IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of:	Koebler
U.S. Patent No.:	9,954,207
Issue Date:	April 24, 2018
Appl. Ser. No.:	14/657,101
Filing Date:	March 13, 2015
Title:	LITHIUM BATTERY WITH SOLID STATE SWITCH

DECLARATION OF MR. LOUIS HRUSKA

I currently hold the opinions expressed in this declaration. But my analysis may continue, and I may acquire additional information and/or attain supplemental insights that may result in added observations.

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

Date: Mar. 30, 2025

By: [signature]

Louis Hruska

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I. QUALIFICATIONS AND BACKGROUND INFORMATION

1. My education and experience are described more fully in the attached curriculum vitae. For ease of reference, I have highlighted certain information below.

2. I have over forty years of experience in electrochemical energy storage technology, including fundamental research, design, testing, and manufacturing of battery cells and battery systems. I hold over twenty patents, issued in a broad range of battery related technologies with coverage in materials, separators, cell design, electrical controls, circuit communication and software. My work experience includes cell design and process development for Lithium cell manufacturing in the time period preceding the claimed priority date of the patent at issue. Additionally, I was a founder and CTO of an organization that developed battery control circuits and mixed signal controllers for battery management. Finally, I was a General Manager of a division focused on battery controllers at Microchip, a leading semiconductor producer.

3. I have been retained on behalf of SHENZHEN FBTECH ELECTRONICS LTD and SHENZHEN LITIME TECHNOLOGY CO., LTD to offer technical opinions relating to U.S. Patent No. 9,954,207 ("the '207 Patent") and prior art references relating to its subject matter. I have reviewed the '207 Patent

(Ex. 1001), and relevant excerpts of the prosecution history of the '207 Patent. *See* Ex. 1004. I have also reviewed the following references:

- Ex. 1005 - File History of U.S. Pat. No. 9,412,994
- 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

4. I have also reviewed various supporting references and other documentation as further noted in my opinions below.

5. Counsel has informed me that I should consider these materials through the lens of one of ordinary skill in the art related to the ’207 Patent at the time of the earliest possible priority date of the ’207 Patent, and I have done so during my review of these materials.

6. 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 discloses 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 discloses these limitations.

7. For example, there is no disclosure 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.

8. The '207 Patent was filed on March 15, 2015 ("the Critical Date"). Counsel has informed me that the Critical Date represents the earliest possible priority date to which the challenged claims of '207 Patent are entitled, and I have therefore used that Critical Date in my analysis below.

9. I have no financial interest in the parties or in the outcome of this proceeding. I am being compensated for my work as an expert on an hourly basis. My compensation is not dependent on the outcome of these proceedings or the content of my opinions.

10. In writing this declaration, I have considered the following: my own knowledge and experience, including my work experience in the fields of electrochemical engineering, battery design, cell manufacturing, and application engineering, my experience in creating and managing organizations devoted to those subjects, and my experience working with other experts in those fields. In addition, I have reviewed and analyzed various publications and patents, in addition to the materials I cite in this declaration.

11. My opinions, as explained below, are based on my education, experience, and expertise in the fields relating to the '207 Patent. Unless otherwise stated, my testimony below refers to the knowledge of one of ordinary skill in the

art as of the Critical Date, or before. Any figures that appear within this document have been prepared with the assistance of Counsel and reflect my understanding of the ’207 Patent and the prior art discussed below.

II. OVERVIEW OF CONCLUSIONS FORMED

12. This declaration explains the conclusions that I have formed based on my analysis. To summarize those conclusions, based upon my knowledge and experience and my review of the prior art publications listed above, I believe that:

a. Claims 1-10 and 12-20 are obvious over Pevear, Poff, and Porsche;

b. Claims 11 and 21 are obvious over Pevear, Poff, Porsche, and Grant; and

c. Claims 1-10 and 12-20 are anticipated by Koebler.

III. LEVEL OF ORDINARY SKILL IN THE ART

13. A person of ordinary skill in the art (“POSITA”) on or before March 15, 2015, would have a minimum of a Bachelor of Science degree in electrical engineering or an equivalent degree, such as chemical engineering or other related engineering, 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 master’s 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. 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.

14. Based on my experience, I have an excellent understanding of the capabilities of one of ordinary skill relevant to this discussion. I have the capabilities of a POSITA at least because I have a master's degree in chemical and materials engineering and at the time of the invention had more than thirty years' experience in the battery industry including more than fifteen years working on the design and development of BMSs. In addition, I have hired, trained, and managed many such persons over the course of my career.

IV. THE '207 PATENT

A. Overview

15. The '207 Patent 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 '207 Patent 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 '207

Patent further discloses that “solid state switches in parallel” are used “to increase the current capabilities.” Ex. 1001, 9:35-36.

16. Despite the purported discoveries, though, the claims of the ’207 Patent merely recite what was already well known in the art: a lithium ion battery assembly with a battery protection circuit that used standard components assembled using well established concepts to provide battery protection in a conventional design. Although the ‘207 Patent appears to assert that this combination leads to unexpected performance characteristics, the examples provided in the Patent merely describe designs that were common in the Li battery industry and would provide entirely predictable performance. A significant body of prior art not only describes the designs detailed in the patent, but also describes improvements to the ’207 concepts, as those designs were so common that any real innovation was focused on addressing issues with those standard approaches. By the time this patent was filed, the industry had leapfrogged these outmoded concepts and was working on the type of refinements covered by the prior art discussed in this declaration.

V. PRIOR ART ANALYSIS

A. [GROUND 1] - Claims 1-10 and 12-20 are obvious over Pevear in view of Porsche and Poff

1. *Overview of Pevear*

17. 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.

18. It is my opinion, the chart below explains where disclosure for each claim of Pevear finds sufficient 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."
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**." 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.
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."

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."

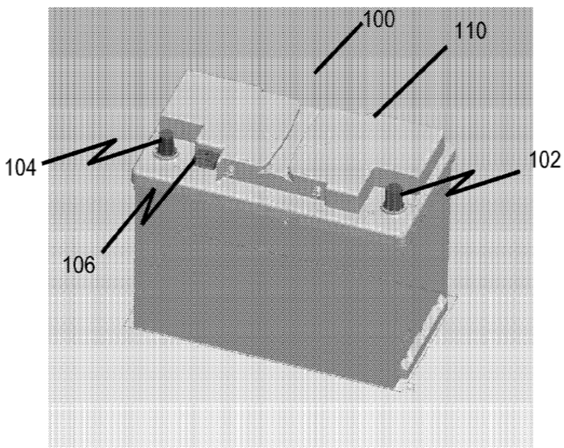
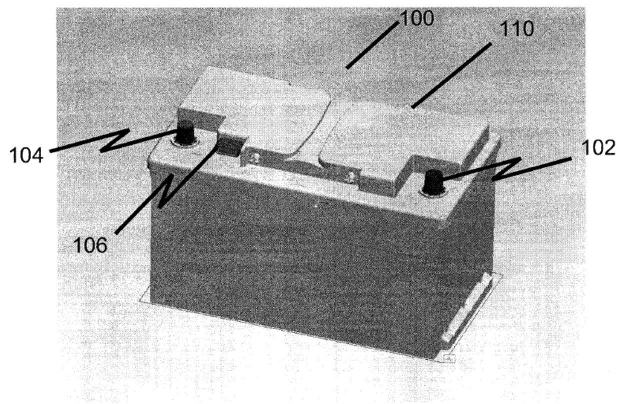
19. Pevear discloses a battery with an integrated power management system and a scalable cutoff component. Ex. 1007: Abstract; Ex. 1008: p. 1, Title. Pevear discloses that the battery may be an automotive battery. Ex. 1007: claim 9; Ex. 1008: p. 1, Title. Pevear specifically discloses rechargeable batteries 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].

20. 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.

21. The drawings from Pevear and the Pevear Provisional are reproduced below. The Figures in Pevear (Ex. 1007) were distorted in the vertical direction as compared to the Pevear Provisional (Ex. 1008). 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. 1007.

22.

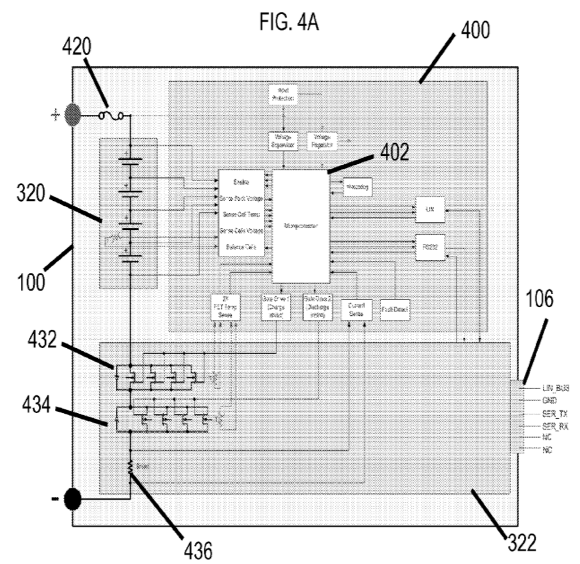
Pevear's FIG. 1:	**Pevear Provisional's FIG. 1:**
FIG. 1  	FIG. 1 

23. 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].

24. 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.

25. The drawings from Pevear and the Pevear Provisional are reproduced below.

26.

<table>
<tr><th>Pevear's FIG. 4A:</th><th>Pevear Provisional's FIG. 4:</th></tr>
<tr><td>


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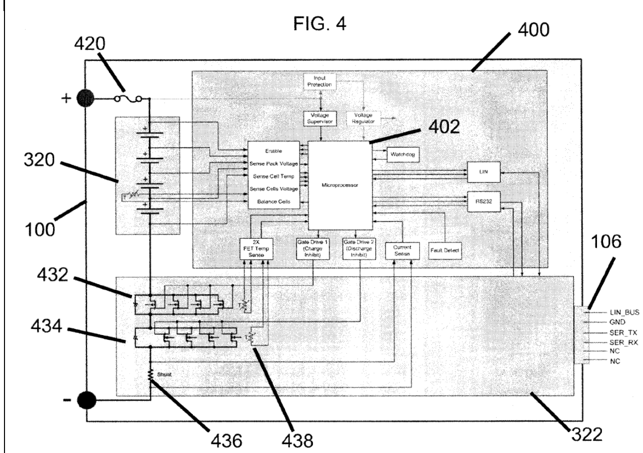


</td></tr>
</table>

27. In these drawings, it appears that the MOSFETs in the first group (432) and the MOSFETs in the second group (434) are oriented such that MOSFETs in the first group (432) connected in a back-to-back configuration with the MOSFETs in the second group (434). In other words, the sources of the MOSFETs in the first group (432) are connected to the sources of the MOSFETs in the second group (434)

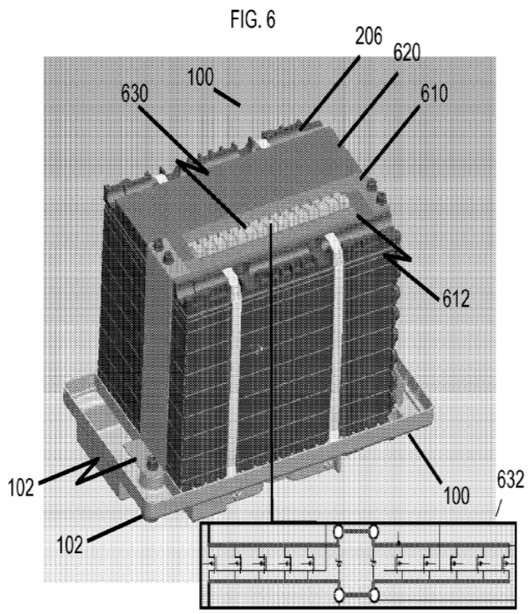
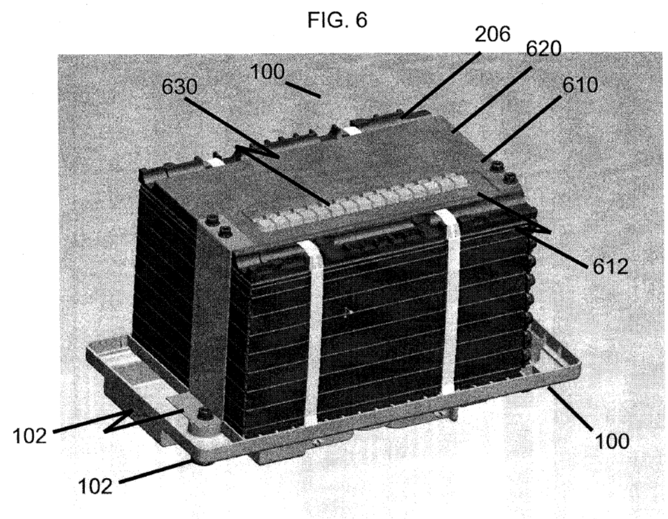
or the drains of the MOSFETs in the first group (432) are connected to the drains of the MOSFETs in the second group (434). Therefore, the series arrangement of the two groups creates a bidirectional switch. Ex. 1007: ¶[0040]; Ex. 1008: p. 9, [0024]. The parallel arrangement of the MOSFETs within each group splits the current flow across the MOSFETs in the group, thereby allowing the use of MOSFETs with lower current ratings than the maximum currents expected for charging and discharging the battery. Ex. 1007: ¶[0040]; Ex. 1008: p. 9, [0024].

28. 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.

29. 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.

30. The drawings from Pevear and the Pevear Provisional are reproduced below.

31.

Pevear's FIG. 6:	Pevear Provisional's FIG. 6:
	

32. 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].

33. 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. *Overview of Porsche*

34. Porsche (Ex. 1009) is a press release published and available to the public at large through Porsche's website at least as early as on September 14, 2010. Ex. 1015, ¶¶ 5-8. Thus, I have been informed and understand that Porsche is prior art under at least pre-AIA 35 U.S.C. § 102(b). Two articles from motortrend.com dated November 23, 2009 (Ex. 1010) and November 24, 2009 (Ex. 1011) further corroborate the dissemination of the Porsche reference at least as early as September 14, 2010.

35. 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. *Overview of Poff*

36. 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]. The circuit as depicted in FIG. 4 of Poff will cut the current on each parallel leg in half.

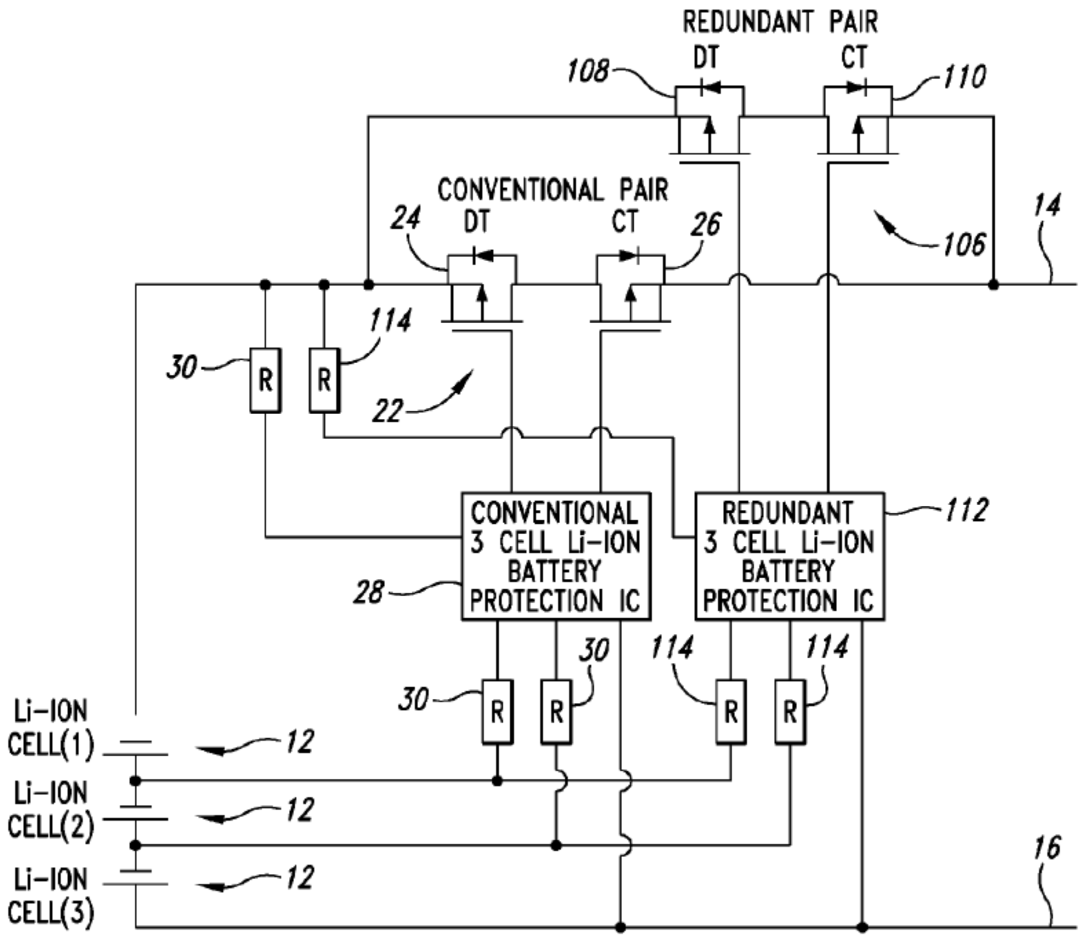


Fig. 4

4. *The combination of Pevear, Porsche, and Poff and reasons for the combination*

37. A POSITA would have been motivated to combine the references and had a reasonable expectation of success for at least the following reasons.

