

(12) **United States Patent**
Senkiw

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- (54) **MICROBUBBLES OF OXYGEN**
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- (73) Assignee: **Aqua Innovation, Inc.**, Bloomington, MN (US)
- (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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- (22) Filed: **Feb. 21, 2003**
- (65) **Prior Publication Data**
US 2003/0164306 A1 Sep. 4, 2003

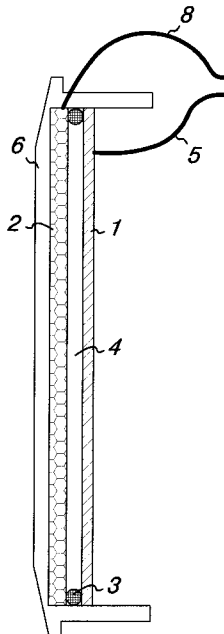
(57) **ABSTRACT**

An oxygen emitter which is an electrolytic cell is disclosed. When the anode and cathode are separated by a critical distance, very small microbubbles and nanobubbles of oxygen are generated. The hydrogen forms bubbles at the cathode, which bubbles rise to the surface. The very small oxygen bubbles remain in suspension, forming a solution supersaturated in oxygen. The electrodes may be a metal or oxide of at least one metal selected from the group consisting of ruthenium, iridium, nickel, iron, rhodium, rhenium, cobalt, tungsten, manganese, tantalum, molybdenum, lead, titanium, platinum, palladium and osmium or oxides thereof. The electrodes may be formed into open grids or may be closed surfaces. The most preferred cathode is a stainless steel mesh. The most preferred mesh is a 1/16 inch grid. The most preferred anode is platinum and iridium oxide on a support. A preferred support is titanium. Models suitable for different uses are disclosed.

- Related U.S. Application Data**
- (60) Provisional application No. 60/358,534, filed on Feb. 22, 2002.
- (51) **Int. Cl.**⁷ **C25B 9/00**
- (52) **U.S. Cl.** **204/278.5**; 204/272; 204/275.1; 205/755; 205/756; 205/757; 205/758; 205/626; 205/628; 205/633; 205/701
- (58) **Field of Search** 205/755, 756, 205/757, 758, 626, 628, 633, 701; 204/255, 256, 263, 266, 270, 272, 275.1, 278.5

