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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))
- of inventorship (Rule 4.17(iv))

(54) Title: DETECTING DOWNHOLE SAND INGRESS LOCATIONS

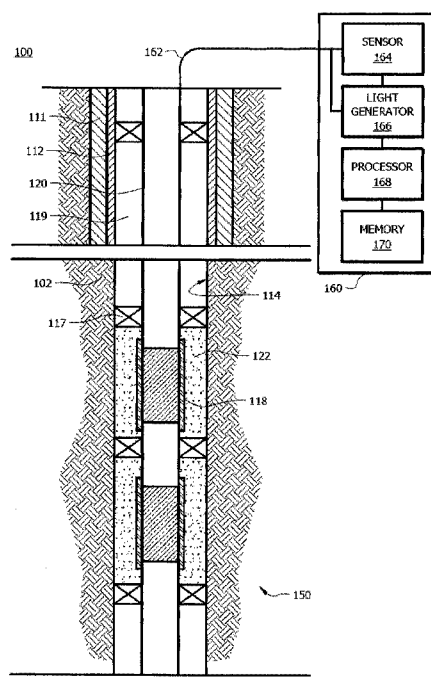


FIG. 1

(57) Abstract: A method of detecting sand inflow into a wellbore is disclosed. The method can include obtaining a sample data set, detecting a broadband signal within the sample data set, comparing the broadband signal with a signal reference, determining that the broadband signal meets or exceeds the signal reference, and determining the presence of sand inflow into the wellbore based on determining that the broadband signal meets or exceeds the signal reference. The sample data set can be a sample of an acoustic signal originating within a wellbore comprising a fluid, and the broadband signal at least includes a portion of the sample data set at frequencies above 0,5 kHz.



Published:

- *with international search report (Art. 21(3))*
- *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))*

(88) Date of publication of the international search report:

16 November 2017 (16.11.2017)

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/058300

A. CLASSIFICATION OF SUBJECT MATTER
INV. E21B47/10
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
E21B G01V

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)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 841 144 A (BALDWIN W) 15 October 1974 (1974-10-15) column 1, line 4 - line 10 column 5, line 36 - line 67 figures 4,5	1-22
X	US 5 257 530 A (BEATTIE ALAN G [US] ET AL) 2 November 1993 (1993-11-02) column 3, line 64 - column 4, line 12 column 4, line 53 - line 61	1-22
A	WO 2007/024763 A2 (ROSEMOUNT INC [US]; WEHRS DAVID [US]; KARSCHNIA ROBERT J [US]; ERYUREK) 1 March 2007 (2007-03-01) page 13, line 24 - page 14, line 5 page 14, line 17 - line 20 page 15, line 15 - line 25	1-22
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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 another 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 25 September 2017	Date of mailing of the international search report 05/10/2017
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Schneiderbauer, K

INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	US 2014/036627 A1 (HULL JOHN [CA] ET AL) 6 February 2014 (2014-02-06)	23-29
Y	paragraphs [0002], [0010], [0058], [0083] - [0086]; figure 9 -----	37-42
A	WO 2016/010550 A1 (HALLIBURTON ENERGY SERVICES INC [US]) 21 January 2016 (2016-01-21) page 14, line 16 - line 31 -----	23-29
A	US 5 042 297 A (LESSI JACQUES [FR]) 27 August 1991 (1991-08-27) column 10, line 6 - line 8 -----	30-36
A	US 2013/167628 A1 (HULL JOHN [CA] ET AL) 4 July 2013 (2013-07-04) paragraph [0186] -----	30-36
Y	US 2007/163780 A1 (ONODERA SHUNETSU [GB] ET AL) 19 July 2007 (2007-07-19) paragraphs [0002], [0015], [0048], [0049], [0051]; figure 6 -----	37-42
A	WO 2009/086279 A2 (SCHLUMBERGER SERVICES PETROL [FR]; SCHLUMBERGER CA LTD [CA]; SHLUMBERG) 9 July 2009 (2009-07-09) paragraph [0051] -----	37-42

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2017/058300

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:

see additional 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 an additional fees, this Authority did not invite payment of 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.:

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-22

Method and system of detecting sand inflow based on determining that a broadband signal of a sample data set exceeds a signal reference.

2. claims: 23-29

System of detecting sand inflow by determining a plurality of frequency domain features of a sample data set and providing a quality indication of a concentration of sand.

3. claims: 30-36

Method of visualizing sand inflow into a wellbore by generating a sand log based on a plurality of frequency domain features of a sample data set and displaying the sand log.

4. claims: 37-42

Method of remediating a wellbore by determining sand ingress based on a plurality of frequency domain features of a sample data set and reducing the sand ingress by performing the remediation process.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/EP2017/058300

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