38. 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.

39. 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 in series. 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.

40. 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.

41. First, the cutoff functions of both references utilize field effect transistors which enable independent or bidirectional 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 modify similar devices. Third, there are a finite number of

known solutions for voltage based bidirectional switch and it would have been obvious to try Poff's solution, with a reasonable expectation of success.

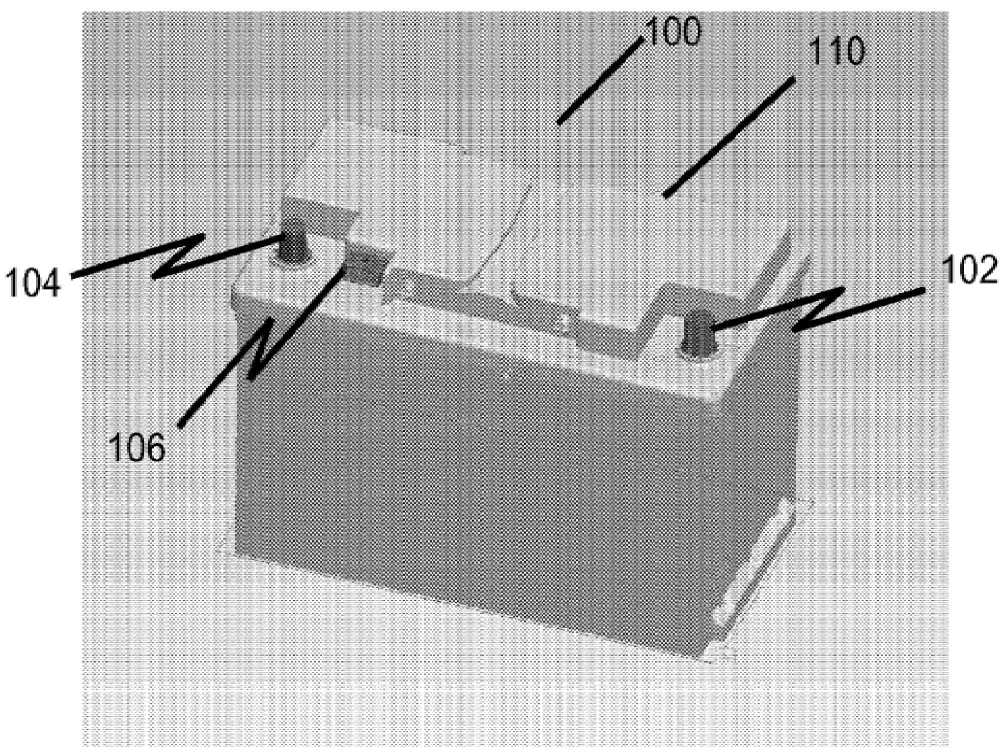
5. *Analysis*

(i) 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

42. 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



43. Additionally, 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 and nearly all vehicles using a starter battery and motor are 12 volt devices. Pevear also 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. 1007: ¶[0005]. 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. 1007: ¶[0005]. Pevear also discloses four cells in series, which at standard lithium cell voltages is more than 12 Volts. Ex. 1007: FIG. 4A. To the extent it can be argued that Pevear does not 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.

[1a]: a battery pack housing

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

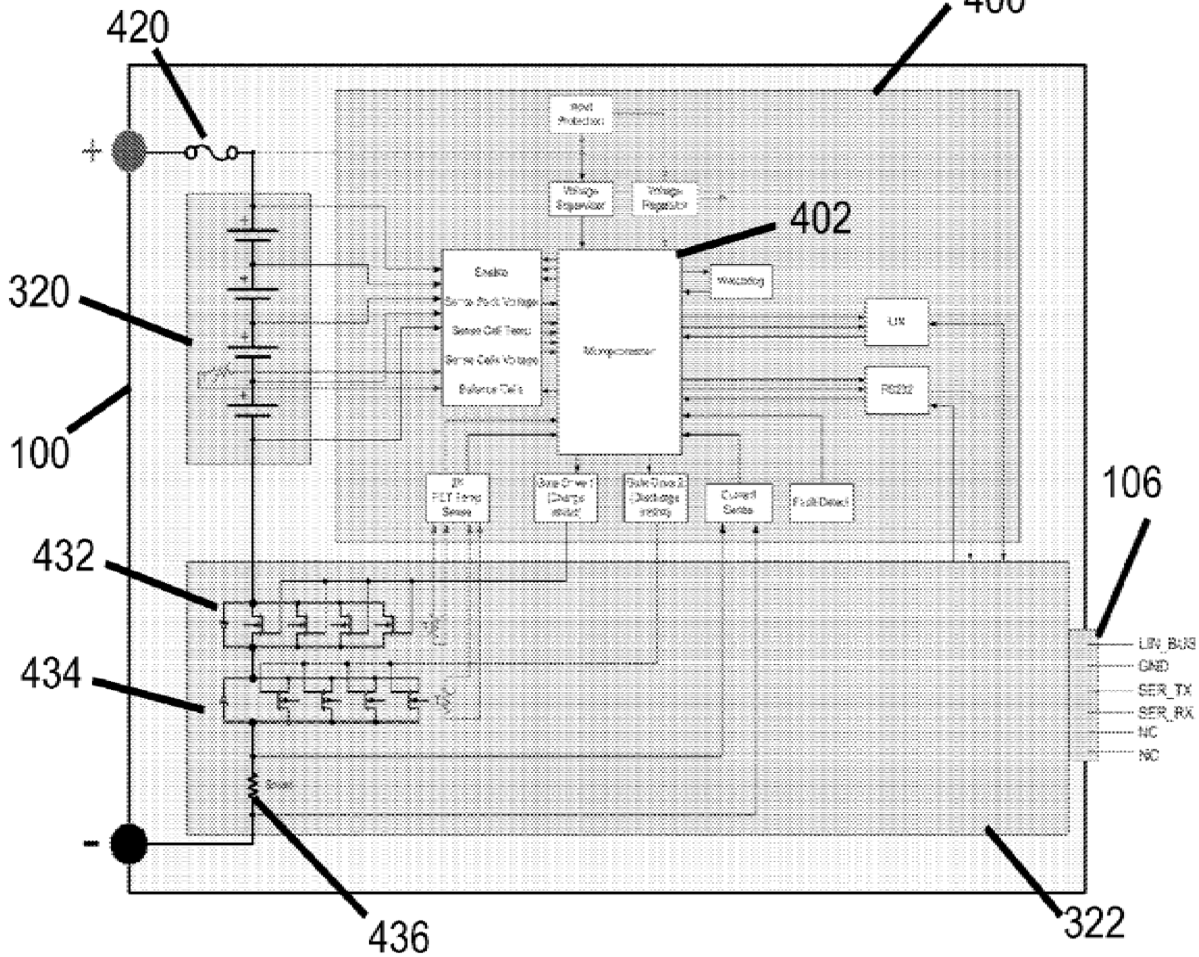
[1b]: at least one lithium-based rechargeable cell within said housing;

45. 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.

[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

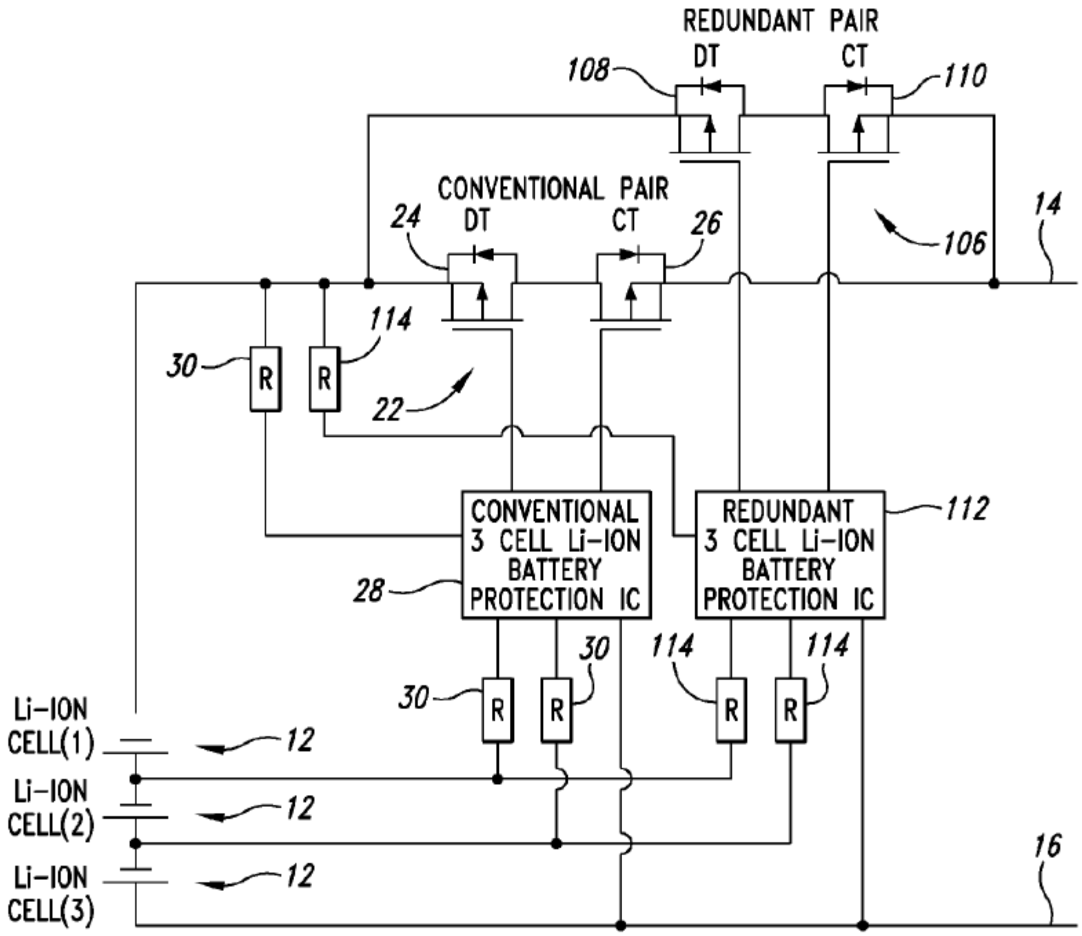
46. Pevear discloses a first group of MOSFETs arranged in parallel (432) and a second group of MOSFETs arranged in parallel (434). Ex. 1007: claim 5, ¶[0007], and FIG. 4A. MOSFETs are solid state switches. Pevear uses parallel elements to achieve the reduced current as claimed in the '207 Patent. The first and second groups (432, 434) are in series with each other. Ex. 1007: claim 5, ¶[0007], and FIG. 4A.

FIG. 4A



47. 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. 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. The transistor pairs are in parallel because the drains and sources of the conventional pair are in parallel with the drains and sources of the redundant pair. As configured, they provide a second current path that can be independently controlled for charge and discharge. The control or gate terminals do not need to be tied together directly - they are tied logically as the controllers will act in concert to control them together. If they were not controlled together, they would not serve the purpose of redundancy. Taking the redundancy all the way back to the controller and the software that determines when the gates are powered does not change the parallel nature of the switches. It does offer a "partial operation" mode if one leg is damaged, or if one controller is not functioning, and that is the purpose of the redundant controls on top of the redundant power path. Poff provides all the elements of a parallel switch design described in the patent claims and meets the objective of the patent (cutting the current in half on each leg during normal operation). He also gains redundancy in the case of a component failure, and makes the control of the parallel switches redundant all the way back to separate pins on the controller. Redundancy was a further objective of Poff, but not detrimental in any way to the '207 patent's function.



REDUNDANT PAIR
DT
CT
108
110
CONVENTIONAL PAIR
24
DT
CT
26
14
106
114
30
R
R
22
CONVENTIONAL
3 CELL Li-ION
BATTERY
PROTECTION IC
REDUNDANT
3 CELL Li-ION
BATTERY
PROTECTION IC
112
28
30
114
114
30
R
R
R
R
Li-ION
CELL(1)
12
Li-ION
CELL(2)
12
16
Li-ION
CELL(3)
12

Fig. 4

[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.

48. For example, in Ex. 1012, Fig. 4, Poff depicts a circuit where both the conventional pair of MOSFETS and the redundant pair of MOSFETS are in the negative leg of the power circuit. This is clear from the diagram illustrating the connection to the negative side of the battery stack (indicated by the shorter of the paired lines in the battery symbol). Placing the switches in the negative power leg requires the use of N channel MOSFETS. Although not labeled in Fig.4, the three connections to the MOSFETS can be identified. The Gate, or control leg, always connects to the control or protection IC. The Source and Drain can be distinguished by the fact that in an N channel MOSFET, the body diode points to the Drain, and Fig.4 illustrates the body diode pointing away from the connected legs of the paired MOSFETS, so the back to back connection can be identified as the Sources of the switches, meeting the limitation where "either the drains of the switches are connected or the sources of the switches are connected"..

[1c-iii]: said parallel configuration being connected with one or more cells between the positive and negative terminals; and

49. In Fig. 4, Poff discloses a battery pack circuit that includes multiple lithium-ion cells (12) with a first external (negative) terminal (14) connected to the negative side of the battery stack, indicated by the shorter of the paired lines that

depict a power source or battery cell. Ex. 1012. The second external (positive) terminal (16) is similarly connected to the positive side of the stacked battery cells. A single pair of back to back connected MOSFETS would provide both charge and discharge cutoff capability, but Poff adds a second redundant pair of MOSFETS. Parallel pairs (24/26) and (108/110) of MOSFETS are thus placed in a series between the battery cells negative terminal and the external negative terminal, forming a duplicate path for current to flow between the cells and the external load. By adding this "redundant" pair of transistor switches, Poff provides both a backup current path in the case of a component failure and reduced current (by 50%) in each pair of switches under normal conditions. Ex. 1012: Fig. 4.

