

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
22 January 2009 (22.01.2009)

PCT

(10) International Publication Number
WO 2009/012018 A3

(51) International Patent Classification:

B60L 11/18 (2006.01) **H02J 7/00** (2006.01)

(21) International Application Number:

PCT/US2008/067670

(22) International Filing Date: 20 June 2008 (20.06.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

11/779,837 18 July 2007 (18.07.2007) US

(71) Applicant (for all designated States except US): **TESLA MOTORS, INC.** [US/US]; 1050 Bing Street, San Carlos, California 94070 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **KELTY, Kurt Russell** [US/US]; 735 Homer Avenue, Palo Alto, California 94301 (US). **BERDICHEVSKY, Eugene Michael** [US/US]; 16 Norwich Street, San Francisco, California 94110 (US).

(74) Agents: **STEFFEY, Charles E.** et al.; Schwegman, Lundberg, Woessner & Kluth, P.A., P.O. Box 2938, Minneapolis, Minnesota 55402 (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, 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, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, 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, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) Date of publication of the international search report:
14 May 2009

(54) Title: BATTERY CHARGING BASED ON COST AND LIFE

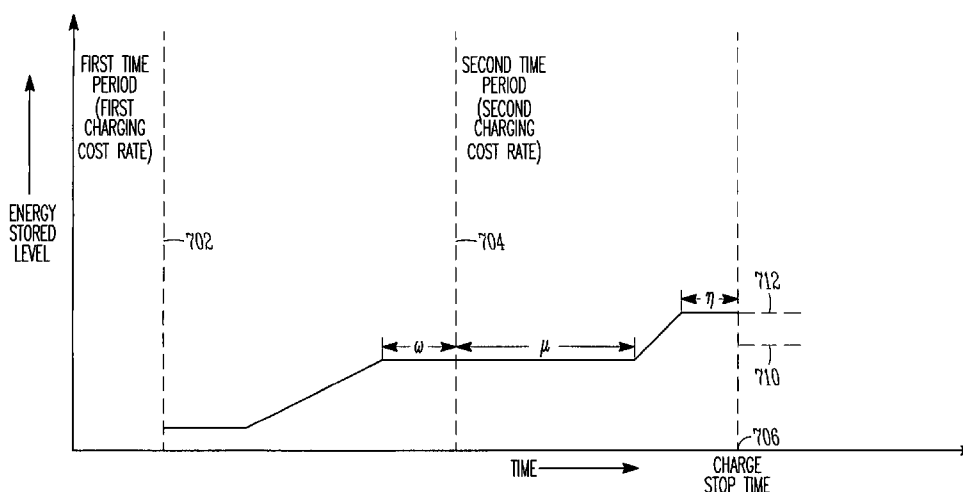


FIG. 7

(57) Abstract: One embodiment of the present subject matter includes a system that includes a battery, an electric vehicle, the battery coupled to the electric vehicle to propel the electric vehicle, and a charging circuit to charge the battery. The embodiment includes a charging cost circuit to estimate a charging cost rate and to turn on the charging circuit. The embodiment also includes a timer circuit to provide a time signal to the charging cost circuit. The embodiment is configured such that the charging cost circuit is to turn on the charging circuit during a first time period (702) in which the charging cost rate is below a first threshold until the battery reaches a first energy stored level (710), and to turn on the charging circuit during a second time period (704) in which the charging cost rate is above the first threshold.

