

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference ESP4-65099-WO-045792	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/US2019/060738	International filing date (<i>day/month/year</i>) 11 November 2019 (11.11.2019)	(Earliest) Priority Date (<i>day/month/year</i>) 19 November 2018 (19.11.2018)
Applicant BAKER HUGHES, A GE COMPANY, LLC		

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 3 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 43.6bis(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. 2

☐ 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.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2019/060738**A. CLASSIFICATION OF SUBJECT MATTER****E21B 34/08(2006.01)i, E21B 43/12(2006.01)i**

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 34/08; E21B 027/00; E21B 034/06; E21B 17/10; E21B 43/00; E21B 43/12; E21B 43/38; F04B 19/22; F04B 47/08

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords: centrifugal pump, impeller, gas lock, shaft passage, valve

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
DA	US 2003-0192702 A1 (GAY et al.) 16 October 2003 paragraphs [0014]-[0021] and figures 1-2	1-15
A	US 2016-0201444 A1 (HALLIBURTON ENERGY SERVICES, INC.) 14 July 2016 paragraphs [0016]-[0023] and figures 2, 3A-3B	1-15
A	US 4867242 A (HART, GORDON E.) 19 September 1989 claims 1-4 and figures 1-2	1-15
A	US 2010-0230091 A1 (PUGH et al.) 16 September 2010 paragraphs [0020]-[0031] and figures 3A-3E	1-15
A	WO 2014-176225 A1 (SCHLUMBERGER CANADA LIMITED et al.) 30 October 2014 paragraphs [0012]-[0029] and figure 1	1-15



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

"D" document cited by the applicant in the international application

"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

07 April 2020 (07.04.2020)

Date of mailing of the international search report

08 April 2020 (08.04.2020)

Name and mailing address of the ISA/KR

International Application Division

Korean Intellectual Property Office

189 Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea



Facsimile No. +82-42-481-8578

Authorized officer

LEE, Hun Gil

Telephone No. +82-42-481-8525



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2019/060738

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2003-0192702 A1	16/10/2003	CA 2425449 A1 CA 2425449 C GB 2390119 A GB 2390119 B US 6684946 B2	12/10/2003 22/01/2008 31/12/2003 31/08/2005 03/02/2004
US 2016-0201444 A1	14/07/2016	WO 2015-041655 A1	26/03/2015
US 4867242 A	19/09/1989	CA 1259224 A	12/09/1989
US 2010-0230091 A1	16/09/2010	CA 2696600 A1 CA 2696600 C EP 2236743 A2 EP 2236743 A3 EP 2236743 B1 US 8303272 B2	11/09/2010 22/10/2013 06/10/2010 04/04/2012 09/09/2015 06/11/2012
WO 2014-176225 A1	30/10/2014	CA 2907907 A1 EP 2989289 A1 EP 2989289 A4 EP 2989289 B1 NO 3018132 T3 RU 2015-149464 A US 10197060 B2 US 2016-0084254 A1	30/10/2014 02/03/2016 20/07/2016 13/12/2017 12/05/2018 26/05/2017 05/02/2019 24/03/2016