(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
31 December 2014 (31.12.2014)

WIPO | PCT

(10) International Publication Number
WO 2014/210367 A3

(51) International Patent Classification:
E21B 34/10 (2006.01) *E21B 34/14* (2006.01)

(21) International Application Number:
PCT/US2014/044420

(22) International Filing Date:
26 June 2014 (26.06.2014)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/839,447 26 June 2013 (26.06.2013) US

(71) Applicant: **WEATHERFORD/LAMB, INC.** [US/US]; 2000 St. James Place, Houston, Texas 77056 (US).

(72) Inventors: **MCDOWELL, Christopher L.**; 2519 Roman Forest Blvd., New Caney, Texas 77357 (US). **NOSKE, Joe**; 408 Peden Street, Houston, Texas 77006 (US). **KING, Kyle Allen**; 12807 Pheasant Lake Court, Houston, Texas 77041 (US). **HARRALL, Simon J.**; 2017B Hazard Street, Houston, Texas 77019 (US).

(74) Agents: **PATTERSON, William B.** et al.; Patterson & Sheridan, LLP, 24 Greenway Plaza, Suite 1600, Houston, Texas 77046 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR,

[Continued on next page]

(54) Title: BIDIRECTIONAL DOWNHOLE ISOLATION VALVE

(57) Abstract: An isolation valve for use in a wellbore includes: a tubular housing; an upper flapper disposed in the housing and pivotable relative thereto between an open position and a closed position; an upper piston operable to open or close the upper flapper; a lower flapper disposed in the housing and pivotable relative thereto between an open position and a closed position; a lower piston operable to open the lower flapper; an opener passage in fluid communication with the pistons and an opener hydraulic coupling; and a closer passage in fluid communication with the pistons and a closer hydraulic coupling.

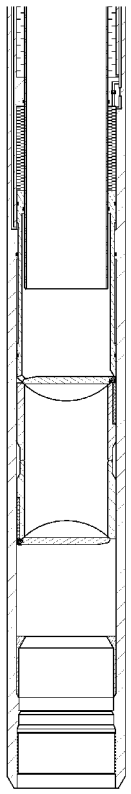

FIG. 4D

WO 2014/210367 A3

KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

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:
10 December 2015

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/044420

A. CLASSIFICATION OF SUBJECT MATTER
INV. E21B34/10 E21B34/14
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

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 2007/095546 A1 (FARQUHAR GRAHAM E [US] ET AL) 3 May 2007 (2007-05-03)	1
A	paragraphs [0021] - [0034]; figures 1A-1E, 2A-2E, 3A-3E	4-7,12

X	US 2007/284119 A1 (JACKSON STEPHEN L [US] ET AL) 13 December 2007 (2007-12-13)	1,2,11
A	paragraphs [0019] - [0032]; figures 1-8	9

X	US 2008/210431 A1 (JOHNSON ERIC T [US] ET AL) 4 September 2008 (2008-09-04)	1,2,11
A	paragraphs [0020] - [0035]; figures 1-8	3,8,10

☐ 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	Date of mailing of the international search report
17 July 2015	23/10/2015

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Maukonen, Kalle

1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/044420

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.:

1-12

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: 1-12

   Isolation valve.
   D1 (US 2007/0095546) discloses an isolation valve according to claim 1. The special technical feature (STF) of this first group of claims is the feature of claim 2, i.e. the flappers opening in opposite directions.
   The significance of this STF can be interpreted to be added safety from pressure from both directions.

   ---

2. claims: 13-23

   Method of drilling a wellbore
   D1 does not mention anything about drilling a wellbore. It is not apparent how not further defined isolation valve of claim 13 could be related to the subject-matter of the first group of claims. Thus, it becomes impossible to attribute an STF to this second group of claims.

   ---

3. claim: 24

   Isolation valve
   D1 does not disclose the feature "passage in communication with the closing chamber and the bore of the valve". This is therefore the STF of this third group of claims. The significance of this STF can be interpreted to as "to facilitate closing by preventing a hydraulic lock".

   ---

4. claims: 25-30

   Isolation valve
   D1 does not disclose wedges or cams. This is therefore the STF of this fourth group of claims. With this STF, the valve is closed through transverse movement only. The significance of this STF can be seen to reduce the need for space in the vertical direction.

   ---

5. claims: 31-36

   Isolation valve
   D1 does not disclose a track or a valve member made of pivotally connected sections. This is the STF of this fifth group of claims. The significance of this STF can be seen as "obviating the need of a seat seal".

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2014/044420

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2007095546 A1	03-05-2007	US 2007095546 A1	03-05-2007
		WO 2008067152 A2	05-06-2008
US 2007284119 A1	13-12-2007	CA 2591360 A1	12-12-2007
		GB 2439187 A	19-12-2007
		GB 2474786 A	27-04-2011
		US 2007284119 A1	13-12-2007
US 2008210431 A1	04-09-2008	CA 2660919 A1	02-10-2009
		GB 2458771 A	07-10-2009
		GB 2485511 A	16-05-2012
		US 2008210431 A1	04-09-2008