. 10, ¶[0027]: “Cutoff component 322 can provide an indication of the current flow through the component (and thus of the current through the battery) in one of two ways. First, the voltage across a shunt resistor 436 of known resistance can be used to provide a voltage signal proportional to the current, as is shown in FIG. 4.”

14. The method for operating a battery system of claim 12, wherein the operating parameters comprise temperature and voltage across a plurality of metal-oxide semiconductor field effect transistors (MOSFETs) within the battery housing.	Ex. 1008: p. 10, ¶[0028]: “Second, the current may be measured by determining the voltage across the drain-source resistance in the MOSFET's ON state ($R_{DS(on)}$) using a temperature-compensated resistance measurement. This is accomplished by using temperature measuring devices 438 packaged in close thermal proximity to the MOSFET devices, which are themselves packaged in close thermal proximity to each other.” Ex. 1008: p. 10, ¶[0029]: “Specifically, power management system 400 uses the measured temperature to determine a temperature-calibrated $R_{DS(on)}$, which is the used to convert the voltage measured across the drain-source terminals into a current without the need for a relatively expensive precision current sensor.”
15. The method for operating a battery system of claim 12, wherein the making or breaking a conductive path comprises activating a cutoff switch comprising a plurality of metal-oxide semiconductor field effect transistors (MOSFETs).	Ex. 1008: p. 9, ¶[0024]: “Cutoff component 322 includes two groups of parallel MOSFET devices, each of which the power management system 400 operates as a single, uni-directional switch to selectively allow or disallow current flow to the battery depending on whether the MOSFETs are switched to an ON or OFF state. One MOSFET group controls whether current can flow in a direction that charges the battery, and the second group controls whether current can flow in a direction that discharges the battery.”

In this section, for each pertinent disclosure, Petitioners will cite both Pevear and the corresponding disclosure in the Pevear Provisional to illustrate support for the earlier reference date. In subsequent sections, Petitioners will only cite Pevear.

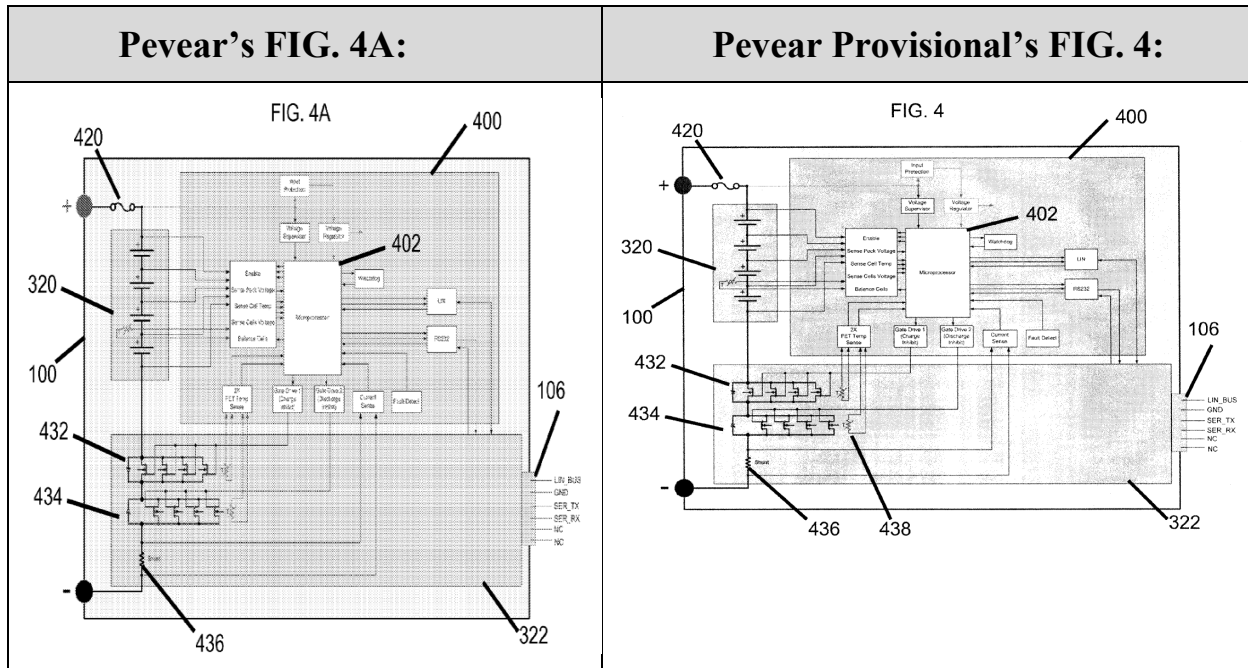
Pevear discloses a battery with an integrated power management system and a scalable cutoff component. Ex. 1007: Abstract; Ex. 1008: p. 1, Title. Pevear discloses that the battery may be an automotive battery. Ex. 1007: claim 9; Ex. 1008: p. 1, Title. Pevear specifically discloses rechargeable batteries which may be used as starter batteries to drive the starter motor of the vehicle. Ex. 1007: ¶[0004]; Ex. 1008: p. 4, ¶[0003]. The batteries may be lithium ion batteries which can be used instead of lead acid batteries and provide improved power-to-weight ratios, longer cycle lives, and environmental benefits due to the lack of lead. Ex. 1007: ¶[0004]; Ex. 1008: p. 4, ¶[0003].

The battery includes an outer case (110) having a top cover and an enclosure based, with terminals (102, 104) insert-molded in place on the top cover of the case. Ex. 1007: ¶[0019] and FIG. 1; Ex. 1008: p. 6, ¶[0013] and p. 13, FIG. 1. The drawings from Pevear and the Pevear Provisional are reproduced below. The Figures in Pevear (Ex. 1006) were distorted in the vertical direction as compared to the Pevear Provisional (Ex. 1007). For ease of reading, the Pevear figures have been copied here with a corrected aspect ratio to diminish the distortion. The Pevear figures in their original aspect ratio are shown in Ex. 1006.

Pevear's FIG. 1:	Pevear Provisional's FIG. 1:
FIG. 1 	FIG. 1 

The power management system is configured to sense individual battery cell voltages and to balance the voltages of each cell by controlling each cell's connection to small resistive loads placed in parallel with each cell. Ex. 1007: ¶[0031]; Ex. 1008: p. 7-8, [0019]. The power management system includes a microprocessor configured to control and monitor a cutoff component that can be used to selectively connect or disconnect the battery from the load(s) connected to its terminals. Ex. 1007: ¶[0039]; Ex. 1008: p. 9, [0023]. The cutoff component can effectively be a bidirectional switch that can be used to control charging and discharging separately and which provides over-voltage, under-voltage, over-current, and over-temperature protection for the battery system. Ex. 1007: ¶[0039]; Ex. 1008: p. 9, [0023].

The cutoff component includes two groups of parallel arranged MOSFET devices (432, 434) connected in series. Ex. 1007: ¶[0040] and FIG. 4A; Ex. 1008: p. 9, [0024] and p. 16, FIG. 4. The drawings from Pevear and the Pevear Provisional are reproduced below.



Paragraph [0040] of Pevear is reproduced below:

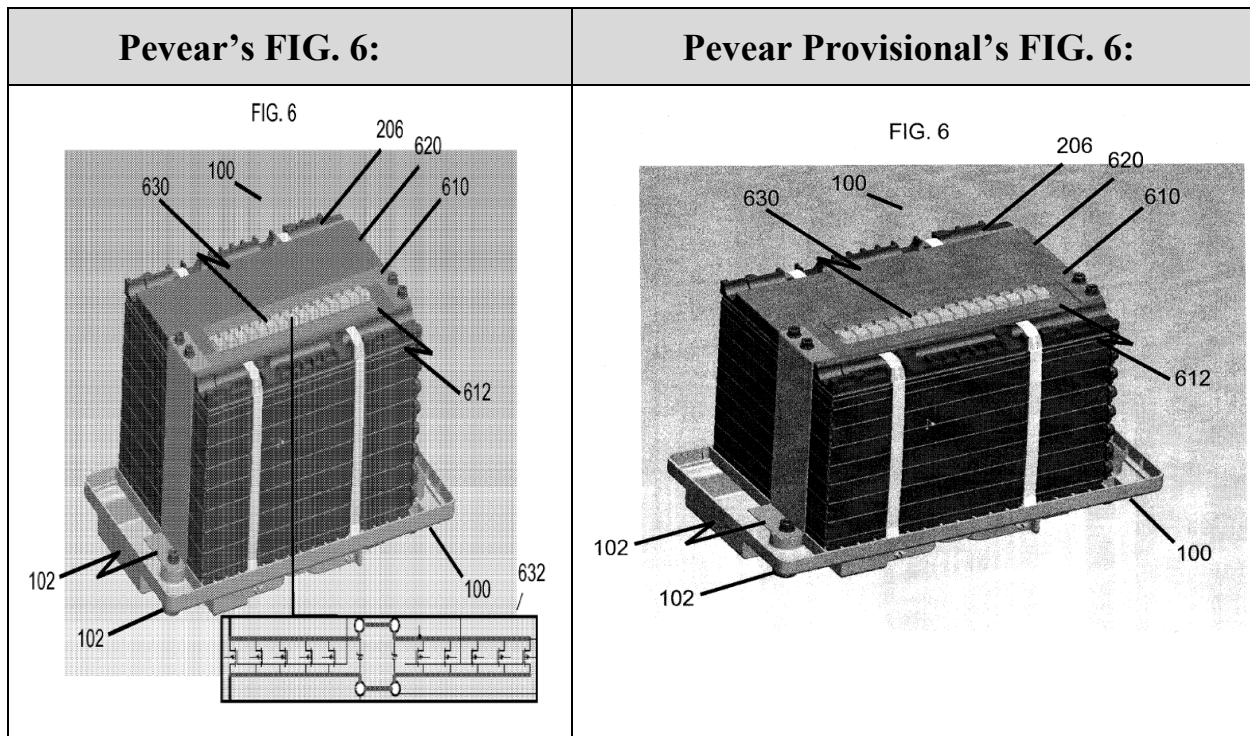
As shown in FIG. 4A, cutoff component 322 includes two groups of parallel arranged MOSFET devices 432 and 434 connected in series. Power management system 400 operates each group to selectively allow or disallow current flow to or from the battery, depending on whether the MOSFETs are switched to an On or Off state. Because the MOSFET groups 432, 434 are arranged in series, the MOSFETs,

one MOSFET group controls whether current can flow in a direction that charges the battery, and the second group controls whether current can flow in a direction that discharges the battery. Therefore, the series arrangement of the two groups creates a bi-directional switch. The parallel arrangement of the MOSFETs within each group splits the current flow across the MOSFETs, allowing the use of MOSFETs with lower current-carrying ratings than the maximum currents expected for charging and discharging of the battery.

Ex. 1006: ¶[0040]; Ex. 1007: p. 9, [0024].

Pevear discloses an embodiment with the two groups of MOSFETs (432, 434) connected in series with each other and in series with the cells (320) between the negative terminal (-) of the battery pack and the positive terminal (+) of the battery pack. Ex. 1007: FIG. 4A; Ex. 1008: p. 16, FIG. 4.

The MOSFETs (630) may be positioned on a printed circuit board (620) within the case/housing. Ex. 1007: ¶[0053] and FIG. 6; Ex. 1008: pp. 12-13, ¶[0033] and p. 18, FIG. 6. The drawings from Pevear and the Pevear Provisional are reproduced below.



Pevear further discloses that the microprocessor processes parameters of the system, such as monitored voltage, current, temperature, etc. to determine appropriate charging parameters and controls the load controller to increase or decrease the discharge current from the battery by selectively connecting or disconnecting loads to/from the battery. Ex. 1007: ¶[0037]; Ex. 1008: p. 8-9, ¶[0021].

Pevear also discloses monitoring voltage, current, temperature, and other relevant parameters and using this information to control a power cutoff switch to actively control the flow of current through the battery pack. Ex. 1007: ¶[0038]; Ex. 1008: p. 9, ¶[0022].

**2. “World Debut: Starter Battery in Lithium-Ion Technology,”
dated November 23, 2009 (“Porsche”)**

Porsche (Ex. 1009) is a press release dated November 23, 2009 and was published online and available to the public through Porsche’s website. Two articles from motortrend.com dated November 23, 2009 (Ex. 1010) and November 24, 2009 (Ex. 1011) further corroborate the publication date of the Porsche reference being November 23, 2009. Further, the Internet Archive’s Wayback Machine archived Porsche at least as early as September 14, 2010 (Ex. 1015: ¶¶ 5-8). Porsche is prior art under AIA 35 U.S.C. § 102(a)(1) if the effective filing date of the claims is March 13, 2015 as discussed in § V(C), or under at least pre-AIA 35 U.S.C. § 102(a) if the challenged claims of the ’207 Patent are entitled to an earlier effective filing date.

Porsche discloses a lithium-ion starter battery weighing 22 pounds less than a conventional lead battery. Ex. 1009: p. 1. The battery has a nominal capacity of 18 Ah. Ex. 1009: p. 1. An advantage of the lithium-ion battery is that it allows a significantly greater number of charging and discharging cycles. Ex. 1009: p. 2. The battery is a lithium-iron-phosphate battery and “consistently guarantees the usual voltage of 12 V in the car’s on-board network.” Ex. 1009: p. 2. The battery is made up of four cells and integrated control electronics including a battery management system that protects from major discharge and guarantees a consistent charge level within the individual cells. Ex. 1009: p. 2.

3. U.S. Patent Publication No. 2007/0145944 (“Poff”)

Poff (Ex. 1012) published on June 28, 2007. Poff is prior art under AIA 35 U.S.C. § 102(a)(1) if the effective filing date of the claims is March 13, 2015 as discussed in § V(C), or under pre-AIA 35 U.S.C. § 102(b) if the challenged claims of the '207 Patent are entitled to an earlier effective filing date.

Poff discloses an enhanced battery pack having an enhanced protection system. Ex. 1012: Abstract. The enhanced protection system includes a conventional protection circuit and a redundant protection circuit, which are connected in parallel. When an undesirable condition (e.g., overcharge of one of the lithium ion cells) occurs, the conventional protection circuit prevents electrical current from flowing to protect the lithium ion cells and any external devices connected to the battery pack. Ex. 1012: ¶[0009]. However, this conventional protection system may undesirably detract from the effectiveness of the battery pack when there is a fault in one of the components of the conventional protection system instead of an undesirable internal or external condition that would potentially harm the lithium ion cell(s) or an external device connected to the battery pack. Ex. 1012: ¶ [0011]. Advantageously, the inclusion of the redundant protection circuit allows the battery pack to continue functioning when there is a fault in the conventional protection system but no unsafe internal or external condition. Ex. 1012: ¶ [0017]. “Likewise, if the redundant protection circuit becomes inoperable due to one or more

of the components of the redundant protection circuit being faulty, the conventional protection circuit 20 can be used as a backup so that the enhanced battery pack will continue to function while the enhanced protection system continues to protect the enhanced battery pack.” Ex. 1012: ¶ [0017].

4. U.S. Patent No. 4,166,241 (“Grant”)

Grant issued on August 28, 1979, and is prior art to the ’207 Patent under at least AIA 35 U.S.C. § 102(a)(1) if the effective filing date of the claims is March 13, 2015 as discussed in § V(C), or under pre-AIA 35 U.S.C. § 102(b) if the claims are entitled to an earlier effective filing date. Grant discloses an apparatus for jumpering a first battery to a second battery. Ex. 1013: Abstract. The apparatus includes a first cable J1 and a second cable J2 connected to the batteries. Ex. 1013, 2:49-54. Cables J1 and J2 are routed through a case 3 having a removable cover 5 for providing access to a relay and a switch. Ex. 1013: 3:18-31.

5. WIPO International Publication No. 2012/074548 (“Koebler”)

Koebler (Ex. 1014) is the publication of WIPO International Application No. PCT/US2011/001937. Koebler published on June 7, 2012, and is prior art under at least AIA 35 U.S.C. § 102(a)(1) if the effective filing date of the claims is March 13, 2015, as discussed in § V(C).

