

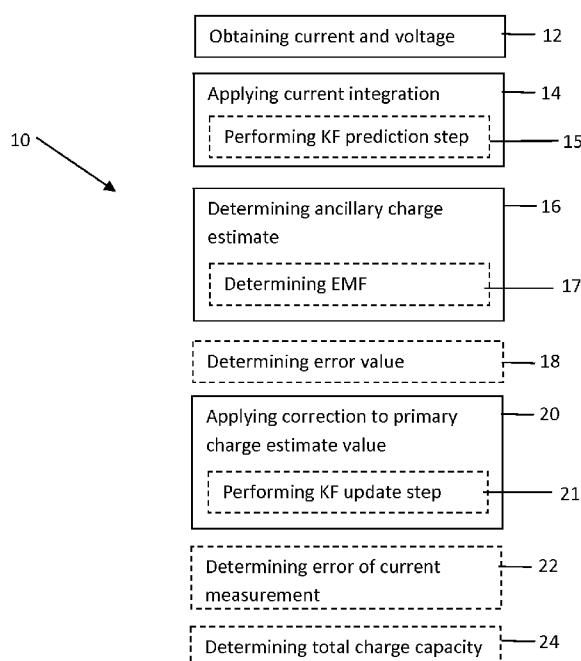


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- (71) **Applicant:** VLAAMSE INSTELLING VOOR TECHNOLOGISCH ONDERZOEK NV (VITO NV) [BE/BE]; Boeretang 200, B-2400 Mol (BE).
- (72) **Inventor:** COENEN, Peter; Craenenbroekstraat 8, B-3380 Glabbeek (BE).
- (74) **Agent:** IPLODGE BVBA; Technologielaan 9, B-3001 Heverlee (BE).

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[Continued on next page]

(54) **Title:** MONITORING CHARGE STORED IN A BATTERY**FIG. 1**

(57) **Abstract:** The present invention relates to a method and a corresponding device, for monitoring a charge of a battery. The method comprises obtaining (12) a battery current measurement value (I_L) and a battery voltage measurement value (V_L), and applying (14) a current integration method to update a primary charge estimate value representative of the charge stored in the battery by taking into account the battery current measurement value (I_L). The method further comprises determining (16) an ancillary charge estimate value representative of the charge stored in the battery using a battery model taking into account the battery voltage measurement value (V_L), and determining (18) an error value for said ancillary charge estimate value, in which the error value expresses the reliability of the battery model taking the battery voltage measurement value (V_L) into account. The method also comprises applying (20) a correction to the primary charge estimate value as function of the ancillary charge estimate value and the error value. Interpretation of the correction applied in this manner allows determination of current sensor offset and battery capacity change.



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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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A. CLASSIFICATION OF SUBJECT MATTER

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ADD.

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)

G01R B60L

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	WO 2013/051241 A1 (CALSONIC KANSEI CORP [JP]; UNIV KEIO [JP]) 11 April 2013 (2013-04-11) paragraphs [0001] - [0075]; claims 1-4; figures 1-9 & US 2014/257726 A1 (BABA ATSUSHI [JP] ET AL) 11 September 2014 (2014-09-11) paragraphs [0001] - [0007], [0032] - [0097]; claims 1,3,4; figures 1-9 -----	1-15
X	WO 2012/098770 A1 (CALSONIC KANSEI CORP [JP]; UNIV KEIO [JP]; BABA ATSUSHI [JP]; ADACHI S) 26 July 2012 (2012-07-26) paragraphs [0001] - [0054]; claims 1-3; figures 1-6 -/-	1-15



Further documents are listed in the continuation of Box C.



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European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Bilzer, Claus

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	-& US 2013/297243 A1 (BABA ATSUSHI [JP] ET AL) 7 November 2013 (2013-11-07) paragraphs [0001] - [0008], [0029] - [0090]; claims 1-4; figures 1-6 ----- EP 1 674 877 A1 (TOYOTA MOTOR CO LTD [JP]) 28 June 2006 (2006-06-28) paragraphs [0001] - [0008], [0023] - [0058]; claims 1-15; figures 1-3 -----	1,9-15

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2014/062858

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2013051241 A1	11-04-2013	CN 103907030 A	02-07-2014
		EP 2765436 A1	13-08-2014
		JP 5404964 B2	05-02-2014
		US 2014257726 A1	11-09-2014
		WO 2013051241 A1	11-04-2013

WO 2012098770 A1	26-07-2012	CN 103328997 A	25-09-2013
		EP 2667211 A1	27-11-2013
		JP 5318128 B2	16-10-2013
		JP 2012149947 A	09-08-2012
		US 2013297243 A1	07-11-2013
		WO 2012098770 A1	26-07-2012

US 2013297243 A1	07-11-2013	CN 103328997 A	25-09-2013
		EP 2667211 A1	27-11-2013
		JP 5318128 B2	16-10-2013
		JP 2012149947 A	09-08-2012
		US 2013297243 A1	07-11-2013
		WO 2012098770 A1	26-07-2012

EP 1674877 A1	28-06-2006	BR PI0415236 A	12-12-2006
		CA 2541537 A1	21-04-2005
		CN 1864072 A	15-11-2006
		EP 1674877 A1	28-06-2006
		JP 4075762 B2	16-04-2008
		JP 2005114646 A	28-04-2005
		RU 2336536 C2	20-10-2008
		US 2006276981 A1	07-12-2006
		WO 2005036192 A1	21-04-2005