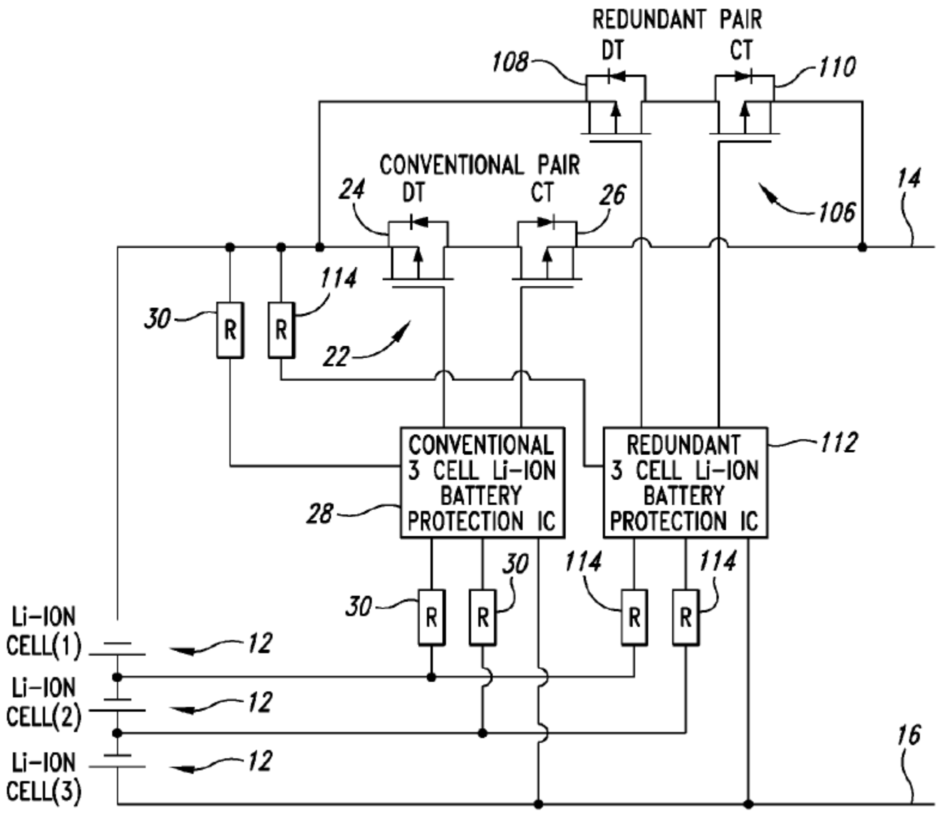


Fig. 4

[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.

50. 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. Therefore, the total discharging amount of each cell in the Porsche battery pack is 4.5 Ah which falls within the recited range.

(ii) Claim 2

[2] A battery pack according to claim 1 wherein the lithium-based cell is selected from the group consisting of LiFePO, $LiFePO_4$, $LiFeMgPO_4$, $LifeYPO_4$, $LiCoO_2$, $LiMn_2O_4$, $LiNiCoAlO_2$, $LiNiMnCoO_2$, $Li_4Ti_5O_{12}$, cells.

51. My analysis of claim 1 also applies to claim 2. Porsche discloses lithium-iron-phosphate (i.e., $LiFePO_4$) cells. Ex. 1009: p. 2.

(iii) 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.

52. My analysis of claim 1 also applies to claim 3. 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.

(iv) 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.

53. My analysis of claim 1 also applies to claim 4. 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 11007and FIG. 6.

(v) 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

54. My analysis of claim 1 also applies to claim 5. 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 11007.

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

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

[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

56. 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.

(vi) 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

57. My analysis of claim 5 also applies to claim 6. Pevear discloses MOSFETs. Ex. 1007: ¶[0007]. Poff also discloses MOSFETs. Ex. 1012: ¶¶[0022]-[0023].

(vii) Claim 7

[7] Apparatus according to claim 5, wherein said one or more cells are selected from the group consisting of LiFePO, LiFePO4, LiFeMgPO4, $LiFeYPO_4$, $LiCoO_2$, $LiMn_2O_4$, $LiNiCoAlO_2$, $LiNiMnCoO_2$, $Li_4Ti_5O_{12}$, lead-acid, NiCd, and nickel metal hydride (NiMH) batteries.

58. My analysis of claim 5 also applies to claim 7. Porsche discloses lithium-iron-phosphate (i.e., $LiFePO_4$) cells. Ex. 1009: p. 2.

(viii) 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.

59. My analysis of claim 1 applies also to claim 8. Pevear discloses that control components, such as MOSFETs, can be provided on a printed circuit board or similar substrate within the housing. Ex. 1007: ¶[0053] and FIG. 6. Lithium ion cells inherently have a positive pole and a negative pole. Additionally, Pevear illustrates cells with a positive (+) label in FIG. 4A and positive (+) and negative (-) labels in FIG. 4B. Ex. 1007: FIGS. 4A-B.

[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.

60. 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.

(ix) 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.

61. My analysis of claim 8 applies also to claim 9. Pevear discloses MOSFETs. Ex. 1007: ¶[0007]. Poff also discloses MOSFETs. Ex. 1012: ¶¶[0022]-[0023].

(x) Claim 10

[10] Apparatus according to claim 8, wherein said one or more cells are selected from the group consisting of LiFePO, $LiFePO_4$, $LiFeMgPO_4$, $LiFeYPO_4$, $LiCoO_2$, $LiMn_2O_4$, $LiNiCoAlO_2$, $LiNiMnCoO_2$, $Li_4Ti_5O_{12}$, lead-acid, NiCd, and nickel metal hydride (NiMH) batteries.

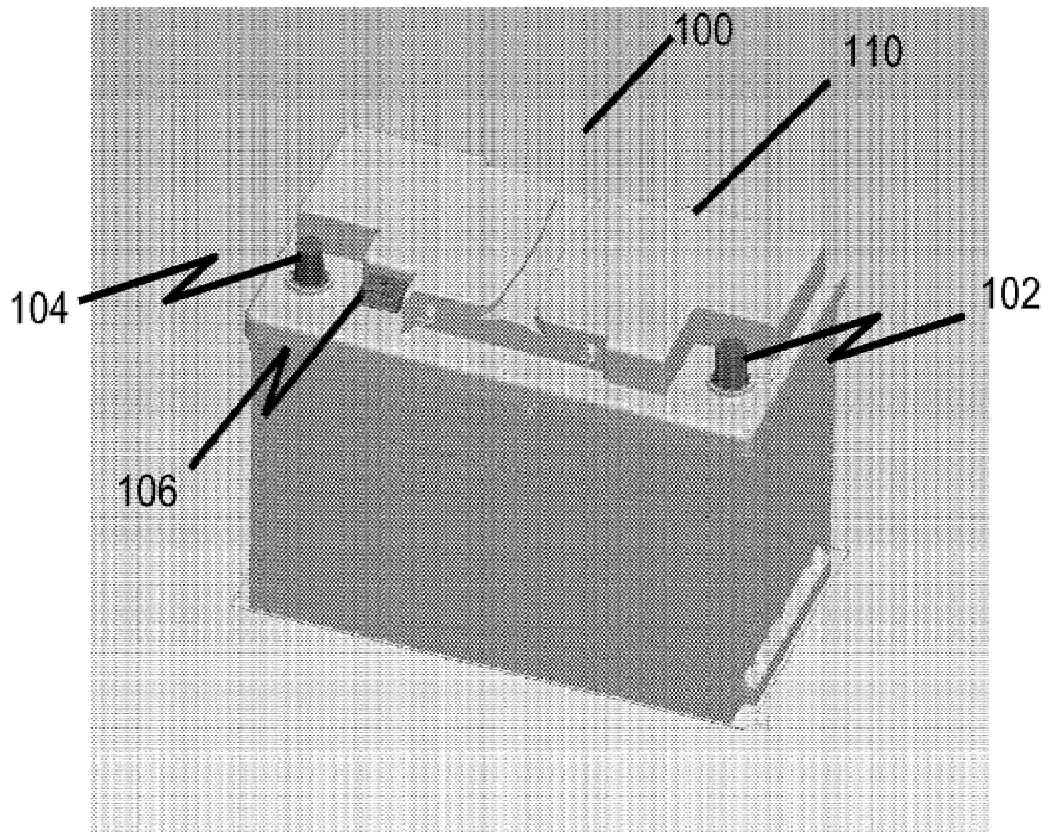
62. My analysis of claim 8 applies also to claim 10. Porsche discloses lithium-iron-phosphate (i.e., $LiFePO_4$) cells. Ex. 1009: p. 2.

(xi) Claim 12

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

63. 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



64. 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. Pevear also 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. 1007: ¶[0005]. Pevear also discloses four cells in series, which at standard lithium cell voltages is more than 12 Volts. Ex. 1007: FIG. 4A. To the extent it can be argued that Pevear

does not 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.

65. 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.

[12a]: a battery pack housing;

66. 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.

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

67. 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.

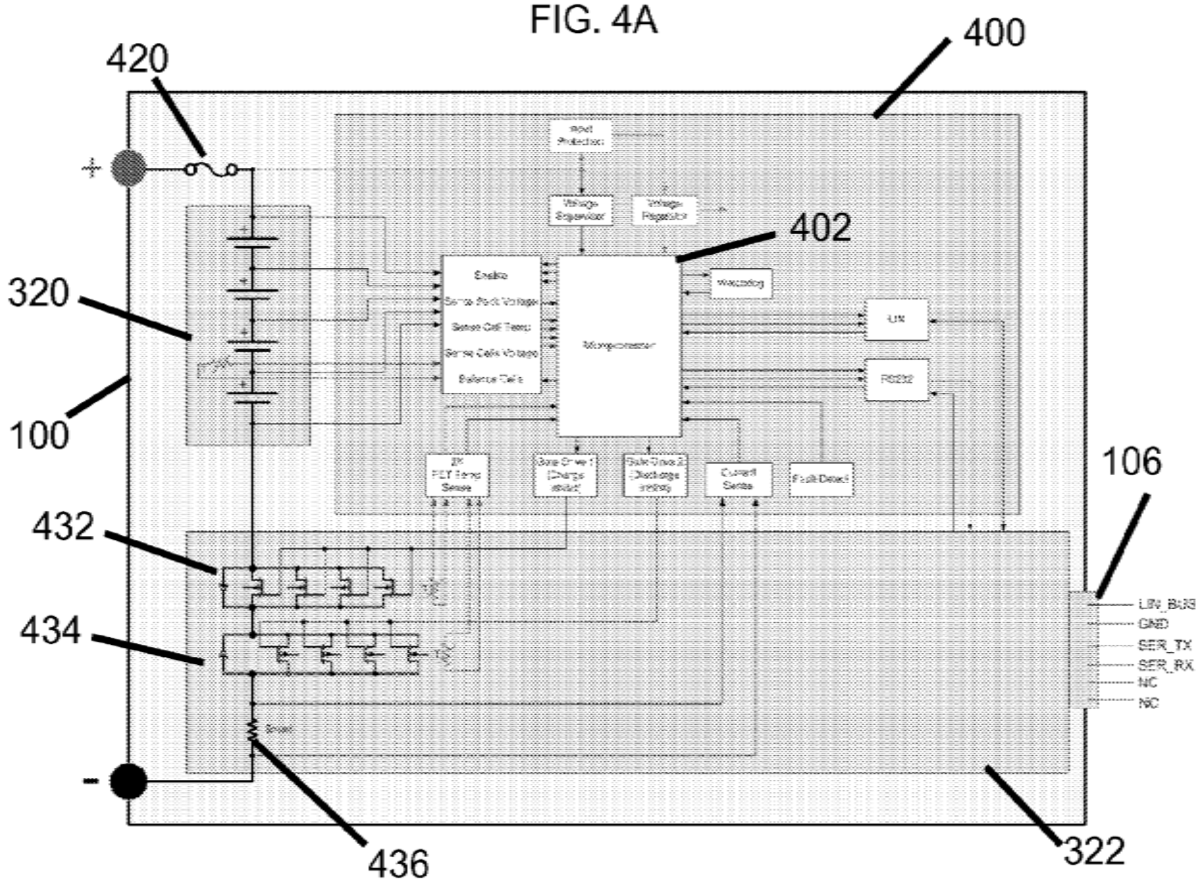
[12c]: a battery management system including a processor and a circuit board which protects from one of overvoltage, undervoltage, reverse polarity, short circuit, and extremes of temperature;

68. 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.

[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;

69. 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. However, the MOSFETs are not arranged in parallel pairs. Instead, the first and second groups (432, 434) are in series with each other and there is a single connection between the first and second groups (432, 434). Ex. 1007: claim 5, ¶[0007], and FIG. 4A.

FIG. 4A



70. 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. 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 depicted in parallel in Poff. Ex. 1009: FIG. 4. The transistor pairs are in parallel because the drains and sources of the conventional pair are in parallel with the drains and sources of the redundant pair. As configured, they provide a second current path that can be independently controlled for charge and discharge. The control or gate terminals do not need to be tied together directly - they are tied logically as the controllers will act in concert to control them together. If they were not controlled together, they would not serve the purpose of redundancy. Taking the redundancy all the way back to the controller and the software that determines when the gates are powered does not change the parallel nature of the switches. It does offer a "partial operation" mode if one leg is damaged, or if one controller is not functioning, and that is the purpose of the redundant controls on top of the redundant power path. Poff provides all the elements of a parallel switch design described in the patent claims and meets the objective of the patent (cutting the current in half on each leg during normal operation). He also gains redundancy in the case of a component failure, and makes the control of the parallel switches redundant all the way back to separate pins on the controller. Redundancy was a further objective of Poff, but not detrimental in any way to the '207 patent's function.

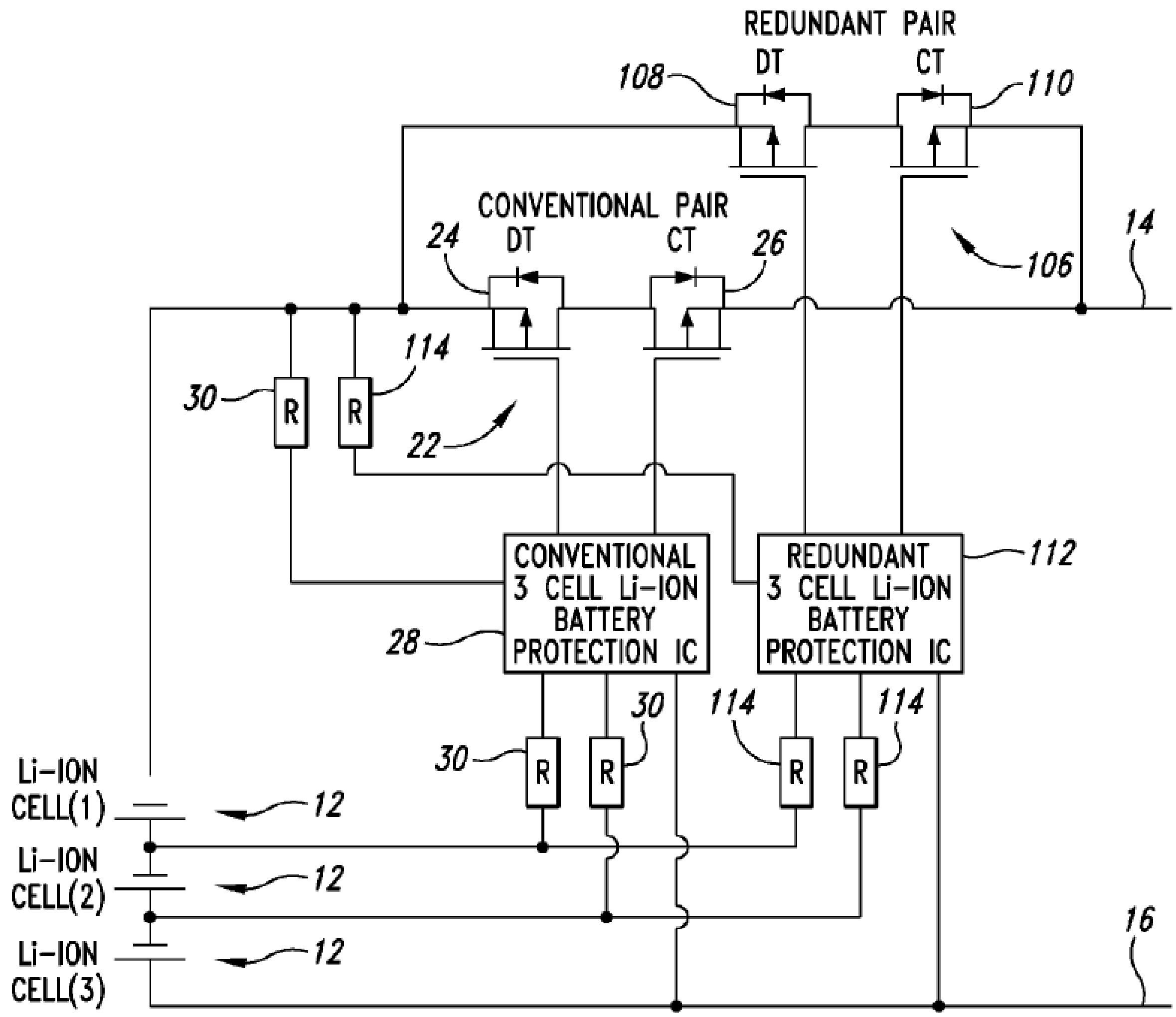


Fig. 4

[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;

71. For example, in Ex. 1012, Fig. 4, Poff depicts a circuit where both the conventional pair of MOSFETS and the redundant pair of MOSFETS are in the

negative leg of the power circuit. This is clear from the diagram illustrating the connection to the negative side of the battery stack (indicated by the shorter of the paired lines in the battery symbol). Placing the switches in the negative power leg requires the use of N channel MOSFETS. Although not labeled in Fig.4, the three connections to the MOSFETS can be identified. The Gate, or control leg, always connects to the control or protection IC. The Source and Drain can be distinguished by the fact that in an N channel MOSFET, the body diode points to the Drain, and Fig.4 illustrates the body diode pointing away from the connected legs of the paired MOSFETS, so the back to back connection can be identified as the Sources of the switches, meeting the limitation where "either the drains of the switches are connected or the sources of the switches are connected".1012. This configuration allows the control system to prevent both over-voltage and under-voltage.

