

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

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|---|---|--|
| Applicant's or agent's file reference IS15.0962-WO-PCT | FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below. | |
| International application No. PCT/IB2016/000261 | International filing date (<i>day/month/year</i>) 11 February 2016 (11-02-2016) | (Earliest) Priority Date (<i>day/month/year</i>) |
| Applicant SERVICES PETROLIERS SCHLUMBERGER | | |

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 7 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of:

- the international application in the language in which it was filed
 a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).

c. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. **Certain claims were found unsearchable** (See Box No. II)

3. **Unity of invention is lacking** (see Box No III)

4. With regard to the **title**,

- the text is approved as submitted by the applicant
 the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- the text is approved as submitted by the applicant
 the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings**,

- a. the figure of the **drawings** to be published with the abstract is Figure No. 1
 as suggested by the applicant
 as selected by this Authority, because the applicant failed to suggest a figure
 as selected by this Authority, because this figure better characterizes the invention
- b. none of the figures is to be published with the abstract

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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.

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A. CLASSIFICATION OF SUBJECT MATTER
 INV. C04B28/02 C04B20/10 C09K8/467 C09K8/493
 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)
 C09K C04B

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 | DE 37 04 783 A1 (HOERLING LUDWIG CHEM [DE]) 25 August 1988 (1988-08-25) column 1, line 64 - column 2, line 21; claims 1-7 | 1-12 |
| X | ----- CHEMICAL ABSTRACTS, CHEMICAL ABSTRACTS SERVICE (C A S), US, 25 March 1991 (1991-03-25), XP000193363, ISSN: 0009-2258 abstract ----- -/-- | 1-4,12 |

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>"&" document member of the same patent family</p> |
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| Date of the actual completion of the international search 23 November 2016 | Date of mailing of the international search report 01/12/2016 |
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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 Büscher, Olaf |
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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. |
| X | US 5 650 004 A (YON MICHAEL D [US]) 22 July 1997 (1997-07-22) column 2, lines 21-29 column 2, lines 47-50 column 2, line 62 - column 3, line 63 column 4, lines 28-35 espec. claim 15; claims 1,11-15 | 1-4,10, 12 |
| X | ----- DATABASE WPI Week 198316 Thomson Scientific, London, GB; AN 1983-37836K XP002762277, & JP S58 41756 A (MATSUSHITA ELECTRIC WORKS LTD) 11 March 1983 (1983-03-11) abstract | 1,3,4,12 |
| X | ----- DATABASE WPI Week 200977 Thomson Scientific, London, GB; AN 2009-Q99658 XP002762278, & JP 2009 263164 A (DENKI KAGAKU KOGYO KK) 12 November 2009 (2009-11-12) abstract | 1,3,4,12 |
| X | ----- DATABASE WPI Week 201310 Thomson Scientific, London, GB; AN 2012-K03691 XP002764519, & RU 2 452 758 C1 (LUKOIL-ENGINEERING CO LTD) 10 June 2012 (2012-06-10) abstract | 13-18 |
| X | ----- US 2005/167107 A1 (RODDY CRAIG W [US] ET AL) 4 August 2005 (2005-08-04) paragraph [0011] - paragraph [0023]; claims 1-78 | 13-18 |
| A | ----- WO 2015/195596 A1 (SCHLUMBERGER SERVICES PETROL [FR]; SCHLUMBERGER CA LTD [CA]; SCHLUMBER) 23 December 2015 (2015-12-23) paragraph [0007] - paragraph [0014]; claims 1-13; examples 1-5 | 13-18 |
| A | ----- EP 2 113 546 A1 (SCHLUMBERGER HOLDINGS [CA]; PRAD RES & DEV LTD [AN]; SCHLUMBERGER SERV) 4 November 2009 (2009-11-04) paragraph [0010] - paragraph [0013] paragraph [0019] - paragraph [0022] paragraph [0030] | 13-18 |
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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. |
| A | WO 2008/034461 A1 (SCHLUMBERGER SERVICES PETROL [FR]; SCHLUMBERGER TECHNOLOGY BV [NL]; SC) 27 March 2008 (2008-03-27) paragraph [0011] - paragraph [0031] ----- | 13-18 |

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Information on patent family members

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|---|
| International application No PCT/IB2016/000261 |
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| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
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| DE 3704783 | A1 | 25-08-1988 | NONE |
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| US 5650004 | A | 22-07-1997 | NONE |
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| JP S5841756 | A | 11-03-1983 | NONE |
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| JP 2009263164 | A | 12-11-2009 | JP 5113610 B2 09-01-2013 JP 2009263164 A 12-11-2009 |
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| RU 2452758 | C1 | 10-06-2012 | ----- |
| US 2005167107 | A1 | 04-08-2005 | AR 049616 A1 23-08-2006 CA 2553897 A1 11-08-2005 EP 1706582 A1 04-10-2006 US 2005167107 A1 04-08-2005 WO 2005073504 A1 11-08-2005 |
| ----- | | | |
| WO 2015195596 | A1 | 23-12-2015 | NONE |
| ----- | | | |
| EP 2113546 | A1 | 04-11-2009 | CA 2721703 A1 05-11-2009 EP 2113546 A1 04-11-2009 EP 2276906 A2 26-01-2011 US 2011098202 A1 28-04-2011 US 2015252245 A1 10-09-2015 WO 2009133438 A2 05-11-2009 |
| ----- | | | |
| WO 2008034461 | A1 | 27-03-2008 | AR 063220 A1 14-01-2009 CA 2663721 A1 27-03-2008 CN 101541915 A 23-09-2009 EG 26864 A 09-11-2014 US 2010081733 A1 01-04-2010 US 2012312535 A1 13-12-2012 WO 2008034461 A1 27-03-2008 |
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FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-12

A delayed-expansion cement mixture comprising particles of hydraulic cement; and a finely-divided, hydratable expanding agent having hydrophobically modified surfaces comprising a hydrophobic film (claim 1) and a method to delay expansion of hydraulic cement, comprising treating particles of a hydratable expanding agent with a hydrophobic film precursor compound to form a finely-divided hydratable expanding agent having hydrophobically modified surfaces; combining the treated expanding agent with water and particles of hydraulic cement to form a settable cement slurry comprising the cement mixture according to claim 1 hardening the slurry to a set cement; and expanding the set cement (claim 12). "Invention I" solving the problem of providing ways to improve the preparation, handling and design of hydraulic cements with hydratable expanding agents.

2. claims: 13-18

A method to cement a subterranean well having a borehole, comprising: (i) mixing particles of hydraulic cement with a finely-divided hydratable expanding agent having hydrophobically modified surfaces to form the cement mixture according to claim 1; (ii) placing the cement mixture in a downhole region of the well; (iii) hardening the cement mixture to form a set cement; and (iv) hydrating the expanding agent to expand the set cement (claim 13). "Invention II" solves the problem for the oil and gas industry by providing ways to better and more controllably delay hydration of the expanding agents, and to improve the bonding between set cement and the casing.
