

[54] SYSTEM FOR THE EXTRACTION AND UTILIZATION OF OXYGEN FROM FLUIDS

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[*] Notice: The portion of the term of this patent subsequent to Jul. 29, 2003 has been disclaimed.

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[22] Filed: Apr. 25, 1986

Related U.S. Application Data

[62] Division of Ser. No. 653,850, Sep. 24, 1984, Pat. No. 4,602,987.

[51] Int. Cl.⁴ C25B 1/02

[52] U.S. Cl. 204/129; 204/265; 204/266; 204/DIG. 4; 429/12; 429/122; 123/2; 123/22; 123/DIG. 13; 55/16; 55/158

[58] Field of Search 204/129, 265, 266, 263, 204/DIG. 4, DIG. 6; 123/2, 22, DIG. 13; 429/12, 122; 55/16, 158

[56] References Cited

U.S. PATENT DOCUMENTS

- 4,251,452 2/1981 McAuliffe et al. 260/429 R
4,475,994 10/1984 Gagné et al. 204/129
4,542,010 9/1985 Roman et al. 55/16

OTHER PUBLICATIONS

International Application No. PCT/US85/02124; SRI

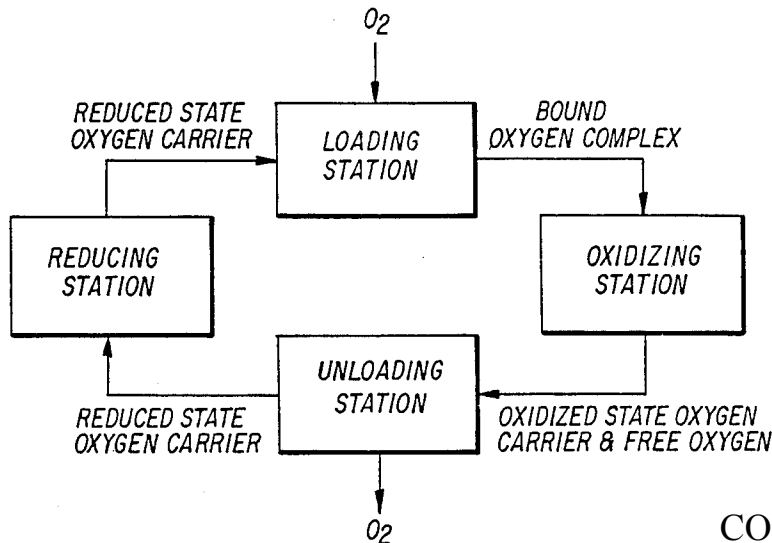
International (Roberts et al.), filed: Oct. 28, 1985 entitled, "Gas Separation Process".

Primary Examiner—R. L. Andrews
Attorney, Agent, or Firm—Oblon, Fisher, Spivak, McClelland & Maier

[57] ABSTRACT

A method for extracting oxygen from a fluid environment, which comprises the steps of (1) contacting a first fluid environment containing oxygen with a first surface of a first oxygen permeable membrane having a first and a second surface, wherein the membrane separates the environment from an interior space of a closed container, (2) transporting a carrier fluid into contact with the second surface of the membrane, wherein the carrier fluid is confined in the closed container and the carrier fluid contains a binding-state oxygen carrier, whereby oxygen which diffuses through the membrane binds to the carrier to give a bound oxygen complex, (3) transporting the carrier fluid containing the bound oxygen complex to a first electrode compartment of an electrochemical cell which forms a second portion of the closed container, (4) electrochemically modifying the binding-state oxygen carrier to an oxidation state having less binding affinity for oxygen, thereby releasing free oxygen into the carrier fluid and producing a nonbinding-state oxygen carrier, (5) removing oxygen from the carrier fluid, (6) transporting the carrier fluid containing the nonbinding-state oxygen carrier to a second electrode compartment of an electrochemical cell which forms a third portion of the closed container, and (7) electrochemically modifying the nonbinding-state oxygen carrier to the binding-state oxygen carrier, is disclosed along with an apparatus useful for carrying out the method of the invention.

