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(54) **UNDERWATER OPTICAL LOAD CELL SYSTEM**

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(58) **Field of Search** 250/227.14, 227.18, 250/227.28, 227.29, 229, 231.1; 359/157; 385/12, 13; 73/655, 800

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,805,461 A * 2/1989 Gupta et al. 73/800
4,825,069 A * 4/1989 Hutchisson et al. 250/229
5,359,445 A * 10/1994 Robertson 359/151
6,276,215 B1 * 8/2001 Berg 73/800

* cited by examiner

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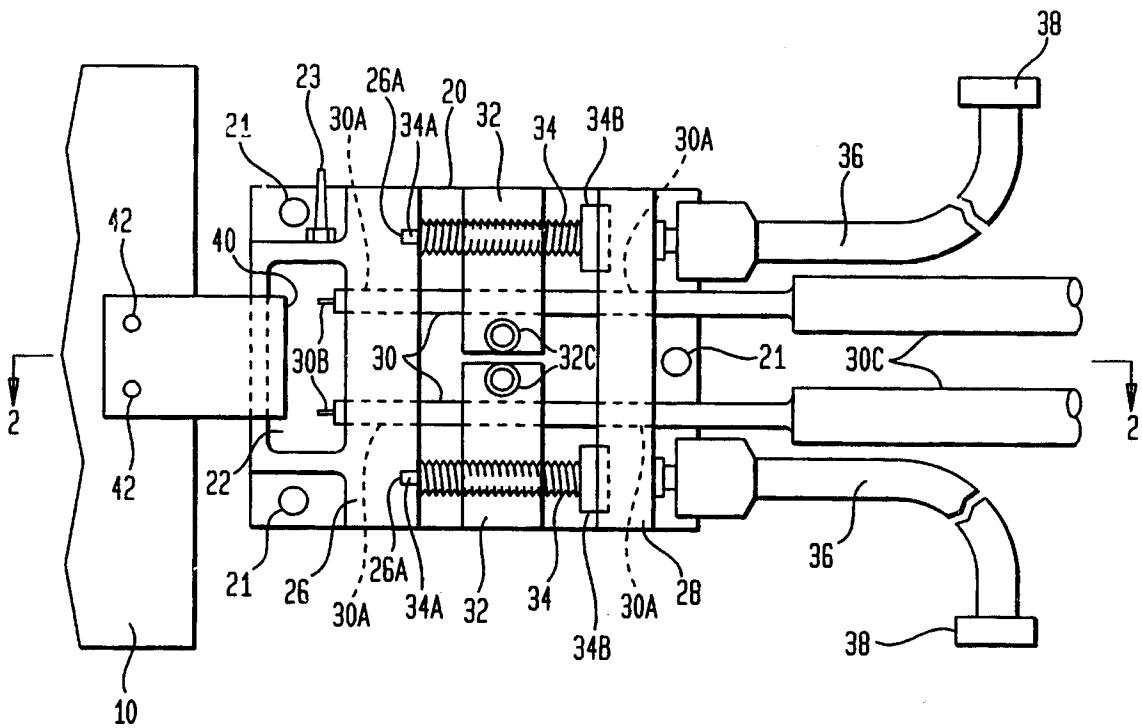
(57) **ABSTRACT**

A system is provided for detecting movement of an object underwater. A housing positioned underwater defines a gas-filled cavity receiving an optical reflector that is fixedly coupled to an object underwater. At least one optical sensor is adjustably positioned with its optical sensing portion located in the cavity a desired distance from the optical reflector. Movement of the object underwater causes movement of the optical reflector that is detected by the optical sensing portion.

12 Claims, 1 Drawing Sheet