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(71) Applicant (for all designated States except US): **BAKER HUGHES INCORPORATED** [US/US]; P.O. Box 4740, Houston, TX 77210-4740 (US).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **DIFOGGIO, Rocco** [US/US]; P.O. Box 720734, Houston, TX 77272-0734 (US).

(74) Agent: **BYNUM, Todd A.**; Baker Hughes Incorporated, P.O. Box 4740, Houston, TX 77210-4740 (US).

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Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

— as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

Published:

— with international search report (Art. 21(3))

[Continued on next page]

(54) Title: FIBER OPTIC REFRACTOMETER

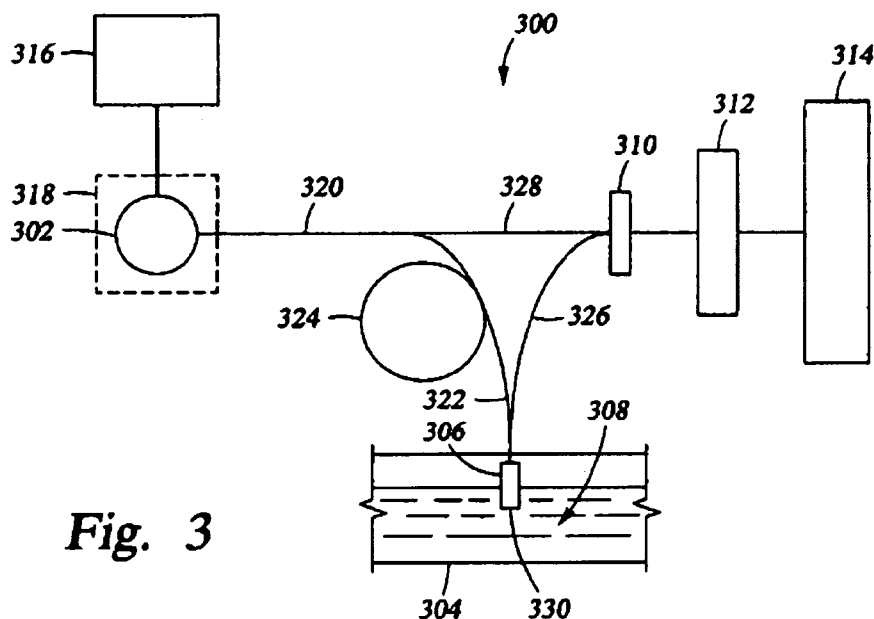


Fig. 3

(57) Abstract: A downhole refractometer apparatus and method include a light source, an optical fiber that receives light emitted from the light source and a fluid cell that receives a downhole fluid. A metalloid interface member is disposed to provide an interface with the downhole fluid in the fluid cell, and a light detecting device detects a light reaction at the metalloid interface member, the downhole fluid property being estimable at least in part based on the light reaction.



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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2008/086432**A. CLASSIFICATION OF SUBJECT MATTER***G01N 21/41(2006.01)i, E21B 49/08(2006.01)i, G02B 5/20(2006.01)i, G02B 6/00(2006.01)i*

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHEDMinimum documentation searched (classification system followed by classification symbols)
IPC G01NDocumentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility Model and Applications for Utility Model since 1975 : IPC as above
Japanese Utility Model and Applications for Utility Model since 1975 : IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

KOMPASS(KIPO internal) "Keywords : refractometer, metalloid, optical fiber, borehole, fluid and similar terms"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|---------------------------|
| X A | US 06388251 B1 (PAPANYAN, V.) 14. May. 2002 See the abstract, column 6, line 7 - column 7, line 7 and figures 3-5 | 1-8, 12-17 9-11, 18-24 |
| A | US 4437761 A (KROGER, H. et al.) 20. Mar. 1984 See the abstract, claims 1-8 and figures 1-8 | 1-24 |
| A | US 4699511 A (SEAVER, G. A.) 13. Oct. 1987 See columns 4-6, 9 and figures 3, 5 | 1-24 |
| A | US 2003-0193662 A1 (DIFOGGIO, R. et al.) 16. Oct. 2003 See the abstract, columns 4-8 and figures 3, 8 | 1-24 |
| A | JP 08-219989 A (JAPAN ENERGY CORP.) 30. Aug. 1996 See pages 5, 6 and figure 7 | 1-24 |

 Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"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

"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

"&" document member of the same patent family

Date of the actual completion of the international search

09 OCTOBER 2009 (09.10.2009)

Date of mailing of the international search report

12 OCTOBER 2009 (12.10.2009)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
Government Complex-Daejeon, 139 Seonsa-ro, Seo-
gu, Daejeon 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

LEE Bong Hoon

Telephone No. 82-42-481-8283



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2008/086432**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:

The subject matters of claims 1-21 are directed to a device and a method for analysing borehole formation fluid using a refractometer.

The subject matters of claims 22-24 are directed to the calibration of a refractometer of which the key technical feature is that two wavelengths of light are emitted from the light source.

There is no technical relationship among the claimed inventions, leaving the claims without a single general inventive concept.

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 an additional fee, this Authority did not invite payment of any additional fee.
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.:

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

Information on patent family members

International application No.

PCT/US2008/086432

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|--|------------------|--|--|
| US 06388251 B1 | 14.05.2002 | GB 2345753 A GB 2362948 A WO 2000-042416 A1 | 19.07.2000 05.12.2001 20.07.2000 |
| US 4437761 A | 20.03.1984 | None | |
| US 4699511 A | 13.10.1987 | None | |
| US 2003-0193662 A1 | 16.10.2003 | AU 2003-234713 A1 AU 2003-234713 A8 AU 2003-234713 A1 AU 2003-234713 A8 CN 1836155 A CN 1836155 A0 EP 1656549 A1 JP 2007-502422 A US 2004-0109156 A1 US 06683681 B2 US 07016026 B2 WO 2003-087788 A1 WO 2005-017503 A1 | 27.10.2003 27.10.2003 10.04.2003 10.04.2003 20.09.2006 20.09.2006 17.05.2006 08.02.2007 10.06.2004 27.01.2004 21.03.2006 23.10.2003 24.02.2005 |
| JP 08-219989 A | 30.08.1996 | None | |