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14 Claims, 5 Drawing Sheets



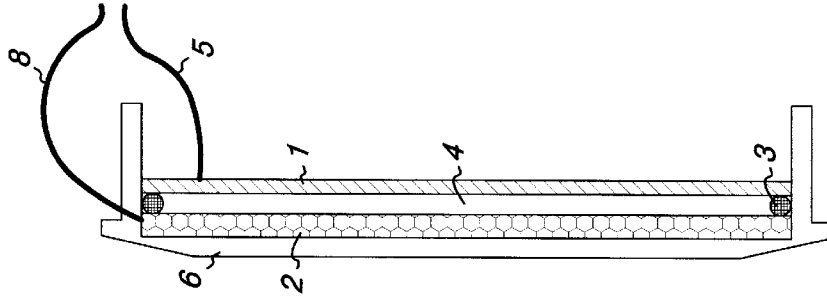


Fig. 1B

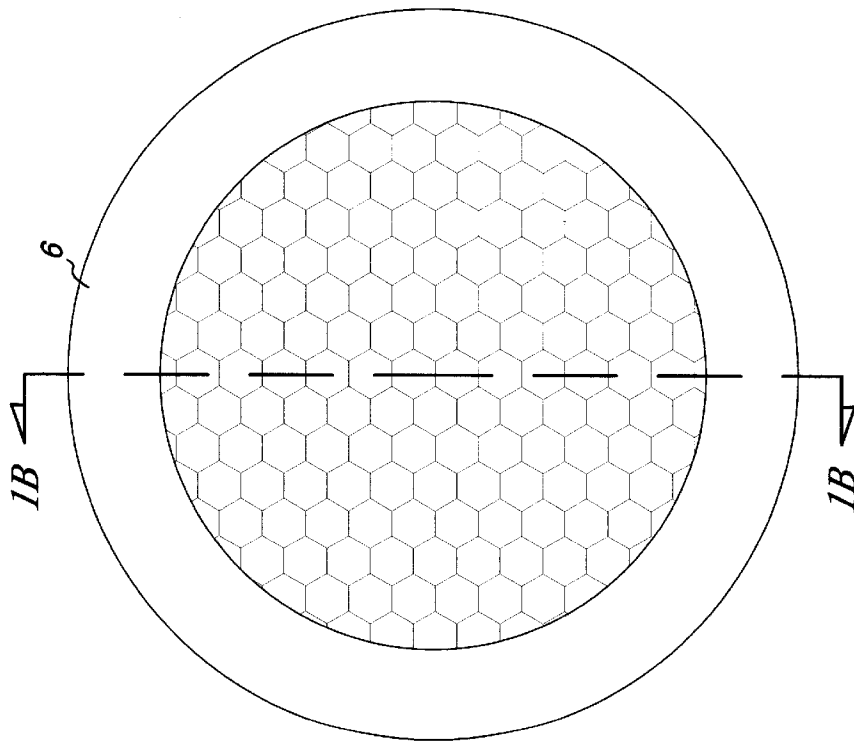


Fig. 1A

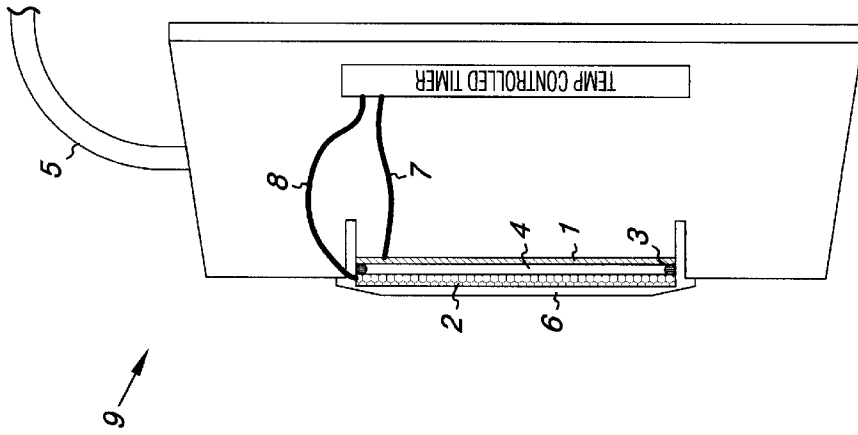


