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Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

— *with international search report (Art. 21(3))*

[Continued on next page]

(54) Title: INTEGRATED BATTERY MANAGEMENT SYSTEM AND METHOD

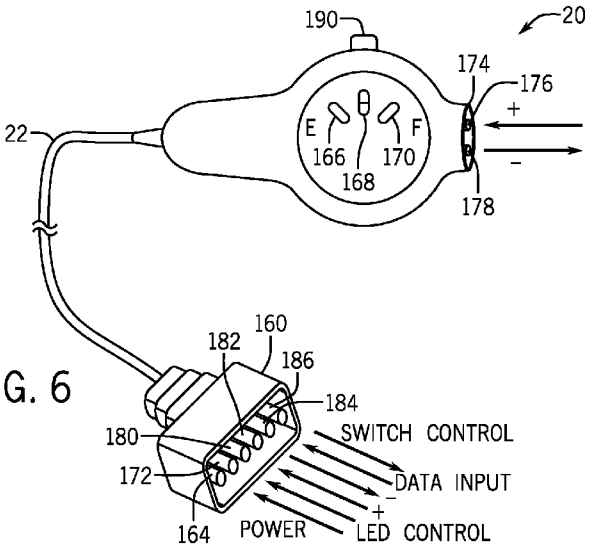


FIG. 6

(57) Abstract: A battery system includes a housing and a plurality of battery cells disposed in the housing. The battery system also includes a battery management system and configured to monitor one or more operational parameters of the battery system. The battery management system is electrically coupled to a positive terminal and a negative terminal of the battery system. Additionally, the battery system includes a multi-conductor connector disposed in an outer surface of the housing and electrically coupled to the battery management system. Further, the battery system includes a state of charge indicator configured to provide an indication of a state of charge of the battery system. The state of charge indicator includes a first multi-conductor connector configured to couple to the multi-conductor connector of the battery system.

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/026983

A. CLASSIFICATION OF SUBJECT MATTER
INV. H01M2/10 H01M10/48 G01R31/36
ADD. H01M10/42

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H01M G01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 2004/189256 A1 (SINK MICHAEL S [US]) 30 September 2004 (2004-09-30) paragraphs [0015], [0029], [0032], [0036]; figures 1, 2	1 2-5, 18-22
X Y	US 2006/267547 A1 (GODOVICH MARK [US]) 30 November 2006 (2006-11-30) paragraphs [0057], [0069], [0070], [0072]; figures 3, 4, 11-13	1 2-5, 18-22
A	DE 20 2008 010010 U1 (HUANG SHUI LIEN [TW]) 2 October 2008 (2008-10-02) the whole document	1-5
A	EP 2 487 498 A2 (VIVA DEVELOPMENTS S L [ES]) 15 August 2012 (2012-08-15) the whole document	1-5

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 July 2015	09/11/2015

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2015/026983

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-5, 18-22

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-5, 18-22

A battery system, comprising a housing, a plurality of battery cells disposed in the housing, a battery management system configured to monitor one or more operational parameters of the battery system, wherein the battery management system is electrically coupled to a positive terminal and a negative terminal of the battery system, a multi-conductor connector disposed in an outer surface of the housing and electrically coupled to the battery management system, and a state of charge indicator configured to provide an indication of a state of charge of the battery system, wherein the state of charge indicator comprises a first multi-conductor connector configured to couple to the multi-conductor connector of the battery system. Furthermore the battery system comprises a charging/maintaining device, wherein the state of charge indicator comprises a second multi-conductor connector configured to couple to the charging/maintaining device.

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2. claim: 6

A battery system, comprising a housing, a plurality of battery cells disposed in the housing, a battery management system configured to monitor one or more operational parameters of the battery system, wherein the battery management system is electrically coupled to a positive terminal and a negative terminal of the battery system, a multi-conductor connector disposed in an outer surface of the housing and electrically coupled to the battery management system, and a state of charge indicator configured to provide an indication of a state of charge of the battery system, wherein the state of charge indicator comprises a first multi-conductor connector configured to couple to the multi-conductor connector of the battery system. Furthermore the state of charge indicator comprises a housing and a cable extending from the housing, and wherein the first multi-conductor connector is coupled to a distal end of the cable extending from the housing.

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3. claims: 7-10

A battery system, comprising a housing, a plurality of battery cells disposed in the housing, a battery management system configured to monitor one or more operational parameters of the battery system, wherein the battery management system is electrically coupled to a positive terminal and a negative terminal of the battery system, a multi-conductor connector disposed in an outer surface of the housing and electrically coupled to the battery

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

management system, and a state of charge indicator configured to provide an indication of a state of charge of the battery system, wherein the state of charge indicator comprises a first multi-conductor connector configured to couple to the multi-conductor connector of the battery system. Furthermore the state of charge indicator comprises a first indicator light configured to emit a first wavelength of light and a second indicator light configured to emit a second wavelength of light

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4. claims: 11-13, 23-27

A battery system, comprising a housing, a plurality of battery cells disposed in the housing, a battery management system configured to monitor one or more operational parameters of the battery system, wherein the battery management system is electrically coupled to a positive terminal and a negative terminal of the battery system, a multi-conductor connector disposed in an outer surface of the housing and electrically coupled to the battery management system, and a state of charge indicator configured to provide an indication of a state of charge of the battery system, wherein the state of charge indicator comprises a first multi-conductor connector configured to couple to the multi-conductor connector of the battery system. Furthermore the battery management system comprises a thermocouple configured to generate a signal related to a temperature of the battery system; a voltmeter configured to generate a signal related to a voltage of the battery system; a processor configured to determine the one or more operational parameters of the battery system based at least in part upon the signal from the thermocouple and the signal from the voltmeter; and a memory configured to store operational parameter history information as determined by the processor, usage information, or a combination thereof.

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5. claims: 14-17

A battery system, comprising a housing, a plurality of battery cells disposed in the housing, a battery management system configured to monitor one or more operational parameters of the battery system, wherein the battery management system is electrically coupled to a positive terminal and a negative terminal of the battery system, a multi-conductor connector disposed in an outer surface of the housing and electrically coupled to the battery management system, and a state of charge indicator configured to provide an indication of a state of charge of the battery system, wherein the state of charge indicator comprises a first multi-conductor connector configured to couple to the multi-conductor connector of the battery system. Furthermore the battery system comprises an internal switch coupled to the battery management system and/or a

reset switch coupled to the SOC indicator, wherein the battery management system is configured to transition the battery system between an operational mode and a sleep mode via the internal switch.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2015/026983

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2004189256 A1	30-09-2004	EP 1450174 A1	25-08-2004
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