

## (12) Indian Patent Application

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(54) Title: BATTERY MANAGEMENT SYSTEM

(57) Abstract: According to an exemplary embodiment of the invention, a battery management system 100 for determining condition of a battery 102 is disclosed. The battery management system 100 may include a circuit 104 for measuring a voltage of the battery 102 and a switch 106 for allowing an electric charge to flow from the battery 102 to the circuit 104. The circuit 104 may include at least one multicolour light source 108. The multicolour light source 108 may emit a wavelength of light corresponding to the electric charge flowing into the multicolour light source 108 from the battery 102. The circuit 104 may further include a spectro sensor 110 to analyse the wavelength of light and provide the voltage corresponding to the wavelength of light. The voltage of the battery 102 provided by the spectro sensor 110 may enable a user in determining the health and charge of the battery 102.

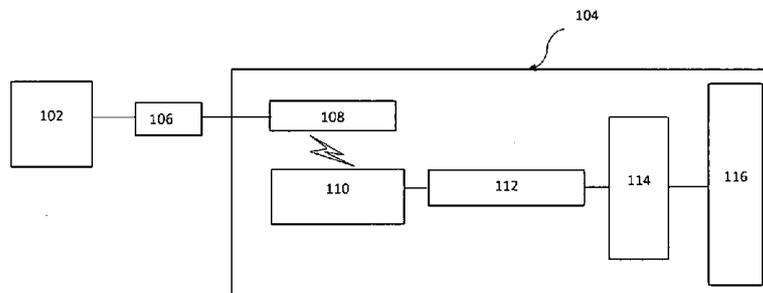


Figure 1

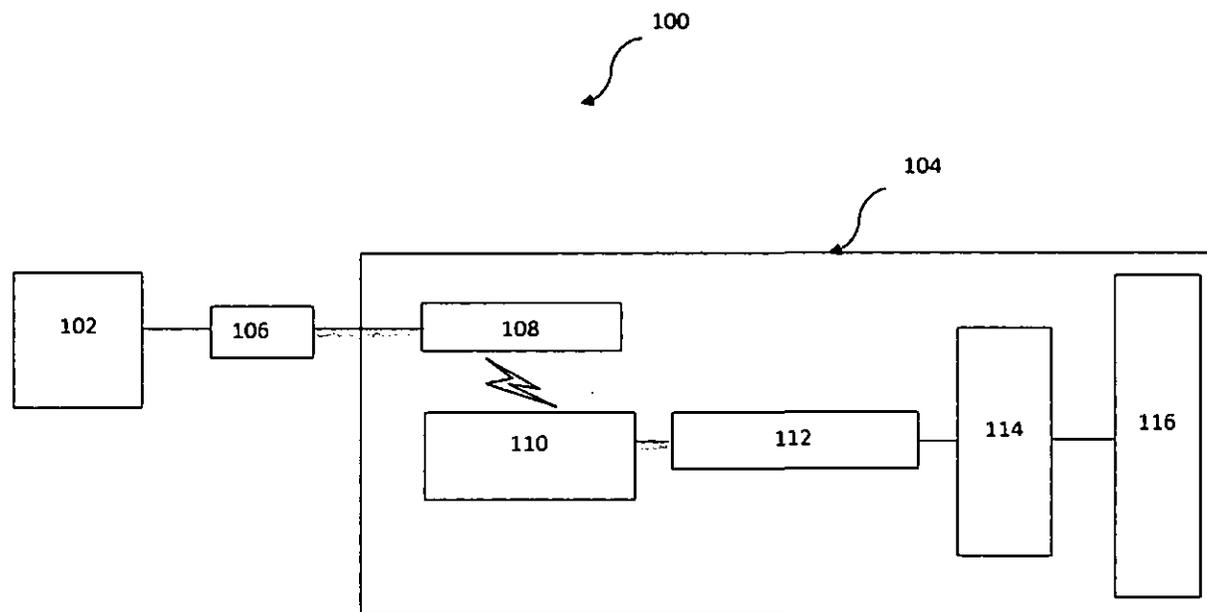


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# ABSTRACT

## Battery management system

According to an exemplary embodiment of the invention, a battery management system 100 for determining condition of a battery 102 is disclosed. The battery management system 100 may include a circuit 104 for measuring a voltage of the battery 102 and a switch 106 for allowing an electric charge to flow from the battery 102 to the circuit 104. The circuit 104 may include at least one multicolour light source 108. The multicolour light source 108 may emit a wavelength of light corresponding to the electric charge flowing into the multicolour light source 108 from the battery 102. The circuit 104 may further include a spectro sensor 110 to analyse the wavelength of light and provide the voltage corresponding to the wavelength of light. The voltage of the battery 102 provided by the spectro sensor 110 may enable a user in determining the health and charge of the battery 102.



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We claim:

1. A battery management system 100 for determining condition of a battery 102, the system 100 having a circuit 104 for measuring a voltage of the battery and a switch 106 for allowing an electric charge to flow from the battery 102 to the circuit 104, wherein the circuit 104 comprising:
  - at least one multicolour light source 108 to emit a wavelength corresponding to the electric charge; and
  - a spectro sensor 110 to analyse the wavelength and provide corresponding voltage as an output.
2. The battery management system 100 as claimed in claim 1, wherein the wavelength of light emitted by the multicolour light source 108 falls within a visible spectrum.
3. The battery management system 100 as claimed in claim 1, wherein the multicolour light source 108 is an LED.
4. The battery management system 100 as claimed in claim 1, wherein the circuit 102 further includes a signal conditioning component.

5. The battery management system 100 as claimed in claim 1, wherein the circuit 102 further includes a microcontroller.

Dated this 7<sup>th</sup> day of March 2017

  
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## FIELD OF INVENTION

The invention generally relates to a field of battery management system and more particularly to determine state of health and state of charge of a battery with accuracy.