Fig. 2B

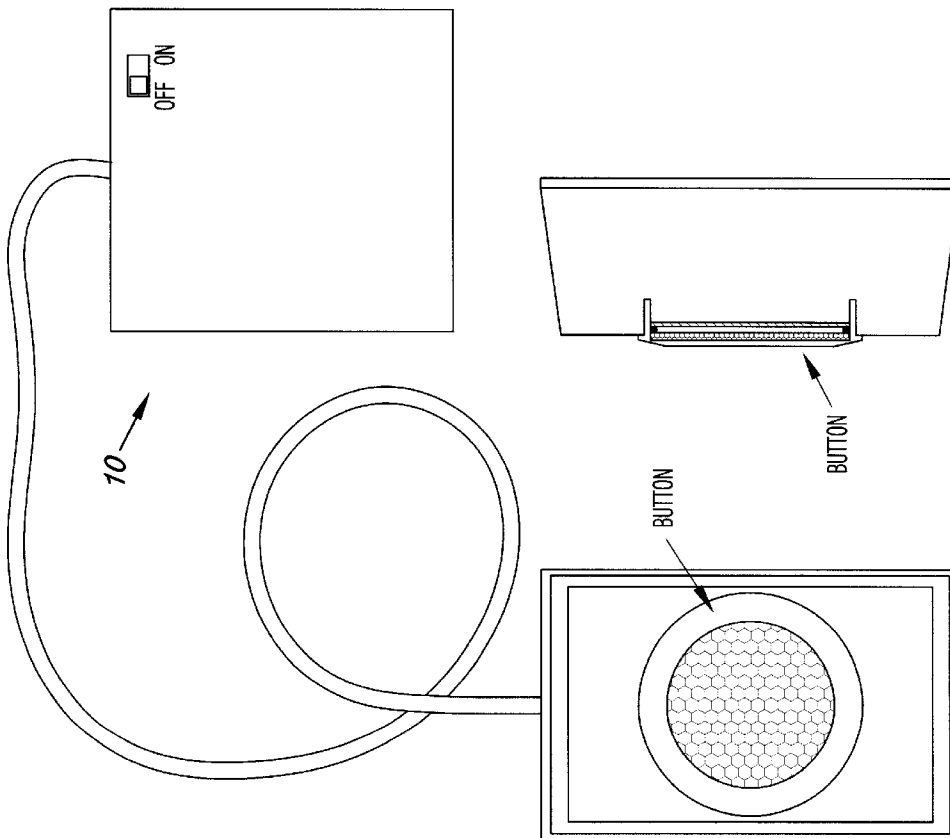


Fig. 2A

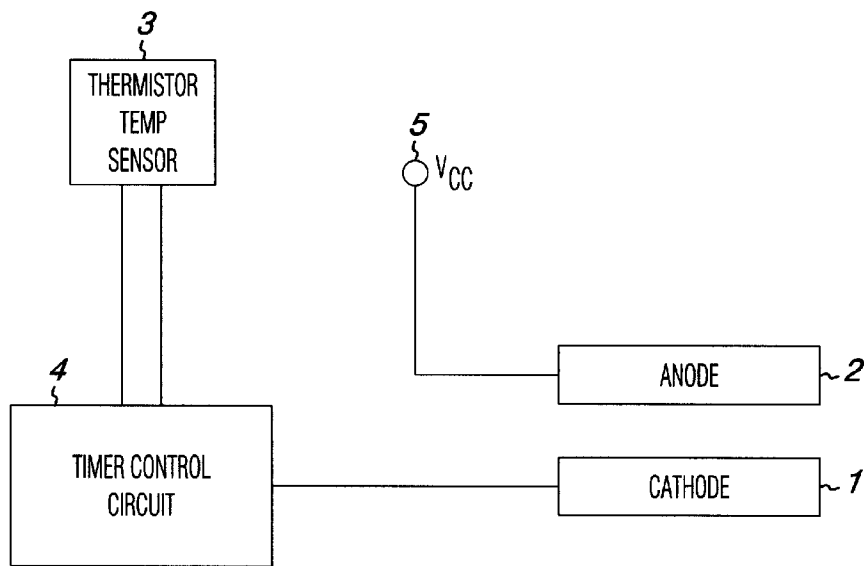


Fig. 3

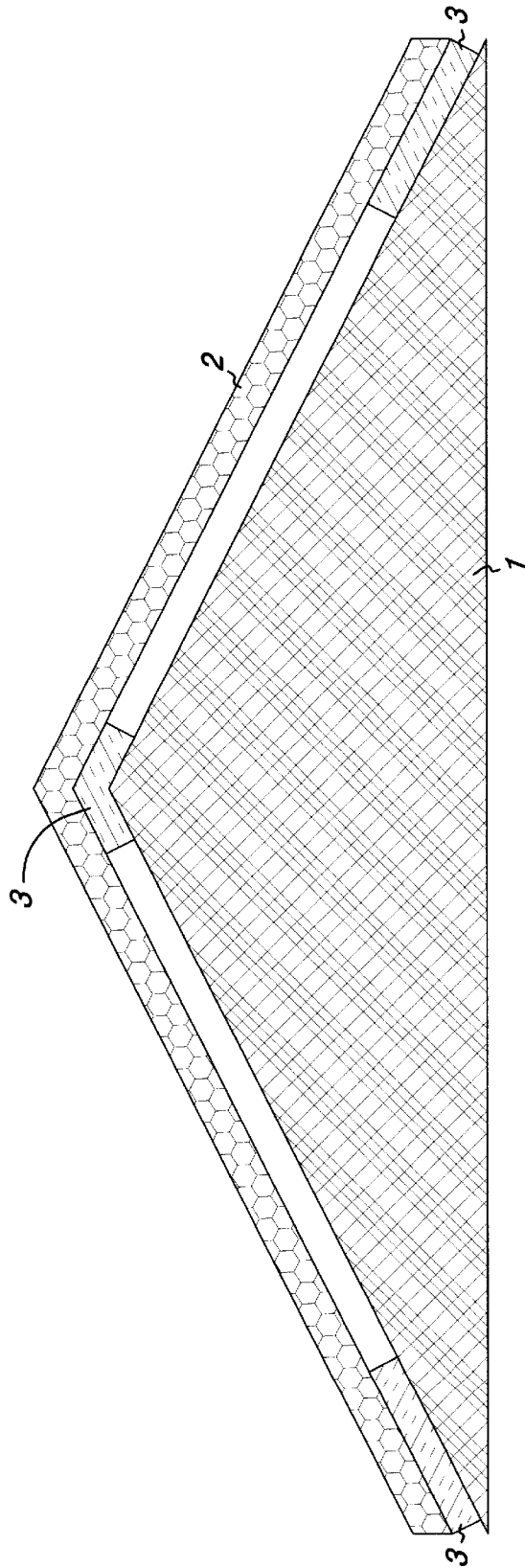


Fig. 4

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