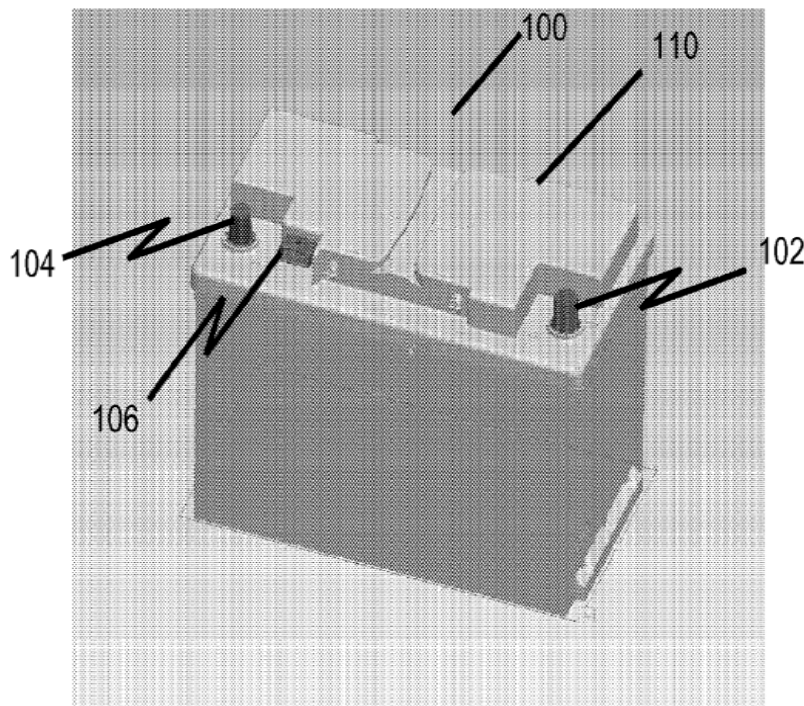
D. Claims 1-10 and 12-20 are unpatentable under § 103 over Pevear in view of Porsche and Poff (Ground 1)

1. Invalidity of Claim 1 Over Pevear in view of Porsche and Poff

(a) Element [1pre]: “A battery pack having positive and negative terminals for powering an electric motor for starting an internal combustion engine in which the electric motor is in a 6 volt to 48 volt operating system, said battery pack comprising”

To the extent it is argued the preamble is limiting, Pevear discloses an automotive battery (100) having a positive terminal (104) and a negative terminal (102) insert molded on an outer case (110). Ex. 1007: ¶[0019] and FIG. 1.

FIG. 1



Pevear discloses that the battery may be used as a starter battery to drive the starter motor of the vehicle. Ex. 1007: ¶[0004]. Pevear discloses that a battery is

designed for used vehicle operating systems, such as a replacement for lead acid batteries in vehicles, that can be charged from the vehicle's alternator and used to provide power for micro-hybrid (start-stop) drive systems, where 12-volt is the standard voltage. Ex. 1006: ¶[0005]; Ex. 1002: ¶43. Pevear also discloses four cells in series, which at standard lithium cell voltages is more than 12 Volts. Ex. 1007: FIG. 4A; Ex. 1002: ¶43. To the extent, PO argues that Pevear does not expressly disclose the 6 volt to 48 volt operating system voltage. Porsche discloses a lithium iron phosphate starter battery which “consistently guarantees the usual voltage of 12 V in the car’s on-board network.” Ex. 1009: p. 2. 12 V is a standard operating system voltage for car starter batteries as taught by Porsche and known to a POSITA. Ex. 1002: ¶43.

(b) Element [1a]: “a battery pack housing”

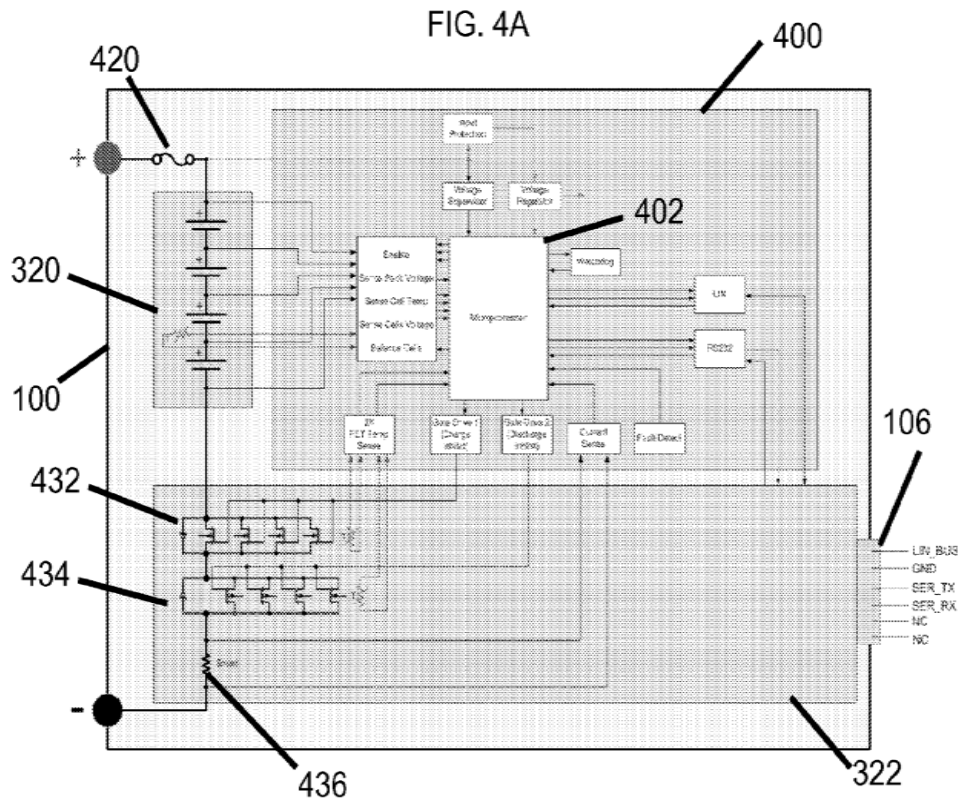
Pevear discloses that the case (i.e., housing) consists of a top cover and an enclosure base. Ex. 1007: ¶[0019].

(c) Element [1b]: “at least one lithium-based rechargeable cell within said housing”

Pevear discloses “a plurality of rechargeable battery cells within the battery housing and having first and second voltage terminals.” Ex. 1007: claim 1. The cells may be lithium ion cells. Ex. 1007: claim 2.

(d) Element [1c-i]: “a solid state switching apparatus comprising a plurality of pairs of solid state switches with one pair of solid state switches connected in a parallel configuration to another pair of solid state switches”

Pevear discloses a microprocessor (402) configured to control and monitor a cutoff component (322) that can be used to selectively connect or disconnect the battery from the load(s) connected to its terminals. Ex. 1007: ¶[0039] and FIG. 4A. The cutoff component includes a first group of MOSFETs arranged in parallel (432) and a second group of MOSFETs arranged in parallel (434). Ex. 1007: claim 5, ¶[0007], and FIG. 4A. MOSFETs are solid state switches. Ex. 1002: ¶46. However, the MOSFETs are not arranged in parallel pairs. Instead, the first and second groups (432, 434) are in series with each other. Ex. 1007: claim 5, ¶[0007], and FIG. 4A.



In the same field, Poff discloses an enhanced protection system for a battery pack including a conventional protection circuit and a redundant protection circuit. Ex. 1012: Abstract. The protection system may cause an open circuit such that current is not allowed to flow from the battery back when an overvoltage or other undesirable condition occurs “with one or more of the Li ion cells” in the battery pack. Ex. 1012: ¶ [0018]. Stopping current when an undesirable condition occurs is a cutoff function. Ex. 1002: ¶47. The conventional protection circuit includes conventional transistor pair (22) having a discharge transistor (24) and a charge transistor (26). Ex. 1012: ¶ [0022]. The redundant protection circuit includes a redundant transistor pair (106) having a discharge transistor (108) and a charge

transistor (110). Ex. 1012: ¶ [0023]. The conventional transistor pair (22) and the redundant transistor pair (106) are in parallel in Poff. Ex. 1012: FIG. 4; Ex. 1002: ¶47.

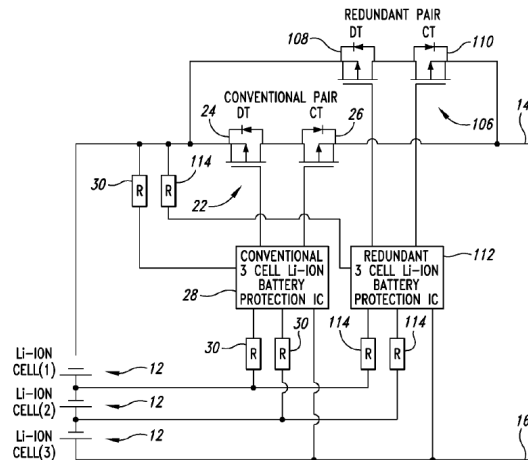


Fig. 4

(e) Element [1c-ii]: “each switch having a source and a drain, the switches of a pair of solid state switches being configured such that either the drains of the switches are connected or the sources of the switches are connected”

Poff discloses that the transistors can be MOSFETs. Ex. 1012: ¶¶[0022]-[0023]. MOSFETs inherently include a source, a gate, and a drain. Poff illustrates the two MOSFETs in each pair of transistors where either the drains of the switches are connected or the sources of the switches are connected. Ex. 1012: Fig. 4; Ex. 1002: ¶48.

(f) Element [1c-iii]: “said parallel configuration being connected with one or more cells between the positive and negative terminals”

Poff discloses that the battery pack includes a plurality of lithium-ion cells (12), a first external (negative) terminal (14), a second external (positive) terminal (16), and parallel pairs (22, 106) of MOSFETs (24, 26, 108, 110) connected in series with the cells (12) between the terminals (14, 16). Ex. 1012: Fig. 4; Ex. 1002: ¶49.

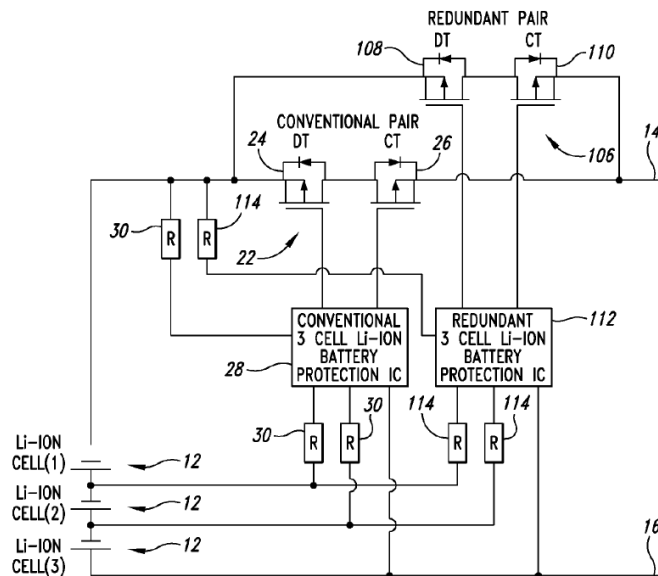


Fig. 4

(g) Element [1d]: “wherein a total discharging amount of each lithium-based cell in the battery pack is from 3 Ah to 2000 Ah, and charging voltage per one cell is 2.0 to 4.2 V.”

Porsche discloses a nominal voltage of 12 V for four lithium-iron-phosphate cells in series. Ex. 1009: p. 2. Thus, each cell must have a charging voltage within the recited range of 2.0 to 4.2 V. Porsche further discloses a nominal capacity of 18

Ah. Ex. 1009: p. 1. The capacity of cells connected in series is the total nominal capacity divided by the number of cells. Ex. 1002: ¶50. Therefore, the total discharging amount of each cell in the Porsche battery pack is 4.5 Ah which falls within the recited range. Ex. 1002: ¶50.

2. Invalidity of Claim 2 Over Pevear in view of Porsche and Poff: “A battery pack according to claim 1 wherein the lithium-based cell is selected from the group consisting of LiFePO, LiFePO₄, LiFeMgPO₄, LiFeYPO₄, LiCoO₂, LiMn₂O₄, LiNiCoAlO₂, LiNiMnCoO₂, and Li₄Ti₅O₁₂ cells”

Pevear, Porsche, and Poff disclose Claim 1. See § VI(D)(1). Porsche discloses lithium-iron-phosphate (i.e., LiFePO₄) cells. Ex. 1009: p. 2.

3. Invalidity of Claim 3 Over Pevear in view of Porsche and Poff: “A battery pack according, to claim 1, wherein said battery pack comprises from three to sixteen lithium-based rechargeable cells in series in said housing”

Pevear, Porsche, and Poff disclose Claim 1. See § VI(D)(1). Pevear discloses rechargeable cells within the housing and that the cells are lithium ion cells. Ex. 1007: claims 1 and 2. Pevear further discloses four cells in series in the housing. Ex. 1007: FIG. 4A.

4. Invalidity of Claim 4 Over Pevear in view of Porsche and Poff: “A battery pack according to claim 1, further comprising a protection circuit board within said battery housing, said protection circuit board including one of a solid state switch, MOSFET, diode, or relay, which protects against temperature, reverse polarity, undervoltage or overvoltage”

Pevear, Porsche, and Poff disclose Claim 1. *See* § VI(D)(1). Pevear discloses that MOSFETs (630) may be positioned on a printed circuit board (620) within the case/housing. Ex. 1007: ¶¶[0024], [0040], [0053], FIG. 4A, Claim 1 and FIG. 6.

5. Invalidity of Claim 5 Over Pevear in view of Porsche and Poff

(a) Element [5a] “A battery pack according to claim 1, wherein the solid state switching apparatus for one or more of said lithium based cells is encased in said battery pack housing”

Pevear, Porsche, and Poff disclose Claim 1. *See* § VI(D)(1). Pevear discloses that control components, such as MOSFETs, can be provided on a printed circuit board or similar substrate within the housing. Ex. 1007: ¶¶[0024], [0040], [0053], FIG. 4A, FIG. 6, Claim 1.

(b) Element [5b] “each of said cells shaving a positive pole and a negative pole, said apparatus comprising:”

Lithium ion cells inherently have a positive pole and a negative pole. Ex. 1002: ¶55. Additionally, Pevear illustrates cells with a positive (+) label in FIG. 4A and positive (+) and negative (-) labels in FIG. 4B. Ex. 1007: FIGS. 4A-B.

(c) Element [5c] “at least one solid state switch being connected to the positive pole of said one or more cells in series, and to said positive terminal, the negative pole of said one or more cells being connected to said negative terminal”

Poff discloses a first electrical switch and a second electrical switch connected in parallel with the first electrical switch, both switches coupled in series with a first battery cell and a first external terminal. Ex: 1012: Claim 1. Each of the switches may be a pair of MOSFETs. Ex: 1012: Claims 2-3. MOSFETs are necessarily either p-type or n-type, the selection of p-type MOSFETs between a positive pole of the cells and a positive terminal would have been an obvious design choice between two possibilities, and this limitation is met when Poff’s first terminal is positive. Ex. 1002: ¶56.

6. Invalidity of Claim 6 Over Pevear in view of Porsche and Poff: “Apparatus according to claim 5, wherein the solid state switches are transistors, FET, MOSFET, IGBT, JFET, BJT, CMOS, VMOS, TMOS, vertical DMOS or HEXFET”

Pevear, Porsche, and Poff disclose Claim 5. *See* § VI(D)(5). Pevear discloses MOSFETs. Ex. 1007: ¶[0007]. Poff also discloses MOSFETs. Ex. 1012: ¶¶[0022]-[0023].

7. Invalidity of Claim 7 Over Pevear in view of Porsche and Poff: “Apparatus according to claim 5, wherein said one or more cells are selected from the group consisting of LiFePO, LiFePO₄, LiFeMgPO₄, LiFeYPO₄, LiCoO₂, LiMn₂O₄, LiNicoAlO₂, LiNiMnCoO₂, Li₄Ti₅O₁₂, lead-acid, NiCd, and nickel metal hydride (NiMH) batteries”

Pevear, Porsche, and Poff disclose Claim 5. *See* § VI(D)(5). Porsche discloses lithium-iron-phosphate (i.e., LiFePO_4) cells. Ex. 1009: p. 2; Ex. 1002: ¶58.

8. Invalidity of Claim 8 Over Pevear in view of Porsche and Poff

(a) Element [8a] “A battery pack according to claim 1, wherein the solid state switching apparatus for one or more of said lithium based cells is encased in said battery pack housing, each of said cells having a positive pole and a negative pole, said apparatus comprising”

Pevear, Porsche, and Poff disclose Claim 1. *See* § VI(D)(1). Pevear discloses that control components, such as MOSFETs, can be provided on a printed circuit board or similar substrate within the housing. Ex. 1006: ¶[0053] and FIG. 6. Lithium ion cells inherently have a positive pole and a negative pole. Ex. 1002: ¶59. Additionally, Pevear illustrates cells with a positive (+) label in FIG. 4A and positive (+) and negative (-) labels in FIG. 4B. Ex. 1007: FIGS. 4A-B.