42 Claims, 15 Drawing Sheets



CO2 Solutions Inc.
Exhibit 2001

Akermin, Inc. v. CO2 Solutions Inc.

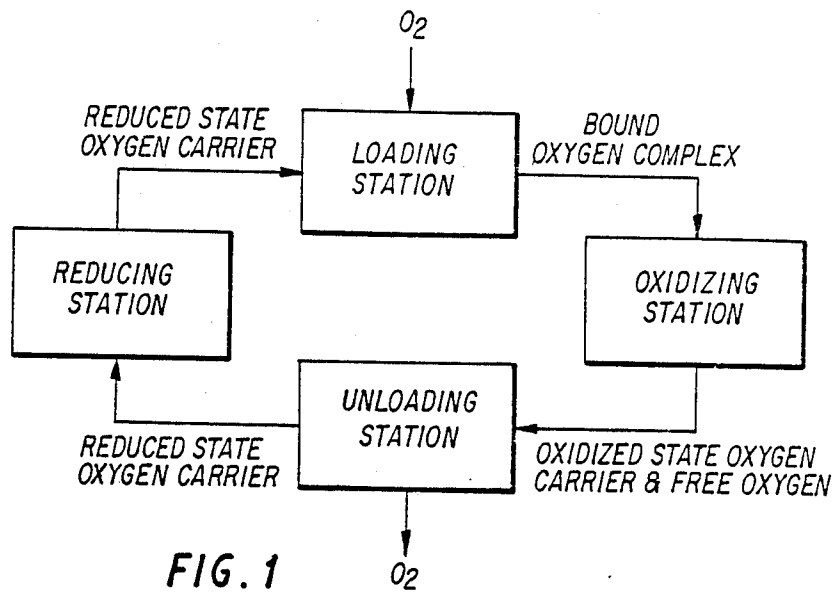


FIG. 1

