(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
29 January 2009 (29.01.2009)

PCT

(10) International Publication Number
WO 2009/014785 A4

(51) International Patent Classification:
H01M 4/88 (2006.01)

(21) International Application Number:
PCT/US2008/061961

(22) International Filing Date: 30 April 2008 (30.04.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/927,595 3 May 2007 (03.05.2007) US

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(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, 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, MT, NL, NO, 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*
— *with amended claims*

(88) Date of publication of the international search report:
12 March 2009

Date of publication of the amended claims: 14 May 2009

(54) Title: OXYGEN GENERATION FOR BATTLEFIELD APPLICATIONS

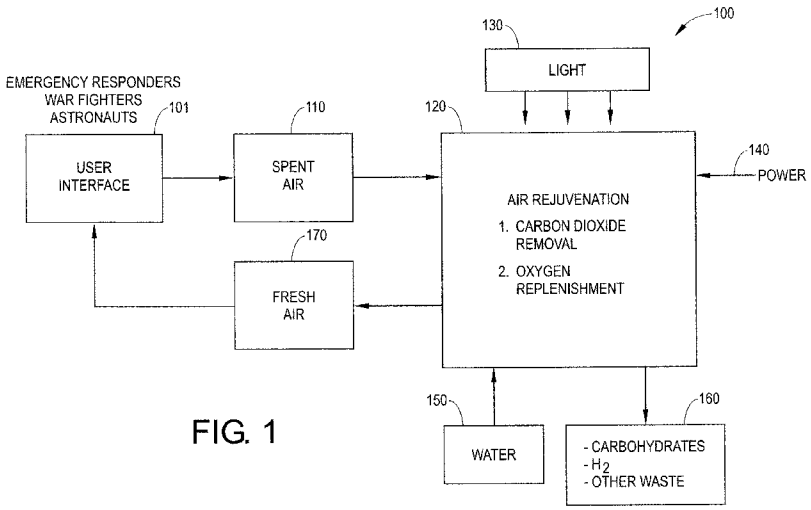

FIG. 1

(57) Abstract: The present invention provides for carbon dioxide removal and fixation using a cell incorporating a carbon dioxide selective film for active/passive transport while simultaneously producing oxygen and an air bladder for use in battlefield applications and the like where oxygen requirements are often extreme.

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AMENDED CLAIMS
received by the International Bureau on 20 March 2009 (20.03.2009)

1. A photolytically energized electrochemical cell comprising:

a gas permeable membrane that is selective for carbon dioxide, having a first side and a second side;

a gas flow chamber located on the first side of the gas permeable membrane;

a porous or gas permeable cathode disposed on the second side of the gas permeable membrane;

an anode electrically connected to the cathode; and

a light activated catalyst layer disposed adjacent to the anode layer.

2. The electrochemical cell of claim 1, further comprising a light transparent window disposed on the light activated catalyst.

3. The electrochemical cell of claim 1, further comprising an ion conductive membrane disposed between the anode and cathode.

4. The electrochemical cell of claim 1, further comprising a catholyte bordering the cathode.

5. The electrochemical cell of claim 1, further comprising an anolyte bordering the anode.

6. (Cancelled)

7. The electrochemical cell of claim 1, wherein the electrochemical cell converts carbon dioxide from a gas flow to carbonaceous materials.

8. The electrochemical cell of claim 1, comprising a living enclosure with a gas flow connecting the living enclosure to the gas flow chamber of the electrochemical cell.

9. The electrochemical cell of claim 1, wherein hydrogen ions flow from the cathode to the anode.

10. The electrochemical cell of claim 1, comprising an anolyte in contact with the light activated catalyst and a catholyte in contact with the cathode.

11. An air maintenance system comprising:

a. a user interface for a human or animal;

b. a separator for separating carbon dioxide from a gas flowing from the enclosure; and

c. an electrochemical cell comprising a photolytic anode and a cathode separated by a cation exchange membrane, wherein oxygen for the enclosure is generated at the photolytic anode and carbon dioxide is reduced to a carbonaceous material at the cathode; and a gas flow chamber for receiving gas flow from the separator; and a gas permeable membrane disposed between the gas flow chamber and the cathode, and wherein the cathode allows gas flow to a catholyte.

12. The air maintenance system of claim 10, wherein the cathode is porous.

13. The air maintenance system of claim 10, further comprising an air bladder between the user interface and the electrochemical cell for receiving gas from the electrochemical cell.

14. (Cancelled)