(b) Element [8b] “at least one solid state switch being connected to the negative pole of said one or more cells in series, and to said negative terminal, the positive pole of said one or more cells being connected to said positive terminal”

In the context of Poff’s Fig. 4, the first terminal (14) is the negative terminal and the MOSFETs (24,26,108,110) are connected to the negative terminal and the negative pole of the cells (12) while the positive pole of the cells is connected to the second, positive terminal (16). Ex. 1012: Fig. 4; Ex. 1002: ¶60.

9. Invalidity of Claim 9 Over Pevear in view of Porsche and Poff: “Apparatus according to claim 8, wherein the solid state switches are transistors, FET, MOSFET, IGBT, JFET, BJT, CMOS, VMOS, TMOS, vertical DMOS HEXFET”

Pevear, Porsche, and Poff disclose Claim 8. *See* § VI(D)(8). Pevear discloses MOSFETs. Ex. 1007: ¶[0007]. Poff also discloses MOSFETs. Ex. 1012: ¶¶[0022]-[0023].

10. Invalidity of Claim 10 Over Pevear in view of Porsche and Poff: “Apparatus according to claim 8, wherein said one or more cells are selected from the group consisting of LiFePO₄, LiFePO₄, LiFeMgPO₄, LiFeYPO₄, LiCoO₂, LiMn₂O₄, LiNiCoAlO₂, LiNiMnCoO₂, Li₄Ti₅O₁₂, lead-acid, NiCd, and nickel metal hydride (NiMH) batteries”

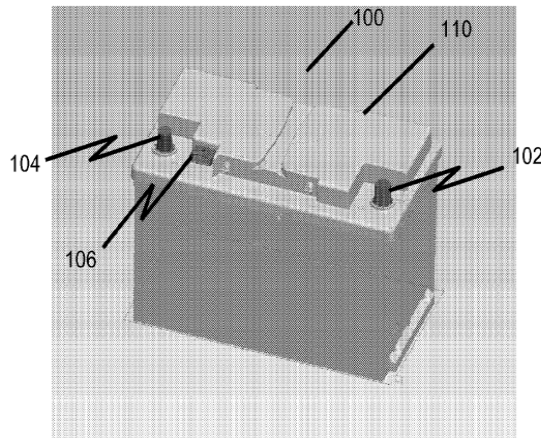
Pevear, Porsche, and Poff disclose Claim 8. *See* § VI(D)(8). Porsche discloses lithium-iron-phosphate (i.e., LiFePO₄) cells. Ex. 1009: p. 2; Ex. 1002: ¶62.

11. Invalidity of Claim 12 Over Pevear in view of Porsche and Poff

(a) Element [12pre]: “A deep cycle battery having positive and negative terminals in a 6 volt to 800 volt operating system, comprising”

To the extent that the preamble is limiting, Pevear discloses an automotive battery (100) having a positive terminal (104) and a negative terminal (102) insert molded on an outer case (110). Ex. 1007: ¶[0019] and FIG. 1.

FIG. 1



Pevear discloses that the battery may be used as a starter battery to drive the starter motor of the vehicle. Ex. 1007: ¶[0004]. The starter motor is an electrical device. Ex. 1002: ¶64. Pevear discloses that a battery is designed for used vehicle operating systems, such as a replacement for lead acid batteries in vehicles, that can be charged from the vehicle's alternator and used to provide power for micro-hybrid (start-stop) drive systems, where 12-volt is the standard voltage. Ex. 1006: ¶[0005]; Ex. 1002: ¶64. Pevear also discloses four cells in series, which at standard lithium cell voltages is more than 12 Volts. Ex. 1007: FIG. 4A; Ex. 1002: ¶____. To the extent, PO argues that Pevear does not expressly disclose the 6 volt to 800 volt operating system voltage. Porsche discloses a lithium iron phosphate starter battery which "consistently guarantees the usual voltage of 12 V in the car's on-board network." Ex. 1009: p. 2. 12 V is a standard operating system voltage for car starter batteries as taught by Porsche and known to a POSITA. Ex. 1002: ¶64.

The '207 Patent does not provide any specific definition for “deep cycle” or explain what adaptations would be required to make a battery a “deep cycle” battery. Moreover, the battery of Pevear as modified by Porsche and Poff has the same structure and composition as the structure and composition disclosed in the '207 Patent. Therefore, the battery of the modified prior art could function as a “deep cycle” battery to the extent that the preamble is limiting. Ex. 1002: ¶65.

(b) Element [12a]: “a battery pack housing”

Pevear discloses that the case consists of a top cover and an enclosure base. Ex. 1007: ¶[0019]. Pevear also refers to the case as a housing. Ex. 1007: claim 1.

(c) Element [12b]: “at least one lithium-based rechargeable Cell within said housing”

Pevear discloses “a plurality of rechargeable battery cells within the battery housing and having first and second voltage terminals.” Ex. 1006: claim 1. The cells may be lithium ion cells. Ex. 1006: claim 2.

(d) Element [12c]: “a battery management system including a processor and a circuit board which protects from one of overvoltage, undervoltage, reverse polarity, short circuit, and extremes of temperature”

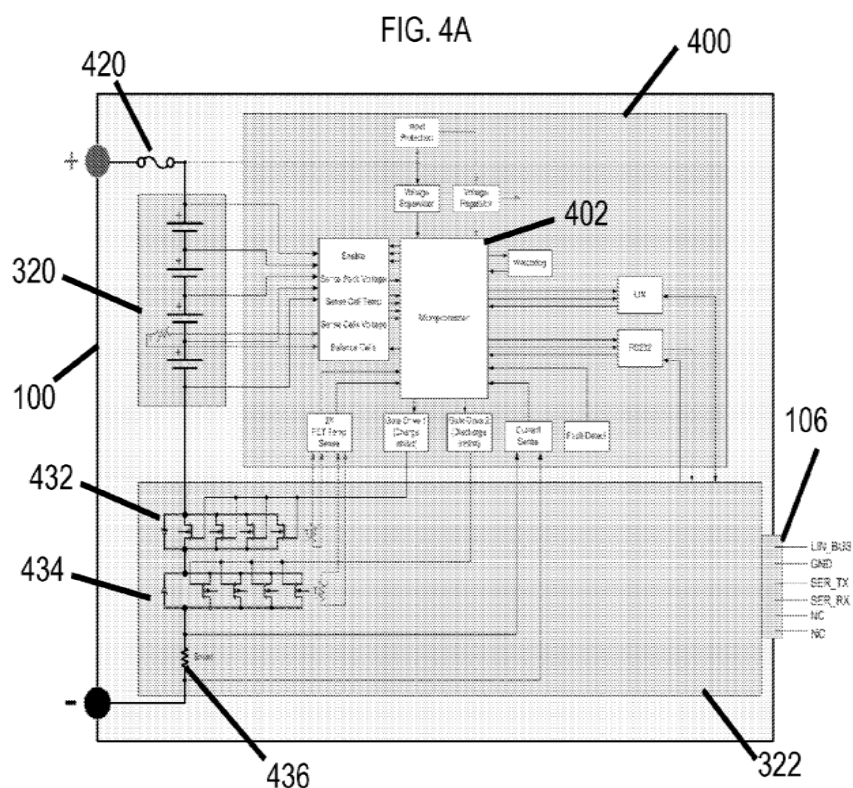
Pevear discloses an integrated power management system including a microprocessor (402) configured to control and monitor a cutoff component (322) that can be used to selectively connect or disconnect the battery from the load(s) connected to its terminals. Ex. 1007: ¶[0039] and FIG. 4A. The system provides

protection against over-charge, over-discharge, over-temperature, and over-current.

Ex. 1007: ¶[0018]. The control components can be provided on a printed circuit board or similar substrate. Ex. 1007: ¶[0053].

(e) Element [12d-i]: “wherein said circuit board comprises a solid state switching apparatus comprising a plurality of pairs of solid state switches with one pair of solid state switches connected in a parallel configuration to another pair of solid state switches”

Pevear discloses a microprocessor (402) configured to control and monitor a cutoff component (322) that can be used to selectively connect or disconnect the battery from the load(s) connected to its terminals. Ex. 1007: ¶[0039] and FIG. 4A. The cutoff component includes a first group of MOSFETs arranged in parallel (432) and a second group of MOSFETs arranged in parallel (434). Ex. 1007: claim 5, ¶[0007], and FIG. 4A. MOSFETs are solid state switches. Ex. 1002: ¶69. However, the MOSFETs are not arranged in parallel pairs. Instead, the first and second groups (432, 434) are in series with each other. Ex. 1007: claim 5, ¶[0007], and FIG. 4A.



In the same field, Poff discloses an enhanced protection system for a battery pack including a conventional protection circuit and a redundant protection circuit. Ex. 1012: Abstract. The protection system may cause an open circuit such that current is not allowed to flow from the battery back when an overvoltage or other undesirable condition occurs “with one or more of the Li ion cells” in the battery pack. Ex. 1012: ¶ [0018]. Stopping current when an undesirable condition occurs is a cutoff function. Ex. 1002: ¶70. The conventional protection circuit includes conventional transistor pair (22) having a discharge transistor (24) and a charge transistor (26). Ex. 1012: ¶ [0022]. The redundant protection circuit includes a redundant transistor pair (106) having a discharge transistor (108) and a charge

transistor (110). Ex. 1012: ¶ [0023]. The conventional transistor pair (22) and the redundant transistor pair (106) are in parallel in Poff. Ex. 1009: FIG. 4; Ex. 1002: ¶70.

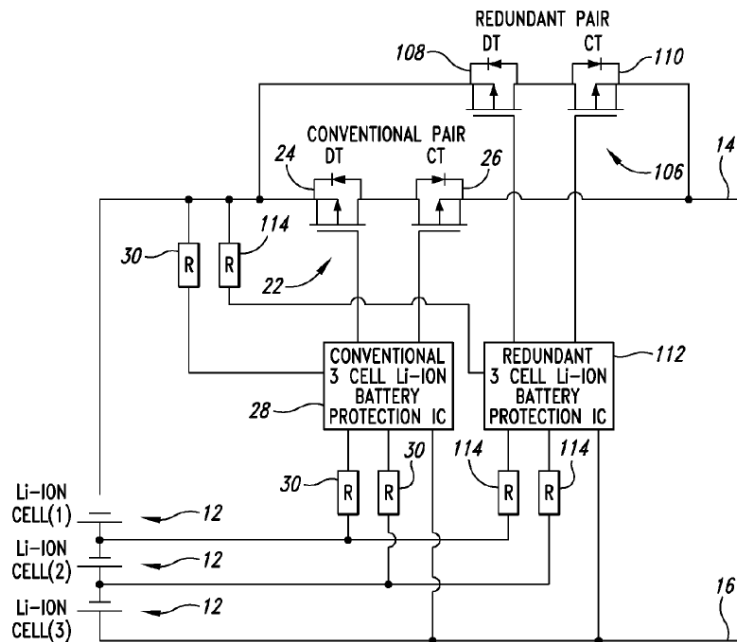


Fig. 4

(f) Element [12d-ii]: “each switch having a source and a drain, the switches of a pair of solid state switches being configured such that either the drains of the switches are connected or the sources of the switches are connected”

The pairs of field effect transistors in Poff are configured such that either the drains of the switches are connected or the sources of the switches are connected. Ex. 1012: Fig. 4; Ex. 1002: ¶71. This configuration allows the control system to prevent both over-voltage and under-voltage. Ex. 1002: ¶71.

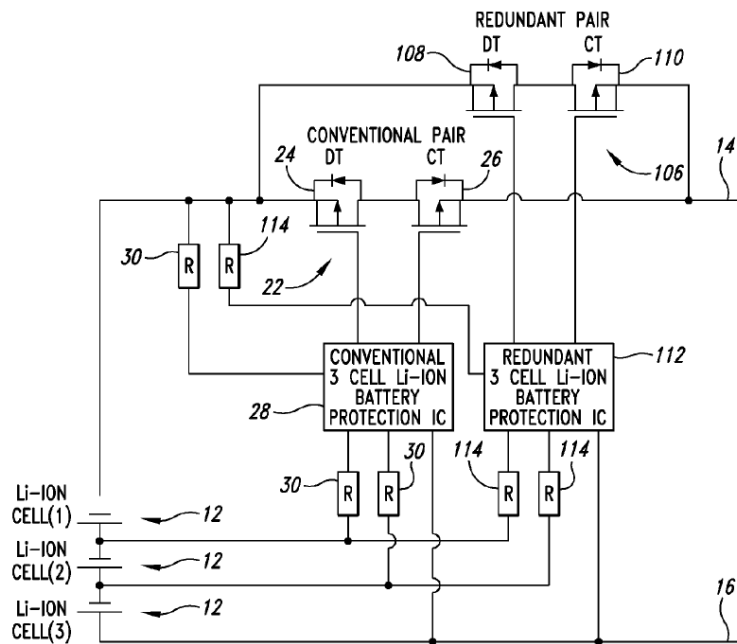


Fig. 4

(g) Element [12d-iii]: “said parallel configuration being connected with one or more cells between the positive and negative terminals”

Poff discloses that the battery pack includes a plurality of lithium-ion cells (12), a first external (negative) terminal (14), a second external (positive) terminal (16), and parallel pairs (22, 106) of MOSFETs (24, 26, 108, 110) connected in series with the cells (12) between the terminals (14, 16). Ex. 1012: Fig. 4; Ex. 1002: ¶72.

(h) Element [12e]: “wherein a total discharging amount of each lithium-based cell in the battery pack is from 3 Ah to 2000 Ah, and charging voltage per one cell is 2.0 to 4.2 V”

Porsche discloses a nominal voltage of 12 V for four lithium-iron-phosphate cells in series. Ex. 1009: p. 2. Thus, each cell must have a charging voltage within the recited range of 2.0 to 4.2 V. Porsche further discloses a nominal capacity of 18 Ah. Ex. 1009: p. 1. The capacity of cells connected in series is the total nominal capacity divided by the number of cells. Ex. 1002: ¶73. Therefore, the total discharging amount of each cell in the Porsche battery pack is 4.5 Ah which falls within the recited range. Ex. 1002: ¶73.

12. Invalidity of Claim 13 Over Pevear in view of Porsche and Poff: “A deep cycle battery according to claim 12 wherein the lithium-based cell is selected from the group consisting of LiFePO, LiFePO₄, LiFeMgPO₄, LiFeYPO₄, LiCoO₂, LiMn₂O₄, LiNiCoAlO₂, LiNiMnCoO₂, and Li₄Ti₅O₁₂ cells”

Pevear, Porsche, and Poff disclose Claim 12. *See* § VI(D)(11). Porsche discloses lithium-iron-phosphate (i.e., LiFePO₄) cells. Ex. 1009: p. 2; Ex. 1002: ¶74.

13. Invalidity of Claim 14 Over Pevear in view of Porsche and Poff: “A deep cycle battery according to claim 12, wherein said battery comprises from two to 250 lithium-based rechargeable cells in series in one or more of said housings”

Pevear, Porsche, and Poff disclose Claim 12. *See* § VI(D)(11). Pevear discloses rechargeable cells within the housing and that the cells are lithium ion cells.

Ex. 1007: claims 1 and 2. Pevear further discloses four cells in series in the housing.

Ex. 1007: FIG. 4A.

14. Invalidity of Claim 15 Over Pevear in view of Porsche and Poff

(a) Element [15a] “A deep cycle battery according to claim 12, wherein the solid state switching apparatus for one or more of said lithium based cells is encased in said battery pack housing, each of said cells having a positive pole and a negative pole, said apparatus comprising”

Pevear, Porsche, and Poff disclose Claim 12. *See* § VI(D)(11). Pevear discloses that control components, such as MOSFETs, can be provided on a printed circuit board or similar substrate within the housing. Ex. 1007: ¶¶[0024], [0040], [0053], FIG. 4A, FIG. 6, Claim 1. Lithium ion cells inherently have a positive pole and a negative pole. Ex. 1002: ¶76. Additionally, Pevear illustrates cells with a positive (+) label in FIG. 4A and positive (+) and negative (-) labels in FIG. 4B. Ex. 1007: FIGS. 4A-B.

(b) Element [15b] “at least one solid state switch connected to the positive pole of said one or more cells in series, and to said positive terminal, the negative pole of said one or more cells being connected to said negative terminal”

Poff discloses a first electrical switch and a second electrical switch connected in parallel with the first electrical switch, both switches coupled in series with a first battery cell and a first external terminal. Ex: 1012: Claim 1. Each of the switches may be a pair of MOSFETs. Ex: 1012: Claims 2-3. MOSFETs are necessarily either

p-type or n-type, the selection of p-type MOSFETs between a positive pole of the cells and a positive terminal would have been an obvious design choice between two possibilities, and this limitation is met when Poff's first terminal is positive. Ex. 1002: ¶77.

