

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
14 February 2008 (14.02.2008)

PCT

(10) International Publication Number
WO 2008/017946 A3

(51) International Patent Classification:

H01M 8/04 (2006.01)

(21) International Application Number:

PCT/IB2007/002311

(22) International Filing Date: 9 August 2007 (09.08.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

2006-218151 10 August 2006 (10.08.2006) JP

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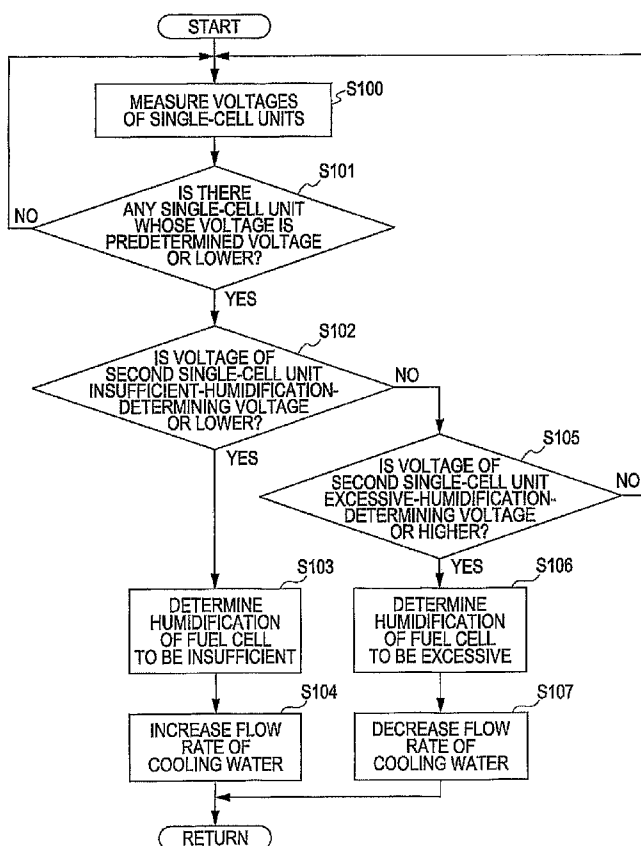
Kanagawa 243-0192 (JP). AOYAMA, Takashi [JP/JP]; c/o NISSAN MOTOR CO., LTD., Intellectual Property Department, 560-2 Okatsukoku, Atsugi-shi, Kanagawa 243-0192 (JP).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, 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, 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, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL,

[Continued on next page]

(54) Title: FUEL CELL SYSTEM



(57) Abstract: A fuel cell system including a plurality of single-cell units (30), each of which include an electrolyte membrane (31) disposed between an anode (33) and a cathode (32) and which generate electric power by a reaction of a fuel gas in the anode and an oxidizer gas in the cathode, and a fuel cell (1) in which the plurality of single-cell units are stacked. A plurality of voltage measurement devices (22) measure the voltages of the single-cell units, respectively. A control unit (20) determines the humidification state of the fuel cell based on the voltage of a second single-cell unit wherein when the voltage of the second single-cell is equal to or lower than an insufficient-humidification-determining voltage which is higher than the predetermined voltage the control unit determines that humidification of the fuel cell is insufficient, disposed in the vicinity of a first single-cell unit, the first single-cell unit having a voltage that is equal to or lower than a predetermined voltage.

WO 2008/017946 A3



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*

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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

26 June 2008

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2007/002311

A. CLASSIFICATION OF SUBJECT MATTER

INV. H01M8/04

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2004/033399 A1 (IMAMURA TOMONORI [JP] ET AL) 19 February 2004 (2004-02-19) abstract paragraphs [0004] - [0013] paragraph [0034] - paragraph [0083] paragraph [0107]	1-15, 17-20
X	JP 2002 164065 A (NISSAN MOTOR) 7 June 2002 (2002-06-07) abstract	1-15, 17-20
X	WO 2006/069070 A (NISSAN MOTOR [JP]; NISSAN NORTH AMERICA [US]; ONO YOSHITAKA [JP]; SHIM) 29 June 2006 (2006-06-29) paragraph [0005] - paragraph [0007] paragraph [0035] - paragraph [0044] paragraph [0047] - paragraph [0049] paragraph [0055] - paragraph [0058]	1-15, 17-20
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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.

Z document member of the same patent family

Date of the actual completion of the international search

29 January 2008

Date of mailing of the international search report

25/04/2008

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INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2007/002311

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 2002/192520 A1 (NONOBE YASUHIRO [JP]) 19 December 2002 (2002-12-19) paragraph [0005] - paragraph [0006] paragraph [0015] paragraph [0028] paragraph [0032] paragraph [0073] - paragraph [0078] -----	1-15, 17-20
X	US 2002/039674 A1 (SUZUKI MOTOHIRO [JP] ET AL) 4 April 2002 (2002-04-04) paragraph [0018] - paragraph [0020] paragraph [0081] -----	1-15, 17-20

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2007/002311

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 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.:

see additional sheet

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: 1-15,17-20

A fuel cell system according to claim 1 with additional details of the voltage measurement device.

2. claims: 16,21

A fuel cell system with a cooling water flow path and a water clogging unit that determines water clogging of the cooling water flow path.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2007/002311

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2004033399 A1	19-02-2004	DE 10334556 A1 JP 2004127915 A	26-02-2004 22-04-2004
JP 2002164065 A	07-06-2002	NONE	
WO 2006069070 A	29-06-2006	JP 2006202718 A	03-08-2006
US 2002192520 A1	19-12-2002	NONE	
US 2002039674 A1	04-04-2002	NONE	