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(54) Title: CONDUCTIVE SENSOR FOR FLUID LEVEL SENSING

(57) Abstract: The invention relates to a device for sensing fluid level comprising a calibration sensor completely immersed in a fluid, and a measurement sensor at least partially immersed in the same fluid, wherein said calibration sensor is disposed in the fluid at a position lower than the lowest level of the measurement sensor. The calibration sensor and measurement sensors comprise elongated apertures in a printed circuit board with electrically conductive plating formed on each side of, and spanning the length of, the elongated apertures. Further, the invention relates to a method for determining a fluid level within a reservoir comprising: providing a calibration sensor completely immersed in the fluid and having a known length, providing a measurement sensor at least partially immersed in the fluid, sensing an electrical property of the fluid through the calibration sensor, sensing the same electrical property of the fluid through the measurement sensor, and determining the fluid level as it relates to the length of the measurement electrode exposed to the fluid.



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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US04/37904

<p>A. CLASSIFICATION OF SUBJECT MATTER IPC(7) : G01L 7/00 US CL : 73/700+, 304C; 324/500+ According to International Patent Classification (IPC) or to both national classification and IPC</p>												
<p>B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) U.S. : 73/700+, 304C; 324/500+ Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)</p>												
<p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p> <table border="1"> <thead> <tr> <th>Category *</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>US 5,046,583 (SASAKI et al.) 10 September 1991 (10.09.1991) whole document</td> <td>1</td> </tr> <tr> <td>Y</td> <td>US 6,253,610 (STRUZIK et al.) 03 July 2001 (03.07.2001), whole document</td> <td>2,8,9</td> </tr> </tbody> </table>			Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	US 5,046,583 (SASAKI et al.) 10 September 1991 (10.09.1991) whole document	1	Y	US 6,253,610 (STRUZIK et al.) 03 July 2001 (03.07.2001), whole document	2,8,9	
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<p><input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.</p>												
<p>* Special categories of cited documents:</p> <table border="0"> <tr> <td>"A" document defining the general state of the art which is not considered to be of particular relevance</td> <td>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>"E" earlier application or patent published on or after the international filing date</td> <td>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>"O" document referring to an oral disclosure, use, exhibition or other means</td> <td>"&" document member of the same patent family</td> </tr> <tr> <td>"P" document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table>			"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	"E" earlier application or patent published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family	"P" document published prior to the international filing date but later than the priority date claimed	
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<p>Date of the actual completion of the international search 30 September 2005 (30.09.2005)</p>		<p>Date of mailing of the international search report 15 NOV 2005</p>										
<p>Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703) 305-3230</p>		<p>Authorized officer Hezron Williams <i>Hezron Williams</i> Telephone No. 703 872 9306</p>										

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/37904

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
Please See Continuation Sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
 2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of any additional fees.
 3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

 4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-11,13 and 14
- Remark on Protest**
- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
 - The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
 - No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
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BOX III. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-11 and 13-14 drawn to an apparatus for sensing fluid level.

Group II, claim 12 drawn to an apparatus for sensing fluid level using PCB

Group III, claims 15-21 drawn to a method for determining the fluid level.

The inventions listed as Groups I-III do not relate to a single general inventive concept...

Groups I and II are related as combination and subcombination. In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because all of the limitations of Group II are not in Group I. The combination has separate utility such as data input from a solar power source.

Groups III and I are related as process and apparatus for its practice. Group III requires the calibration and the measurement sensors to determine the fluid level and communicate to a remote location. Groups II and III are related as process and apparatus for its practice. Group III requires the calibration and the measurement sensors to determine the fluid level and communicate to a remote location.