

(12) **United States Patent**  
**Canty et al.**

(10) **Patent No.:** **US 7,193,702 B2**  
(45) **Date of Patent:** **Mar. 20, 2007**

(54) **INSERTION FLUID INSPECTION DEVICE**

(75) Inventors: **Thomas M. Canty**, Williamsville, NY (US); **Paul J. O'Brien**, East Aurora, NY (US)

(73) Assignee: **J.M. Canty Inc.**, Buffalo, NY (US)

(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 418 days.

(21) Appl. No.: **10/895,874**

(22) Filed: **Jul. 21, 2004**

(65) **Prior Publication Data**

US 2006/0017930 A1 Jan. 26, 2006

(51) **Int. Cl.**

**G01N 21/01** (2006.01)  
**G01N 1/10** (2006.01)  
**G01N 21/00** (2006.01)

(52) **U.S. Cl.** ..... **356/244; 356/246; 356/440**

(58) **Field of Classification Search** ..... 356/244,  
356/246

See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

2,744,487 A	5/1956	Moore et al. ....	116/117
3,299,851 A	1/1967	Olsen .....	116/117
3,770,342 A	11/1973	Dudragne .....	351/7
3,837,226 A	9/1974	Kawawa .....	73/331
4,245,566 A	1/1981	Shimansky et al. ....	109/49.5
4,736,734 A	4/1988	Matsuura et al. ....	128/6
4,746,178 A	5/1988	Canty .....	350/96.1
5,202,758 A	4/1993	Tamburrino .....	358/98
5,230,556 A	7/1993	Canty et al. ....	362/32

5,604,532 A	2/1997	Tillmanns .....	348/84
5,730,701 A	3/1998	Furukawa et al. ....	600/127
6,259,523 B1 *	7/2001	Welker .....	356/241.1
6,450,655 B1	9/2002	Walck et al. ....	362/3
2003/0103756 A1	6/2003	Canty et al. ....	385/138

**FOREIGN PATENT DOCUMENTS**

DE	200 03 712	7/2000
EP	0 343 558	11/1989

**OTHER PUBLICATIONS**

International Search Report for EP 05 01 5505 (3 pages).

\* cited by examiner

*Primary Examiner*—Gregory J. Toatley, Jr.

*Assistant Examiner*—Amanda Merlino

(74) *Attorney, Agent, or Firm*—Darby & Darby

(57) **ABSTRACT**

A fluid inspection device for inspecting a fluid in a vessel includes an elongate insertion well having a rear end disposed at the wall of the vessel and a front end disposed in the interior of the vessel. An inside of the insertion well is sealed off from the fluid in the vessel and an outside of the insertion well is in contact with the fluid in the vessel. A camera unit is disposed in the inside of the insertion well, and a lens in operative communication with the camera unit is disposed at the front end of the insertion well so that a front end of the lens is in contact with the fluid and a rear end of the lens is inside the insertion well. In addition, a light guide having a light emitting end is configured to guide light from the inside of the insertion well to the light emitting end. The light emitting end is disposed forward of the front end of the lens and directs the light at an angle toward the front end of the lens, and a gap between the front end of the lens and the light emitting end is capable of receiving the fluid.

**22 Claims, 3 Drawing Sheets**