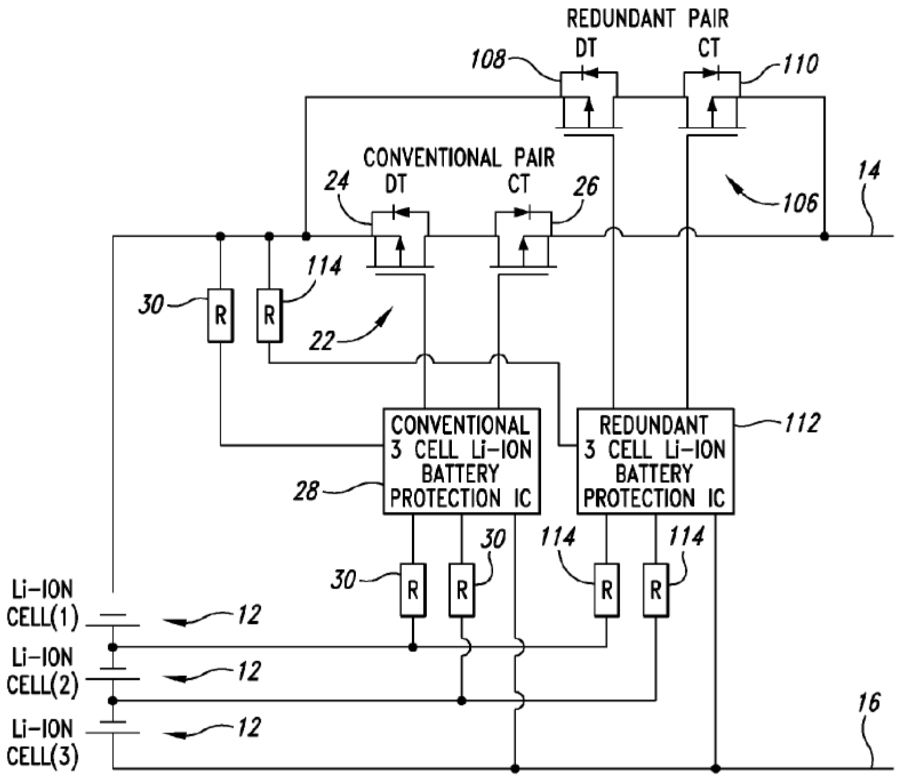


Fig. 4

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

72. Poff discloses that the battery pack includes a plurality of lithium-ion cells (12), a first (negative) external terminal (14), a second (positive) external 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.

[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;

73. 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. Therefore, the total discharging amount of each cell in the Porsche battery pack is 4.5 Ah which falls within the recited range.

(xii) Claim 13

[13]: A deep cycle battery according to claim 12 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 $Li_4Ti_5O_{12}$ cells;

74. My analysis of claim 12 applies also to claim 13. Porsche discloses lithium-iron-phosphate (i.e., $LiFePO_4$) cells. Ex. 1009: p. 2.

(xiii) 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;

75. My analysis of claim 12 applies also to claim 14. 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

(xiv) 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:

76. My analysis of claim 12 applies also to claim 15. 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. Additionally, Pevear illustrates cells with a positive (+) label in FIG. 4A and positive (+) and negative (-) labels in FIG. 4B. Ex. 1007: FIGS. 4A-B.

[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;

77. 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.

(xv) 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.

78. My analysis of claim 15 applies also to claim 16. Pevear discloses MOSFETs. Ex. 1007: ¶[0007]. Poff also discloses MOSFETs. Ex. 1012: ¶¶[0022]-[0023].

(xvi) Claim 17

[17]: Apparatus according to claim 15, wherein said one or more cells are selected from the group consisting of LiFePO, $LiFePO_4$, $LiFeMgPO_4$, $LiFeYPO_4$, $LiCoO_2$, $LiMn_2O_4$, $LiNicoAlO_2$, $LiNiMnCoO_2$, $Li_4Ti_5O_{12}$, lead-acid, Nicd, and nickel metal hydride (NiMH) batteries.

79. My analysis of claim 15 applies also to claim 17. Porsche discloses lithium-iron-phosphate (i.e., $LiFePO_4$) cells. Ex. 1009: p. 2.

(xvii) 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

80. My analysis of claim 12 also applies to claim 18. 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, and Claim 1. Lithium ion cells inherently have a positive pole and a negative pole. Additionally, Pevear illustrates cells with a positive (+) label in FIG. 4A and

positive (+) and negative (-) labels in FIG. 4B. Ex. 1007: FIGS. 4A-B.

[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

81. 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.

(xviii) 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.

82. My analysis of claim 18 applies also to claim 19. Pevear discloses MOSFETs. Ex. 1007: ¶[0007]. Poff also discloses MOSFETs. Ex. 1012: ¶¶[0022]-[0023].

(xix) Claim 20

[20]: Apparatus according to claim 18, wherein said one or more cells are selected from the group consisting of LiFePO, $LiFePO_4$, $LiFeYPO_4$, $LiCoO_2$, $LiMn_2O_4$, $LiNiCoAlO_2$, $LiNiMnCoO_2$, $Li_4Ti_5O_{12}$, lead-acid, NiCd, and nickel metal hydride (NiMH) batteries.

83. My analysis of claim 18 applies also to claim 20. Porsche discloses lithium-iron-phosphate (i.e., $LiFePO_4$) cells. Ex. 1009: p. 2.

C. [GROUND 2] – Claims 11 and 21 obvious over Pevear, Porsche, Poff, and Grant

1. *Overview of Grant*

84. Grant discloses an apparatus for safely 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 and a switching device or relay to form a connection between batteries remotely. 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, 3:18-30

2. *Combination of Pevear, Porsche, Poff, and Grant and motivation to combine*

85. 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.

3. *Analysis*

(i) 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.

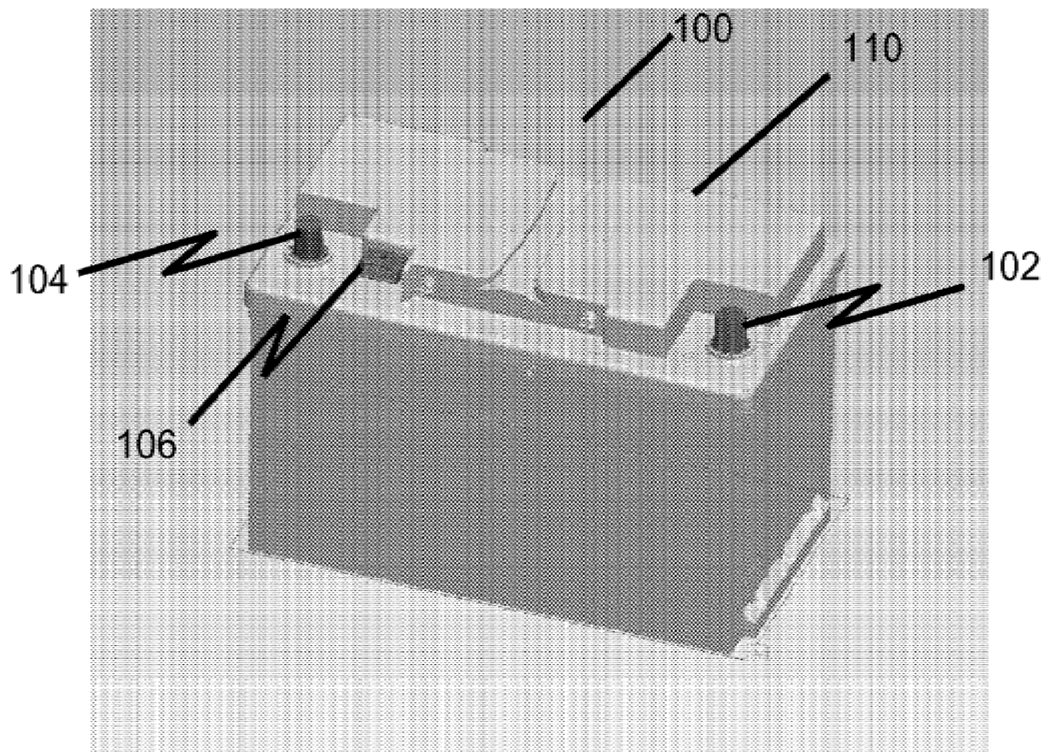
86. My analysis of claim 1 applies also to claim 11. The battery pack of these references is not expressly disclosed in the context of the specific components recited in claim 11. Grant discloses a battery jumpering apparatus including first and second cables connected between two batteries. Ex. 1013, 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.

(ii) Claim 21

[21pre]: A battery pack having positive and negative terminals for driving a battery device in a 12 volt to 120 volt internal combustion engine, said battery pack comprising:

87. 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



88. Pevear discloses that the battery may be used as a starter battery to drive the starter motor of the vehicle. Ex. 1007: ¶[0004]. Pevear also 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. 1007: ¶[0005]. Pevear also discloses four cells in series, which at standard lithium cell voltages is more than 12 Volts. Ex. 1007: FIG. 4A. To the extent it can be argued that Pevear does not disclose the 12 volt to 120 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.

[21a]: a battery pack housing;

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

[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;

90. 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.

91. 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. Therefore, the total discharging amount of each cell in the Porsche battery pack is 4.5 Ah which falls within the recited range.

[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

92. Grant discloses a battery jumpering apparatus including first and

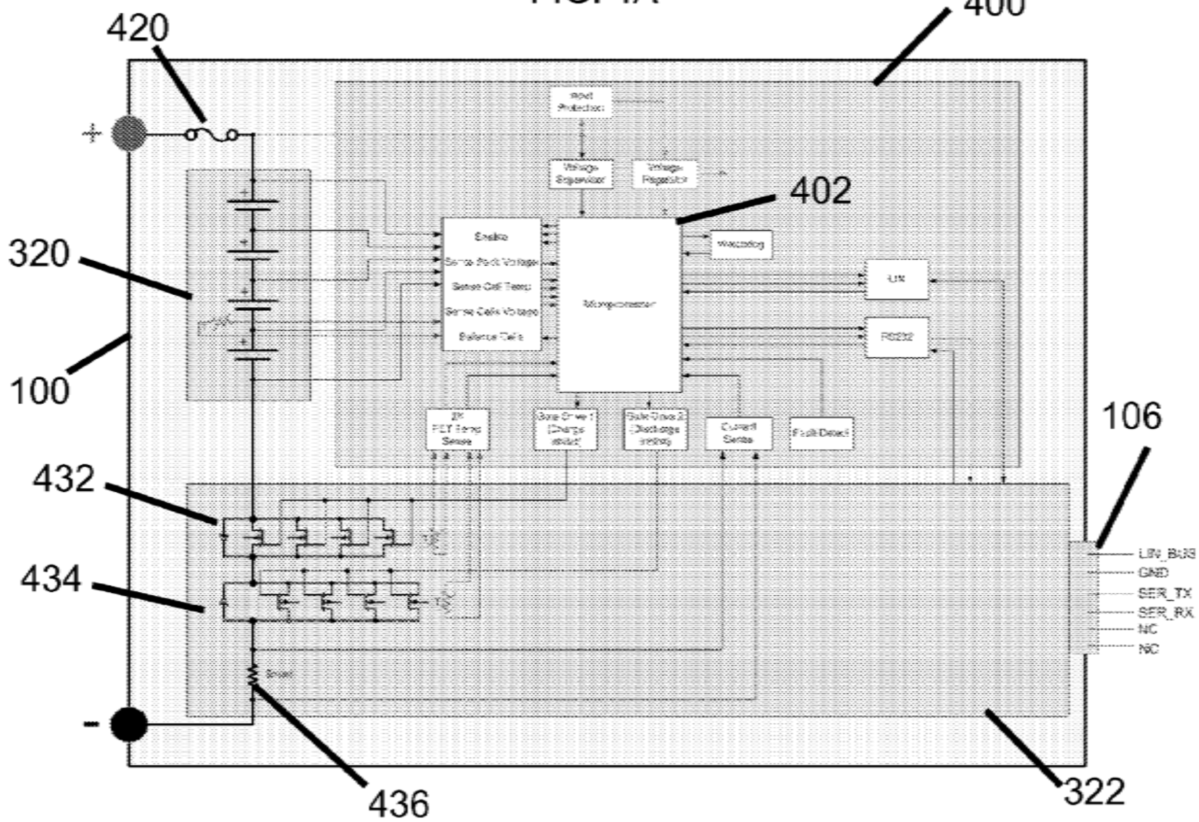
second cables connected between two batteries. Ex. 1013: 2:30-36 and 49-54. The jumper cables are connected into a case (i.e., housing) and one of the cables is connected to a relay within the case. Ex. 1013: 3:5-26.

[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,

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

94. 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. 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.

FIG. 4A



95. 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. 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 depicted in parallel in Poff. Ex. 1012: FIG. 4.

96.

