



(51) International Patent Classification:

H01M 10/36 (2006.01) H01M 2/10 (2006.01)
H01M 10/63 (2014.01)

(21) International Application Number:

PCT/US2014/059726

(22) International Filing Date:

8 October 2014 (08.10.2014)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/890,012 11 October 2013 (11.10.2013) US
14/255,780 17 April 2014 (17.04.2014) US

(71) Applicant: **EC POWER, LLC** [US/US]; 341 North Science Park Road, Suite 206, State College, Pennsylvania 16803 (US).

(72) Inventors: **WANG, Chao-Yang**; 341 North Science Park Road, Suite 206, State College, Pennsylvania 16803 (US). **GE, Shanhai**; 341 North Science Park Road, Suite 206, State College, Pennsylvania 16803 (US). **JL, Yan**; 341

North Science Park Road, Suite 206, State College, Pennsylvania 16803 (US). **XU, Tianren**; 341 North Science Park Road, Suite 206, State College, Pennsylvania 16803 (US).

(74) Agent: **BUCCA, Daniel**; McDermott Will & Emery LLP, 500 North Capitol Street, N.W., Washington, District of Columbia 20001 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ,

[Continued on next page]

(54) Title: ALL CLIMATE BATTERY AND MANUFACTURING AND USING SAME

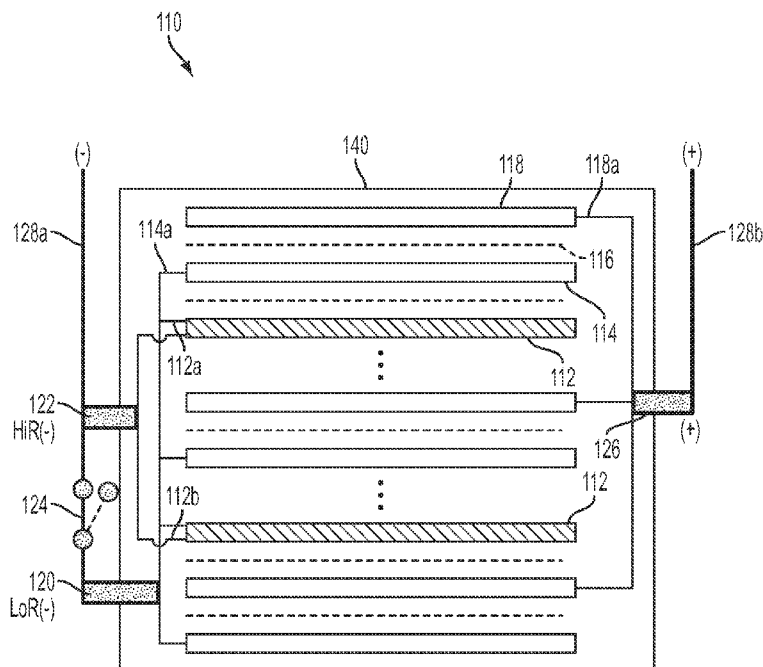


FIG. 1

(57) Abstract: A rechargeable battery, module or a pack, having different levels of internal resistance that operate at different temperatures are disclosed. In a subfreezing environment, the battery can exhibit high resistance which once operated or activated, generates heat internally to warm up the battery quickly. Once the battery reaches normal operating temperatures, the battery can switch to a low resistance operating mode, thereby delivering superior power and energy despite operating in a very low ambient temperature.



TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

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

Declarations under Rule 4.17:

- *of inventorship (Rule 4.17(iv))*

(88) Date of publication of the international search report:

20 August 2015

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/059726**A. CLASSIFICATION OF SUBJECT MATTER****H01M 10/36(2006.01)i, H01M 10/63(2014.01)i, H01M 2/10(2006.01)i**

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 10/36; B60L 3/00; B60L 11/18; H01M 2/30; H01M 2/34; H01M 2/10; H01M 10/50; H01H 61/00; H01M 10/63

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & keywords: battery, terminal, internal resistance, temperature, switch

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2010-205710 A (TOYOTA MOTOR CORPORATION) 16 September 2010 See abstract; paragraphs [0002] and [0007]-[0042]; claim 1; figures 1-4.	1-29
Y	US 2006-0275653 A1 (CHANG, SUNG KYUN et al.) 7 December 2006 See abstract; paragraphs [0035]-[0046]; claims 1-20; figures 1-2.	1-29
Y	JP 2009-118729 A (DENSO CORPORATION) 28 May 2009 See abstract; paragraphs [0044]-[0045], [0058]-[0061], [0101], [0125]-[0134] and [0139]; claims 1-8 and 13-16; figures 2, 4, 15 and 21-22.	2, 7-9, 11-13
A	JP 2009-231243 A (SANYO ELECTRIC CO., LTD. et al.) 8 October 2009 See abstract; paragraphs [0021]-[0035]; claims 1-5; figures 2-5.	1-29
A	JP 2005-285624 A (SANYO ELECTRIC CO., LTD.) 13 October 2005 See abstract; paragraphs [0027]-[0041]; claims 1-3; figure 1.	1-29



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

26 June 2015 (26.06.2015)

Date of mailing of the international search report

26 June 2015 (26.06.2015)

Name and mailing address of the ISA/KR

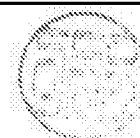
International Application Division
Korean Intellectual Property Office
189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan City, 302-701,
Republic of Korea

Facsimile No. +82-42-472-7140

Authorized officer

LEE, Dong Wook

Telephone No. +82-42-481-8163



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2014/059726

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2010-205710 A	16/09/2010	JP 05359390 B2	04/12/2013
US 2006-0275653 A1	07/12/2006	CN 101171704 A	30/04/2008
		CN 101171704 B	16/11/2011
		JP 05372495 B2	18/12/2013
		JP 05723925 B2	27/05/2015
		JP 2008-541374 A	20/11/2008
		JP 2013-239442 A	28/11/2013
		KR 10-0786941 B1	17/12/2007
		KR 10-2006-0116723 A	15/11/2006
		US 8574733 B2	05/11/2013
		WO 2006-121290 A1	16/11/2006
JP 2009-118729 A	28/05/2009	JP 05169715 B2	27/03/2013
JP 2009-231243 A	08/10/2009	JP 05315742 B2	16/10/2013
JP 2005-285624 A	13/10/2005	None	