



## (51) International Patent Classification:

F23D 14/32 (2006.01) F23D 14/28 (2006.01)  
F23D 14/22 (2006.01) F23D 14/58 (2006.01)

## (21) International Application Number:

PCT/GB20 12/050892

## (22) International Filing Date:

23 April 2012 (23.04.2012)

## (25) Filing Language:

English

## (26) Publication Language:

English

## (30) Priority Data:

|           |                              |    |
|-----------|------------------------------|----|
| 1106826.9 | 21 April 2011 (21.04.2011)   | GB |
| 1110399.1 | 20 June 2011 (20.06.2011)    | GB |
| 1118771.3 | 31 October 2011 (31.10.2011) | GB |

(71) Applicant (for all designated States except US): **ITM POWER (RESEARCH) LIMITED** [GB/GB]; 22 Atlas Way, Sheffield, South Yorkshire S4 7QQ (GB).

## (72) Inventors; and

(75) Inventors/Applicants (for US only): **NEWBOROUGH, Marcus** [GB/GB]; ITM Power Pic, Unit H, Sheffield Business Park, Europa Link, Sheffield South Yorkshire S9 1XU (GB). **ELLIS, Andrew** [GB/GB]; ITM Power Pic, Unit H, Sheffield Business Park, Europa Link, Sheffield South Yorkshire S9 1XU (GB). **DAVIES, Derek** [GB/GB]; 7 Ragley Close, Poynton, Cheshire SK12 1DW (GB).

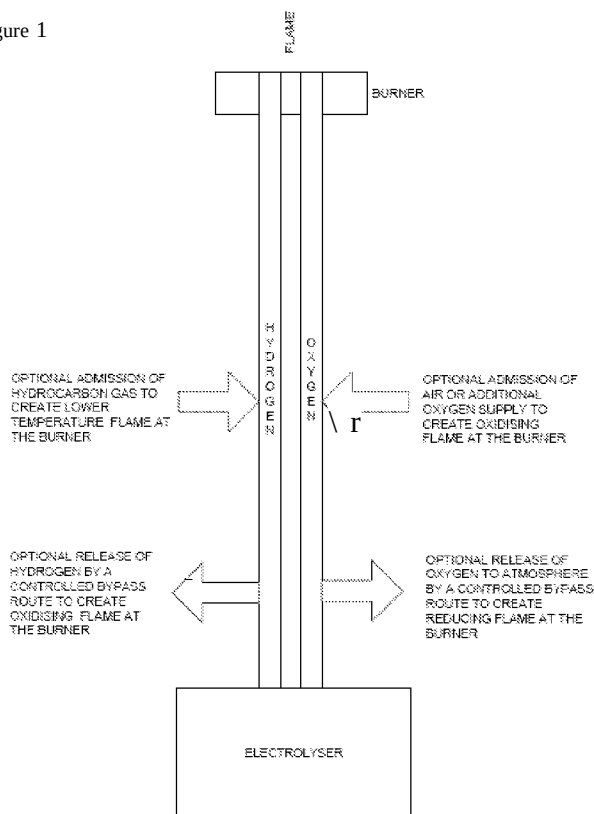
(74) Agent: **STEVENS, Fiona**; Gill Jennings & Every LLP, The Broadgate Tower, 20 Primrose Street, London, Greater London EC2A 2ES (GB).

(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, QA, RO, RS, RU, RW, SC, SD,

[Continued on nextpage]

## (54) Title: BURNER SYSTEM

Figure 1



(57) Abstract: A system comprises a burner having orifices where a flame can be generated, and a water electrolyser producing oxygen and hydrogen streams, which each flow to the burner, and are either completely separate when they leave the electrolyser, or are separated after leaving the electrolyser and before reaching the burner, and wherein the system is adapted to mix the hydrogen and an oxidant together, at, or downstream of the burner orifices. Further, a method of supplying hydrogen and oxidant to a burner, comprises supplying the hydrogen and oxidant separately and mixing them either at, or downstream of the burner orifices wherein the hydrogen is supplied directly from the output of an electrolyser, and the oxidant is preferably oxygen, preferably supplied directly from the output of the same electrolyser.

