

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
18 November 2004 (18.11.2004)

PCT

(10) International Publication Number
WO 2004/100298 A3

(51) International Patent Classification⁷: **H01M 8/04**

(21) International Application Number:
PCT/CA2004/000653

(22) International Filing Date: 3 May 2004 (03.05.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/430,903 6 May 2003 (06.05.2003) US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, 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, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

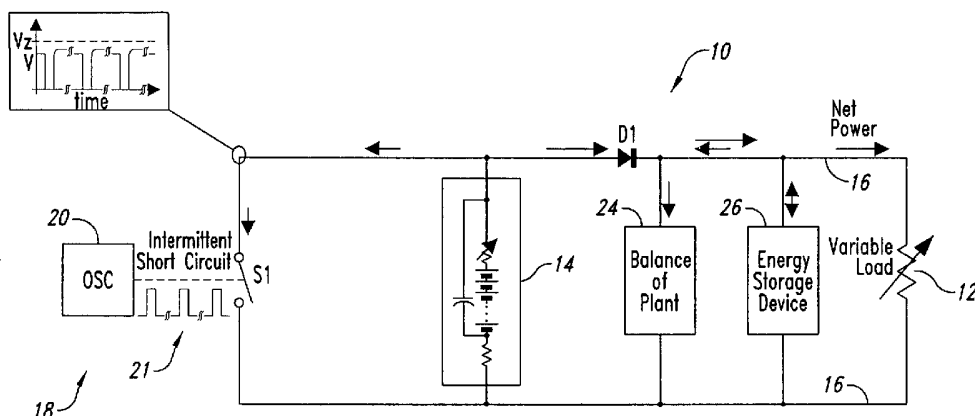
Published:

- 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:
28 April 2005

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD AND APPARATUS FOR IMPROVING THE PERFORMANCE OF A FUEL CELL ELECTRIC POWER SYSTEM



(57) Abstract: Current pulsing improves the performance of fuel cells in a fuel cell stack based power system. Voltage clamping limits the voltage peaks that occur after a current pulse. In a hybrid power system, an electric storage device supplies the loads during current pulsing. The electric storage device may sink current to achieve the voltage clamping, and/or power system may employ other the voltage clamping circuits.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/CA2004/000653

A. CLASSIFICATION OF SUBJECT MATTER IPC 7 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) IPC 7 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, WPI Data, PAJ		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	BERNAY C ET AL: "Prospects of different fuel cell technologies for vehicle applications" JOURNAL OF POWER SOURCES, ELSEVIER SEQUOIA S.A. LAUSANNE, CH, vol. 108, no. 1-2, 1 June 2002 (2002-06-01), pages 139-152, XP004355467 ISSN: 0378-7753 page 140, right-hand column, paragraph 5 page 145, right-hand column, paragraph 5 page 149, right-hand column, paragraph 3 ----- -/--	1-11, 20-24, 26-40
☒ Further documents are listed in the continuation of box C. ☒ Patent family members are listed in 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 19 October 2004		Date of mailing of the international search report 09. 03. 2005
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016		Authorized officer Standaert, F

INTERNATIONAL SEARCH REPORT

International Application No
PCT/CA2004/000653

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	MAHESH MURTHY, ET AL: "The Performance of a PEM Fuel Cell Exposed to Transient CO Concentrations" ELECTROCHEMICAL AND SOLID STATE LETTERS, [Online] October 2001 (2001-10), pages 1-22, XP002300588 Retrieved from the Internet: URL:http://www.gore.com/fuelcells/pdfs/1.pdf> [retrieved on 2004-10-13] page 3, paragraph 1 page 4, line 27 - line 31 -----	1-11, 20-24, 26-40
A	MARR C ET AL: "Composition and performance modelling of catalyst layer in a proton exchange membrane fuel cell" JOURNAL OF POWER SOURCES, ELSEVIER SEQUOIA S.A. LAUSANNE, CH, vol. 77, no. 1, 1999, pages 17-27, XP004156276 ISSN: 0378-7753 page 21, left-hand column, line 34 - line 38 -----	1-11, 20-40
A	EP 0 961 334 A (MATSUSHITA ELECTRIC IND CO LTD) 1 December 1999 (1999-12-01) paragraphs [0049], [0050], [0058] -----	1-11, 20-40

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/CA2004/000653

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0961334	A	01-12-1999	JP 3460793 B2	27-10-2003
			JP 11345624 A	14-12-1999
			JP 3469091 B2	25-11-2003
			JP 2000003718 A	07-01-2000
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			CN 1237804 A ,C	08-12-1999
			EP 0961334 A2	01-12-1999
			US 6187464 B1	13-02-2001

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2004/000653

Box 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 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 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.:
1-11, 26-40 (completely), 20-25 (partially)

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ 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: 1-11, 26-40 (completely), 20-25 (partially)

Clamping a fuel cell voltage below a maximum fuel cell voltage after current pulsing (shorting) the cell.

2. claims: 12-19, 41-48 (completely), 20-25 (partially)

Supplying power from the electriocal storage device to the load while current pulsing (shorting) the cell.