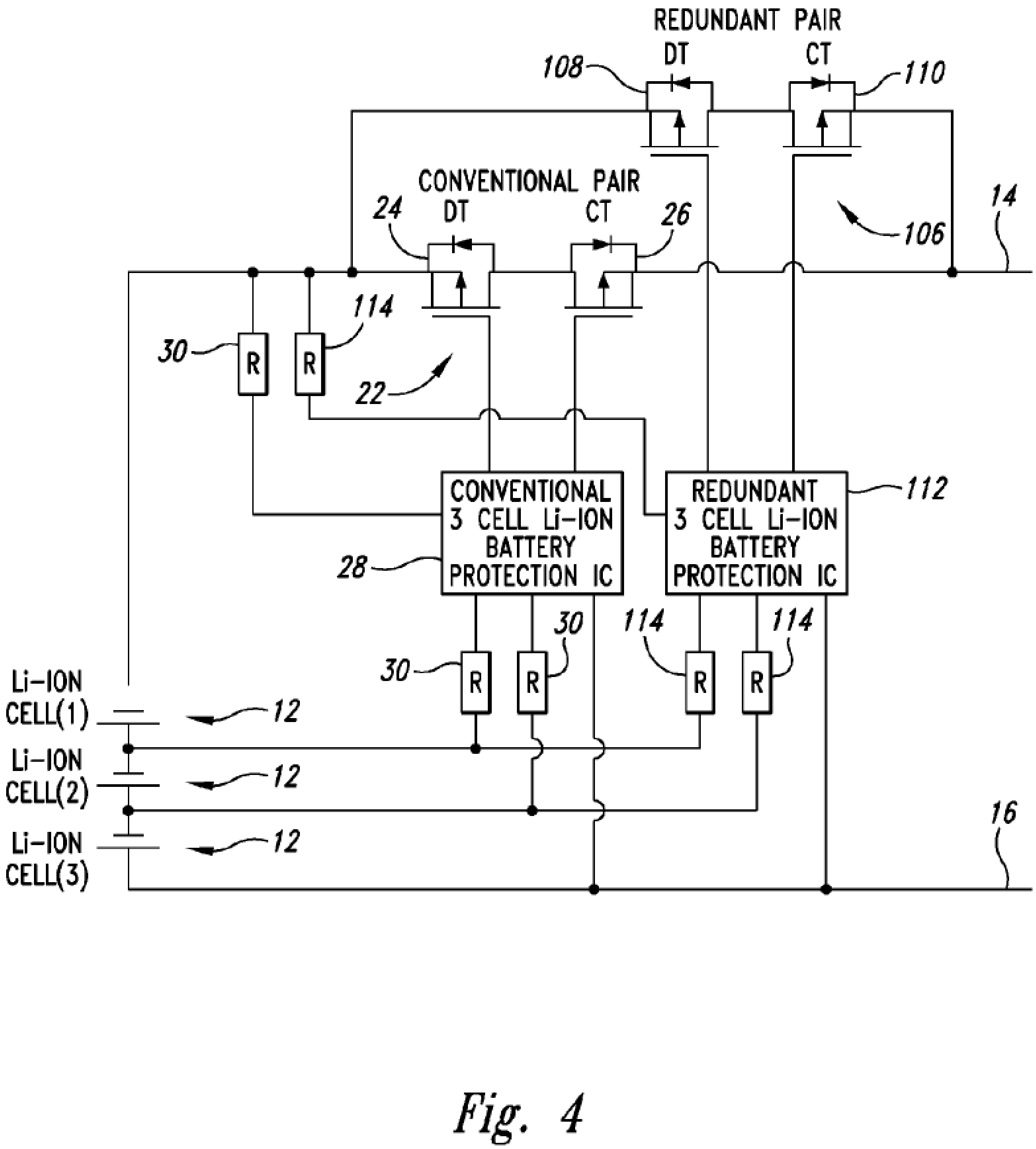


Fig. 4

[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

97. Poff discloses that the transistors can be MOSFETs. Ex. 1012: ¶¶[0022]-[0023]. MOSFETs inherently include a source, a gate, and a drain. For example, in Ex. 1012, Fig. 4, Poff depicts a circuit where both the conventional pair of MOSFETS and the redundant pair of MOSFETS are in the negative leg of the power circuit. This is clear from the diagram illustrating the connection to the negative side of the battery stack (indicated by the shorter of the paired lines in the battery symbol). Placing the switches in the negative power leg requires the use of N channel MOSFETS. Although not labeled in Fig. 4, the three connections to the MOSFETS can be identified. The Gate, or control leg, always connects to the control or protection IC. The Source and Drain can be distinguished by the fact that in an N channel MOSFET, the body diode points to the Drain, and Fig.4 illustrates the body diode pointing away from the connected legs of the paired MOSFETS, so the back to back connection can be identified as the Sources of the switches, meeting the limitation where “either the drains of the switches are connected or the sources of the switches are connected”. Ex. 1012, Fig. 4.

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

98. In Fig. 4, Poff discloses a battery pack circuit that includes multiple

lithium-ion cells (12) with a first external (negative) terminal (14) connected to the negative side of the battery stack, indicated by the shorter of the paired lines that depict a power source or battery cell. Ex. 1012. The second external (positive) terminal (16) is similarly connected to the positive side of the stacked battery cells. A single pair of back to back connected MOSFETS would provide both charge and discharge cutoff capability, but Poff adds a second redundant pair of MOSFETS. Parallel pairs (24/26) and (108/110) of MOSFETS are thus placed in a series between the battery cells negative terminal and the external negative terminal, forming a duplicate path for current to flow between the cells and the external load. By adding this "redundant" pair of transistor switches, Poff provides both a backup current path in the case of a component failure and reduced current (by 50%) in each pair of switches under normal conditions.

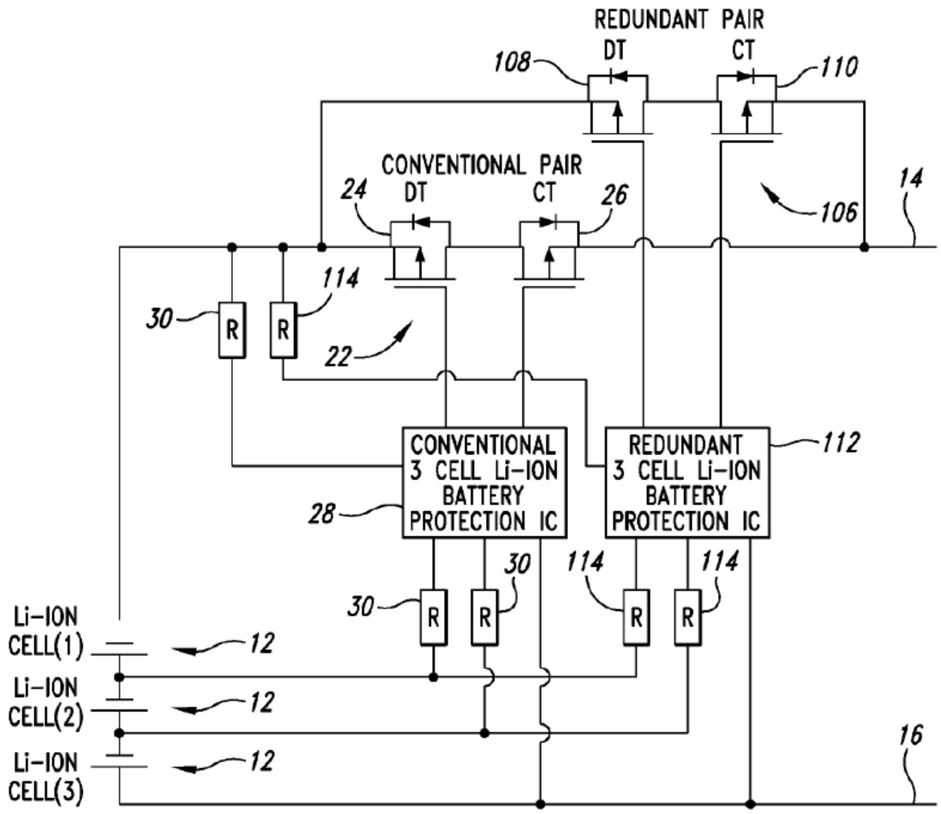


Fig. 4

D. [GROUND 3] – Claims 1-10 and 12-20 are anticipated by Koebler

1. *Overview of Koebler*

99. Koebler relates to an apparatus for increasing the efficiency of a starter battery for a starter motor of an internal combustion engine in a battery pack arrangement with one or more lithium based cells. The apparatus includes a solid state switching configuration for high powered battery systems for protecting against over-charging, over- discharging and short circuiting of batteries, especially starter

batteries for internal combustion engines. Ex. 1014, Abstract.

2. ***Analysis***

(i) 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

100. Koebler anticipates or renders obvious 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, for the following reasons:

101. Koebler discloses a battery pack having a positive terminal (34) and a negative terminal (36). Ex. 1014, 10:25-27 and FIG. 10.

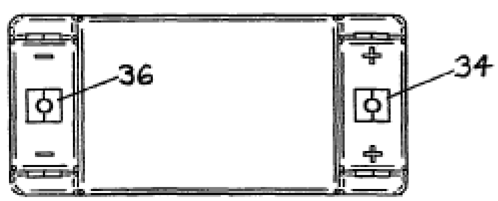


Fig. 10

102. Additionally, 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.

[1a]: a battery pack housing;

103. Koebler discloses that the battery pack includes a housing. Ex. 1014,

8:24-25.

[1b]: at least one lithium-based rechargeable cell within said housing;

104. Koebler discloses "at least one lithium-based rechargeable cell within said housing." Ex. 1014, claim 1.

[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

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

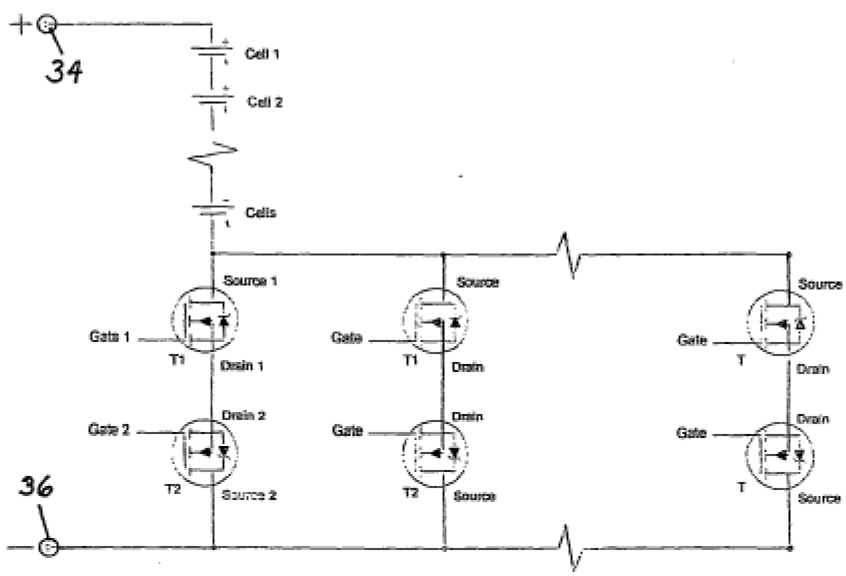


Fig. 16

[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;

106. Koebler discloses pairs of solid state switches with connected drains

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

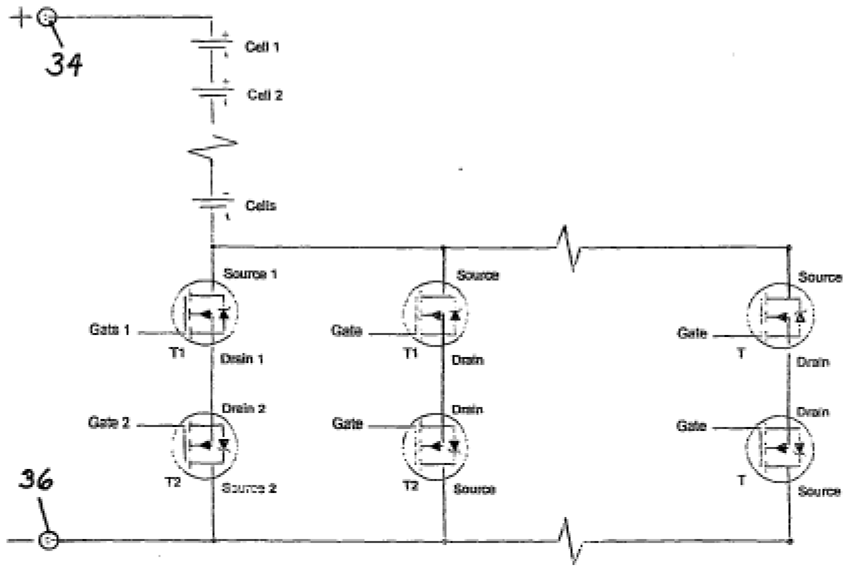


Fig. 16

[1c-iii]: said parallel configuration being connected with one or more cells between the positive and negative terminals; and

107. 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.

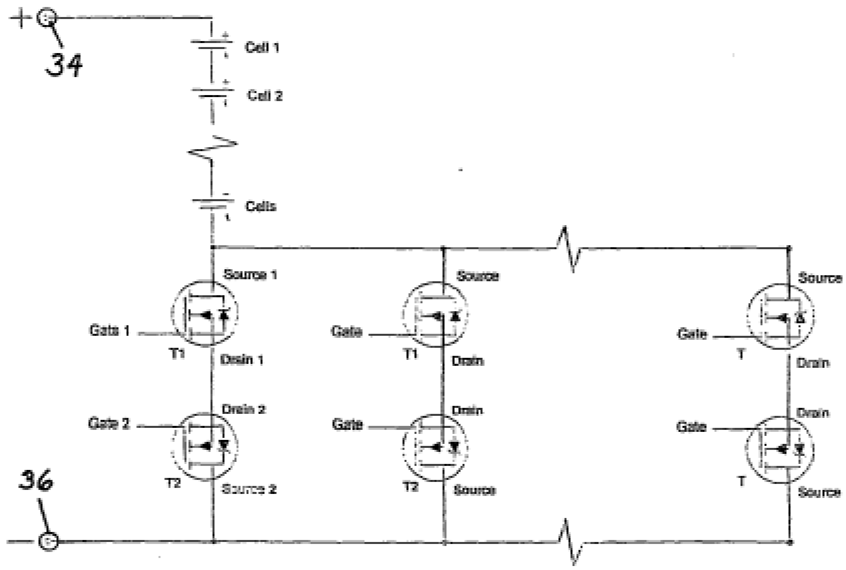


Fig. 16

[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.

108. 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, each of which is anticipatory of the recited range of 3 Ah to 2000 Ah.

(ii) 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 $Li_4Ti_5O_{12}$ cells.

109. My analysis of claim 1 also applies to claim 2. Koebler further

discloses LiFePO, LiFePO4, LiFeMgPO4, LiFeYPO4, LiCoO2, LiMn2O4, LiNiCoA1O2, LiNiMnCoO2, and Li4Ti5O12 cells. Ex. 1014, 3:26-30 and claims 3, 4, 16, and 20.

(iii) 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.

110. My analysis of claim 1 also applies to claim 3. Koebler further discloses "four lithium-based rechargeable cells in series in said housing." Ex. 1014, claim 5.

(iv) 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.

111. My analysis of claim 1 also applies to claim 4. 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.

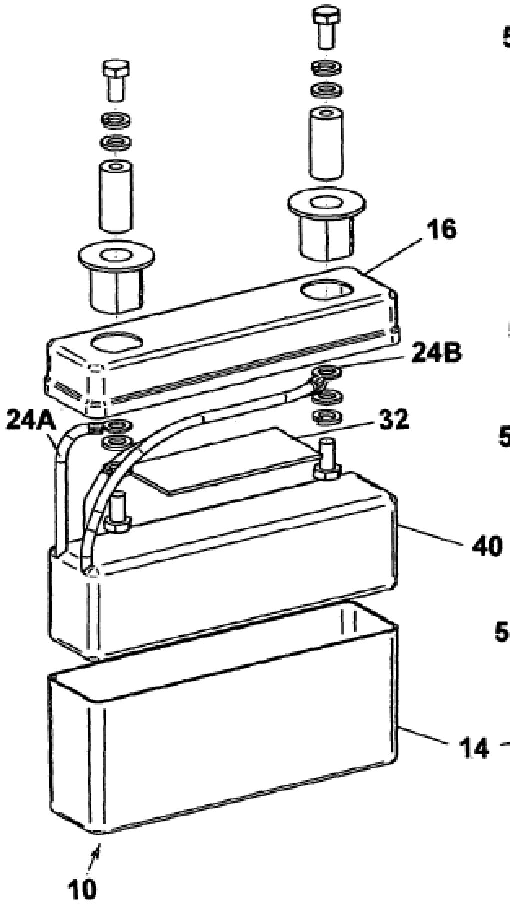


Fig. 3

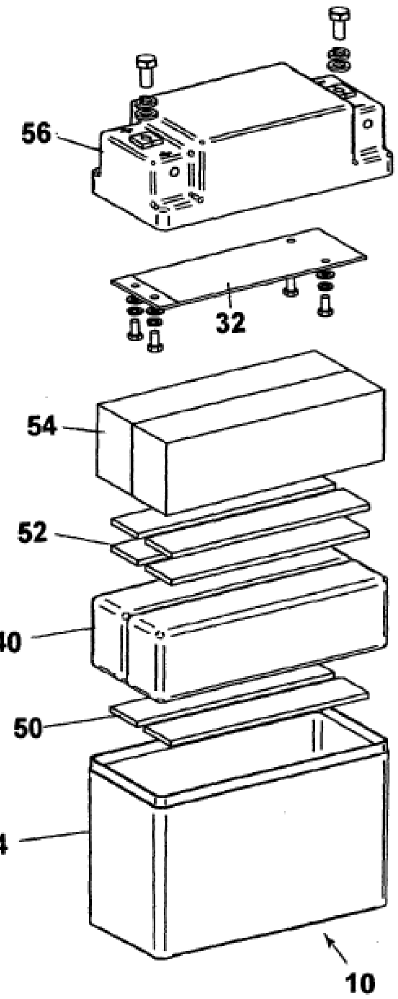
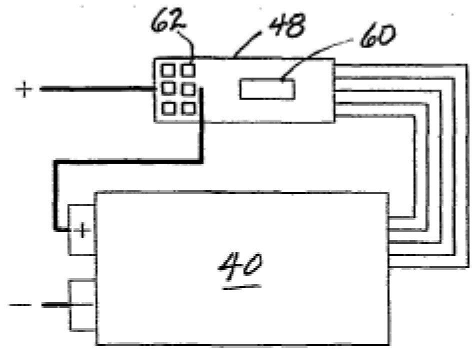


Fig. 13

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



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

(v) 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

114. My analysis of claim 1 also applies to claim 5. Koebler further discloses that the circuitry is placed within the upper casing of the housing for safety protection. Ex. 1014, 4:14-19.

