

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

# PCT

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY  
(PCT Rule 43bis.1)**

To:

see form PCT/ISA/220

Date of mailing  
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference  
see form PCT/ISA/220

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
PCT/B2016/000261

International filing date (day/month/year)  
11.02.2016

Priority date (day/month/year)

International Patent Classification (IPC) or both national classification and IPC  
INV. C04B28/02 C04B20/10 C09K8/467 C09K8/493

Applicant  
SERVICES PETROLIERS SCHLUMBERGER

**1. This opinion contains indications relating to the following items:**

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application


**2. FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:



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Date of completion of this opinion

see form  
PCT/ISA/210

Authorized Officer

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**Box No. I Basis of the opinion**

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1. With regard to the **language**, this opinion has been established 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)).
2.  This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3.  With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
  - a.  forming part of the international application as filed:
    - in the form of an Annex C/ST.25 text file.
    - on paper or in the form of an image file.
  - b.  furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
  - c.  furnished subsequent to the international filing date for the purposes of international search only:
    - in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).
    - on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).
4.  In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

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**Box No. IV Lack of unity of invention**

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1.  In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has, within the applicable time limit:
- paid additional fees
  - paid additional fees under protest and, where applicable, the protest fee
  - paid additional fees under protest but the applicable protest fee was not paid
  - not paid additional fees
2.  This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
- complied with
  - not complied with for the following reasons:  
**see separate sheet**
4. Consequently, this report has been established in respect of the following parts of the international application:
- all parts.
  - the parts relating to claims Nos.

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**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	<u>5-9, 11, 14-18</u>
	No: Claims	<u>1-4, 10, 12, 13</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-18</u>
Industrial applicability (IA)	Yes: Claims	<u>1-18</u>
	No: Claims	

2. Citations and explanations

**see separate sheet**

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**Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**Re Item IV**

**Lack of unity of invention**

- 1 This Authority considers that the application does not meet the requirements of unity of invention and that there are 2 inventions covered by the claims indicated as follows.
  
- 2 Specification according to rule 40.1 PCT of the reasons for which the international application is not considered as complying with the requirement of unity of invention according to Art. 3(4)(iii) PCT and Rule 13 PCT.
  
- 3 According to the PCT International Search and Examination Guidelines, Part III, 10.06, unity of invention has to be considered in the first place only in relation to the independent claims.
  
- 4 The reasons for which the inventions are not so linked as to form a single general inventive concept, as required by Rule 13.1 PCT, are as follows:
  - 4.1 There are 3 independent claims:  
Product claim 1: a delayed-expansion cement mixture.  
Method claim 12: a method to delay expansion of hydraulic cement utilizing the cement mixture of claim 1.  
Method claim 13: a method to cement a subterranean well having a borehole utilizing the cement mixture of claim 1.
  
  - 4.2 It appears that within these independent claims unity does not exist for the following reasons: the "same" or "corresponding" technical feature between these independent claims is a cement mixture comprising particles of hydraulic cement and finely-divided hydratable expanding agent having hydrophobically modified surfaces comprising a hydrophobic film.

- 4.3 This feature is already known from **document D1**. **D1** discloses an expansion inhibited cement mortar mixture comprising hydraulic cement and finely-divided particles of an expansion agent in form of quicklime/CaO having hydrophobically modified surfaces comprising a hydrophobic coating/film (col. 1, line 64 - col. 2, line 21; claims 1-7).
- 4.4 Therefore, this feature is not a special (new and inventive) technical feature. Thus, no "same" or "corresponding" special technical features could be found between the independent claims 1/12 and independent claim 13 as required by Rule 13.2 PCT.
- 5 In addition, it becomes evident from the application documents that the two inventions solve different technical problems. "Invention I" solves the problem for the cement industry in that a need of ways to improve the preparation, handling and design of hydraulic cements with hydratable expanding agents are provided (see page 2, line 7-9), while "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 (see page 2, line 9-19).
- 6 This appears to show lack of corresponding technical effect as well. Consequently, neither the objective problem underlying the subjects of the claimed inventions, nor their solutions defined by the special technical features allow for a relationship to be established between the said inventions, which involves a single general inventive concept.
- 7 No other common problem could be found which could serve as the general inventive concept required by Rule 13.1 PCT.
- 8 Consequently, these claims are not unitary according to Rule 13 PCT.
- 9 Thus, the application is split into 2 (two) groups of (alleged) inventions:

**"Invention I"**: 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.

**"Invention II"**: 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.

- 10 According to Article 17(3)(a) PCT the ISA shall establish the International Search Report on those parts of the International Application which relate to the invention first mentioned in the claims, i.e., the above mentioned group I.

### **Re Item VIII**

#### **Certain observations on the international application**

#### **"Inventions I-II"**

- 1 The explanations found on page 5, line 1-12 are superfluous since the interpretation of ranges and optional features is regulated by the PCT and the PCT-Guidelines.

- 2 The expression "incorporated herein by reference" used in the description on page 10, line 10-12 is unclear and not recognized by the PCT (Article 5 PCT and PCT Guidelines, Part II, 4.26) and should be deleted.

