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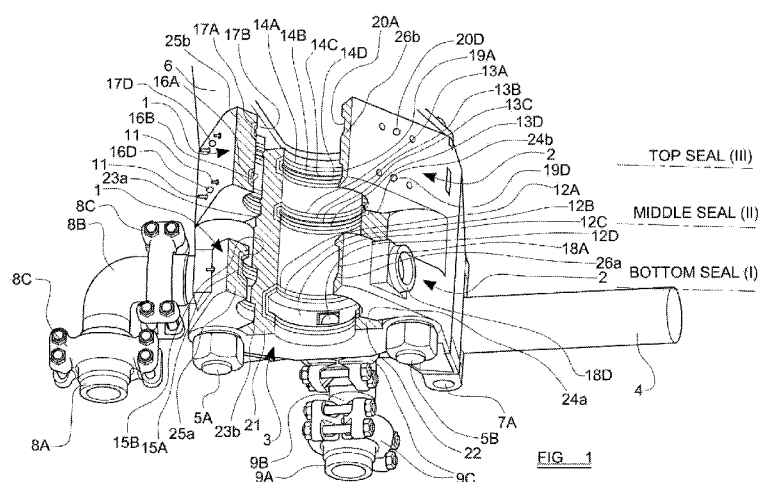
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[Continued on next page]

(54) **Title:** APPARATUS FOR CONTINUOUS CIRCULATION DRILLING OF A WELLBORE

(57) **Abstract:** An apparatus for continuous circulation drilling comprising a tubular body (106) having a main passage (108) extending along a longitudinal axis of the tubular body from a first end of the tubular body to a second end of the tubular body, a side passage (110) and a control passage (111, 112, 114), the side passage and control passage both extending through the tubular body into the main passage, the tubular body containing a valve assembly (102, 104) which is operable to close the main passage when the side passage is open and to close the side passage when the main passage is open, the assembly further comprising a hydraulic connector which is operable to clamp around the tubular body, the connector comprising a housing (1, 2, 3) with an interior surface which is provided with first (12a) and second (13a) grooves which, when the connector is clamped around the tubular body, each form a channel which extends in continuous loop around the exterior of the tubular body, there being at least one passage (12d, 13d) extending through the housing from an exterior surface of the housing into each of the channels, wherein the tubular body is further provided with two grooves (120a, 120b) which extend around an exterior surface of the body so that, when the connector is clamped around the tubular body, the connector housing engages with the grooves, the grooves thus restricting longitudinal movement of the connector relative to the tubular body, and the side passage and control passage each connect the main passage with one of the channels formed by the connector.

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30 April 2015

- *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))*

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2013/052712

A. CLASSIFICATION OF SUBJECT MATTER

INV. E21B21/10 E21B19/16
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.
Y	US 2011/308860 A1 (DEBOER LUC [US]) 22 December 2011 (2011-12-22)	1-10
A	paragraph [0030] - paragraph [0034] -----	11-18
Y	US 2009/025930 A1 (IBLINGS DAVID [US] ET AL) 29 January 2009 (2009-01-29)	1-10
A	paragraph [0036] -----	11-14
A	US 2010/155143 A1 (BRADDICK BRITT O [US]) 24 June 2010 (2010-06-24) the whole document -----	1-14
A	WO 2009/022914 A1 (I TEC AS [NO]; HAUGHOM PER OLAV [NO]) 19 February 2009 (2009-02-19) the whole document -----	1-14
	-/-	

☒ 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

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"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

26 February 2015

Date of mailing of the international search report

18/03/2015

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2013/052712

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 2005/019596 A1 (COUPLER DEVELOPMENTS [GB]; AYLING LAURENCE JOHN [GB]) 3 March 2005 (2005-03-03) the whole document	1-14
A	WO 2009/093069 A2 (NAT OILWELL VARCO LP [US]; LUCAS BRIAN RONALD [GB]; SPRINGETT FRANK BE) 30 July 2009 (2009-07-30) the whole document	1-18

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2013/052712

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: 1-14

An apparatus for continuous circulation drilling comprising a tubular body having a main passage extending along a longitudinal axis of the tubular body from a first end of the tubular body to a second end of the tubular body, a side passage and a control passage, the side passage and control passage both extending through the tubular body into the main passage, the tubular body containing a valve assembly which is operable to close the main passage when the side passage is open and to close the side passage when the main passage is open, the assembly further comprising a hydraulic connector which is operable to clamp around the tubular body, the connector comprising a housing with an interior surface which is provided with first and second grooves which, when the connector is clamped around the tubular body, each form a channel which extends in continuous loop around the exterior of the tubular body, there being at least one passage extending through the housing from an exterior surface of the housing into each of the channels, wherein the tubular body is further provided with at least one groove which extends around an exterior surface of the body so that, when the connector is clamped around the tubular body, the connector housing engages with the groove, the groove thus restricting longitudinal movement of the connector relative to the tubular body, and the side passage and control passage each connect the main passage with one of the channels formed by the connector.

2. claims: 15-18

An apparatus for continuous circulation drilling comprising a tubular body having a main passage extending along a longitudinal axis of the tubular body from a first end of the tubular body to a second end of the tubular body, a side passage and a control passage, the side passage and control passage both extending through the tubular body into the main passage, the tubular body containing a valve assembly which is operable to close the main passage when the side passage is open and to close the side passage when the main passage is open, the assembly further comprising a hydraulic connector which is operable to clamp around the tubular body, the connector comprising a housing with an interior surface which is provided with first and second grooves which, when the connector is clamped around the tubular body, each form a channel which extends in continuous loop around the exterior of the tubular body, there being at least one passage extending through the housing from an exterior surface of the housing into each of the channels, wherein the connector housing comprises three sections, the first two of which are pivotally mounted on the third.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2013/052712

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2011308860 A1	22-12-2011	US 2011308860 A1	22-12-2011
		WO 2011159983 A1	22-12-2011

US 2009025930 A1	29-01-2009	AT 538285 T	15-01-2012
		AU 2008282452 A1	05-02-2009
		AU 2012203290 A1	21-06-2012
		AU 2014202900 A1	19-06-2014
		CA 2694482 A1	05-02-2009
		CA 2809156 A1	05-02-2009
		CA 2809159 A1	05-02-2009
		EP 2179124 A2	28-04-2010
		EP 2415960 A2	08-02-2012
		EP 2532828 A2	12-12-2012
		EP 2532829 A2	12-12-2012
		US 2009025930 A1	29-01-2009
		US 2012061087 A1	15-03-2012
		US 2014182943 A1	03-07-2014
		WO 2009018173 A2	05-02-2009

US 2010155143 A1	24-06-2010	CA 2688765 A1	24-06-2010
		GB 2466568 A	30-06-2010
		US 2010155143 A1	24-06-2010

WO 2009022914 A1	19-02-2009	EP 2176509 A1	21-04-2010
		NO 328945 B1	21-06-2010
		US 2010252272 A1	07-10-2010
		WO 2009022914 A1	19-02-2009

WO 2005019596 A1	03-03-2005	CA 2539039 A1	03-03-2005
		EP 1660753 A1	31-05-2006
		US 2006254822 A1	16-11-2006
		WO 2005019596 A1	03-03-2005

WO 2009093069 A2	30-07-2009	CA 2710564 A1	30-07-2009
		CN 102046914 A	04-05-2011
		EP 2232001 A2	29-09-2010
		RU 2010134919 A	27-02-2012
		US 2009205838 A1	20-08-2009
		WO 2009093069 A2	30-07-2009