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

115. 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.

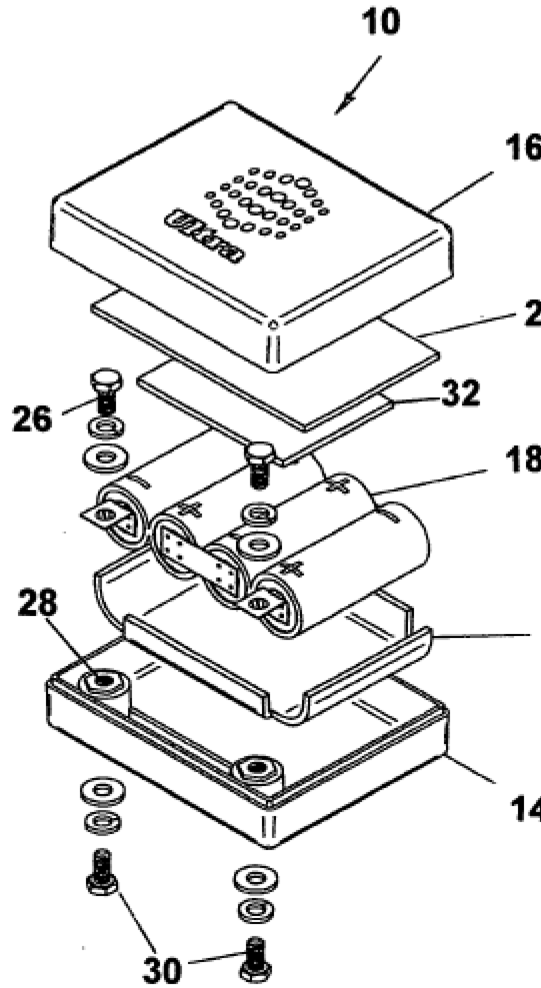


Fig. 1

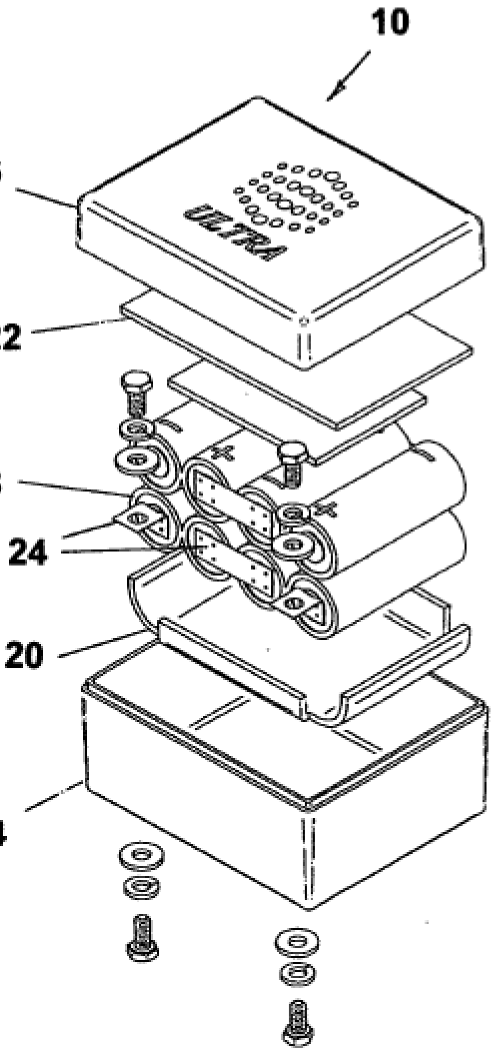


Fig. 2

[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

116. 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.

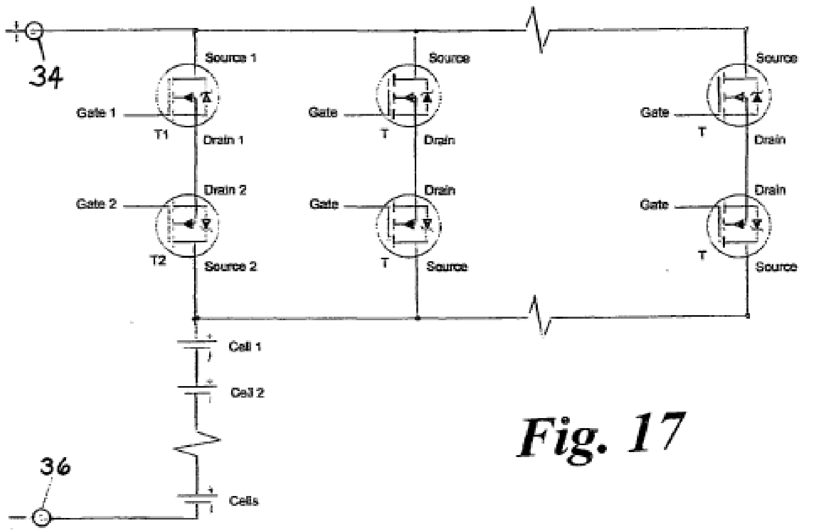


Fig. 17

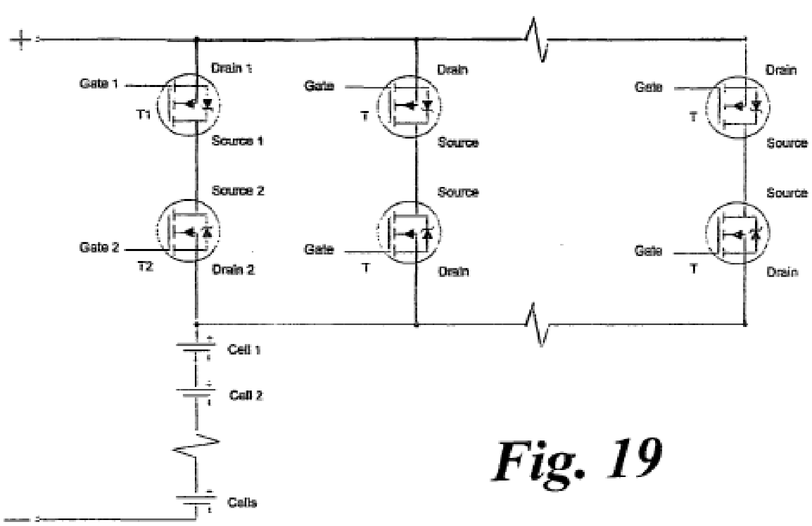


Fig. 19

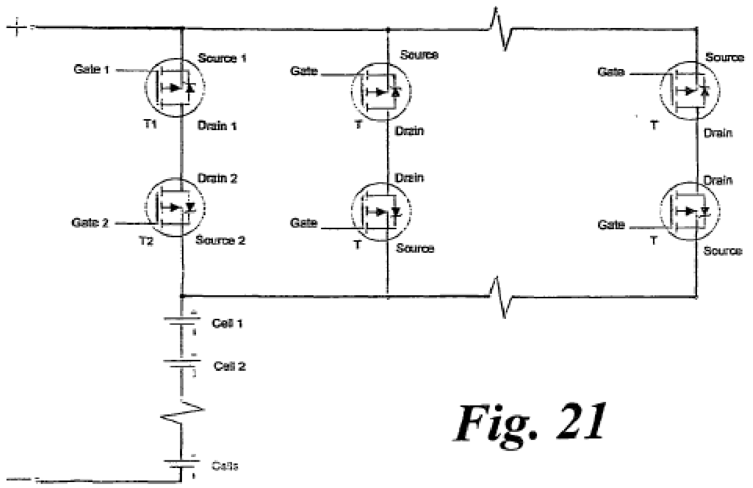


Fig. 21

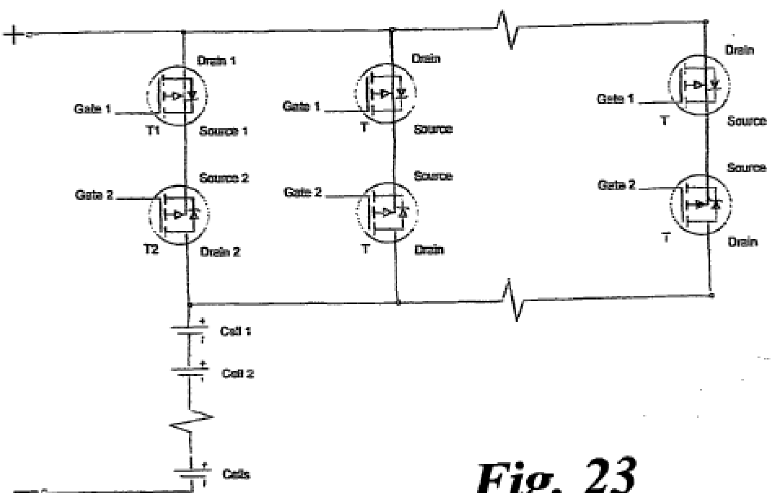


Fig. 23

(vi) 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

117. My analysis of claim 5 also applies to claim 6. Koebler further 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.

(vii) Claim 7

[7] Apparatus according to claim 5, wherein said one or more cells are selected from the group consisting of LiFePO, $LiFePO_4$, $LiFeMgPO_4$, $LiFeYPO_4$, $LiCoO_2$, $LiMn_2O_4$, $LiNicoAlO_2$, $LiNiMnCoO_2$, $Li_4Ti_5O_{12}$, lead-acid, NiCd, and nickel metal hydride (NiMH) batteries.

118. My analysis of claim 5 also applies to claim 7. Koebler further discloses LiFePO, LiFePO4, LiFeMgP04, LiFeYPO4, LiCoO2, LiMn2O4, LiNiCoA1O2, LiNiMnCoO2, and Li4Ti5O12 cells. Ex. 1014, 3:26-30 and claims 3, 4, 16, and 20.

(viii) 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.

119. My analysis of claim 1 applies also to claim 8. Koebler further discloses that the circuitry is placed within the upper casing of the housing for safety protection. Ex. 1014, 4:14-19.

[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.

120. 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.

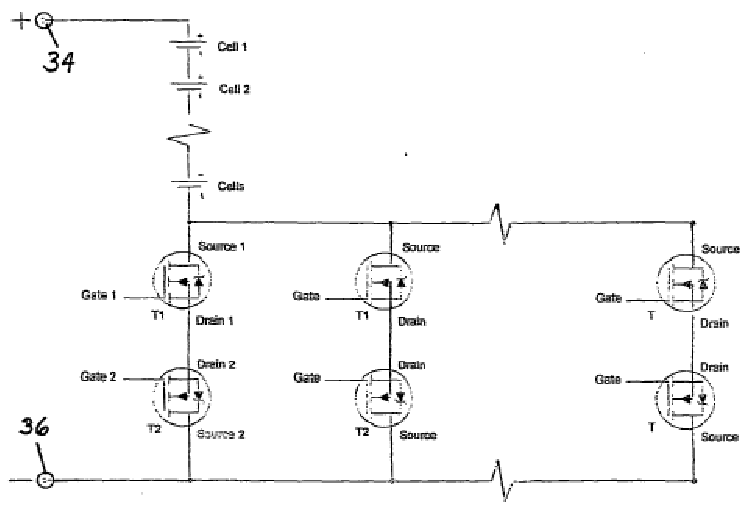


Fig. 16

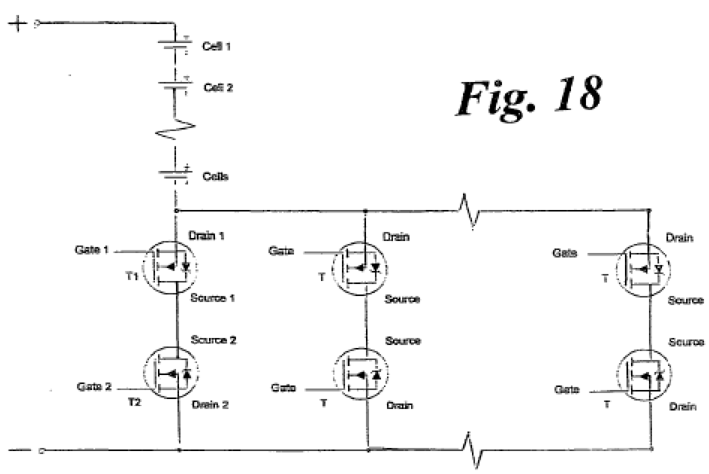


Fig. 18

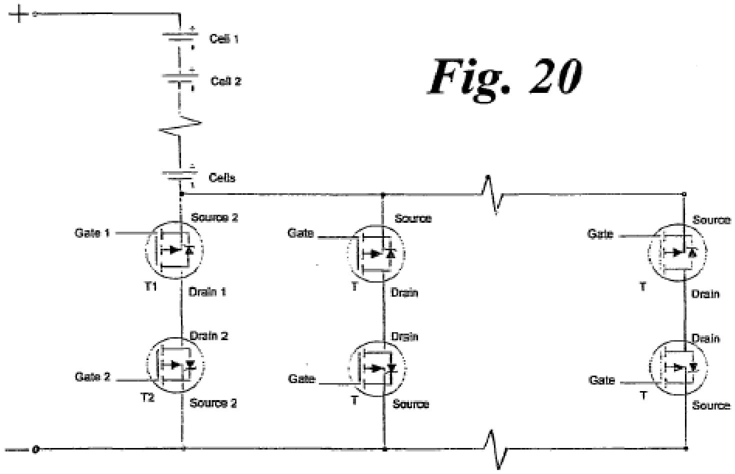


Fig. 20

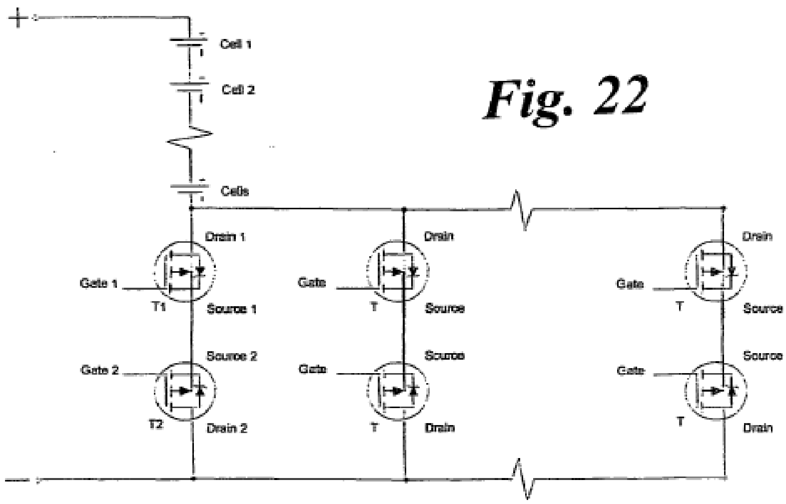


Fig. 22

(ix) 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.

121. My analysis of claim 8 applies also to claim 9. Koebler further 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.

(x) Claim 10

[10] Apparatus according to claim 8, wherein said one or more cells are selected from the group consisting of LiFePO, $LiFePO_4$, $LiFeMgPO_4$, $LiFeYPO_4$, $LiCoO_2$, $LiMn_2O_4$, $LiNiCoAlO_2$, $LiNiMnCoO_2$, $Li_4Ti_5O_{12}$, lead-acid, NiCd, and nickel metal hydride (NiMH) batteries.