## BACKGROUND

A battery management system (BMS) is an electronic system that manages a cell or a battery. The battery management system protects the battery from operating outside its safe operating conditions by monitoring its state, calculating secondary data, reporting that data, controlling its environment, authenticating it and balancing it. The battery management system monitors the state of the battery by monitoring certain parameters of the battery. The parameters may include voltage, current, temperature, state of health (SOH) and state of charge (SOC) of the battery.

After prolonged use of a battery, the performance of the battery is subjected to degradation. Such battery will exhibit reduced voltage output in comparison to a battery in a proper working condition. This degradation in the performance may cause the battery to overheat, or may induce adverse reactions within the battery which may further cause it to become hazardous.

In conventional battery management systems, for determining the condition of a battery, the battery management system use a capacitor to store charge of the battery and convert its voltage from an analog form into a digital form such that a microcontroller can calculate the voltage value. The voltage value determined by the conventional battery management system for

determining the condition of the battery are less accurate.

Hence there is a need for an improved battery management system.

## **SUMMARY OF THE INVENTION**

According to an exemplary embodiment of the invention, a battery management system for determining condition of a battery is disclosed. The battery management system may include a circuit for measuring a voltage of the battery and a switch for allowing an electric charge to flow from the battery to the circuit. The circuit for measuring the voltage of the battery may include at least one multicolour light source. The multicolour light source may emit a wavelength of light corresponding to the electric charge flowing into the multicolour light source from the battery. The circuit may further include a spectro sensor. The spectro sensor may analyse the wavelength of light emitted from the multicolour light source and provide the voltage corresponding to the wavelength of light emitted from the multicolour light source. The voltage provided by the spectro sensor may enable a user in determining the health and charge of the battery.

## **BRIEF DESCRIPTION OF DRAWINGS**

Other objects, features, and advantages of the invention will be apparent from the following description when read with reference to the accompanying drawing.

Figure 1 illustrates a schematic diagram of a battery management system according to an exemplary embodiment of the invention.

## DETAILED DESCRIPTION OF DRAWINGS

The following description with reference to the accompanying drawing is provided to assist in a comprehensive understanding of exemplary embodiments. It includes various specific details to assist in that understanding but these are to be regarded as merely exemplary. Accordingly, those of ordinary skill in the art will recognize that various changes and modifications of the embodiments described herein can be made without departing from the scope and spirit of the invention. In addition, descriptions of well-known functions and constructions are omitted for clarity and conciseness.