**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))

13 June 2013

## INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2012/05Q892

A. CLASSIFICATION OF SUBJECT MATTER  
INV. F23D14/32 F23D14/22 F23D14/28 F23D14/58  
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)  
F23D

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)

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         | FR 2 235 092 AI (DEFLASSI EUX PIERRE [FR] )<br>24 January 1975 (1975-01-24)                                                                                                                     | 1-6,8-22              |
| Y         | page 1, line 36 - line 4400<br>page 5, line 3 - line 10<br>page 5, line 30 - line 40<br>page 6, line 3 - line 13<br>page 6, line 22 - line 27<br>page 10, line 28 - line 32<br>figures<br>----- | 7, 14, 15             |
| Y         | DE 100 52 722 AI (LIN YANG CHEN [TW] LIN<br>YANG-CHEN [TW] ) 10 May 2001 (2001-05-10)<br>abstract<br>-----                                                                                      | 7                     |
| X         | EP 0 285 485 AI (AI R LIQUIDE [FR] )<br>5 October 1988 (1988-10-05)                                                                                                                             | 16                    |
| Y         | page 3, lines 6-11; figures<br>-----<br>- / -                                                                                                                                                   | 14, 15                |



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 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

"&amp;" document member of the same patent family

Date of the actual completion of the international search

17 April 2013

Date of mailing of the international search report

23/04/2013

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

Haegeman, Marc

# INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2012/05Q892

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                         | Relevant to claim No. |
|-----------|------------------------------------------------------------------------------------------------------------|-----------------------|
| X         | JP 2006 056743 A (SUMITOMO ELECTRIC INDUSTRIES) 2 March 2006 (2006-03 -02 )<br>the whole document<br>----- | 16 - 19               |
| X         | CN 2 653 323 Y (ZHANG RUNHENG [CN] )<br>3 November 2004 (2004 - 11-03 )<br>the whole document<br>-----     | 1-6,20,<br>22         |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No  
PCT/GB2012/05Q892

| Patent document<br>cited in search report |    | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|-------------------------------------------|----|---------------------|----------------------------|---------------------|
| FR 2235092                                | AI | 24-01-1975          | NONE                       |                     |
| -----                                     |    |                     |                            |                     |
| DE 10052722                               | AI | 10-05-2001          | AU 6655000 A               | 17-05-2001          |
|                                           |    |                     | CA 2322305 AI              | 04-04-2002          |
|                                           |    |                     | DE 10052722 AI             | 10-05-2001          |
|                                           |    |                     | FR 2800393 AI              | 04-05-2001          |
|                                           |    |                     | GB 2367559 A               | 10-04-2002          |
|                                           |    |                     | JP 3420565 B2              | 23-06-2003          |
|                                           |    |                     | JP 2001182934 A            | 06-07-2001          |
|                                           |    |                     | TW 409828 U                | 21-10-2000          |
|                                           |    |                     | US 6372100 BI              | 16-04-2002          |
| -----                                     |    |                     |                            |                     |
| EP 0285485                                | AI | 05-10-1988          | CN 88101392 A              | 05-10-1988          |
|                                           |    |                     | DE 3860179 DI              | 28-06-1990          |
|                                           |    |                     | EP 0285485 AI              | 05-10-1988          |
|                                           |    |                     | FR 2612606 AI              | 23-09-1988          |
|                                           |    |                     | JP S63279014 A             | 16-11-1988          |
| -----                                     |    |                     |                            |                     |
| JP 2006056743                             | A  | 02-03-2006          | NONE                       |                     |
| -----                                     |    |                     |                            |                     |
| CN 2653323                                | Y  | 03-11-2004          | NONE                       |                     |
| -----                                     |    |                     |                            |                     |