



(51) International Patent Classification:

H01M 8/04 (2006.01) *H01M 10/44* (2006.01)
H02J 7/32 (2006.01) *B60L 11/18* (2006.01)

(21) International Application Number:

PCT/US2009/034367

(22) International Filing Date:

18 February 2009 (18.02.2009)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/064,143 19 February 2008 (19.02.2008) US

(71) Applicant (for all designated States except US):
BLOOM ENERGY CORPORATION [US/US]; 1252
Orleans Drive, Sunnyvale, CA 94089-1137 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **SRIDHAR, K., R.**
[US/US]; C/o Bloom Energy Corporation, 1252 Orleans
Drive, Sunnyvale, CA 94089-1137 (US). **AARON, Stu-**
art [US/US]; C/o Bloom Energy Corporation, 1252 Or-
leans Drive, Sunnyvale, CA 94089-1137 (US). **BAL-**
LANTINE, Arne [US/US]; C/o Bloom Energy Corpora-
tion, 1252 Orleans Drive, Sunnyvale, CA 94089-1137
(US). **LIGHT, Peter** [US/US]; C/o Bloom Energy Cor-
poration, 1252 Orleans Drive, Sunnyvale, CA

94089-1137 (US). **REYNOLDS, Scott** [US/US]; C/o
Bloom Energy Corporation, 1252 Orleans Drive, Sunny-
vale, CA 94089-1137 (US). **SRINIVASAN, Ramesh** [IN/
IN]; C/o Bloom Energy Corporation, 1252 Orleans Drive,
Sunnyvale, CA 94089-1137 (US). **GURUNATHAN,**
Ranganathan [IN/IN]; C/o Bloom Energy Corporation,
1250 Orleans Drive, Sunnyvale, CA 94089-1137 (US).

(74) Agents: **RADOMSKY, Leon** et al.; Foley & Lardner
LLP, 3000 K Street NW, Washington, DC 22428 (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, ST, 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, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR),

[Continued on next page]

(54) Title: FUEL CELL SYSTEM FOR CHARGING AN ELECTRIC VEHICLE

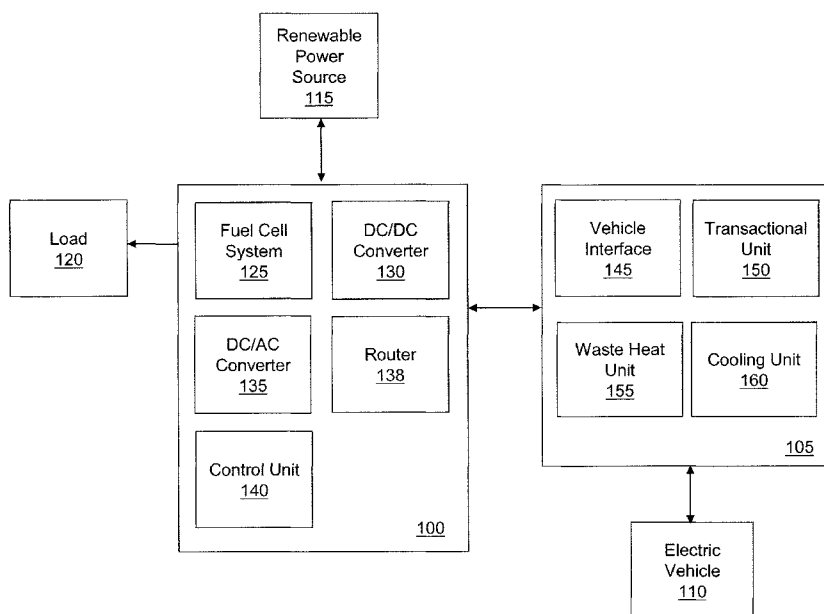


Fig. 1

(57) Abstract: A method for charging electric vehicles includes receiving information regarding an electric vehicle. At least a portion of the information is received through a vehicle interface configured to place a battery of the electric vehicle into electrical communication with a fuel cell system. A charge is delivered from the fuel cell system to the battery of the electric vehicle through the vehicle interface without use of a direct current to alternating current (DC/AC) converter. The charge is delivered based at least in part on the information.



OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML,
MR, NE, SN, TD, TG).

— *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))*

Published:

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

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

12 November 2009

A. CLASSIFICATION OF SUBJECT MATTER**H01M 8/04(2006.01)i, H02J 7/32(2006.01)i, H01M 10/44(2006.01)i, B60L 11/18(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)

IPC 9: H01M, B60L, F02N, H02P

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)

eKOMPASS (KIPO internal) and keywords "electric vehicle, interface, battery, charge, waste heat, router, converter, fuel cell, and similar terms"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5726551 A (MIYAZAKI et al.) 10 March 1998 See abstract, Figure 6, column 2, lines 14-16 and column 2, line 40 to column 3, line 26 and column 6, lines 10-23 and lines 44-46, and claims 1-18	1-3
A	US 6326765 B1 (Hughes et al.) 04 December 2001 See abstract, Figures 1-5, column 1, lines 9-11 and lines 50-59 and column 2, line 50 to column 3, line 54 and column 4, line 15 to column 5, line 28 and column 7, lines 25-33, and claims 1-14	1-31
A	JP 15-333707 A (TOYOTA MOTOR CORP.) 21 November 2003 See abstract, Figures 1 and 5-6, paragraphs [0019] and [0022] to [0025] and [0030] and [0040]], and claims 1-17	1-31
A	US 6847127 B1 (Lee) 25 January 2005 See abstract, Figures 1 and 4, column 4, lines 40-67 and column 5, lines 15-55 and column 6, lines 40-55, and claims 1-15	1-31



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 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

24 SEPTEMBER 2009 (24.09.2009)

Date of mailing of the international search report

25 SEPTEMBER 2009 (25.09.2009)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
Government Complex-Daejeon, 139 Seonsa-ro, Seo-
gu, Daejeon 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

KIM, Kyong Min

Telephone No. 82-42-481-8173



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2009/034367**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:

- I. claims 1-11 directed to a method for charging electric vehicle receiving information regarding an electric vehicle and delivering a charge from the fuel cell system to the battery of the electric vehicle through the vehicle interface.
- II. Claims 12-22 directed to a charging station comprising a transactional unit, a vehicle interface, and a waste heat unit.
- III. Claims 23-31 directed to a fuel cell generator system comprising a fuel cell system, a DC/DC converter and a router.

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 fee, this Authority did not invite payment of any additional fee.
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.:

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.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2009/034367

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5726551 A	10.03.1998	CN 1152813 A	25.06.1997
		CN 1052583 C	17.05.2000
		EP 0769837 A2	23.04.1997
		EP 0769837 A3	16.07.1997
		EP 0769837 B1	16.08.2001
		JP 3228097 B2	12.11.2001
		JP 09-117067 A	02.05.1997
		KR 10-1997-0024433 A	30.05.1997
US 6326765 B1	04.12.2001	AU 9311601 A	15.04.2002
		AU 2001-93116 A1	25.09.2001
		CA 2424743 A1	11.04.2002
		CN 1469821 A	21.01.2004
		CN 100384657 C	30.04.2008
		CN 100384657 C	30.04.2008
		EP 1326761 A2	16.07.2003
		JP 2004-510626 A	08.04.2004
		KR 10-2003-0097787 A	31.12.2003
		PA 03002885 A	03.12.2004
		TW 531909 B	11.05.2003
		WO 2002-029956 A3	11.04.2002
JP 2003-333707 A	21.11.2003	JP 3901009 B2	04.04.2007
US 6847127 B1	25.01.2005	DE 10258204 A1	05.02.2004
		JP 2004-040994 A	05.02.2004
		KR 20040001776 A	07.01.2004
		KR 10-0460881 B1	09.12.2004