



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

- (51) International Patent Classification:
E21B 4/14 (2006.01)
- (21) International Application Number:
PCT/EP2014/063622
- (22) International Filing Date:
26 June 2014 (26.06.2014)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
1311674.4 28 June 2013 (28.06.2013) GB
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- (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, 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).

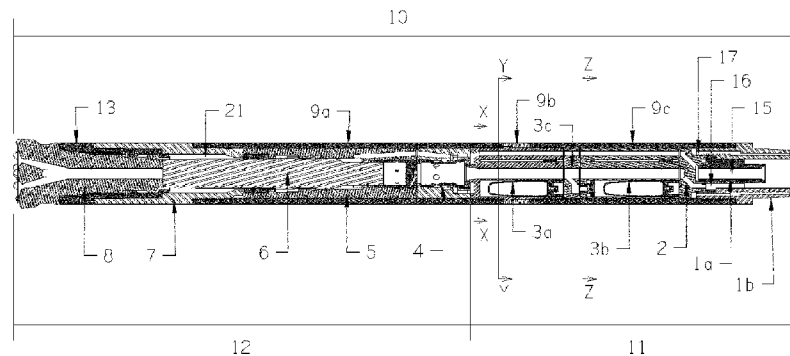
Published:

- 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:
16 July 2015

(54) Title: MULTI-ACCUMULATOR ARRANGEMENT FOR HYDRAULIC PERCUSSION MECHANISM

Figure 1



(57) Abstract: The present invention relates to a hydraulically powered percussion mechanism (12), comprising a piston (6) to impact a percussion bit (8). The percussion mechanism also includes a first accumulator assembly (3a) for hydraulic fluid. The first accumulator assembly comprises a plurality of first accumulator elements (27). In a first aspect, the plurality of first accumulator elements are arranged in a common housing (14). In a second aspect, each of the first accumulator elements is arranged at the same proximity to the piston. In a third aspect, each of the first accumulator elements comprises an accumulator membrane (32) or piston, and wherein the primary direction of movement of the membrane or piston in contact with the hydraulic fluid is substantially parallel to a longitudinal axis of the mechanism.



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/063622

A. CLASSIFICATION OF SUBJECT MATTER
INV. E21B4/14
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 Y	US 3 465 834 A (SOUTHWORTH HAMILTON JR) 9 September 1969 (1969-09-09) column 5, line 3 - line 13 -----	1,4,8, 10-15 9
X Y	WO 98/51900 A1 (WISAKANTO RISTO [FI]; SALMI PEKKA [FI]; SJOEHOLM HARRI [FI]) 19 November 1998 (1998-11-19) the whole document -----	1 9
X	WO 2012/138287 A1 (ATLAS COPCO ROCK DRILLS AB [SE]; PETTERSSON MARIA [SE]) 11 October 2012 (2012-10-11) the whole document -----	1,10-12

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 27 February 2015	Date of mailing of the international search report 22/05/2015
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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 Ott, Stéphane
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2014/063622

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.:

"see additional sheet(s)"

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, 4, 8-15

A hydraulically powered percussion mechanism, comprising: a piston to impact a percussion bit; and a first accumulator assembly for hydraulic fluid; the first accumulator assembly comprising a plurality of first accumulator elements in a common housing.

2. claims: 2, 5, 6

A hydraulically powered percussion mechanism, comprising: a piston to impact a percussion bit; and a first accumulator assembly for hydraulic fluid; the first accumulator assembly comprising a plurality of first accumulator elements, wherein each of the first accumulator elements is arranged at the same proximity to the piston.

3. claim: 3

A hydraulically powered percussion mechanism, comprising: a piston to impact a percussion bit; and a first accumulator assembly for hydraulic fluid; wherein the first accumulator assembly comprises a plurality of first accumulator elements, wherein each of the first accumulator elements comprises an accumulator membrane or piston, and wherein the primary direction of movement of the membrane or piston in contact with the hydraulic fluid is substantially parallel to a longitudinal axis of the mechanism.

4. claims: 7, 16-20

A hydraulically powered percussion mechanism, comprising: a piston to impact a percussion bit; and a first accumulator assembly for hydraulic fluid; wherein the first accumulator assembly comprises a plurality of first accumulator elements in a common housing, further comprising: a shuttle valve to control reciprocation of the piston, the shuttle valve having a shuttle valve diameter; and wherein the first accumulator assembly is arranged proximate to the shuttle valve, the shuttle valve has a surface that controls flow of fluid into and out of the first accumulator assembly and wherein each of the first accumulator elements comprises an accumulator membrane or piston, and wherein the minimum distance between at least one accumulator membrane or piston and the shuttle valve surface during operation of the percussion mechanism less than or equal to three times the shuttle valve diameter from the shuttle valve surface.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/EP2014/063622

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3465834	A	09-09-1969	NONE
WO 9851900	A1	19-11-1998	AU 7337198 A 08-12-1998
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