

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
17 November 2011 (17.11.2011)

PCT

(10) International Publication Number
WO 2011/143156 A3

- (51) International Patent Classification:
H02J 7/04 (2006.01)
- (21) International Application Number:
PCT/US2011/035836
- (22) International Filing Date:
10 May 2011 (10.05.2011)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
61/334,403 13 May 2010 (13.05.2010) US
- (71) Applicant (for all designated States except US): **MAS-SACHUSETTS INSTITUTE OF TECHNOLOGY** [US/US]; 77 Massachusetts Avenue, Cambridge, Massachusetts 02139 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **GUIMARAES DO VALLE, Bruno** [BR/US]; 49 Marion Street, Apt. 9C, Brookline, Massachusetts 02446 (US). **WENTZ, Christian, T.** [US/US]; 195 Binney Street, Suite 2220, Cambridge, Massachusetts 02142 (US). **SARPESHKAR, Rahul** [US/US]; 27 Oakland Avenue, Arlington, Massachusetts 02476 (US).
- (74) Agents: **DALY, Christopher, S.** et al.; Daly, Crowley, Mofford & Durkee, LLP, 354A Turnpike Street, Suite 301A, Canton, MA 02021 (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, 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, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, 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, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, 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, 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))

- (88) Date of publication of the international search report:
12 January 2012

(54) Title: BATTERY CHARGER CIRCUIT AND CONTROL SCHEMES

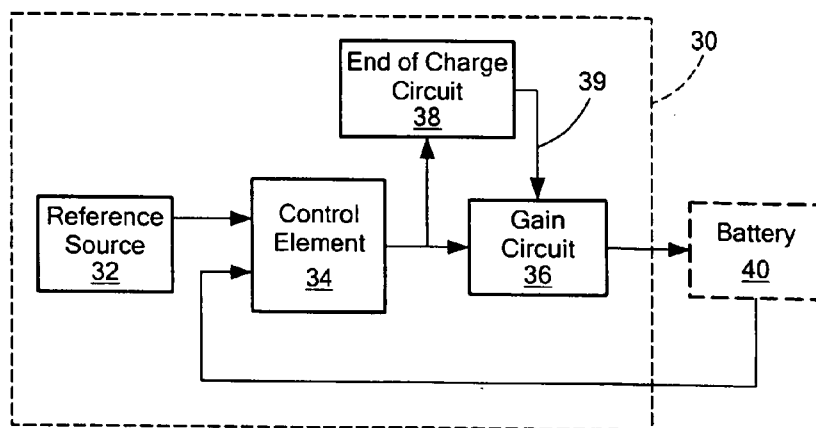


FIG. 2A

(57) Abstract: Described is a battery charger circuit for charging a battery. The battery charger circuit comprises a control element having a first input configured to receive an input from a reference source, a second input configured to receive an input from the battery and an output, said control element having an output current response characteristic which varies with respect to the battery input such that said control element implements a saturating function that causes the charging current of the battery to automatically transition between a constant current operating mode and a constant voltage operating mode or a constant voltage operating mode to a constant current operating mode.



WO 2011/143156 A3

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2011/035836

A. CLASSIFICATION OF SUBJECT MATTER
INV. H02J7/04
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)
H02J
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 practical, 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	US 2010/079127 A1 (GRANT MATTHEW A [US]) 1 April 2010 (2010-04-01) paragraphs [0002], [0003] paragraphs [0047], [0048] paragraph [0052] paragraphs [0057], [0059] paragraph [0029] - paragraph [0031] paragraphs [0026], [0027] figures 2, 3, 6, 9	1-27
X	US 2009/295338 A1 (HAWAWINI SHADI [US] ET AL) 3 December 2009 (2009-12-03) paragraph [0006] paragraph [0015] - paragraph [0017] figures 2, 3b, 4, 5 ----- -/--	1,2,5-8, 11,17, 18,25-27

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 document 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 21 November 2011	Date of mailing of the international search report 29/11/2011
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Roider, Anton

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2011/035836

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 2008/203974 A1 (MANAI BILAL [FR] ET AL) 28 August 2008 (2008-08-28) paragraph [0003] paragraph [0021] paragraph [0053] - paragraph [0055] claim 1 figures 1, 2, 7, 15 -----	1,2,5-8, 11,17, 18,25-27
X	JP 2009 225594 A (RICOH KK) 1 October 2009 (2009-10-01) abstract -----	1,2,5-8, 11,17, 18,25-27
X	US 2008/197811 A1 (HARTULAR ALEX [US] ET AL) 21 August 2008 (2008-08-21) paragraphs [0024], [0028] figure 5 -----	1,17, 25-27
X	US 2005/253560 A1 (POPESCU-STANESTI VLAD MIHAIL [US] ET AL) 17 November 2005 (2005-11-17) paragraphs [0021], [0022] paragraphs [0042], [0047] figure 5 -----	1,17, 25-27

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/US2011/035836

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
US 2010079127	A1	01-04-2010	CN 101714818 A CN 201541197 U US 2010079127 A1	26-05-2010 04-08-2010 01-04-2010

US 2009295338	A1	03-12-2009	NONE	

US 2008203974	A1	28-08-2008	CN 101617455 A DE 112008000457 T5 TW 200843285 A US 2008203974 A1 WO 2008103465 A1	30-12-2009 21-01-2010 01-11-2008 28-08-2008 28-08-2008

JP 2009225594	A	01-10-2009	NONE	

US 2008197811	A1	21-08-2008	CN 101286650 A TW 200849764 A US 2008197811 A1 US 2010264882 A1	15-10-2008 16-12-2008 21-08-2008 21-10-2010

US 2005253560	A1	17-11-2005	TW I271016 B US 2005253560 A1	11-01-2007 17-11-2005