122. My analysis of claim 8 applies also to claim 10. Koebler further discloses LiFePO, LiFePO4, LiFeMgPO4, LiFeYPO4, LiCoO2, LiMn2O4, LiNiCoA1O2, LiNiMnCoO2, and Li4Ti5O12 cells. Ex. 1014, 3:26-30 and claims 3, 4, 16, and 20.

(xi) Claim 12

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

123. Koebler discloses a battery pack having a positive terminal (34) and a negative terminal (36). Ex. 1014, 10:25-27 and FIG. 10.

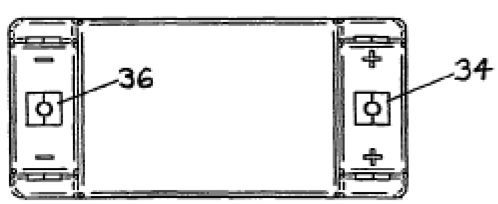


Fig. 10

124. 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.

[12a]: a battery pack housing;

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

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

126. Koebler discloses "at least one lithium-based rechargeable cell within said housing." Ex. 1014, claim 1.

[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;

127. 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.

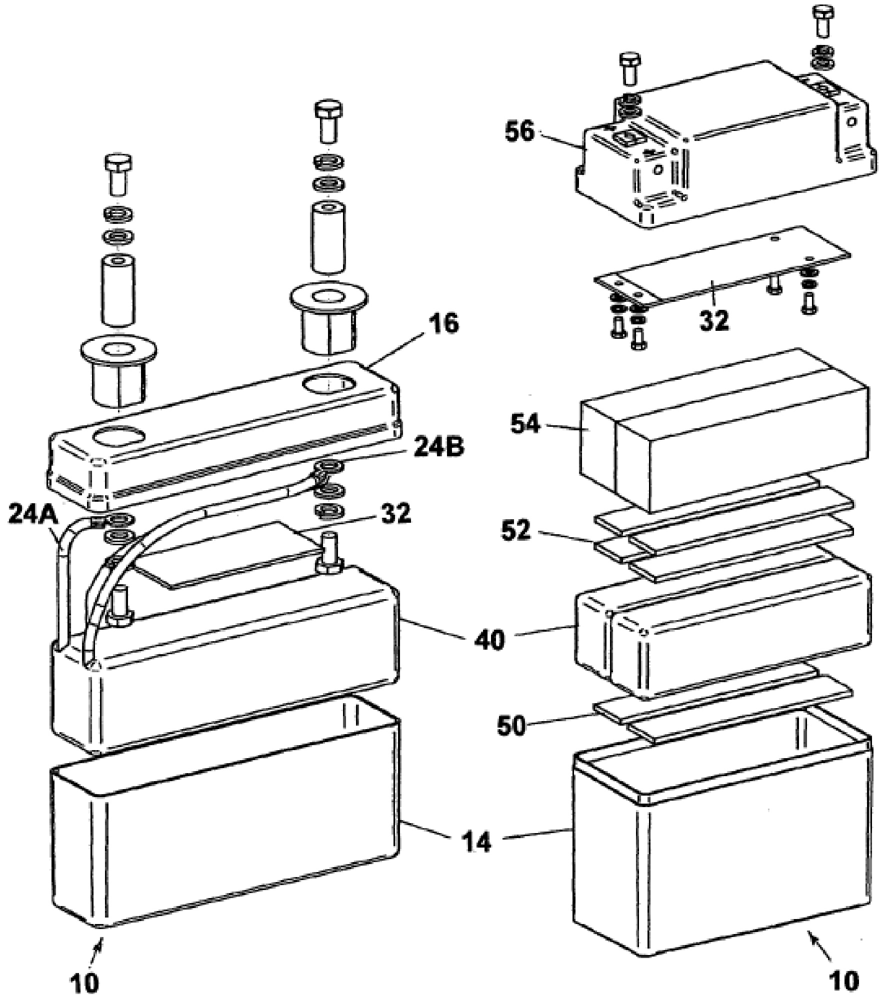
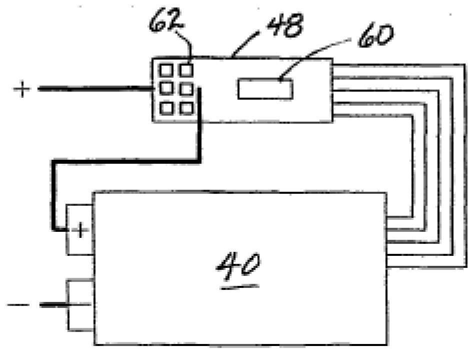


Fig. 3 *Fig. 13*

128. 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.



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

[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;

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

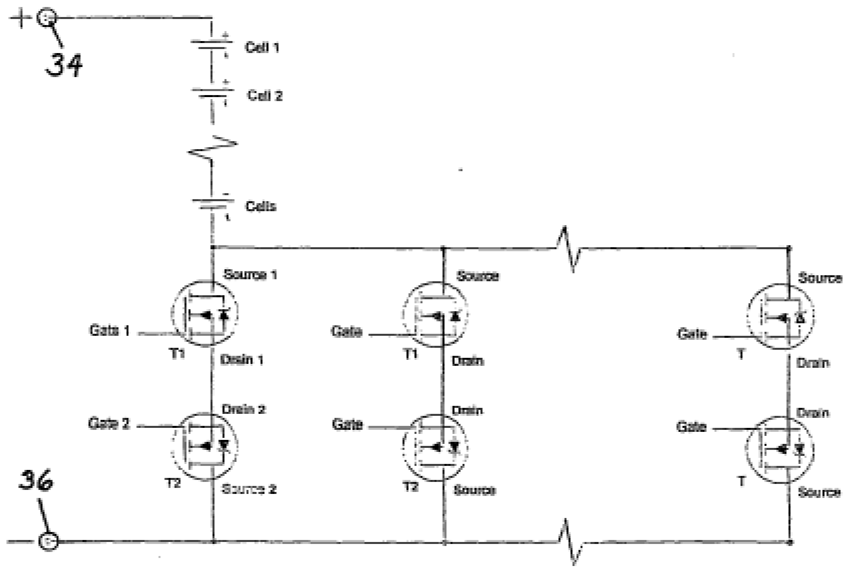


Fig. 16

[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;

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

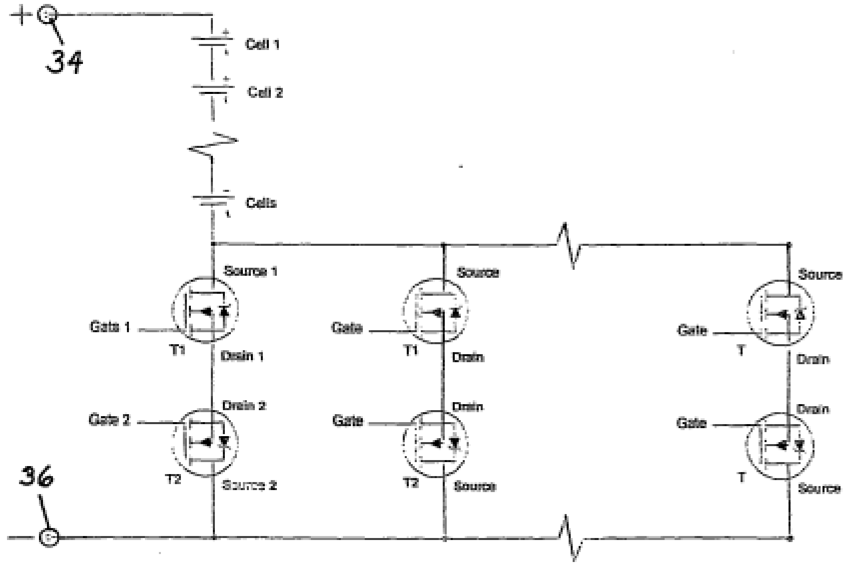


Fig. 16

132. Koebler discloses "at least one lithium-based rechargeable cell within said housing." Ex. 1014, claim 1.

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

133. 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.

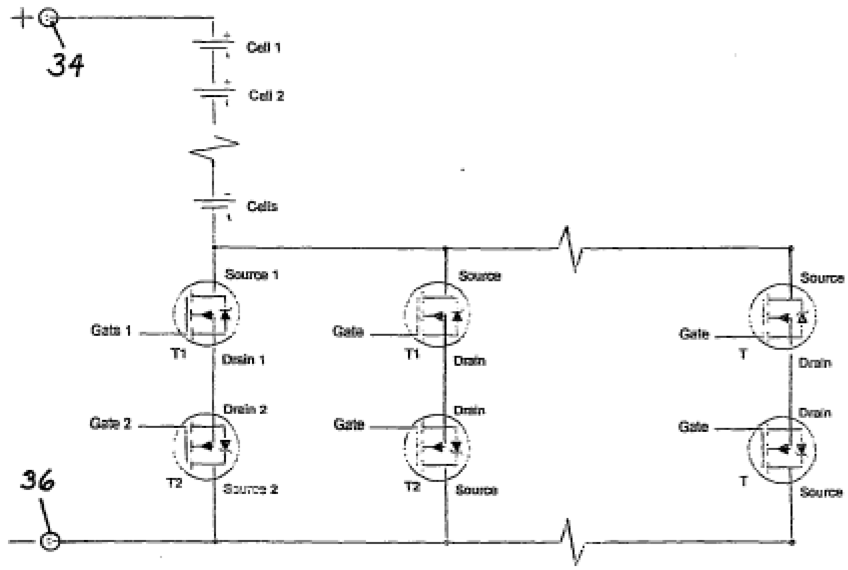


Fig. 16

[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;

134. 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, each of which is anticipatory of the recited range of 3 Ah to 2000 Ah.

(xii) Claim 13

[13]: A deep cycle battery according to claim 12 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 $Li_4Ti_5O_{12}$ cells;

135. My analysis of claim 12 applies also to claim 13. Koebler further

discloses LiFePO, LiFePO4, LiFeMgPO4, LiFeYPO4, LiCo02, LiMn2O4, LiNiCoA102, LiNiMnCo02, and Li4Ti5O12 cells. Ex. 1014, 3:26-30 and claims 3, 4, 16, and 20.

(xiii) 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;

136. My analysis of claim 12 applies also to claim 14. Koebler further discloses "four lithium-based rechargeable cells in series in said housing." Ex. 1014, claim 5.

(xiv) 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:

137. My analysis of claim 12 applies also to claim 15. Koebler further 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.

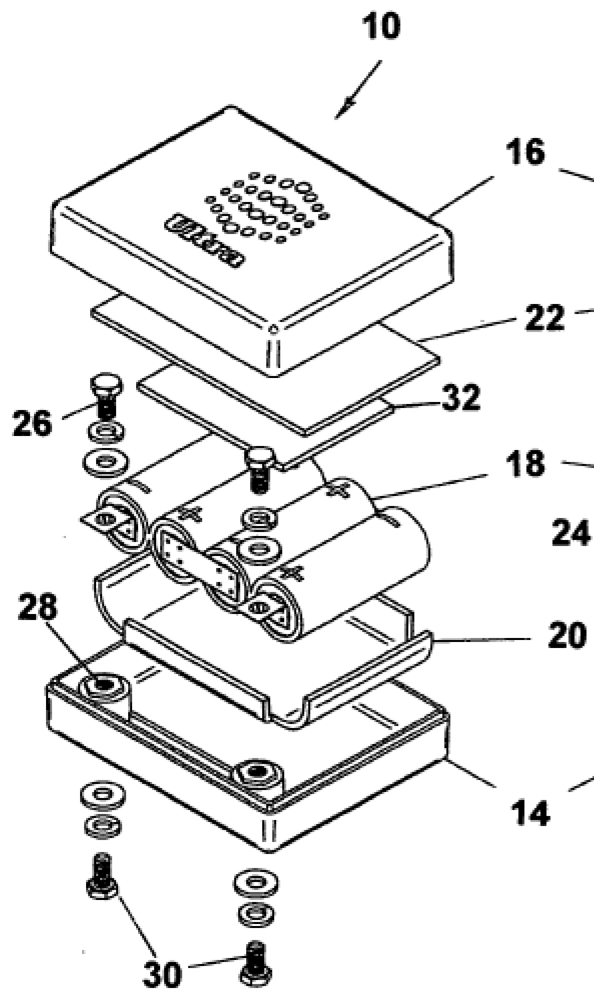


Fig. 1

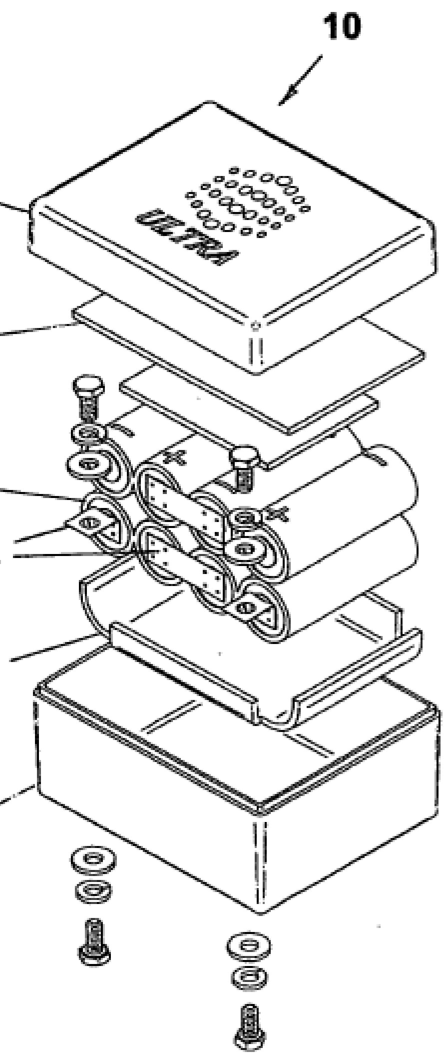


Fig. 2

[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;

138. 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.