15. Invalidity of Claim 16 Over Pevear in view of Porsche and Poff: "Apparatus according to claim 15, wherein the solid state switches are transistors, FET, MOSFET, IGBT, JFET, BJT, CMOS, VMOS, TMOS, vertical DMOS or HEXFET"

Pevear, Porsche, and Poff disclose Claim 15. *See* § VI(E)(14). Pevear discloses MOSFETs. Ex. 1007: ¶[0007]. Poff also discloses MOSFETs. Ex. 1012: ¶¶[0022]-[0023].

16. Invalidity of Claim 17 Over Pevear in view of Porsche and Poff: "Apparatus according to claim 15, wherein said one or more cells are selected from the group consisting of LiFePO, LiFePO₄, LiFeMgPO₄, LiFeYPO₄, LiCoO₂, LiMn₂O₄, LiNicoAlO₂, LiNiMnCoO₂, Li₄Ti₅O₁₂, lead-acid, Nicd, and nickel metal hydride (NiMH) batteries"

Pevear, Porsche, and Poff disclose Claim 15. *See* § VI(D)(14). Porsche discloses lithium-iron-phosphate (i.e., LiFePO₄) cells. Ex. 1009: p. 2; Ex. 1002: ¶79.

17. Invalidity of Claim 18 Over Pevear in view of Porsche and Poff

(a) Element [18a]" A deep cycle battery according to claim 12, wherein the solid state switching apparatus for one or more of said lithium based cells is encased in said battery pack housing, each of said cells having a positive pole and a negative pole, said apparatus comprising"

Pevear discloses that control components, such as MOSFETs, can be provided on a printed circuit board or similar substrate within the housing. Ex. 1007: ¶¶[0024], [0040], [0053], FIG. 4A, FIG. 6, Claim 1 and FIG. 6. Lithium ion cells inherently have a positive pole and a negative pole. Ex. 1002: ¶80. Additionally, Pevear illustrates cells with a positive (+) label in FIG. 4A and positive (+) and negative (-) labels in FIG. 4B. Ex. 1007: FIGS. 4A-B.

(b) Element [18b] “at least one solid state switch connected to the negative pole of said one or more cells in series, and to said negative terminal, the positive pole of said one or more cells being connected to said positive terminal”

In the context of Poff’s Fig. 4, the first terminal (14) is the negative terminal and the MOSFETs (24,26,108,110) are connected to the negative terminal and the negative pole of the cells (12) while the positive pole of the cells is connected to the second, positive terminal (16). Ex. 1012: Fig. 4; Ex. 1002: ¶81.

18. Invalidity of Claim 19 Over Pevear in view of Porsche and Poff: “Apparatus according to claim 18, wherein, the solid state switches are transistors, FET, MOSFET, IGBT, JFET, BJT, CMOS, VMOS, TMOS, vertical DMOS or HEXFET”

Pevear, Porsche, and Poff disclose Claim 18. *See* § VI(D)(17). Pevear discloses MOSFETs. Ex. 1007: ¶[0007]. Poff also discloses MOSFETs. Ex. 1012: ¶¶[0022]-[0023].

19. Invalidity of Claim 20 Over Pevear in view of Porsche and Poff: “Apparatus according to claim 18, wherein said one or more cells are selected from the group consisting of LiFePO,

**LiFePO₄, LiFeYPO₄, LiCoO₂, LiMn₂O₄, LiNiCoAlO₂,
LiNiMnCoO₂, Li₄Ti₅O₁₂, lead-acid, NiCd, and nickel metal
hydride (NiMH) batteries”**

Pevear, Porsche, and Poff disclose Claim 18. *See* § VI(D)(17 Porsche discloses lithium-iron-phosphate (i.e., LiFePO₄) cells. Ex. 1009: p. 2; Ex. 1002: ¶83.

20. Motivation to Combine Pevear, Porsche, and Poff and Reasonable Expectation of Success

A POSITA would have been motivated to use Porsche’s lithium iron phosphate cells as the lithium ion cells in modified Pevear for at least the following reasons.

First, both references deal with automotive batteries with battery management systems and specifically disclose the weight reduction advantages of lithium ion cells. Second, Porsche discloses lithium-iron-phosphate as a known lithium ion cell material for automotive batteries and using a known material for its known purpose to obtain predictable results is obvious. Third, both references disclose batteries with exactly four lithium ion cells. Fourth, using Porsche’s lithium iron phosphate cells would be suitable for a conventional 12 V operating system in the car’s on-board network. Ex. 1002: ¶39.

A POSITA would have been motivated to replace Pevear’s cutoff circuitry with Poff’s cutoff circuitry having parallel pairs of solid state switches with the two

switches in each pair having connected sources or drains for at least the following reasons.

First, the cutoff functions of both references utilize field effect transistors which enable independent control of charging and discharging in connection with lithium ion batteries. Second, both references disclose cutoff functions. The modification involving replacing Pevear's cutoff function/circuitry with that of Poff would constitute a simple substitution of one known element for another known element to obtain predictable results and would use a known technique to improve similar devices. Ex. 1002: ¶41. Third, there are a finite number of known solutions for voltage cutoff and it would have been obvious to try Poff's solution, with a reasonable expectation of success. Ex. 1002: ¶41.

A. Claims 11 and 21 are unpatentable under § 103 over Pevear, Porsche, Poff, and Grant (Ground 2)

1. Invalidity of Claim 11 Over Pevear in view of Porsche, Poff, and Grant

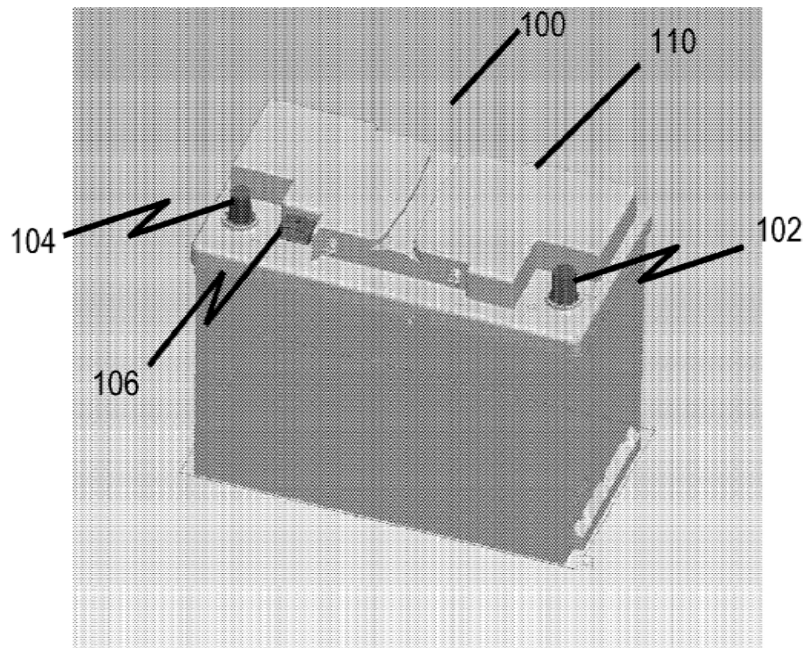
Pevear, Porsche, and Poff disclose claim 1. *See* § VI(D)(1). The battery pack of these references is not expressly disclosed in the context of the specific components recited in claim 11. Grant discloses a battery jumpering apparatus including first and second cables connected between two batteries. Ex. 1013: 2:30-36 and 49-54. The jumper cables are connected into a case (i.e., housing) and one of the cables is connected to a relay within the case. Ex. 1013: 3:5-26.

2. Invalidity of Claim 21 Over Pevear in view of Porsche, Poff, and Grant

(a) Element [21pre]

To the extent it is argued the preamble is limiting, Pevear discloses an automotive battery (100) having a positive terminal (104) and a negative terminal (102) insert molded on an outer case (110). Ex. 1007: ¶[0019] and FIG. 1.

FIG. 1



Pevear discloses that the battery may be used as a starter battery to drive the starter motor of the vehicle. Ex. 1007: ¶[0004]. . Pevear discloses that a battery is designed for used vehicle operating systems, such as a replacement for lead acid batteries in vehicles, that can be charged from the vehicle's alternator and used to provide power for micro-hybrid (start-stop) drive systems, where 12-volt is the

standard voltage. Ex. 1006: ¶[0005]; Ex. 1002: ¶88. Pevear also discloses four cells in series, which at standard lithium cell voltages is more than 12 Volts. Ex. 1007: FIG. 4A; Ex. 1002: ¶____. To the extent, PO argues that Pevear does not expressly disclose the 6 volt to 48 volt operating system voltage. Porsche discloses a lithium iron phosphate starter battery which “consistently guarantees the usual voltage of 12 V in the car’s on-board network.” Ex. 1009: p. 2. 12 V is a standard operating system voltage for car starter batteries as taught by Porsche and known to a POSITA. Ex. 1002: ¶88.

(b) Element [21a]

Pevear discloses that the case (i.e., housing) consists of a top cover and an enclosure base. Ex. 1007: ¶[0019].

(c) Element [21b]

Pevear discloses “a plurality of rechargeable battery cells within the battery housing and having first and second voltage terminals.” Ex. 1007: claim 1. The cells may be lithium ion cells. Ex. 1007: claim 2. ; Ex. 1002: ¶¶ 90.

Porsche discloses a nominal voltage of 12 V for four lithium-iron-phosphate cells in series. Ex. 1009: p. 2. Thus, each cell must have a charging voltage within the recited range of 2.0 to 4.2 V. Porsche further discloses a nominal capacity of 18 Ah. Ex. 1009: p. 1. The capacity of cells connected in series is the total nominal capacity divided by the number of cells. Ex. 1002: ¶91. Therefore, the total

discharging amount of each cell in the Porsche battery pack is 4.5 Ah which falls within the recited range. Ex. 1002: ¶91.

(d) Element [21c]

Grant discloses a battery jumpering apparatus including first and second cables connected between two batteries. Ex. 1013: 2:30-36 and 49-54. The jumper cables are connected into a case (i.e., housing) and one of the cables is connected to a relay within the case. Ex. 1013: 3:5-26.

(e) Element [21d-i]

Grant discloses a relay within the cable housing but does not specifically disclose the recited solid state switching apparatus.

Pevear discloses a microprocessor (402) configured to control and monitor a cutoff component (322) that can be used to selectively connect or disconnect the battery from the load(s) connected to its terminals. Ex. 1007: ¶[0039] and FIG. 4A. The cutoff component includes a first group of MOSFETs arranged in parallel (432) and a second group of MOSFETs arranged in parallel (434). Ex. 1007: claim 5, ¶[0007], and FIG. 4A. MOSFETs are solid state switches. Ex. 1002: ¶94. However, the MOSFETs are not arranged in parallel pairs. Instead, the first and second groups (432, 434) are in series with each other. Ex. 1007: claim 5, ¶[0007], and FIG. 4A.

In the same field, Poff discloses an enhanced protection system for a battery pack including a conventional protection circuit and a redundant protection circuit.

Ex. 1012: Abstract. The protection system may cause an open circuit such that current is not allowed to flow from the battery back when an overvoltage or other undesirable condition occurs “with one or more of the Li ion cells” in the battery pack. Ex. 1012: ¶ [0018]. Stopping current when an undesirable condition occurs is a cutoff function. Ex. 1002: ¶95. The conventional protection circuit includes conventional transistor pair (22) having a discharge transistor (24) and a charge transistor (26). Ex. 1012: ¶ [0022]. The redundant protection circuit includes a redundant transistor pair (106) having a discharge transistor (108) and a charge transistor (110). Ex. 1012: ¶ [0023]. The conventional transistor pair (22) and the redundant transistor pair (106) are in parallel in Poff. Ex. 1012: FIG. 4; Ex. 1002: ¶95.

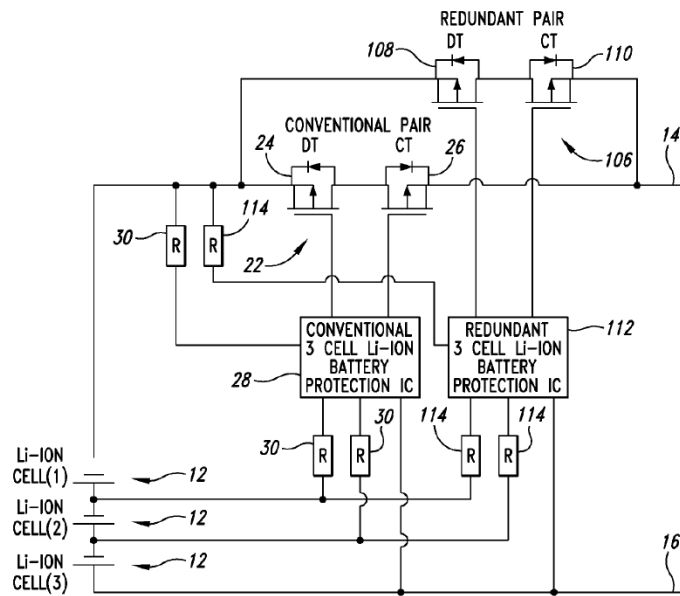
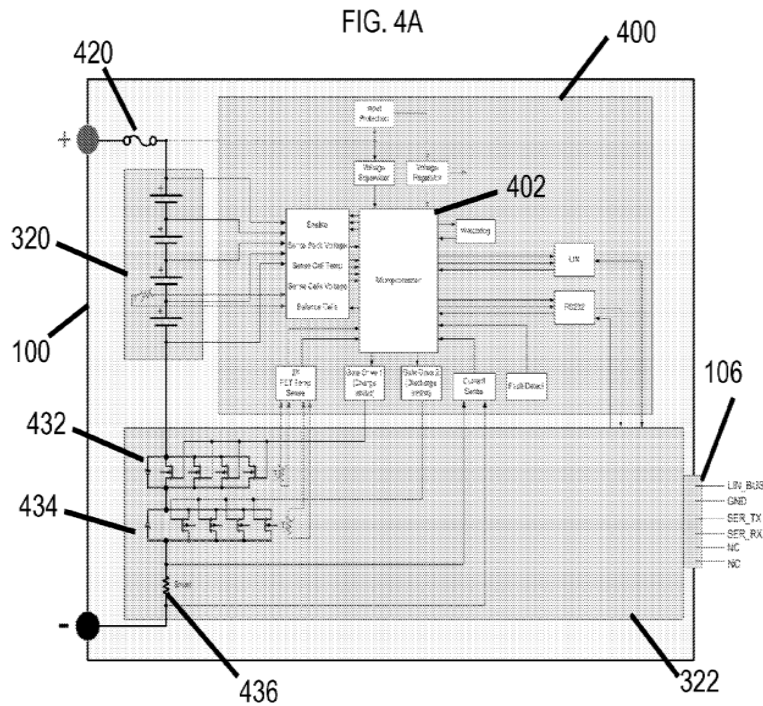


Fig. 4

(f) Element [21d-ii]

Poff discloses that the transistors can be MOSFETs. Ex. 1012: ¶¶[0022]-[0023]. MOSFETs inherently include a source, a gate, and a drain. Poff illustrates the two MOSFETs in each pair of transistors where either the drains of the switches are connected or the sources of the switches are connected. Ex. 1012: Fig. 4; Ex. 1002: ¶97.



(g) Element [21d-iii]

Poff discloses that the battery pack includes a plurality of lithium-ion cells (12), a first external (negative) terminal (14), a second external (positive) terminal (16), and parallel pairs (22, 106) of MOSFETs (24, 26, 108, 110) connected in series with the cells (12) between the terminals (14, 16). Ex. 1012: Fig. 4; Ex. 1002: ¶98.

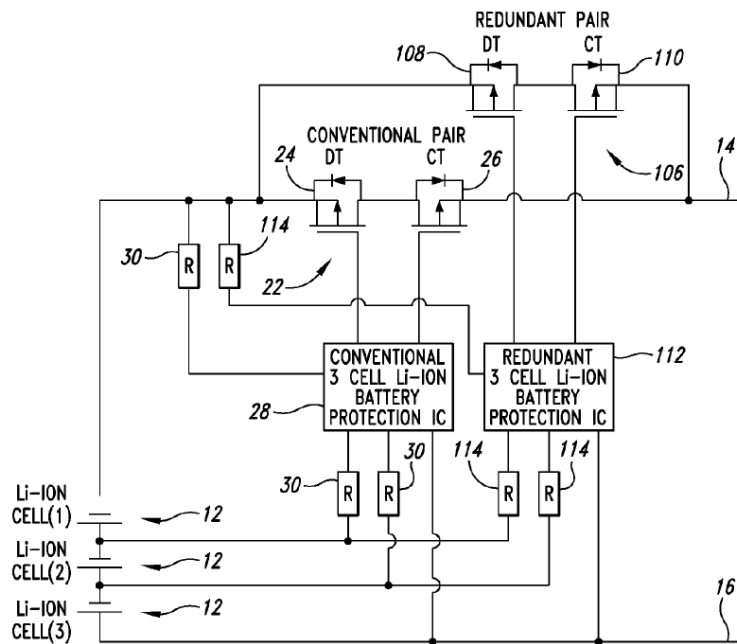


Fig. 4

3. Motivation to Combine Pevear, Porsche, Poff, and Grant

A POSITA would have been motivated to combine the teachings of Pevear, Porsche, and Poff for the reasons discussed above in § VI(D)(20).