WO 2009/012018 A3

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2008/067670

A. CLASSIFICATION OF SUBJECT MATTER
 INV. B60L11/18 H02J7/00

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)

B60L 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 6 545 449 B2 (UEDA TOSHIFUMI [JP] ET AL) 8 April 2003 (2003-04-08) column 3, line 37 - column 5, line 4; figures 1,2	1,4,6,10
A	US 5 467 006 A (SIMS RONALD I [US]) 14 November 1995 (1995-11-14) the whole document	
A	US 6 335 610 B1 (WINSTEAD VINCENT JOHN [US]) 1 January 2002 (2002-01-01) the whole document	
A	US 2005/127855 A1 (WOBLEN ALOYS [DE]) 16 June 2005 (2005-06-16) abstract paragraphs [0002], [0035] - [0039], [0041], [0042]; claims 1,3,4,6-14	
	----- -/--	

☒ 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

6 October 2008

Date of mailing of the international search report

25/03/2009

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

Lorenzo Feijoo, S

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2008/067670 .

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2004/164616 A1 (OBAYASHI KAZUYOSHI [JP] ET AL) 26 August 2004 (2004-08-26) paragraphs [0009], [0010], [0028] - [0032], [0037], [0044] - [0050], [0052] - [0058]; claims 1,4,5 -----	
A	US 7 013 205 B1 (HAFNER JAMES LEE [US] ET AL) 14 March 2006 (2006-03-14) abstract column 3, line 25 - line 56 column 5, line 3 - line 59 -----	
A	US 2004/074682 A1 (FUSSEY PETER MICHAEL [GB] ET AL) 22 April 2004 (2004-04-22) paragraphs [0010] - [0012], [0042] -----	
A	US 2005/237029 A1 (TAKEZAWA HIDEHARU [JP] ET AL) 27 October 2005 (2005-10-27) the whole document -----	
A	US 5 650 710 A (HOTTA YOSHIHIKO [JP]) 22 July 1997 (1997-07-22) the whole document -----	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2008/067670

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 allsearchable 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 reportcovers 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.:

1-17

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: 1-17

Charging the battery of an electric vehicle in two periods of time and determining the charging cost rate, in the first period the battery is charged to a first energy stored level.

2. claims: 18-20

Charging a battery of an electric vehicle to a percentage of capacity that ensures powering of the vehicle through a user selected driving range.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2008/067670

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6545449	B2	08-04-2003	DE 60204810 D1 DE 60204810 T2 EP 1249886 A1 JP 2002315218 A KR 20020079572 A TW 257725 B US 2002145402 A1	04-08-2005 27-04-2006 16-10-2002 25-10-2002 19-10-2002 01-07-2006 10-10-2002
US 5467006	A	14-11-1995	DE 4337978 A1 GB 2273614 A JP 6225404 A	23-06-1994 22-06-1994 12-08-1994
US 6335610	B1	01-01-2002	CA 2351911 A1 JP 2002118905 A	30-12-2001 19-04-2002
US 2005127855	A1	16-06-2005	AT 336819 T AU 2003215541 A1 CN 1623262 A DK 1470627 T3 WO 03062018 A2 EP 1470627 A2 ES 2266823 T3 JP 4071197 B2 JP 2005515747 T KR 20060115923 A	15-09-2006 02-09-2003 01-06-2005 18-12-2006 31-07-2003 27-10-2004 01-03-2007 02-04-2008 26-05-2005 10-11-2006
US 2004164616	A1	26-08-2004	DE 102004009146 A1 FR 2851516 A1 JP 3896973 B2 JP 2004260908 A	02-09-2004 27-08-2004 22-03-2007 16-09-2004
US 7013205	B1	14-03-2006	WO 2006057889 A2	01-06-2006
US 2004074682	A1	22-04-2004	AT 372909 T AU 2386902 A CA 2429690 A1 CN 1476396 A DE 60130484 T2 EP 1347887 A1 ES 2294049 T3 WO 0242110 A1 JP 3927119 B2 JP 2004514399 T	15-09-2007 03-06-2002 30-05-2002 18-02-2004 19-06-2008 01-10-2003 01-04-2008 30-05-2002 06-06-2007 13-05-2004
US 2005237029	A1	27-10-2005	NONE	
US 5650710	A	22-07-1997	JP 3554057 B2 JP 8214412 A	11-08-2004 20-08-1996