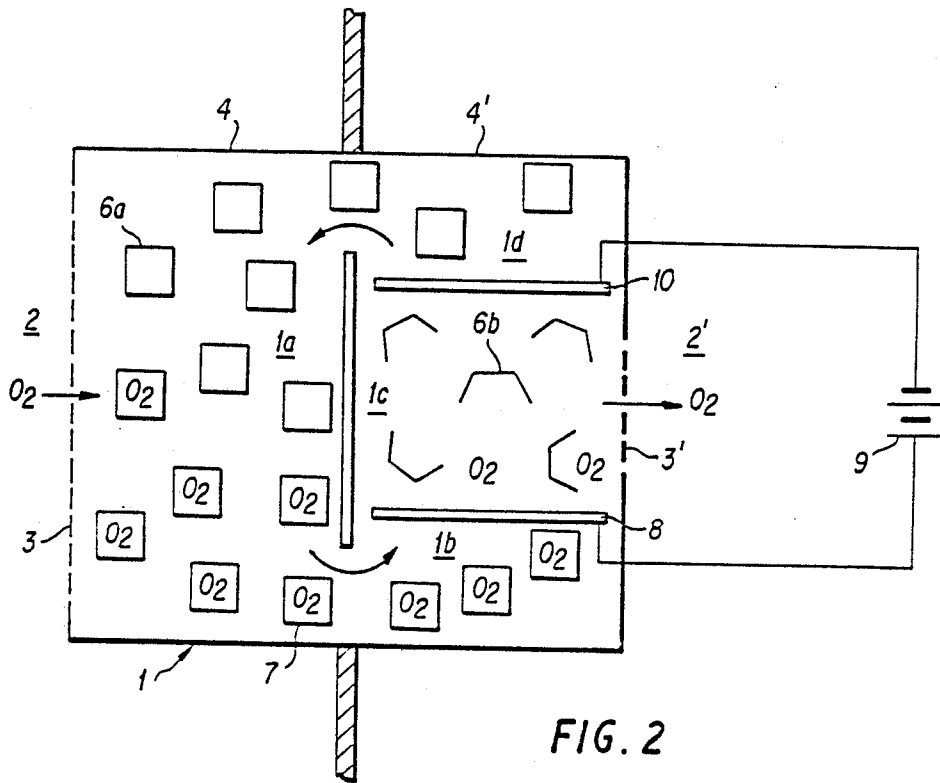


FIG. 2

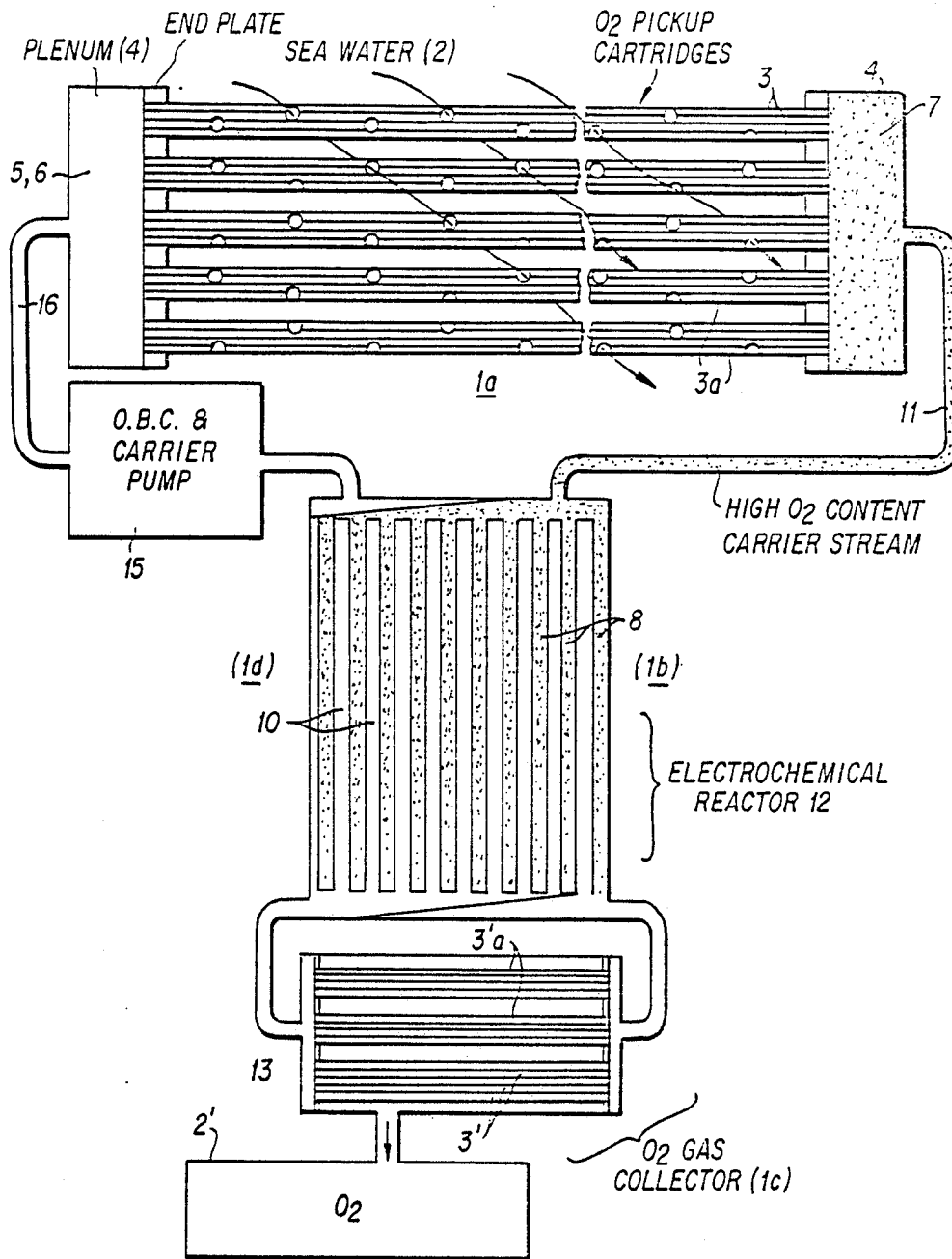


FIG. 4
O₂ EXTRACTION FLUID SYSTEM

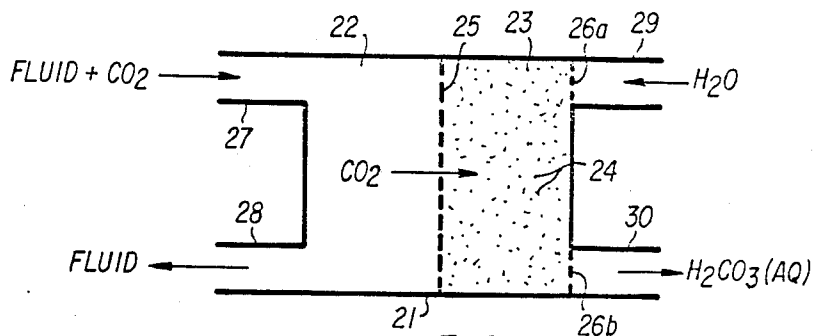