A POSITA would have been motivated to include the cables and cable housing with the relay as taught by Grant to connect the battery pack of Pevear-Porsche-Poff in order to jump start the battery as taught by Grant without harmful sparks being created at the terminals of the battery. Ex. 1013: 2:30-54.

B. Claims 1-10 and 12-20 are unpatentable under §§ 102 and 103 over Koebler (Ground 3)

1. Invalidity of Claim 1 Over Koebler

(a) Element [1pre]:

To the extent it is argued the preamble is limiting, Koebler discloses a battery pack having a positive terminal (34) and a negative terminal (36). Ex. 1014: 11:25-27 and FIG. 10.



Fig. 10

Koebler discloses the battery is useful “for a starter motor of an internal combustion engine.” Ex. 1014: 3:26-27. Koebler specifically discloses 12 volt operating systems. Ex. 1014: 7:17-26 and 10:7.

(b) Element [1a]:

Koebler discloses that the battery pack includes a housing. Ex. 1014: 8:24-25.

(c) Element [1b]:

Koebler discloses “at least one lithium-based rechargeable cell within said housing.” Ex. 1014: claim 1.

(d) Element [1c-i]:

Koebler discloses connecting pairs of solid state switches in parallel “to increase the current capabilities.” Ex. 1014: 11:20-23 and FIG. 16.

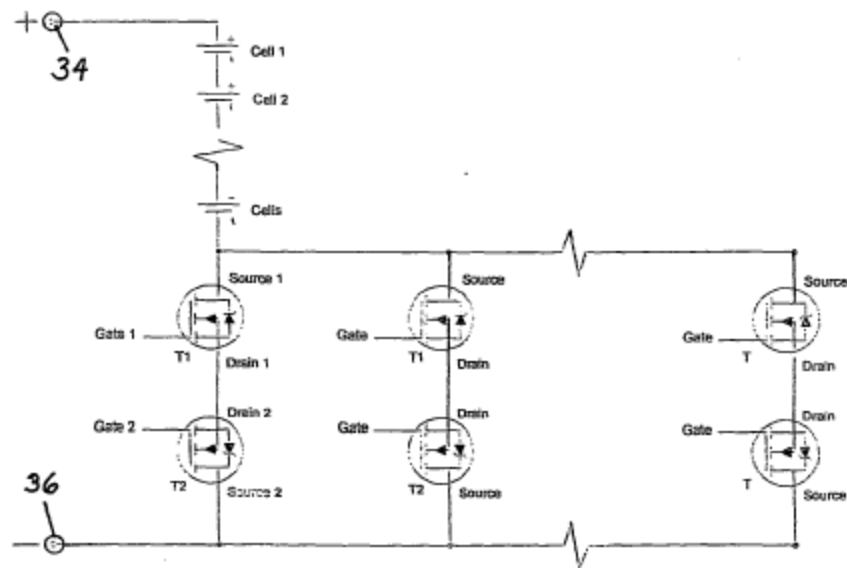


Fig. 16

(e) Element [1c-ii]:

Koebler discloses pairs solid state switches with connected drains or sources. Ex. 1014: 11:20-23 and FIG. 16 (drains connected).

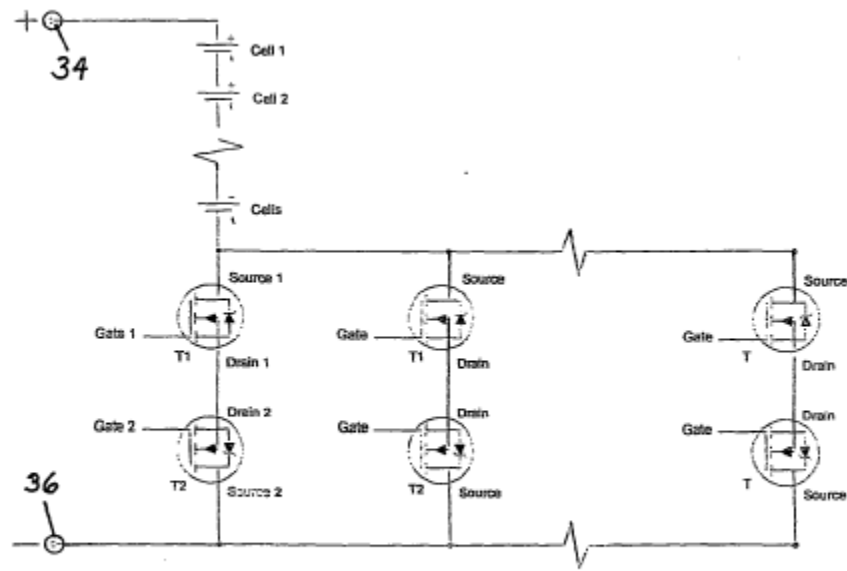


Fig. 16

(f) Element [1c-iii]:

Koebler discloses that the parallel configuration is connected with one or more cells between the positive (34) and negative (36) terminals. Ex. 1014: FIG. 16.

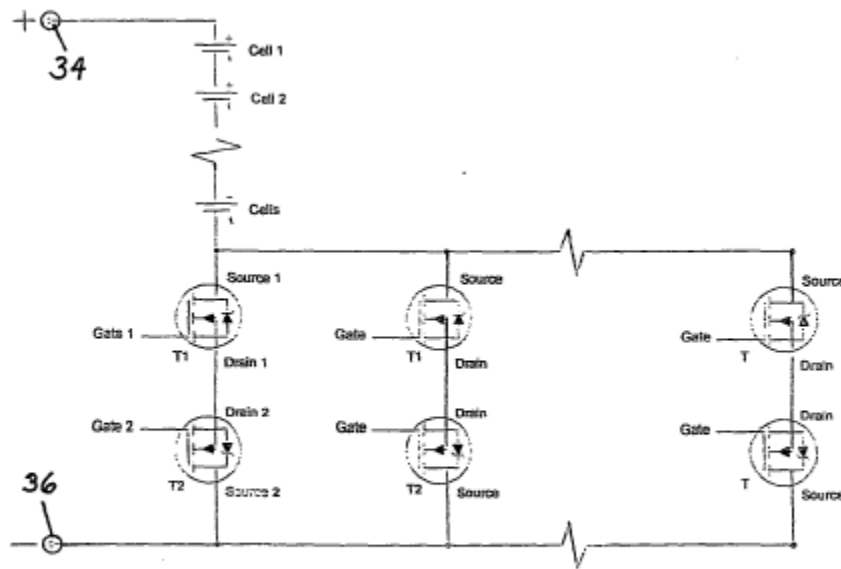


Fig. 16

(g) Element [1d]:

Koebler discloses a total discharging amount of each lithium-based cell of 1 to 5000 Ah and a charging voltage per cell of 3.0 to 4.2 V. Ex. 1014: 8:27-28. Koebler further discloses specific total discharging amounts per cell of 5, 10, 20, 50, 100, 400, and 500 Ah (Ex. 1014: 4:3-5), each of which is anticipatory of the recited range of 3 Ah to 2000 Ah. To the extent that any overlapping ranges are not determined to be anticipatory, Petitioners respectfully submit that such overlapping ranges render the claim obvious.

2. Invalidity of Claim 2 Over Koebler:

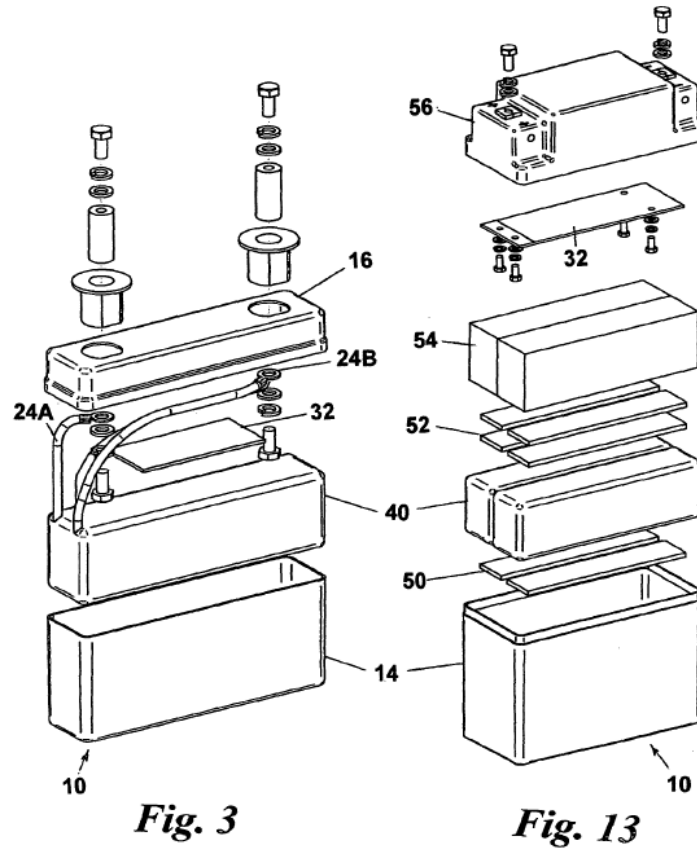
Koebler discloses LiFePO , LiFePO_4 , LiFeMgPO_4 , LiFeYPO_4 , LiCoO_2 , LiMn_2O_4 , LiNiCoAlO_2 , LiNiMnCoO_2 , and $\text{Li}_4\text{Ti}_5\text{O}_{12}$ cells. Ex. 1014: 3:26-30 and claims 3, 4, 16, and 20.

3. Invalidity of Claim 3 Over Koebler:

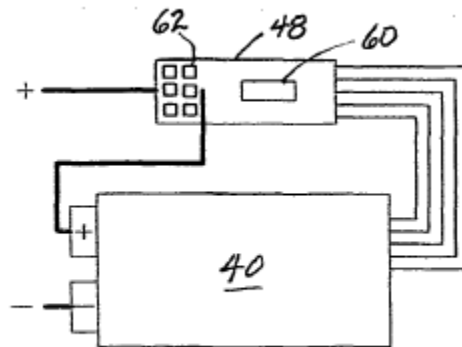
Koebler discloses “four lithium-based rechargeable cells in series in said housing.” Ex. 1014: claim 5.

4. Invalidity of Claim 4 Over Koebler:

Koebler discloses a protection circuit board (32) which may be placed within the upper casing or top (14) of the battery pack housing for safety protection and may be a cutoff board or a cell-balancing board. Ex. 1014: 9:2-4 and FIGS. 3 and 13.



The cutoff board (48) includes a solid state cutoff switch (62), such as an FET. Ex. 1014: 10:22-25 and FIG. 8.



Koebler further discloses that the cutoff function turns off the FET when the voltage drops to a preselected level (i.e., an undervoltage condition). Ex. 1014: 12:4-8.

5. Invalidity of Claim 5 Over Koebler

(a) Element [5a]

Koebler discloses that the circuitry is placed within the upper casing of the housing for safety protection. Ex. 1014: 4:14-19.

(b) Element [5b]

Koebler further discloses that each cell (18) has a positive pole and a negative pole. Ex. 1014: 8:32-9:1 and FIGS. 1-2.

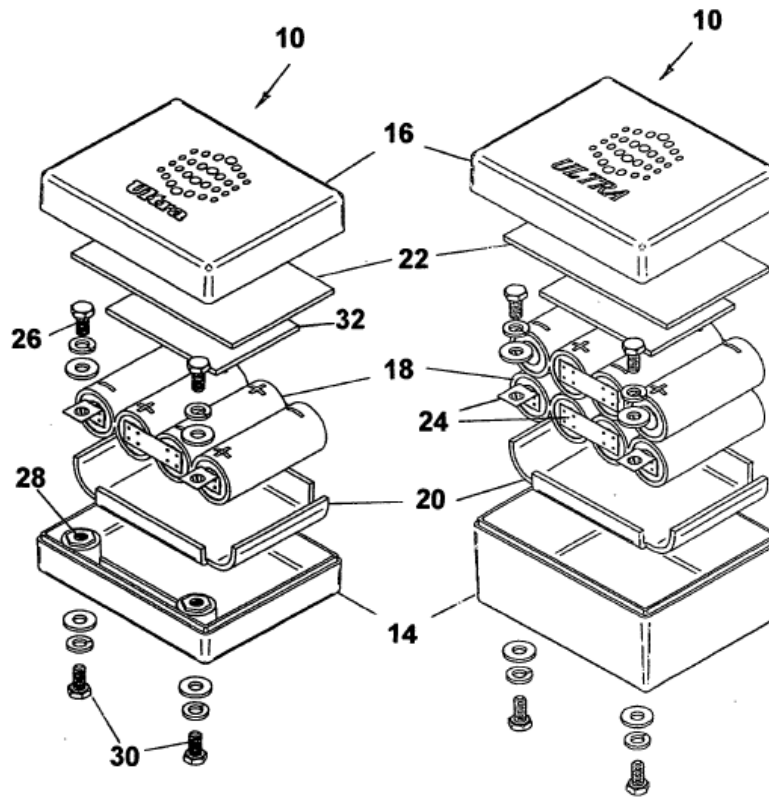


Fig. 1

Fig. 2

(c) Element [5c]

Koebler further discloses multiple examples with the switches connected to the positive pole of the cells and the positive terminal, wherein the negative pole of the cells is connected to the negative terminal. Ex. 1014: FIGS. 17, 19, 21 and 23.