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**"Invention I"**

Reference is made to the following documents:

- D1 DE 37 04 783 A1 (HOERLING LUDWIG CHEM [DE]) 25 August 1988
- D2 CHEMICAL ABSTRACTS, CHEMICAL ABSTRACTS SERVICE (C A S), US, 25 March 1991 (1991-03-25), XP000193363, ISSN: 0009-2258
- D3 US 5 650 004 A (YON MICHAEL D [US]) 22 July 1997 (1997-07-22)
- D4 DATABASE WPI Week 198316 Thomson Scientific, London, GB; AN 1983-37836K & JP S58 41756 A (MATSUSHITA ELECTRIC WORKS LTD) 11 March 1983 (1983-03-11)
- D5 DATABASE WPI Week 200977 Thomson Scientific, London, GB; AN 2009-Q99658 & JP 2009 263164 A (DENKI KAGAKU KOGYO KK) 12 November 2009 (2009-11-12)

**1 Article 33(1) PCT, Article 33(2) PCT & Article 33(3) PCT**

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of independent claims 1 and 12 and their dependent claims 2-4 and 10 is not new (Article 33(2) PCT), while for the subject-matter of claims 5-9 and 11 no inventive step can be acknowledged in the meaning of Article 33(3) PCT.

- 1.1 **Document D1** discloses an expansion inhibited cement mortar mixture comprising hydraulic cement and finely-divided particles of an expansion agent in form of quicklime/CaO having hydrophobically modified surfaces



comprising a hydrophobic coating/film (col. 1, line 64 - col. 2, line 21; claims 1-7). **D1** further discloses a method to delay expansion of hydraulic cement, comprising: treating particles of a hydratable expanding agent (CaO) with a hydrophobic film precursor (shellac etc.: col. 2, line 11-21) 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; hardening the slurry to a set cement; and expanding the set cement (obviously the steps of "hardening" and "expanding" are inherent once the mortar is applied).

The subject-matter of independent claims 1 and 12 is not new over document D1 (Article 33(2) PCT).

- 1.2 **Document D2** discloses (abstract) a cement mixture comprising hydraulic cement and finely-divided particles of an expansion agent (CaO) having hydrophobically modified surfaces comprising a hydrophobic coating/film of fatty-acid (coconut oil).

The subject-matter of independent claims 1 and 12 is not new over document D2 (Article 33(2) PCT).

- 1.3 Furthermore, **documents D3-D5** are disclosing cement mixtures comprising hydraulic cement and finely-divided particles of an expansion agent (D3: CaO; D4: dehydrated ettringite; D5: CaO) having hydrophobically modified surfaces comprising a hydrophobic coating/film (D3: silane/silicone water repellent coating; D4: paraffin/latex; D5: paraffin).

The subject-matter of independent claims 1 and 12 is not new over documents D3-D5 (Article 33(2) PCT).

1.4 **Dependent claims**

- 1.4.1 The subject-matter of dependent claims 2, 3, 4 and 10 is disclosed in documents D1-D5 (Article 33(2) PCT).

- 1.4.2 In absence of technical effects demonstrated for the features of dependent claims 5-9 and 11 over the prior art, these claims do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT with respect to Article 33(3) PCT, because neither are surprising technical effects derivable from their characterising features, nor do these claims solve a technical problem in a non-obvious manner. Claims 5-9 and 11 are defining a number of hydrophobic compounds. The hydrophobic properties of these compounds are well-known to the skilled person. It would therefore be obvious for the skilled person that any of these compounds can be used to provide hydrophobicity.

**"Invention II"**

Reference is made to the following documents:

- D6 DATABASE WPI Week 201310 Thomson Scientific, London, GB;  
AN 2012-K03691 & RU 2 452 758 C1 (LUKOIL-ENGINEERING CO LTD)  
10 June 2012
- D7 US 2005/167107 A1 (RODDY CRAIG W [US] ET AL) 4 August 2005

Preliminary remark: claim 13 defines in step (iv) hydrating of the expanding agent to expand the set cement. The ISA is of the opinion this process step is anticipated once the set cement forms the cement sheath and is put into operation downhole. Formation water and wellbore fluids will be contacted with the cement sheath and automatically cause hydration of the expanding agent.

**1 Article 33(1) PCT, Article 33(2) PCT & Article 33(3) PCT**

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of independent claim 13 is not new (Article 33(2) PCT), while for the subject-matter of claims 14-18 no inventive step can be acknowledged in the meaning of Article 33(3) PCT.

- 1.1 **Document D6** discloses a method to cement a subterranean well having a borehole (abstract), comprising:
- (i) mixing particles of hydraulic cement with a finely-divided hydratable expanding agent (expanding agents: MgO or CaO) having hydrophobically modified surfaces (a hydrophobisator: sodium oleate or potassium oleate is adsorbed on the surface of the expanding agent) to form a cement mixture;
  - (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 (this step occurs once the set cement is contacted by formation water).

The subject-matter of independent claim 13 is not new over document D6 (Article 33(2) PCT).

- 1.2 **Document D7** discloses a method to cement a subterranean well having a borehole ([0011]-[0023]; claims 1-78), comprising:
- (i) mixing particles of hydraulic cement with a finely-divided hydratable expanding agent (expanding agent: expansive cement: [0017]) having hydrophobically modified surfaces (a hydrophic coating [0019]-[0022]) to form a cement mixture;
  - (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 (this step occurs once the set cement is contacted by formation water).

The subject-matter of independent claim 13 is not new over document D7 (Article 33(2) PCT).

**1.3 Dependent claims**

In absence of technical effects demonstrated for the features of dependent claims 14-18 over the prior art, these claims do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT with respect to Article 33(3) PCT, because neither are surprising technical effects derivable from their characterising features, nor do these claims solve a technical problem in a non-obvious manner.