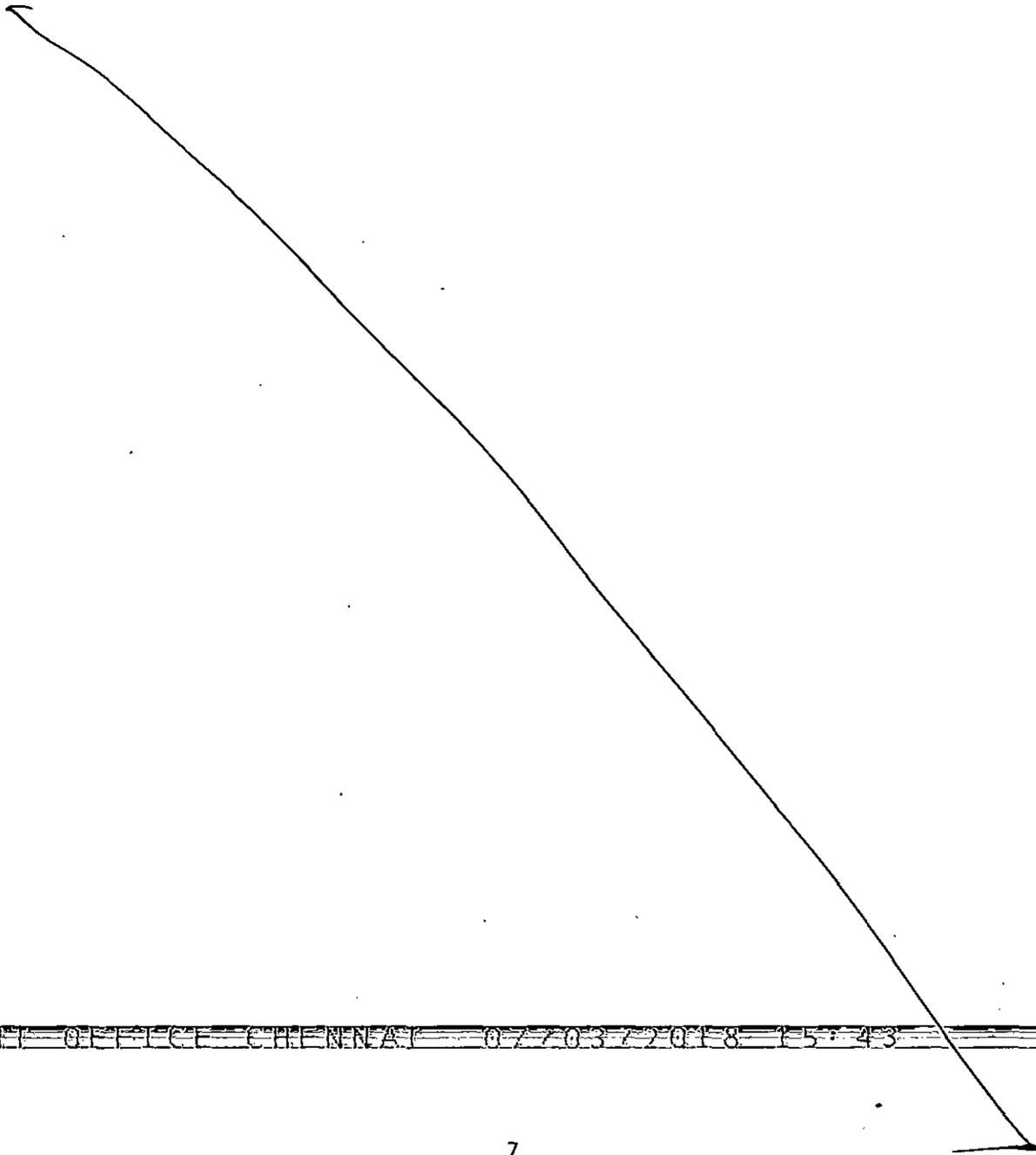
Figure 1 illustrates a schematic diagram of a battery management system 100 for determining condition of a battery 102, according to an exemplary embodiment of the invention. The battery management system 100 may enable a user to monitor the state of health and state of charge of the battery 102. The battery management system 100 may monitor the condition of the battery 102 by measuring voltage of the battery 102. According to an embodiment, the battery 102 under monitoring may be a single cell. According to another embodiment, the battery 102 under monitoring may be a group of cells packed together. The individual cells in the battery 102 may be connected to each other in a series or parallel arrangement. The battery management system 100 may determine the condition of batteries such as, but not limited to lithium batteries, aluminium batteries, magnesium batteries, zinc batteries etc. According to an embodiment, the battery management system 100 may include a battery holder for placing the battery 102 whose condition is to be determined. According to another embodiment, the terminals of the battery 102 may be manually contacted with the battery management system