FIG. 6

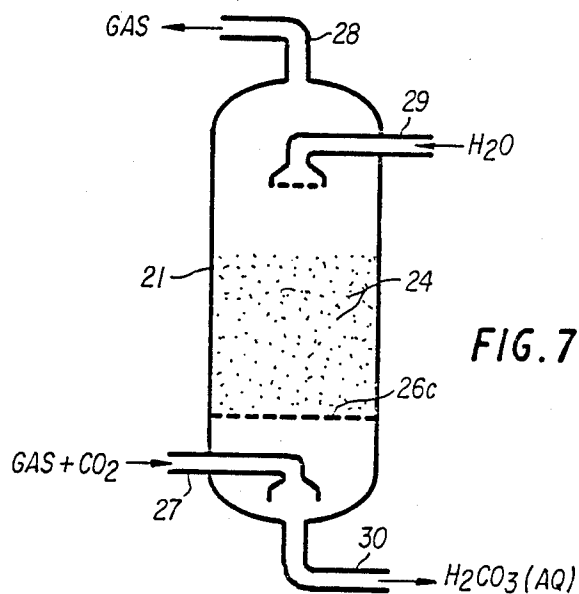


FIG. 7

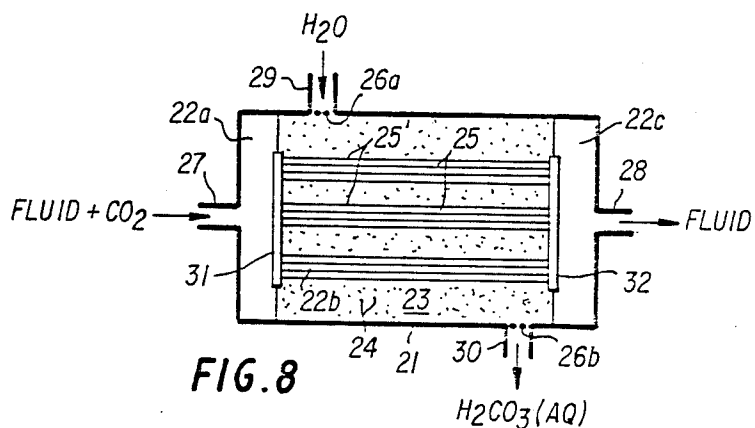


FIG. 8

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