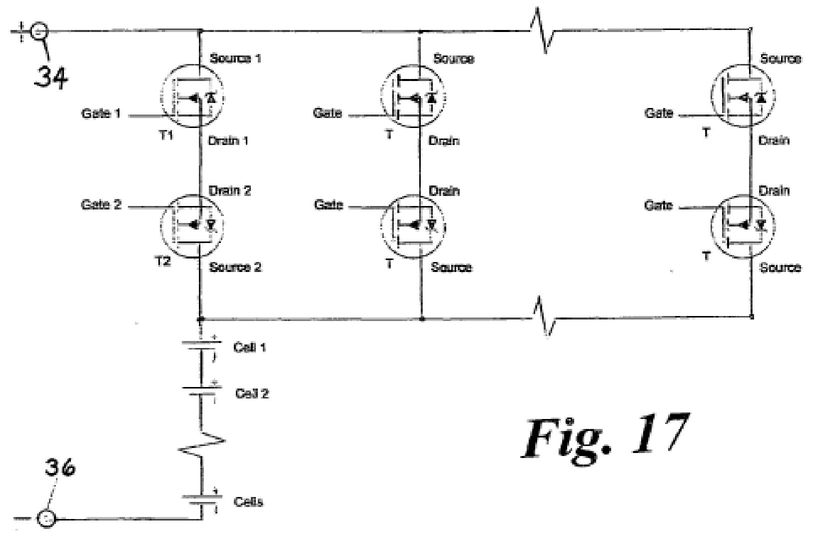


Fig. 17

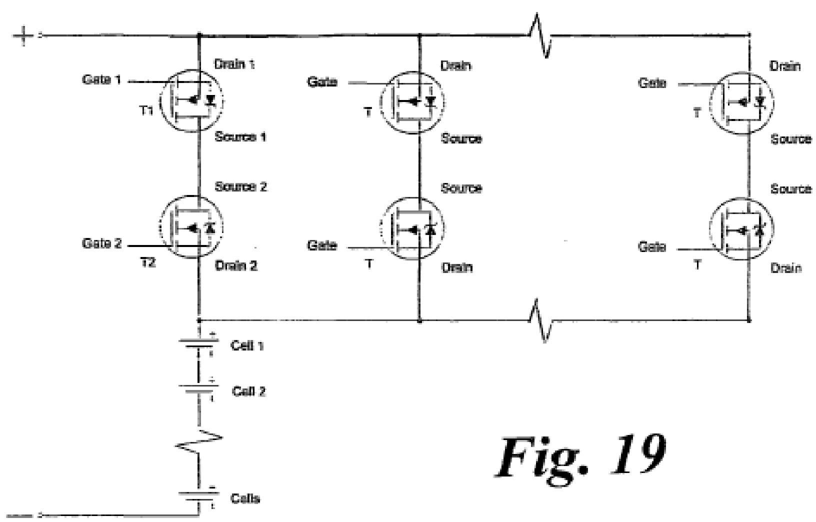


Fig. 19

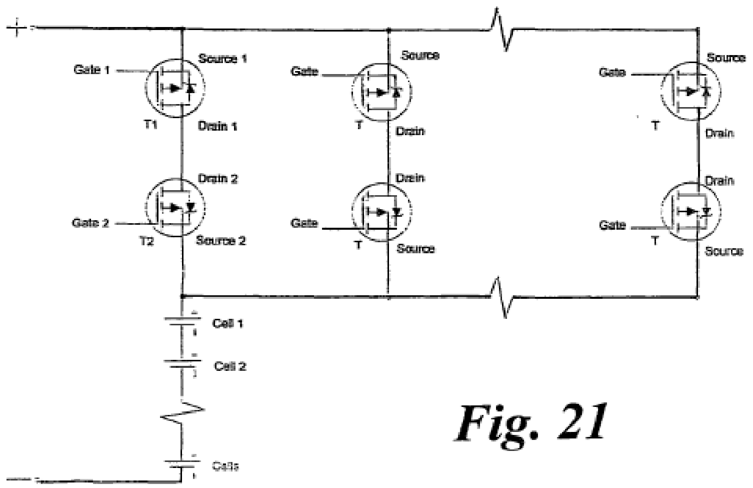


Fig. 21

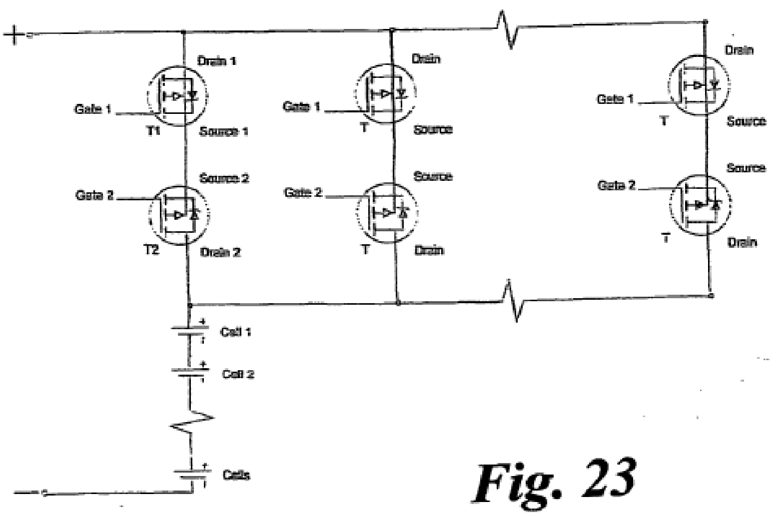


Fig. 23

(xv) 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.

139. My analysis of claim 15 applies also to claim 16. Koebler further 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.

(xvi) Claim 17

[17]: Apparatus according to claim 15, wherein said one or more cells are selected from the group consisting of LiFePO, $LiFePO_4$, $LiFeMgPO_4$, $LiFeYPO_4$, $LiCoO_2$, $LiMn_2O_4$, $LiNicoAlO_2$, $LiNiMnCoO_2$, $Li_4Ti_5O_{12}$, lead-acid, Nicd, and nickel metal hydride (NiMH) batteries.

140. My analysis of claim 15 applies also to claim 17. Koebler further discloses LiFePO, LiFePO4, LiFeMgPO4, LiFeYPO4, LiCoO2, LiMn2O4, LiNiCoA1O2, LiNiMnCoO2, and Li4Ti5O12 cells. Ex. 1014, 3:26-30 and claims 3, 4, 16, and 20.

(xvii) 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

141. My analysis of claim 12 also applies to claim 18. Koebler further 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.

[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

142. 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.

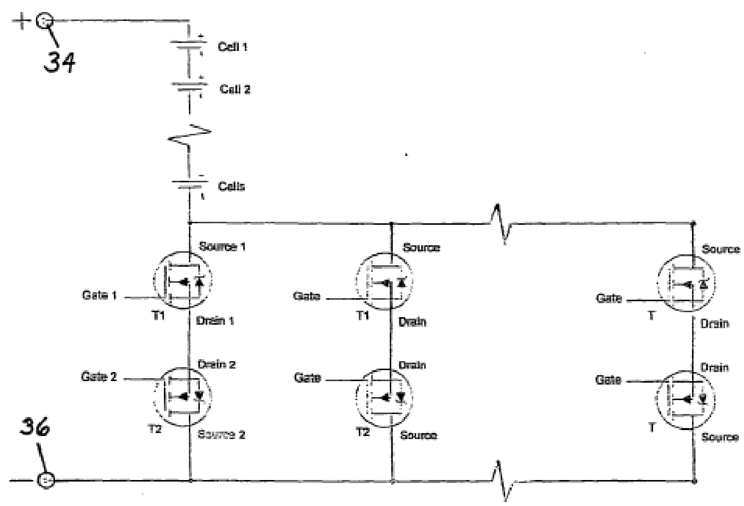


Fig. 16

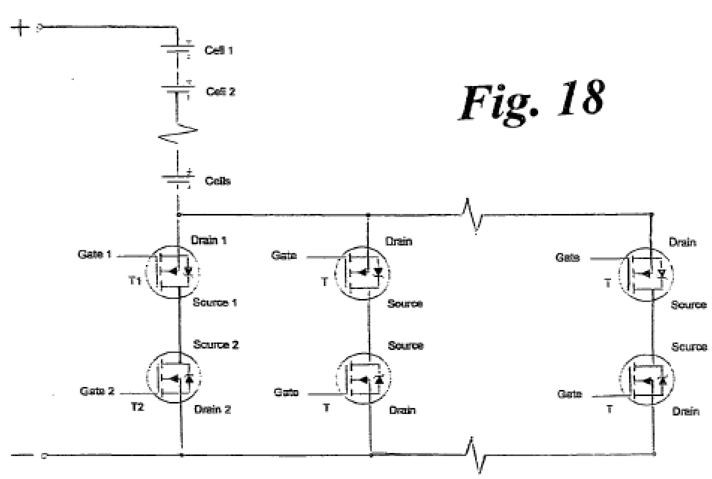


Fig. 18

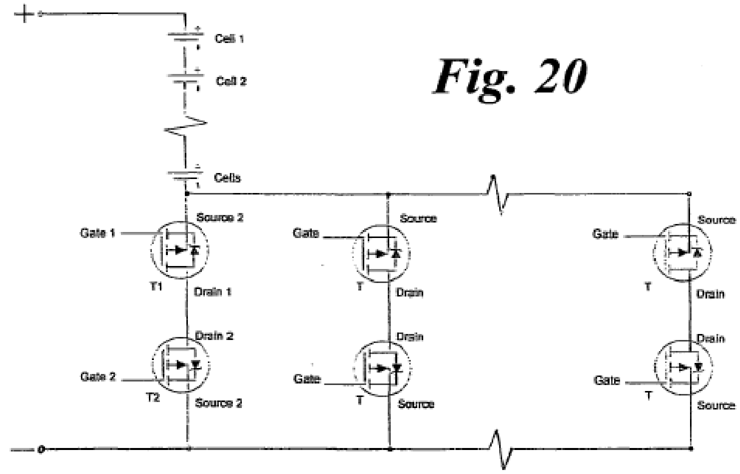


Fig. 20

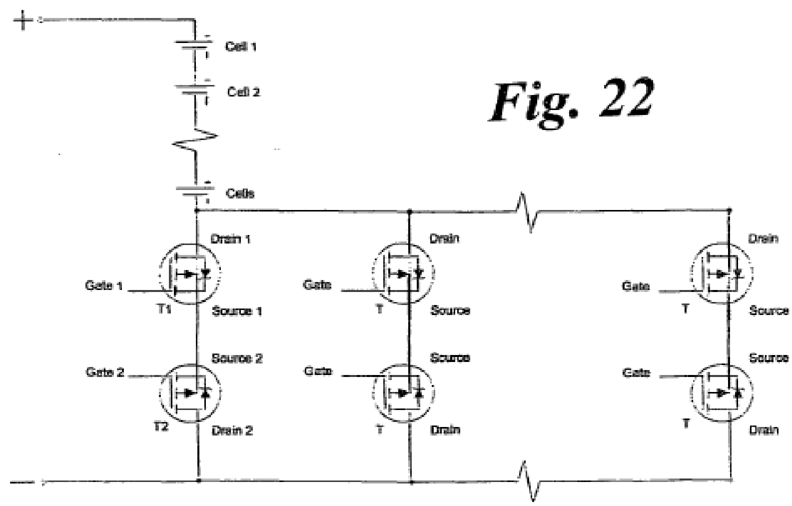


Fig. 22

(xviii) 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.

143. My analysis of claim 18 applies also to claim 19. Koebler further 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.

(xix) Claim 20

[20]: Apparatus according to claim 18, wherein said one or more cells are selected from the group consisting of LiFePO, $LiFePO_4$, $LiFeYPO_4$, $LiCoO_2$, $LiMn_2O_4$, $LiNiCoAlO_2$, $LiNiMnCoO_2$, $Li_4Ti_5O_{12}$, lead-acid, NiCd, and nickel metal hydride (NiMH) batteries.

144. My analysis of claim 18 applies also to claim 20. Koebler further discloses LiFePO, LiFePO4, LiFeMgPO4, LiFeYPO4, LiCoO2, LiMn2O4, LiNiCoA1O2, LiNiMnCoO2, and Li4Ti5O12 cells. Ex. 1014, 3:26-30 and claims 3, 4, 16, and 20.

VI. LEGAL STANDARDS

A. Terminology

145. I have been informed by Counsel and understand that the best indicator of claim meaning is its usage in the context of the patent specification as understood by one of ordinary skill. I further understand that the words of the claims should be given their plain meaning unless that meaning is inconsistent with the patent specification or the patent’s history of examination before the Patent Office. Counsel has also informed me, and I understand that, the words of the claims should be interpreted as they would have been interpreted by one of ordinary skill at the time of the invention was made (not today). Because I do not know at what date the

invention as claimed was made, I have used the earliest possible priority date of the '641 Patent as the point in time for claim interpretation purposes (the Critical Date).

B. Legal Standards for Anticipation

146. I have been informed by Counsel and understand that documents and materials that qualify as prior art can render a patent claim unpatentable as anticipated. I am informed by Counsel and understand that all prior art references are to be looked at from the viewpoint of a person of ordinary skill in the art.

147. I am informed by Counsel and understand that a challenged claim is unpatentable as "anticipated" under 35 U.S.C. § 102 if it is determined that all the limitations of the claim are described in a single prior art reference.

148. I am informed by Counsel and understand that, to anticipate a claim, a prior art reference must disclose, either expressly or inherently, each and every limitation of that claim and enable one of ordinary skill in the art to make and use the invention.

149. I have been informed by Counsel and understand that in an inter partes review, "the petitioner shall have the burden of proving a proposition of unpatentability," including a proposition of anticipation, "by a preponderance of the evidence." 35 U.S.C. §316(e).

C. Legal Standards for Obviousness

150. I have been informed by Counsel and understand that documents and

materials that qualify as prior art can render a patent claim unpatentable as obvious. I am informed by Counsel and understand that all prior art references are to be looked at from the viewpoint of a person of ordinary skill in the art at the time of the invention, and that this viewpoint prevents one from using his or her own insight or hindsight in deciding whether a claim is obvious.

151. I have been informed by Counsel and understand that a claim is unpatentable for obviousness under 35 U.S.C. § 103 (in the pre-AIA form of that statute that applies to the ’641 Patent) “if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” I am informed by Counsel and understand that obviousness may be based upon a combination of references. I am informed by Counsel and understand that the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. However, I am informed by Counsel and understand that a patent claim composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.

152. I am informed by Counsel and understand that when a patented invention is a combination of known elements, a court must determine whether there

was an apparent reason to combine the known elements in the fashion claimed by the patent at issue by considering the teachings of prior art references, the effects of demands known to people working in the field or present in the marketplace, and the background knowledge possessed by a person having ordinary skill in the art.

153. I am informed by Counsel and understand that a patent claim composed of several limitations is not proved obvious merely by demonstrating that each of its limitations was independently known in the prior art. I am informed by counsel for the Patent Owner and understand that identifying a reason those elements would be combined can be important because inventions in many instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known. I am informed by Counsel and understand that it is improper to use hindsight in an obviousness analysis, and that a patent's claims should not be used as a "roadmap."

154. I am informed by Counsel and understand that an obviousness inquiry requires consideration of the following factors: (1) the scope and content of the prior art; (2) the differences between the claims and the prior art; (3) the level of ordinary skill in the pertinent art; and (4) any objective indicia of non-obviousness, such as commercial success, long-felt but unresolved need, failure of others, industry recognition, copying, and unexpected results. I understand that the foregoing factors are sometimes referred to as the "Graham factors."

155. I have been informed by Counsel and understand that an obviousness evaluation can be based on a combination of multiple prior art references. I understand that the prior art references themselves may provide a suggestion, motivation, or reason to combine, but that the nexus linking two or more prior art references is sometimes simple common sense. I have been informed by Counsel and understand that obviousness analysis recognizes that market demand, rather than scientific literature, often drives innovation, and that a motivation to combine references may be supplied by the direction of the marketplace.

156. I have been informed by Counsel and understand that if a technique has been used to improve one device, and a person of ordinary skill at the time of invention would have recognized that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.

157. I have been informed by Counsel and understand that practical and common sense considerations should guide a proper obviousness analysis, because familiar items may have obvious uses beyond their primary purposes. I have been informed by Counsel and understand that a person of ordinary skill looking to overcome a problem will often be able to fit together the teachings of multiple prior art references. I have been informed by Counsel and understand that obviousness analysis therefore takes into account the inferences and creative steps that a person

of ordinary skill would have employed at the time of invention.

158. I have been informed by Counsel and understand that a proper obviousness analysis focuses on what was known or obvious to a person of ordinary skill at the time of invention, not just the patentee. Accordingly, I understand that any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.

159. I have been informed by Counsel and understand that a claim can be obvious in light of a single reference, without the need to combine references, if the elements of the claim that are not found explicitly or inherently in the reference can be supplied by the common sense of one of skill in the art.

160. I have been informed by Counsel and understand that secondary indicia of non-obviousness may include (1) a long felt but unmet need in the prior art that was satisfied by the invention of the patent; (2) commercial success of processes covered by the patent; (3) unexpected results achieved by the invention; (4) praise of the invention by others skilled in the art; (5) taking of licenses under the patent by others; (6) deliberate copying of the invention; (7) failure of others to find a solution to the long felt need; and (8) skepticism by experts. I understand that evidence of secondary indicia of non-obviousness, if available, should be considered as part of the obviousness analysis.

161. I have been informed by Counsel and understand that there must be a relationship between any such secondary considerations and the invention, and that contemporaneous and independent invention by others is a secondary consideration supporting an obviousness determination.

162. In sum, my understanding is that prior art teachings are properly combined where one of ordinary skill having the understanding and knowledge reflected in the prior art and motivated by the general problem facing the inventor, would have been led to make the combination of elements recited in the claims. Under this analysis, the prior art references themselves, or any need or problem known in the field of endeavor at the time of the invention, can provide a reason for combining the elements of multiple prior art references in the claimed manner.

163. I have been informed by Counsel and understand that in an inter partes review, "the petitioner shall have the burden of proving a proposition of unpatentability," including a proposition of obviousness, "by a preponderance of the evidence." 35 U.S.C. §316(e).

VII. CONCLUSION

164. I reserve the right to supplement my opinions to address any information obtained, or positions taken, based on any new information introduced throughout this proceeding.

165. I declare under penalty of perjury that the foregoing is true and accurate to the best of my ability.