100. The manual contact of the battery management system 100 with the terminals of the

battery 102 may be achieved by contacting the end points of terminals of battery management system to the terminals of the battery 102. The battery management system 100 may include a circuit 104 and a switch 106. The switch 106 may be configured to make or break an electrical connection between the battery 102 and the circuit 104. The user may operate the switch 106 for allowing an electric charge to flow from the battery 102 to the circuit 104. The switch provided in the battery management system 100 may be of any type such as, but not limited to, flip switch, push and release switch etc. It may be apparent to a person skilled in the art that the switch 106 is depicted merely for illustrative purpose and may be provided on the circuit 104 or on a housing enclosing the circuit 104. The housing enclosing the circuit 104 may be constructed from materials or combination of materials such as, but not limited to one or more of metal, alloy, plastic, and any other suitable material known in the art. The circuit 104 of the battery management system 100 may include a multicolour light source 108. According to an embodiment, the multicolour light source 108 may be a multicolour LED. According to another embodiment, the multicolour light source 108 may be in any form such as, but not limited to, bulb, LED strip etc. According to an embodiment, the multicolour light source 108 may be printed on the circuit 104. According to another embodiment, the multicolour light source 108 may be provided external to the circuit 104. The electric charge flowing from the battery 102 may flow to the multicolour light source 108. The multicolour light source 108 may emit a wavelength of light corresponding to the electric charge flowing from the battery 102. According to an embodiment, the wavelength of light emitted by the multicolour light source 108 may depend upon the magnitude of the electric charge flowing from the battery 102. By way of an example, for a certain magnitude of electric charge, the multicolour light source 108 may emit a wavelength of blue light and for a higher magnitude of electric charge, the multicolour light source 108 may emit a wavelength of green light. According to an embodiment, the wavelength of light emitted by the multicolour light source 108 may fall

within a visible spectrum. The battery management system 100 for determining the condition of the battery may further include a spectro sensor 110. The spectro sensor 110 may be mounted in proximity to the multicolour light source 108 such that the light emitted by the multicolour light source falls on the spectro sensor 110. The spectro sensor 110 may be configured to analyse the property of light and provide a voltage corresponding to the property of light. The spectro sensor 110 may analyse the wavelength of light emitted from the multicolour light source 108. On analysing the wavelength of light, the spectro sensor 110 may provide the voltage corresponding to the wavelength of light emitted by the multicolour light source 108. In other words, the spectro sensor 110 may convert the wavelength of light into a voltage signal. According to an embodiment the battery management system 100 may further include a signal conditioning component 112. The signal conditioning component 112 may condition the voltage signal generated from the spectro sensor 110. The signal conditioning component 112 may convert the voltage signal to an easily readable signal. In the process of conversion, the voltage signal may be filtered, amplified and isolated. The signal conditioning component 112 may further transmit the voltage signal to an Analog to Digital converter (ADC) 114. The Analog to Digital converter 114 may convert the voltage signal from an analog form into a digital form. The digital form of voltage may be further send to a microcontroller 116. The microcontroller 116 may be configured to process the digital voltage and provide a voltage value. The signal conditioning component 112, the ADC 114 and the microcontroller 116 may be printed on the circuit 104 of the system 100. The voltage value achieved by the battery management system 100 may be expected to be highly accurate and the battery management system 100 may determine the health and charge of the battery based on the voltage value. The voltage value by the battery management system 100 may enable the user to determine the state of the battery 104 accurately.