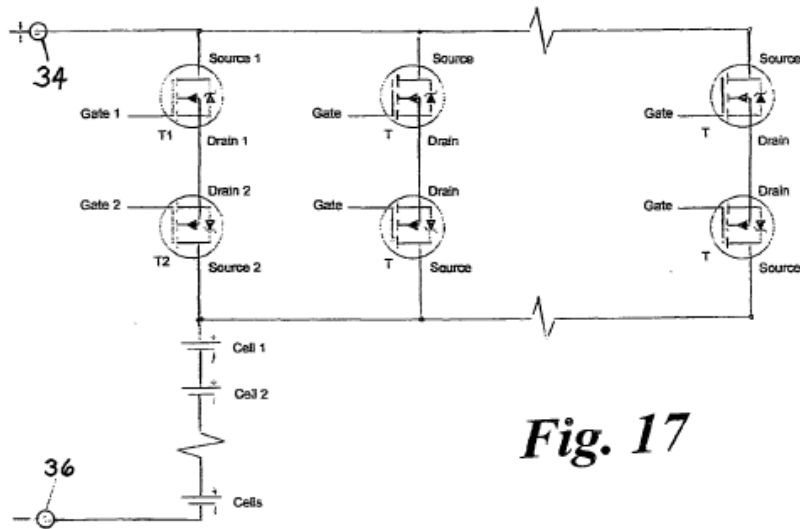


Fig. 17

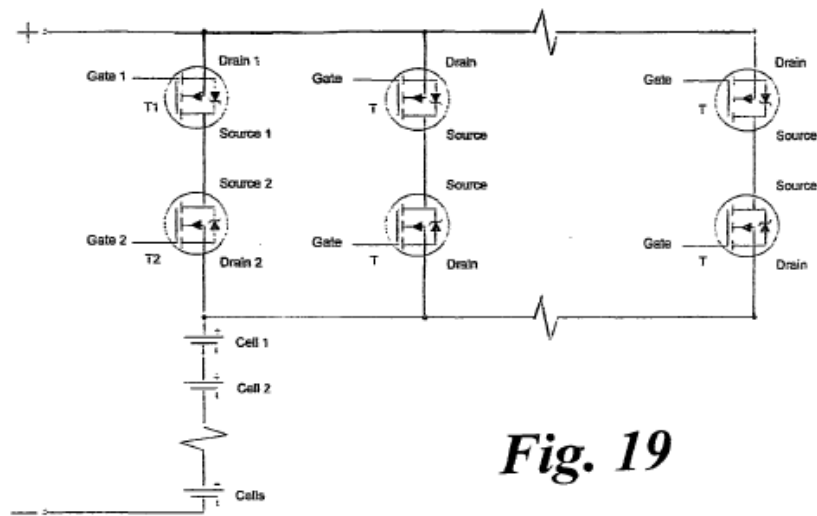


Fig. 19

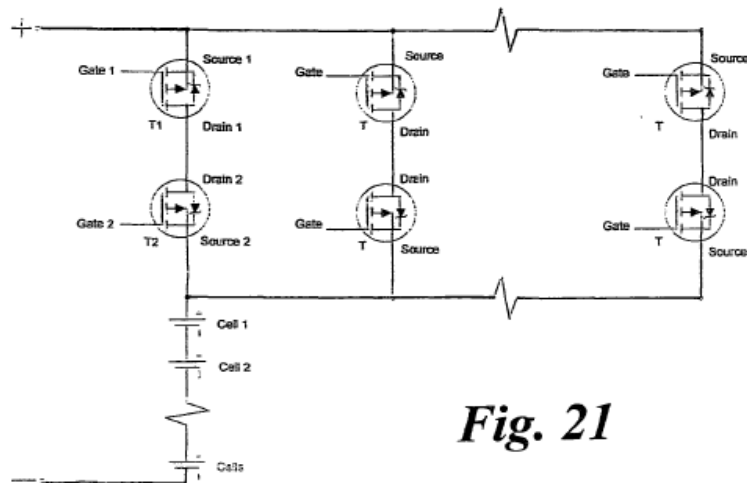


Fig. 21

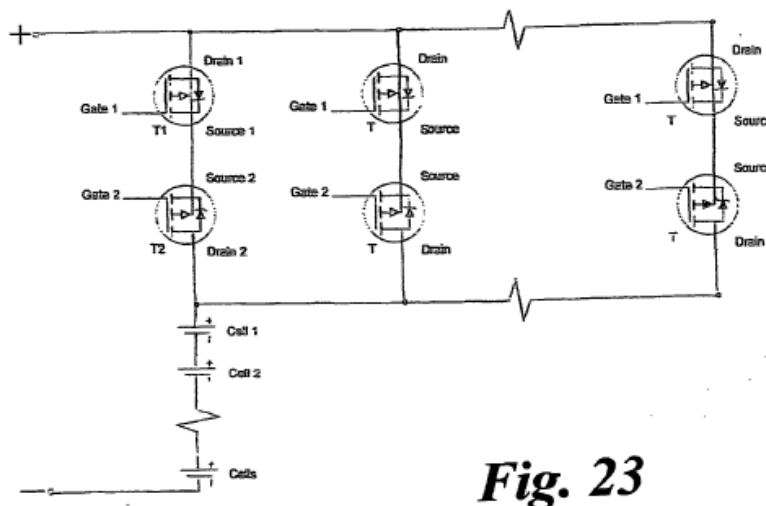


Fig. 23

6. Invalidity of Claim 6 Over Koebler:

Koebler discloses that the solid state switches “can be transistors, FET (field-effect transistors), JFET or JUGFET (junction gate field-effect transistors), BJT bipolar junction transistors, CMOS (complementary metal-oxide-semiconductors), VMOS (Vertical Metal Oxide Silicon), TMOS transistors, vertical DMOS (Double-Diffused MOS), or HEXFET.(hexagonal shape MOSFET).” Ex. 1014: 13:25-29.

7. Invalidity of Claim 7 Over Koebler:

Koebler discloses LiFePO , LiFePO_4 , LiFeMgPO_4 , LiFeYPO_4 , LiCoO_2 , LiMn_2O_4 , LiNiCoAlO_2 , LiNiMnCoO_2 , and $\text{Li}_4\text{Ti}_5\text{O}_{12}$ cells. Ex. 1014: 3:26-30 and claims 3, 4, 16, and 20.

8. Invalidity of Claim 8 Over Koebler

(a) Element [8a]

Koebler discloses that the circuitry is placed within the upper casing of the housing for safety protection. Ex. 1014: 4:14-19.

(b) Element [8b]

Koebler discloses multiple examples with the switches connected to the negative pole of the cells and the negative terminal, wherein the positive pole of the cells is connected to the positive terminal. Ex. 1014: FIGS. 16, 18, 20 and 22.

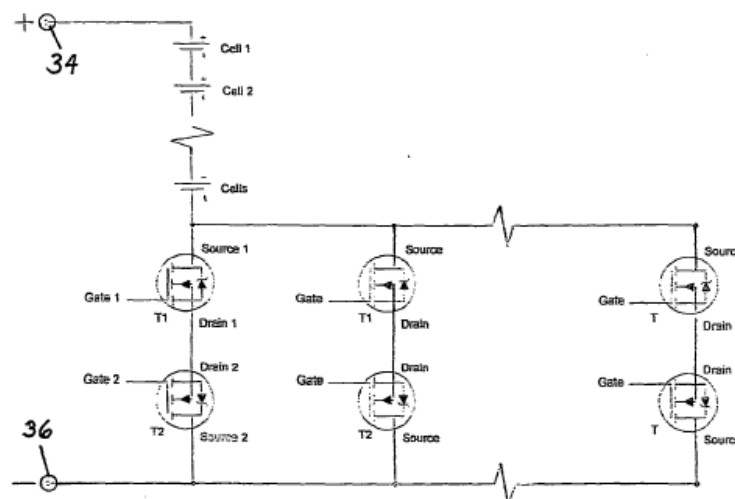


Fig. 16

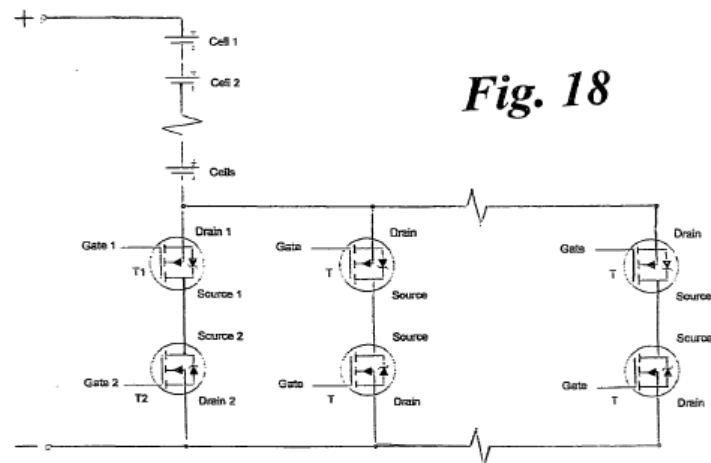


Fig. 18

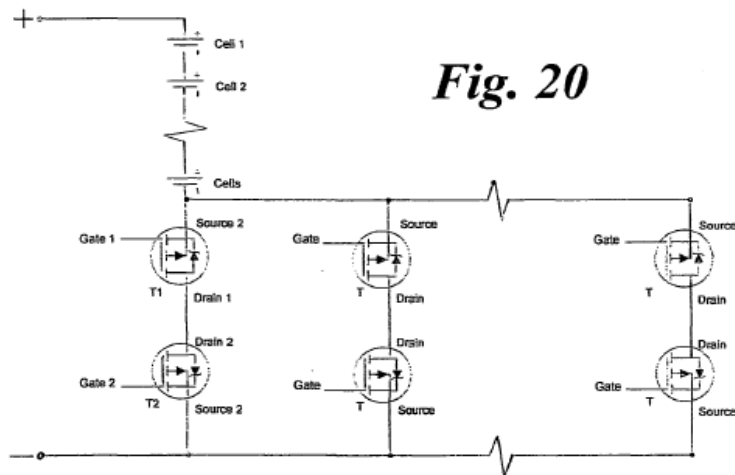


Fig. 20

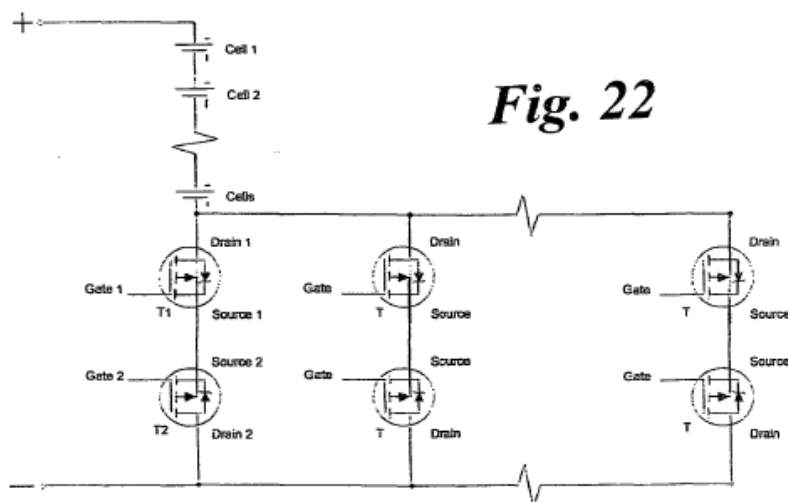


Fig. 22

9. Invalidity of Claim 9 Over Koebler:

Koebler discloses that the solid state switches “can be transistors, FET (field-effect transistors), JFET or JUGFET (junction gate field-effect transistors), BJT bipolar junction transistors, CMOS (complementary metal-oxide-semiconductors), VMOS (Vertical Metal Oxide Silicon), TMOS transistors, vertical DMOS (Double-Diffused MOS), or HEXFET.(hexagonal shape MOSFET).” Ex. 1014: 13:25-29.

10. Invalidity of Claim 10 Over Koebler:

Koebler discloses LiFePO , LiFePO_4 , LiFeMgPO_4 , LiFeYPO_4 , LiCoO_2 , LiMn_2O_4 , LiNiCoAlO_2 , LiNiMnCoO_2 , and $\text{Li}_4\text{Ti}_5\text{O}_{12}$ cells. Ex. 1014: 3:26-30 and claims 3, 4, 16, and 20.

11. Invalidity of Claim 12 Over Koebler

(a) Element [12pre]:

To the extent it is argued the preamble is limiting, Koebler discloses Koebler discloses a battery pack having a positive terminal (34) and a negative terminal (36). Ex. 1014: 10:25-27 and FIG. 10.

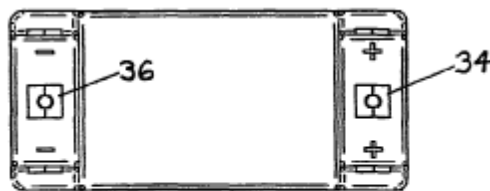


Fig. 10

Koebler discloses the battery is useful “for a starter motor of an internal combustion engine.” Ex. 1014: 3:26-27. Koebler specifically discloses 12 volt operating systems. Ex. 1014: 7:17-26 and 10:7. The battery may be a deep cycle battery. Ex. 1014: 10:32-11:1.

(b) Element [12a]:

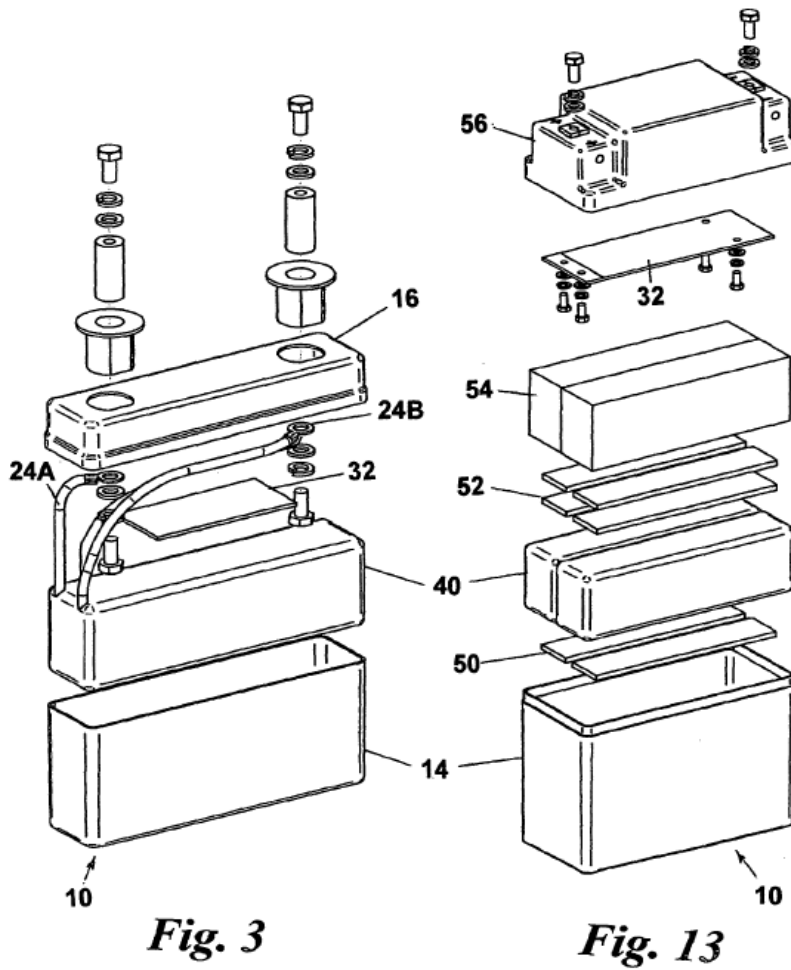
Koebler discloses that the battery pack includes a housing. Ex. 1014: 8:24-25.

(c) Element [12b]:

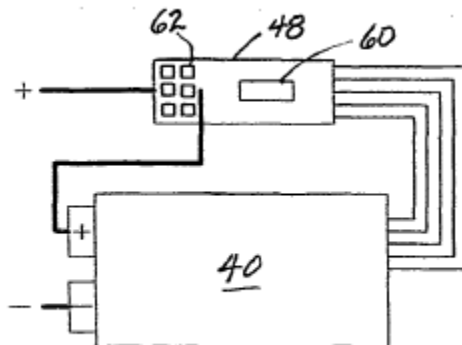
Koebler discloses “at least one lithium-based rechargeable cell within said housing.” Ex. 1014: claim 1.

(d) Element [12c]:

Koebler discloses that control electronics in battery systems are often referred to as battery management systems (BMS). Ex. 1014: 11:11-19. Koebler further discloses a protection circuit board (32) which may be placed within the upper casing or top (14) of the battery pack housing for safety protection and may be a cutoff board or a cell-balancing board. Ex. 1014: 9:2-4 and FIGS. 3 and 13.



The cutoff board (48) includes a processor (60) and solid state cutoff switch (62), such as an FET. Ex. 1014: 10:22-25 and FIG. 8.



Koebler further discloses that the cutoff function turns off the FET when the voltage drops to a preselected level. Ex. 1014: 11:4-8.

(e) Element [12d-i]:

Koebler discloses connecting pairs of solid state switches in parallel “to increase the current capabilities.” Ex. 1014: 11:20-23 and FIG. 16.

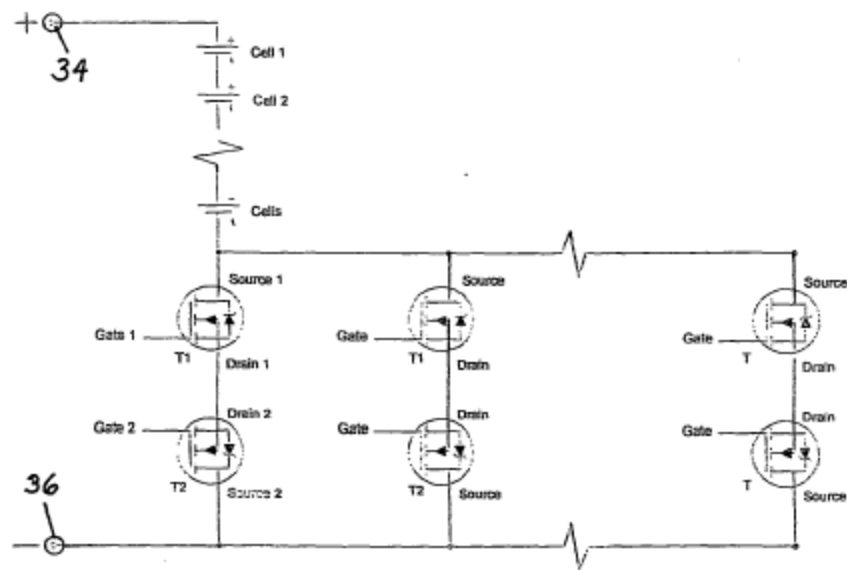


Fig. 16

(f) Element [12d-ii]:

Koebler discloses pairs solid state switches with connected drains or sources.

Ex. 1014: 11:20-23 and FIG. 16 (drains connected).

