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[Continued on next page]

(54) Title: RESTORABLE ANTENNAE APPARATUS AND SYSTEM FOR WELL LOGGING

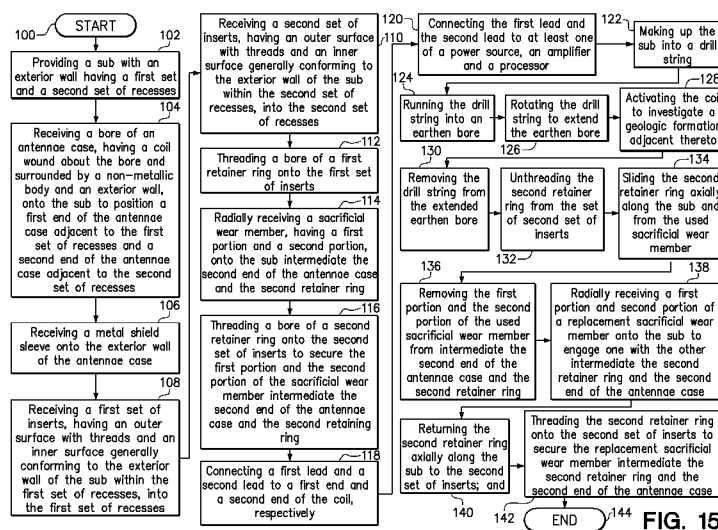


FIG. 15

(57) Abstract: An apparatus includes a sub with recesses along an exterior wall to receive inserts, an antennae case including a coil surrounded by a sacrificial wear portion of a material through which signals between the coil and a formation of interest may pass. An eroded outer wall of the sacrificial wear portion is restorable by application of an uncured restorative material to the antennae case. A method includes securing an antennae case having a coil there within onto a sub, surrounding the coil with a metal sleeve shield, and radially receiving and securing a multi-piece sacrificial wear member intermediate the antennae case and a retainer ring having a threaded bore. The multi-piece sacrificial wear member is replaceable after use by unthreading the retainer ring to release the sacrificial wear member for radial removal from the sub.

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INTERNATIONAL SEARCH REPORT

International application No  
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A. CLASSIFICATION OF SUBJECT MATTER  
 INV. G01V3/30 E21B47/01 G01V13/00  
 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)  
 G01V E21B  
 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.
A	US 2004/061622 A1 (CLARK BRIAN [US]) 1 April 2004 (2004-04-01) abstract figures 17,18,20 paragraphs [0063] - [0068] -----	1-9
A	US 6 788 065 B1 (HOMAN DEAN [US] ET AL) 7 September 2004 (2004-09-07) abstract figures 11a,11b column 8, line 40 - column 9, line 15 -----	1-9
A	US 5 631 563 A (MORIARTY KEITH A [US]) 20 May 1997 (1997-05-20) abstract figures 2,4 -----	1-9
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Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents :

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"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</p> <p>"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</p> <p>"&amp;" document member of the same patent family</p>
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Date of the actual completion of the international search  17 October 2014	Date of mailing of the international search report  10/11/2014
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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  Meyer, Matthias
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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2014/023053

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2011/074427 A1 (WANG TSILI [US] ET AL) 31 March 2011 (2011-03-31) figures 5a,5b,8a,8b paragraphs [0038], [0039] paragraphs [0043], [0044] -----	10-23
A	US 2011/316542 A1 (FREY MARK T [US] ET AL) 29 December 2011 (2011-12-29) figure 5 paragraphs [0051] - [0055] -----	10-23

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2014/023053

## 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: 1-9

Antennae case has sacrificial portion, first and second shoulder portions; the antenna coil is located within the sacrificial portion;  
first and second wear bands provide additional fixation on first and second shoulder portions;  
outer surface of sacrificial portion of antennae case is restorable after erosive damage by application of an uncured restorative material  
These special features solve the problem of how to facilitate restoration of the antenna case to its original undamaged condition.

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2. claims: 10-23

Antenna case comprising the coil, is covered by a metal shield sleeve;  
a separate external sacrificial wear member is placed adjacent to the antenna case  
These special features solve the problem of how to facilitate easy and convenient removal of wear member and replacement with a new one.

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2014/023053

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