It is understood that the above description is intended to be illustrative, and not restrictive. It is intended to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention as defined in the appended claims. Many other embodiments will be apparent to those of skill in the art upon reviewing the above description. The scope of the invention should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled. In the appended claims, the terms "including" and "in which" are used as the plain-English equivalents of the respective terms "comprising" and "wherein," respectively.





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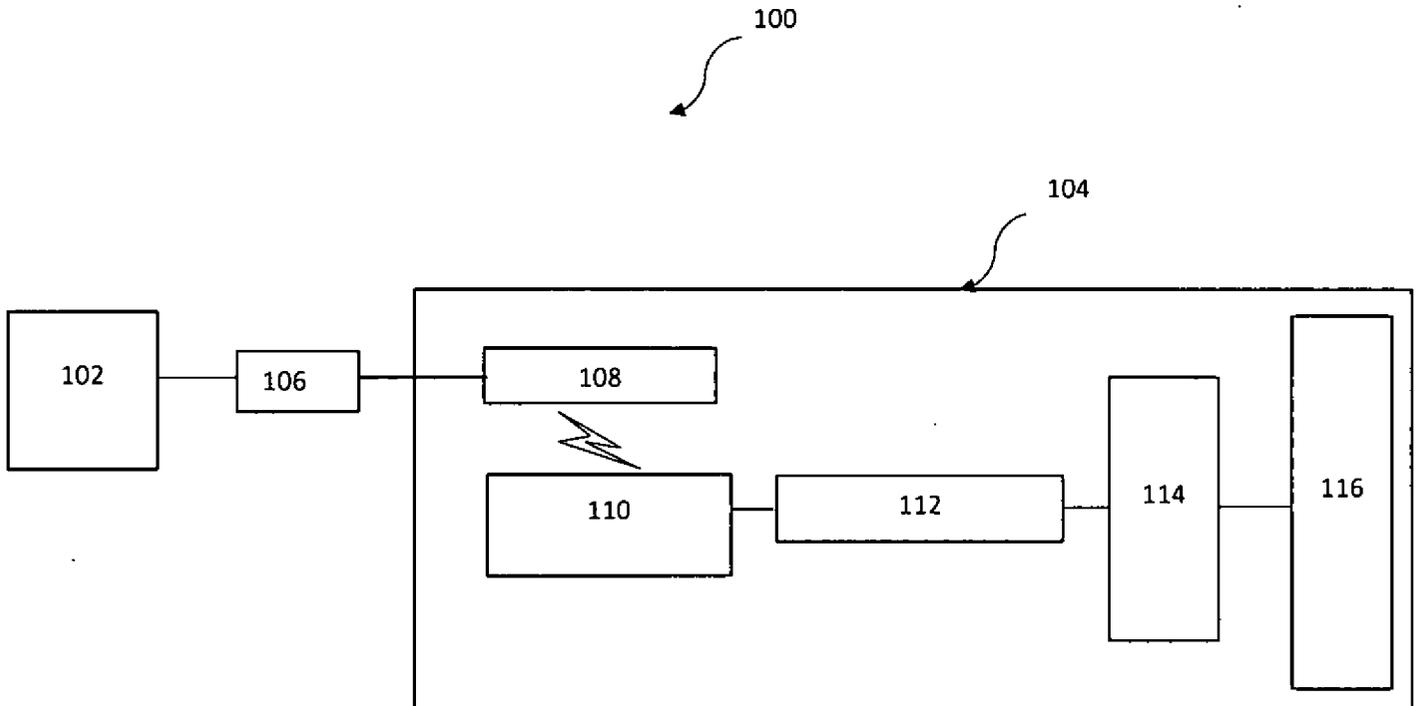


Figure 1

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ATTENTION: CHECK THE PATENT STATUS OF THE INVENTION BEFORE PROCEEDING WITH THE PROJECT.