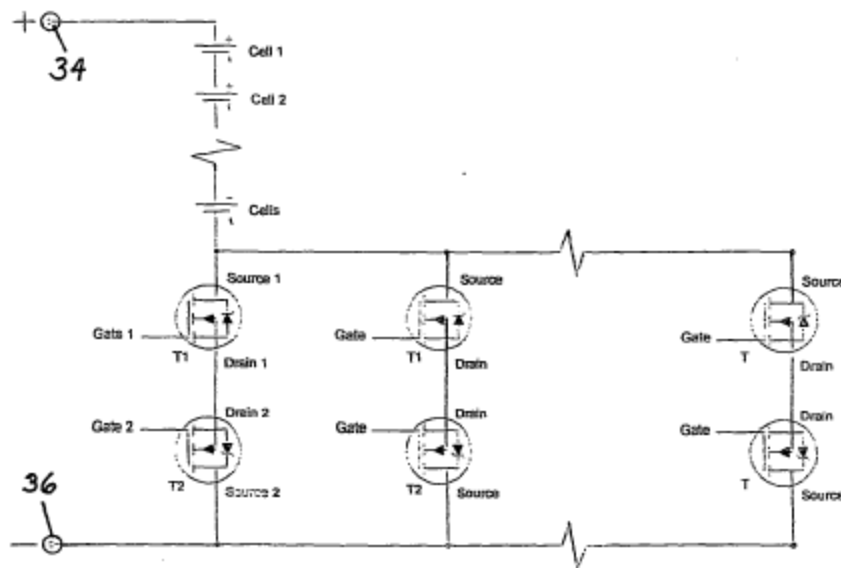


Fig. 16

(g) Element [12d-iii]:

Koebler discloses that the parallel configuration is connected with one or more cells between the positive (34) and negative (36) terminals. Ex. 1014: FIG. 16.

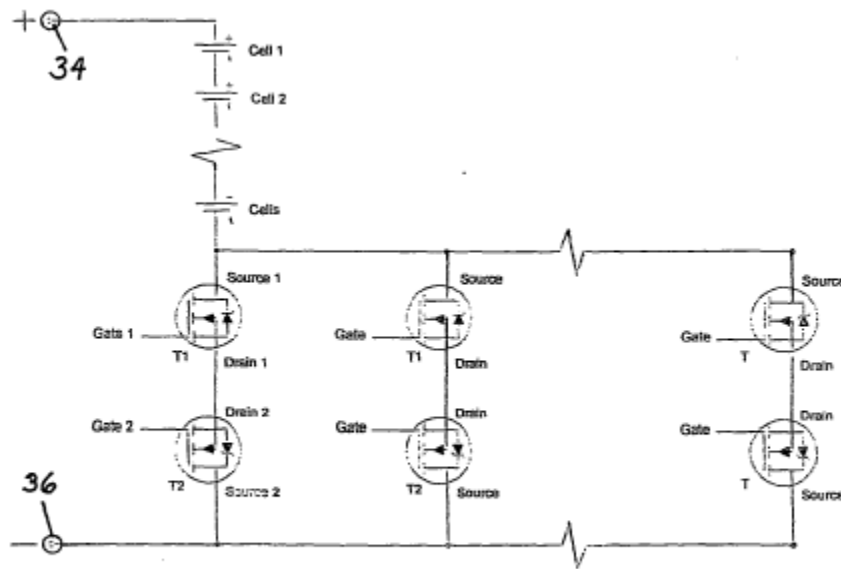


Fig. 16

(h) Element [12e]:

Koebler discloses a total discharging amount of each lithium-based cell of 1 to 5000 Ah and a charging voltage per cell of 3.0 to 4.2 V. Ex. 1014: 8:27-28. Koebler further discloses specific total discharging amounts per cell of 5, 10, 20, 50, 100, 400, and 500 Ah (Ex. 1014: 4:3-5), each of which is anticipatory of the recited range of 3 Ah to 2000 Ah. To the extent that any overlapping ranges are not determined to be anticipatory, Petitioners respectfully submit that such overlapping ranges render the claim obvious.

12. Invalidity of Claim 13 Over Koebler:

Koebler discloses LiFePO , LiFePO_4 , LiFeMgPO_4 , LiFeYPO_4 , LiCoO_2 , LiMn_2O_4 , LiNiCoAlO_2 , LiNiMnCoO_2 , and $\text{Li}_4\text{Ti}_5\text{O}_{12}$ cells. Ex. 1014: 3:26-30 and claims 3, 4, 16, and 20.

13. Invalidity of Claim 14 Over Koebler:

Koebler discloses “four lithium-based rechargeable cells in series in said housing.” Ex. 1014: claim 5.

14. Invalidity of Claim 15 Over Koebler

(a) Element [15a]

Koebler discloses that the circuitry is placed within the upper casing of the housing for safety protection. Ex. 1014: 4:14-19. Koebler also discloses that each cell (18) has a positive pole and a negative pole. Ex. 1014: 8:32-9:1 and FIGS. 1-2.

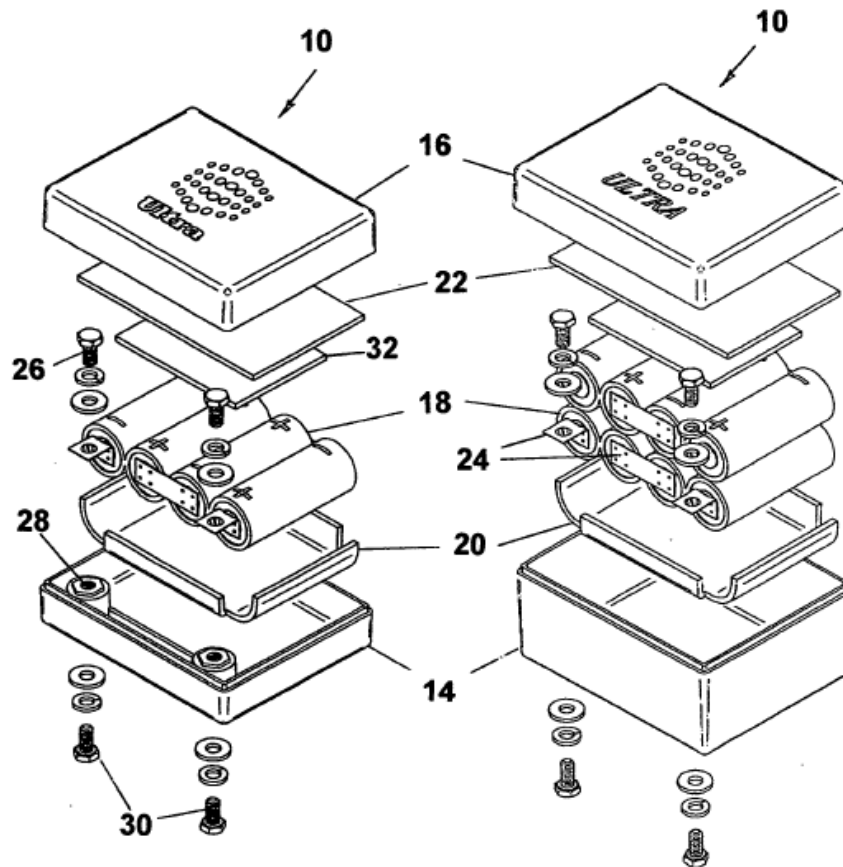


Fig. 1

Fig. 2

(b) Element [15b]

Koebler further discloses multiple examples with the switches connected to the positive pole of the cells and the positive terminal, wherein the negative pole of the cells is connected to the negative terminal. Ex. 1014: FIGS. 17, 19, 21 and 23.

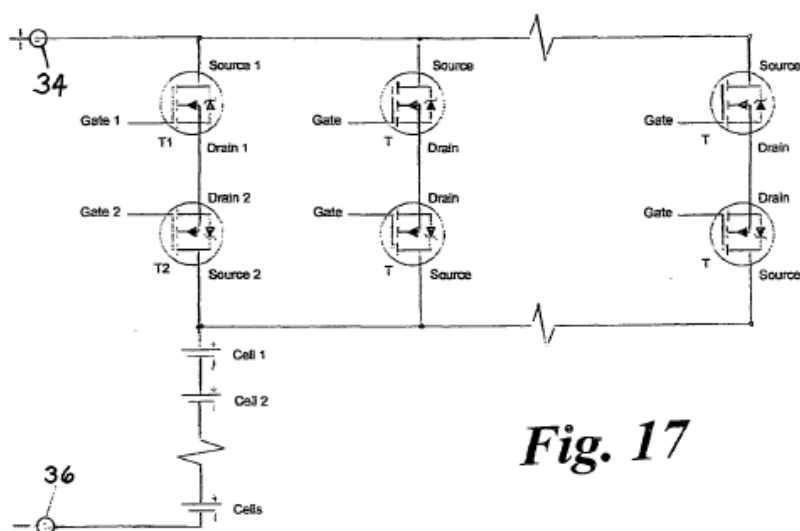


Fig. 17

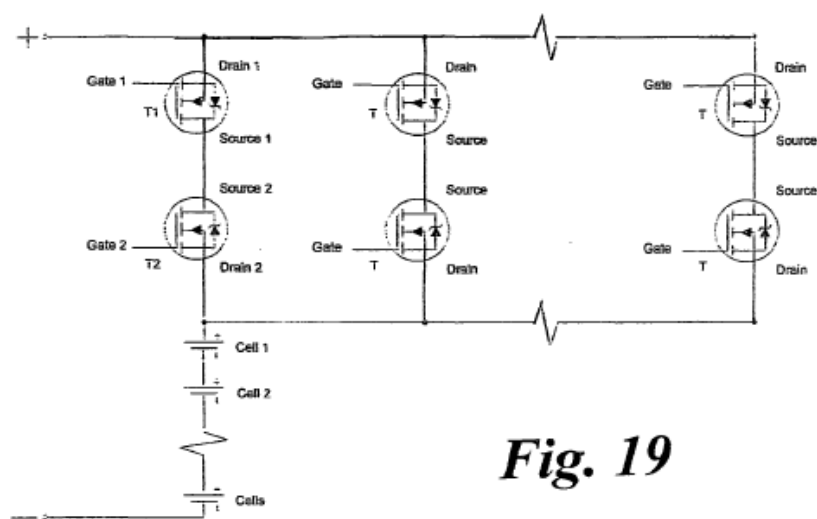


Fig. 19

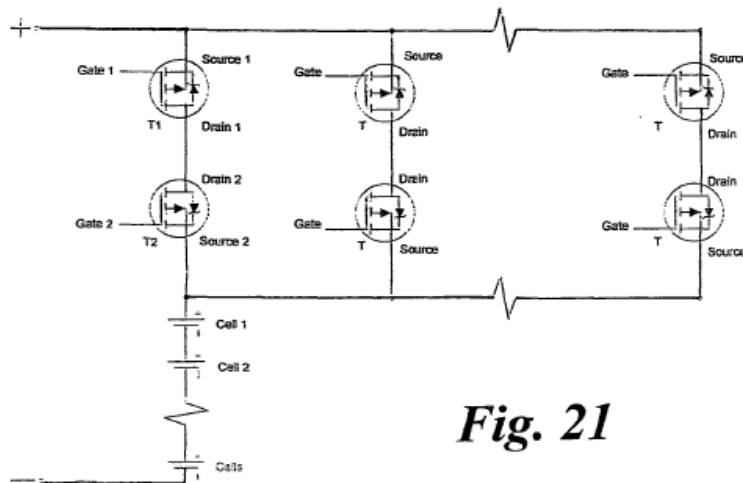


Fig. 21

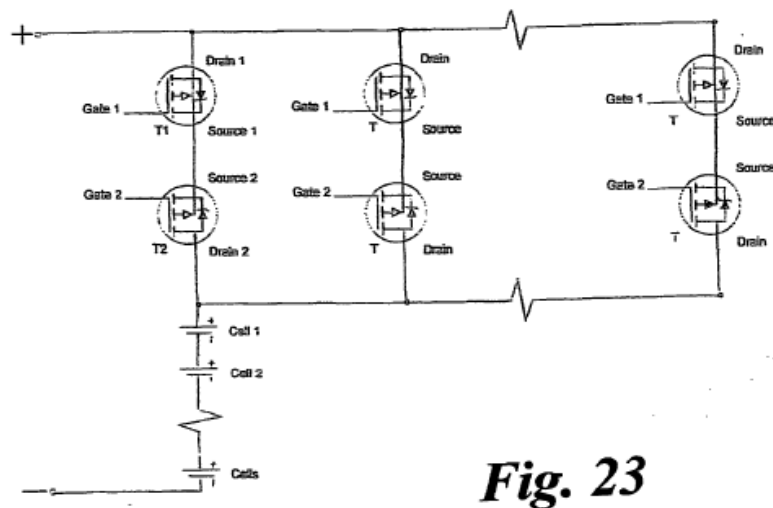


Fig. 23

15. Invalidity of Claim 16 Over Koebler:

Koebler discloses that the solid state switches “can be transistors, FET (field-effect transistors), JFET or JUGFET (junction gate field-effect transistors), BJT bipolar junction transistors, CMOS (complementary metal-oxide-semiconductors), VMOS (Vertical Metal Oxide Silicon), TMOS transistors, vertical DMOS (Double-Diffused MOS), or HEXFET.(hexagonal shape MOSFET).” Ex. 1014: 13:25-29.

16. Invalidity of Claim 17 Over Koebler:

Koebler discloses LiFePO , LiFePO_4 , LiFeMgPO_4 , LiFeYPO_4 , LiCoO_2 , LiMn_2O_4 , LiNiCoAlO_2 , LiNiMnCoO_2 , and $\text{Li}_4\text{Ti}_5\text{O}_{12}$ cells. Ex. 1014: 3:26-30 and claims 3, 4, 16, and 20.

17. Invalidity of Claim 18 Over Koebler

(a) Element [18a]

Koebler discloses that the circuitry is placed within the upper casing of the housing for safety protection. Ex. 1014: 4:14-19. Koebler also discloses that each cell (18) has a positive pole and a negative pole. Ex. 1014: 8:32-9:1 and FIGS. 1-2.

(b) Element [18b]

Koebler further discloses multiple examples with the switches connected to the negative pole of the cells and the negative terminal, wherein the positive pole of the cells is connected to the positive terminal. Ex. 1014: FIGS. 16, 18, 20 and 22.

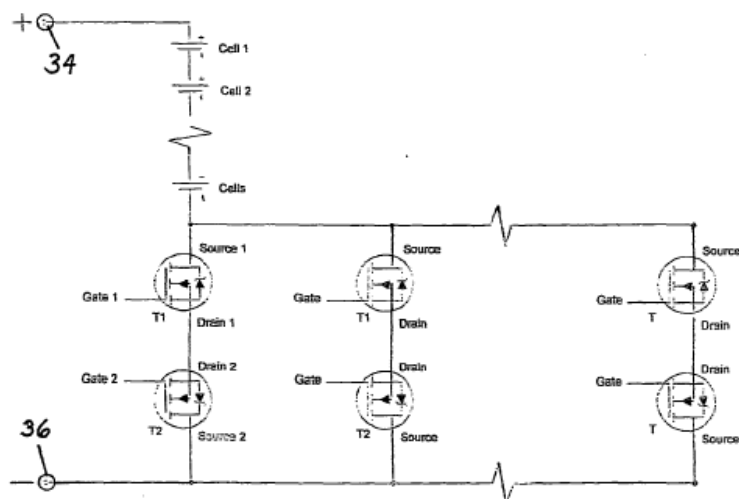


Fig. 16

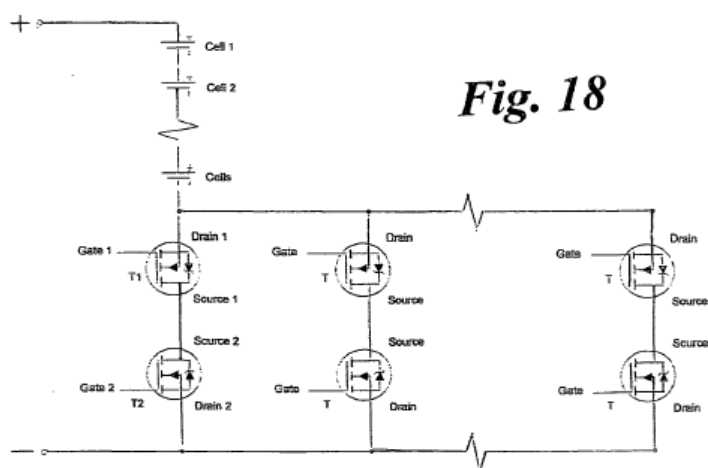
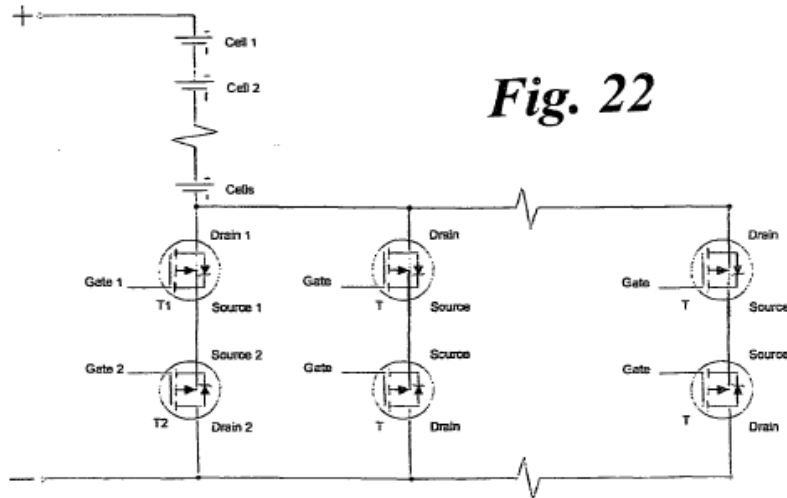
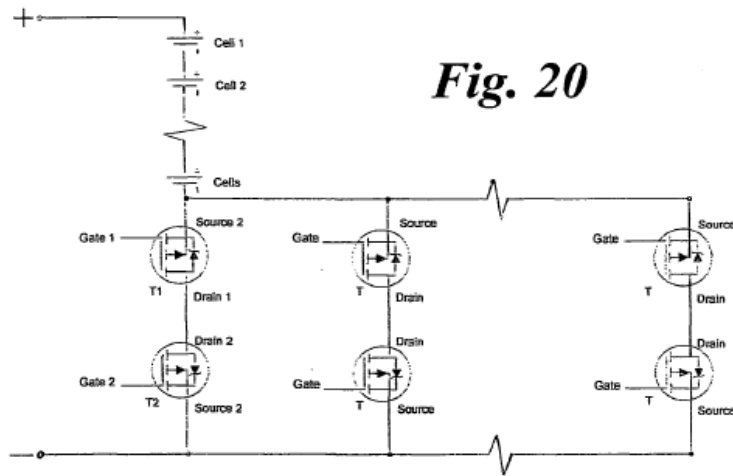


