Title: PLASMATRON FUEL CONVERTER HAVING DECOUPLED AIR FLOW CONTROL

Abstract: A novel apparatus and method is disclosed for a plasmatron fuel converter ("plasmatron") that efficiently uses electrical energy to produce hydrogen rich gas. The plasmatron (10) has multiple decoupled gas flow apertures or channels (30, 40, 50, 60, 80) for performing multiple functions including fuel atomization, wall protection, plasma shaping, and downstream mixing. In one aspect, the invention is a plasmatron fuel converter comprising a first electrode (20) and a second electrode (24) separated from the first electrode by an electrical insulator (22) and disposed to create a gap with respect to the first electrode (20) so as to form a discharge region (26) adapted to receive a reactive mixture. A power supply (18) is connected to the first and second electrodes and adapted to provide voltage and current sufficient to generate a plasma discharge within the discharge region (26). Fluid flows are established in the vicinity of the plasma discharge region (26) by multiple decoupled flow establishing means.
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, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJK, 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: 6 May 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.
### INTERNATIONAL SEARCH REPORT

**A. CLASSIFICATION OF SUBJECT MATTER**
- IPC(7) : B01J 19/08
- US CL. : 422/186.04; 123/3

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)
  - U.S. : 422/186.04; 123/3

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Category *</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>US 6,322,757 B1 (COHN et al.) 27 November 2001, see Fig. 4, col. 9, lines 16-24 and claim 1.</td>
<td>1-4, 6, 7, 11-13, 16-25, 27, 28 and 30-37</td>
</tr>
<tr>
<td>Y</td>
<td></td>
<td>14, 15, 38 and 39</td>
</tr>
<tr>
<td>A,P</td>
<td>US2003/0221949 A1 (RABINOVICH et al.) 4 December 2003, see abstract.</td>
<td>5, 8-10, 26 and 29</td>
</tr>
</tbody>
</table>

- *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 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 oral disclosure, use, exhibition or other means.
  - "P" document published prior to the international filing date but later than the priority date claimed.

- "I" 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 January 2005 (24.01.2005)

**Date of mailing of the international search report**
- 25 February 2005

**Name and mailing address of the ISA/US**
- Mail Stop PCT, Attn: ISA/US Commissioner for Patents
- P.O. Box 1450
- Alexandria, Virginia 22313-1450
- Facsimile No. (703) 305-3230

**Authorized officer**
- Kishor Mavelyar

**Telephone No.**
- (571) 272-1300

---

Form PCT/ISA/210 (second sheet) (January 2004)