

(12) **United States Patent**  
Weiss

(10) **Patent No.:** US 7,049,622 B1  
(45) **Date of Patent:** May 23, 2006

(54) **OPTICAL POSITION SENSOR FOR DETERMINING THE INTERFACE BETWEEN A CLEAR AND AN OPAQUE FLUID**

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(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/019,841**

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

**Related U.S. Application Data**

(60) Provisional application No. 60/561,028, filed on Apr. 9, 2004.

(51) **Int. Cl.**  
**G01N 21/49** (2006.01)

(52) **U.S. Cl.** ..... 250/577; 250/573; 250/574; 250/900; 250/904; 340/619; 73/64.55; 73/290 R; 73/293

(58) **Field of Classification Search** ..... 250/573-577, 250/900, 904; 340/619, 686.1; 73/64.55, 73/293, 290 B, 290 R; 385/12, 141, 142  
See application file for complete search history.

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(57) **ABSTRACT**

An inexpensive, optical position sensor for measuring a position or length,  $x$ , along a one-dimensional curvilinear, coordinate system. The sensor can be used, for example, to determine the position of an interface between a clear and an opaque fluid (such as crude oil and water). In one embodiment, the sensor utilizes the principle of dual-fluorescence, where a primary fiber emits primary fluorescent light and a parallel secondary fiber collects a portion of the primary fluorescent light that is not blocked by the opaque fluid. This, in turn, excites secondary fluorescence in the secondary fiber at a longer wavelength. A light detector measures the intensity of secondary fluorescence emitted from an end of the secondary fiber, which is used to calculate the unknown position or length,  $x$ . Side-emitting fibers can be used in place of, or in addition to, fluorescent fibers. The all-optical sensor is attractive for applications involving flammable liquids.

**28 Claims, 17 Drawing Sheets**