Fig. 18



18. Invalidity of Claim 19 Over Koebler:

Koebler discloses that the solid state switches “can be transistors, FET (field-effect transistors), JFET or JUGFET (junction gate field-effect transistors), BJT bipolar junction transistors, CMOS (complementary metal-oxide-semiconductors), VMOS (Vertical Metal Oxide Silicon), TMOS transistors, vertical DMOS (Double-Diffused MOS), or HEXFET.(hexagonal shape MOSFET).” Ex. 1014: 13:25-29.

19. Invalidity of Claim 20 Over Koebler:

Koebler discloses LiFePO , LiFePO_4 , LiFeMgPO_4 , LiFeYPO_4 , LiCoO_2 , LiMn_2O_4 , LiNiCoAlO_2 , LiNiMnCoO_2 , and $\text{Li}_4\text{Ti}_5\text{O}_{12}$ cells. Ex. 1014: 3:26-30 and claims 3, 4, 16, and 20.

VII. DISCRETIONARY DENIAL WOULD BE INAPPROPRIATE

A. The Board Should Not Deny Institution Under Fintiv

Petitioners respectfully submit that the Fintiv factors weigh in favor of institution. *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (P.T.A.B. Mar. 20, 2020).

With respect to Fintiv factor 1, the parallel district court cases are stayed pending the resolution of the ITC investigation. The ITC investigation cannot resolve all or substantially all of the patentability disputes between the parties. In particular, claims 11 and 21 are not involved in the ITC investigation but are challenged in this Petition. Moreover, claims 5-7 and 15-17 are challenged in this Petition but were not charted in the expert reports signed by PO's infringement expert. Additionally, Petitioners have strong arguments concerning non-infringement and a lack of domestic industry in connection with the ITC investigation. Accordingly, it is likely that the outcome of the ITC investigation is determined on issues unrelated to patentability and that the ITC does not resolve any of the patentability disputes between the parties. Petitioners served final invalidity

contentions in connection with the ITC Investigation on February 14, 2025. Pevear and Porsche were not charted in the final invalidity contentions or Petitioners' expert report on invalidity in connection with the ITC Investigation. Accordingly, the invalidity contentions in the ITC proceeding and invalidity grounds 1 and 2 presented herein do not overlap. This factor weighs against a discretionary denial of institution. This factor weighs against a discretionary denial of institution.

Regarding Fintiv factor 4, in the district court cases, only independent claims 1 and 12 are asserted. In the ITC investigation, only claims 1-9 and 11-20 are asserted. However, as noted above, claims 5-7 and 15-17 are challenged in this Petition but were not charted in the expert reports signed by PO's infringement expert. In contrast, this petition challenges all of the claims (i.e., claims 1-21), including claims 11 and 21 which are not involved in the district court cases or the ITC investigation. Moreover, invalidity grounds 1 and 2 presented in this Petition do not match Petitioners' final invalidity contentions in the ITC investigation. Therefore, this petition raises issues that do not overlap with the ITC investigation. Ground 3 is being raised in the ITC investigation. Petitioners note that, as discussed above, the Examiner during prosecution clearly erred by assuming the '207 Patent claims were entitled to an earlier effective filing date. This factor weighs strongly against a discretionary denial of institution.

With respect to Fintiv factor 6, the strength of the merits of Petitioners' grounds raised in this petition weigh in favor of institution. Additionally, similar claims in a corresponding European patent application (published as EP2647102A1) were rejected and the application abandoned after the European Patent Office (EPO) cited one of many prior art references disclosing parallel pairs of switches with their drains or sources connected, which the inventor of the '207 Patent erroneously described as unique. Specifically, the EPO cited EP 2 124 340 A2 for disclosing the switch configuration in a communication dated September 3, 2018, and the application was deemed withdrawn because the applicant never responded.

B. The Board Should Not Deny Institution Under General Plastic

The *General Plastic* factors do not apply because this is the first and only *inter partes review* petition filed by Petitioners with respect to the '207 Patent. *General Plastic Industrial Co., Ltd. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19 (P.T.A.B. Sept. 6, 2017).

C. Ground 1 Presents New References Not Addressed in Prosecution

None of the prior art presented in Ground 1 of this Petition was considered by the USPTO prior to the allowance of the '207 Patent.

D. Grant Was Cited in Prosecution

Grant was cited in a rejection of the same claims Petitioners are citing Grant against. Petitioners note that, as discussed in § V(B), the Examiner's reasons for

allowance indicate that this claim was allowed based on the circuit configuration, not based on any cable or cable housing-related limitations recited in claims 11 and 21 for which Petitioners rely on Grant.

E. Koebler Was Addressed in Prosecution But the Examiner Clearly Erred

As noted in § V(C), the effective filing date of the challenged claims is March 13, 2015, and the Examiner clearly erred by accepting applicant's argument that Koebler was disqualified from being considered as prior art. The Examiner was not convinced that the challenged claims were patentable over Koebler on substantive grounds but instead based on the Examiner's procedural error.

VIII. FEES

Petitioners authorize charge of fees to Deposit Account 06-0308.

IX. CONCLUSION

For all grounds discussed herein based on § 103, to the extent further disclosure is required for a limitation identified herein as having been disclosed, a POSITA would certainly have found that limitation obvious to include based on the same disclosures and analysis identified herein.

Petitioners have demonstrated a reasonable likelihood that claims 1-21 of the '207 are invalid in view of the prior art. Accordingly, *inter partes* review of those claims is requested.

DATED: April 1, 2025

Respectfully submitted,

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Shenzhen LiTime Technology Co.,
Ltd.***

CLAIM LISTING APPENDIX (CLAIMS 1-21)

Claim 1
[1pre] A battery pack having positive and negative terminals for powering an electric motor for starting an internal combustion engine in which the electric motor is in a 6 volt to 48 volt operating system, said battery pack comprising:
[1a] a battery pack housing;
[1b] at least one lithium-based rechargeable cell within said housing; and
[1c-i] a solid state switching apparatus comprising a plurality of pairs of solid state switches with one pair of solid state switches connected in a parallel configuration to another pair of solid state switches,
[1c-ii] each switch having a source and a drain, the switches of a pair of solid state switches being configured such that either the drains of the switches are connected or the sources of the switches are connected, and
[1c-iii] said parallel configuration being connected with one or more cells between the positive and negative terminals,
[1d] wherein a total discharging amount of each lithium-based cell in the battery pack is from 3 Ah to 2000 Ah, and charging voltage per one cell is 2.0 to 4.2 V.

Claim 2

[2] A battery pack according to claim 1 wherein the lithium-based cell is selected from the group consisting of LiFePO , LiFePO_4 , LiFeMgPO_4 , LiFeYPO_4 , LiCoO_2 , LiMn_2O_4 , LiNiCoAlO_2 , LiNiMnCoO_2 , and $\text{Li}_4\text{Ti}_5\text{O}_{12}$ cells.

Claim 3

[3] A battery pack according, to claim 1, wherein said battery pack comprises from three to sixteen lithium-based rechargeable cells in series in said housing.

Claim 4

[4] A battery pack according to claim 1, further comprising a protection circuit board within said battery housing, said protection circuit board including one of a solid state switch, MOSFET, diode, or relay, which protects against temperature, reverse polarity, undervoltage or overvoltage.

Claim 5

[5a] A battery pack according to claim 1, wherein the solid state switching apparatus for one or more of said lithium based cells is encased in said battery pack housing,

[5b] each of said cells shaving a positive pole and a negative pole, said apparatus comprising:

[5c] at least one solid state switch being connected to the positive pole of said one or more cells in series, and to said positive terminal, the negative pole of said one or more cells being connected to said negative terminal.

Claim 6

[6] Apparatus according to claim 5, wherein the solid state switches are transistors, FET, MOSFET, IGBT, JFET, BJT, CMOS, VMOS, TMOS, vertical DMOS or HEXFET.

Claim 7

[7] Apparatus according to claim 5, wherein said one or more cells are selected from the group consisting of LiFePO, LiFePO₄, LiFeMgPO₄, LiFeYPO₄, LiCoO₂, LiMn₂O₄, LiNicoAlO₂, LiNiMnCoO₂, Li₄Ti₅O₁₂, lead-acid, NiCd, and nickel metal hydride (NiMH) batteries.

Claim 8

[8a] A battery pack according to claim 1, wherein the solid state switching apparatus for one or more of said lithium based cells is encased in said battery pack housing, each of said cells having a positive pole and a negative pole, said apparatus comprising:

[8b] at least one solid state switch being connected to the negative pole of said one or more cells in series, and to said negative terminal, the positive pole of said one or more cells being connected to said positive terminal.

Claim 9

[9] Apparatus according to claim 8, wherein the solid state switches are transistors, FET, MOSFET, IGBT, JFET, BJT, CMOS, VMOS, TMOS, vertical DMOS HEXFET.

Claim 10

[10] Apparatus according to claim 8, wherein said one or more cells are selected from the group consisting of LiFePO, LiFePO₄, LiFeMgPO₄, LiFeYPO₄, LiCoO₂, LiMn₂O₄, LiNiCoAlO₂, LiNiMnCoO₂, Li₄Ti₅O₁₂, lead-acid, NiCd, and nickel metal hydride (NiMH) batteries.

Claim 11

[11] Apparatus according to claim 1, wherein the operating system of said internal combustion engine includes a battery, said apparatus further comprising a pair of cables, each cable situated in a cable housing, one end of each cable connectable to a respective terminal clamp, the opposite end of each cable having a connector for connecting to said battery pack, and at least one of a MOSFET, diode, or relay being situated within one of said cable housings.

Claim 12

[12pre] A deep cycle battery having positive and negative terminals in a 6 volt to 800 volt operating system, comprising:

[12a] a battery pack housing;

[12b] at least one lithium-based rechargeable Cell within said housing; and

[12c] a battery management system including a processor and a circuit board which protects from one of overvoltage, undervoltage, reverse polarity, short circuit, and extremes of temperature;

[12d-i] wherein said circuit board comprises a solid state switching apparatus comprising a plurality of pairs of solid state switches with one pair of solid state switches connected in a parallel configuration to another pair of solid state switches,

[12d-ii] each switch having a source and a drain, the switches of a pair of solid state switches being configured such that either the drains of the switches are connected or the sources of the switches are connected, and

[12d-iii] said parallel configuration being connected with one or more cells between the positive and negative terminals,

[12e] wherein a total discharging amount of each lithium-based cell in the battery pack is from 3 Ah to 2000 Ah, and charging voltage per one cell is 2.0 to 4.2 V.

Claim 13

[13] A deep cycle battery according to claim 12 wherein the lithium-based cell is selected from the group consisting of LiFePO, LiFePO₄, LiFeMgPO₄, LiFeYPO₄, LiCoO₂, LiMn₂O₄, LiNiCoAlO₂, LiNiMnCoO₂, and Li₄Ti₅O₁₂ cells.

Claim 14

[14] A deep cycle battery according to claim 12, wherein said battery comprises from two to 250 lithium-based rechargeable cells in series in one or more of said housings.

Claim 15

[15a] A deep cycle battery according to claim 12, wherein the solid state switching apparatus for one or more of said lithium based cells is encased in said battery pack housing, each of said cells having a positive pole and a negative pole, said apparatus comprising:

[15b] at least one solid state switch connected to the positive pole of said one or more cells in series, and to said positive terminal, the negative pole of said one or more cells being connected to said negative terminal.

Claim 16

[16] Apparatus according to claim 15, wherein the solid state switches are transistors, FET, MOSFET, IGBT, JFET, BJT, CMOS, VMOS, TMOS, vertical DMOS or HEXFET.

Claim 17

[17] Apparatus according to claim 15, wherein said one or more cells are selected from the group consisting of LiFePO , LiFePO_4 , LiFeMgPO_4 , LiFeYPO_4 , LiCoO_2 , LiMn_2O_4 , LiNiCoAlO_2 , LiNiMnCoO_2 , $\text{Li}_4\text{Ti}_5\text{O}_{12}$, lead-acid, NiCd , and nickel metal hydride (NiMH) batteries.

Claim 18

[18a] A deep cycle battery according to claim 12, wherein the solid state switching apparatus for one or more of said lithium based cells is encased in said battery pack housing, each of said cells having a positive pole and a negative pole, said apparatus comprising:

[18b] at least one solid state switch connected to the negative pole of said one or more cells in series, and to said negative terminal, the positive pole of said one or more cells being connected to said positive terminal.

Claim 19

[19] Apparatus according to claim 18, wherein, the solid state switches are transistors, FET, MOSFET, IGBT, JFET, BJT, CMOS, VMOS, TMOS, vertical DMOS or HEXFET.

Claim 20

[20] Apparatus according to claim 18, wherein said one or more cells are selected from the group consisting of LiFePO, LiFePO₄, LiFeYPO₄, LiCoO₂, LiMn₂O₄, LiNiCoAlO₂, LiNiMnCoO₂, Li₄Ti₅O₁₂, lead-acid, NiCd, and nickel metal hydride (NiMH) batteries.

Claim 21

[21pre] A deep cycle battery having positive and negative terminals in a 6 volt to 800 volt operating system, comprising:

[21a] a battery pack housing;

[21b] at least one lithium-based rechargeable cell within said housing, the total discharging amount of each lithium-based cell in the battery pack being from three (3) Ah to 5000 Ah, and charging voltage per one cell being 3.0 to 4.2 V;

[21c] a pair of cables each cable having a cable housing in which it is situated; one end of each cable being provided with and connected to a respective terminal clamp, the opposite end of each cable having a connector for connecting to said battery pack; and

[21d-i] a solid state switching apparatus being situated within one of said cable housings and comprising a plurality of pairs of solid state switches with one pair of solid state switches connected in a parallel configuration to another pair of solid state switches,

[21d-ii] each switch having a source and a drain, the switches of a pair of solid state switches being configured such that either the drains of the switches are connected or the sources of the switches are connected, and

[21d-iii] said parallel configuration being connected with one more cells between the positive and negative terminals.

CERTIFICATION UNDER 37 CFR § 42.24(d)

Pursuant to 37 CFR § 42.24(d), the undersigned certifies that this Petition complies with the type-volume limitation of 37 CFR § 42.24(a). According to the word processing system's word count, the Petition contains 13,679 words, excluding the parts exempted by 37 C.F.R. § 42.24(a).

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Respectfully submitted,

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 42.6(e)(4)(i) *et seq.* and 42.105(b), the undersigned certifies that on April 1, 2025, a complete and entire copy of this Petition for *Inter Partes* Review, including exhibits was provided via FedEx overnight, to the Patent Owner by serving the correspondence address of record as follows:

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