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(54) Demolition hammer with optimized resistance

(57) A demolition hammer (1) with optimized resistance, which comprises a body (2) for the containment of valve means for distributing a fluid medium to a linear actuator (3) provided with a piston which can move in a reciprocating manner along a percussion direction and operates on a demolition tool (5) which is guided so as to slide in a reciprocating manner by a support (4), the body (2) and the support (4) being substantially aligned along the percussion direction with the actuator (3) interposed between them. The demolition hammer (1) is further provided with a plurality of tension members (6) for the connection of the body (2) and the support (4), each of which has a first end associated with the body (2) and a second end associated with the support (4) by respective connection assemblies (7; 7').

At least one of the connection assemblies is of the obstacle type (7').

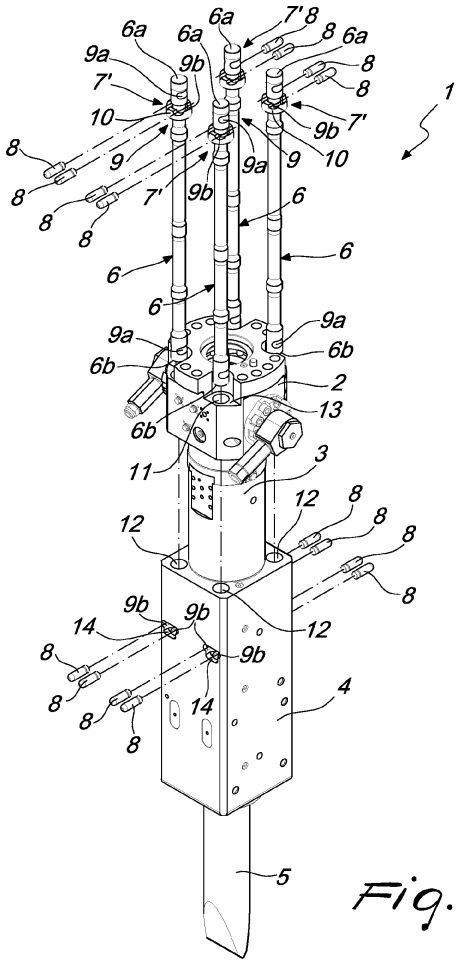

Fig. 1

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Description

[0001] The present invention relates to a demolition hammer with optimized resistance.

[0002] Demolition hammers are known which are used generally to break up rocks or the like or for work for perforating a road surface. These demolition hammers are machines actuated by a fluid medium and are essentially constituted by a body for containing valve means for the distribution of a fluid medium for feeding a linear actuator provided with a piston that is actuated with a reciprocating motion along a percussion direction and acts as a hammer on a tool (chisel) that is guided so as to slide in a reciprocating manner within a support.

[0003] The actuator is usually interposed between the body and the support that holds the tool. Assembly of the demolition hammer occurs by connection to tension members that are engaged in the body and in the support so as to fasten them to each other.

[0004] Each tension member is constituted by an appropriately sized screw that is inserted so as to pass through the body and the threaded root of which engages in a corresponding threaded dead seat provided or applied on the support. The head end of the screw can be shaped so as to form an abutment shoulder on the body or it can also be threaded (stud screw) and be coupled to a nut that abuts against said body.

[0005] In any case, one or both of the ends of each tension member are connected to the body and/or to the support of the tool by means of a threaded coupling.

[0006] It should be taken into account that tension members are critical components of the demolition hammer, since during use they are subjected to intense stresses due to the operating pressures and to the vibrations transmitted in the impact of the piston on the tool.

[0007] If one or more tension members break, moreover, the consequent misalignment of the distribution valve means, of the actuator and of the tool can cause the seizure of the piston, with considerable damage to the demolition hammer.

[0008] These demolition hammers of the known type are not free from drawbacks, which include the fact that in most cases the tension members break at the threaded ends and in particular at the height of the first meshing thread turns.

[0009] In order to obviate this drawback, threads have been provided which have an increased pitch and/or rounded ends, but they do not make it possible to substantially increase the reliability of demolition hammers.

[0010] The aim of the present invention is to eliminate the drawbacks cited above of the background art, by providing a demolition hammer with optimized resistance that allows a drastic reduction, if not elimination, of breakage of the tension members, increasing their fatigue strength.

[0011] Within this aim, an object of the present invention is to optimize the reliability and durability over time of demolition hammers, reducing maintenance costs and inefficiencies tied to the intervention times thereon for replacement of damaged components.

[0012] Another object of the present invention is to allow it to be included both in newly manufactured demolition hammers and in existing demolition hammers simply by replacing some components.

[0013] Another object of the present invention is to provide a structure that is simple, relatively easy to provide in practice, safe to use, effective in operation, and relatively low-cost.

[0014] This aim and these objects are all achieved by the present demolition hammer with optimized resistance, comprising a body for the containment of valve means for distributing a fluid medium to a linear actuator provided with a piston which can move in a reciprocating manner along a percussion direction and operates on a demolition tool which is guided so as to slide in a reciprocating manner by a support, the body and the support being substantially aligned along the percussion direction with the actuator interposed between them, a plurality of tension members being furthermore provided for the connection of said body and of said support, each of which has a first end associated with said body and a second end associated with said support by respective connection assemblies, **characterized in that** at least one of said connection assemblies is of the obstacle type.

[0015] Further characteristics and advantages of the present invention will become more apparent from the detailed description of some preferred but not exclusive embodiments of a demolition hammer with optimized resistance, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a partially exploded schematic perspective view of a first embodiment of the demolition hammer according to the invention;

Figure 2 is a schematic perspective view of the demolition hammer of Figure 1 in the assembled configuration;

Figure 3 is a schematic side view of the demolition hammer of Figure 2;

Figure 4 is a partial sectional view, along the plane IV-IV of Figure 3;

Figure 5 is a partially exploded schematic perspective view of a second embodiment of the demolition hammer according to the invention;

Figure 6 is a schematic perspective view of the demolition hammer of Figure 5 in the assembled configuration;

Figure 7 is a schematic side view of the demolition hammer of Figure 6;

Figure 8 is a partial sectional view, along the plane VIII-VIII of Figure 7;

Figure 9 is a schematic partially exploded perspective view of a third embodiment of the demolition hammer according to the invention;

Figure 10 is a schematic perspective view of the demolition hammer of Figure 9 in the assembled con-

figuration;

Figure 11 is a schematic side view of the demolition hammer of Figure 10;

Figure 12 is a partial sectional view, along the plane XII-XII of Figure 11;

Figure 13 is a partially exploded schematic perspective view of a fourth embodiment of the demolition hammer according to the invention;

Figure 14 is a schematic perspective view of the demolition hammer of Figure 13 in the assembled configuration;

Figure 15 is a schematic side view of the demolition hammer of Figure 14;

Figure 16 is a partial sectional view, along the plane XVI-XVI of Figure 15.

[0016] With reference to the figures, the reference numeral 1 generally designates a demolition hammer with optimized resistance.

[0017] The demolition hammer 1 comprises a body 2 for the containment of valve means for distributing a fluid medium, for example hydraulic oil or air, to a linear actuator 3 provided with a piston which can move in a reciprocating manner and operates along a percussion direction on a demolition tool 5 which is guided so as to slide in a reciprocating manner within a support 4 along the percussion direction, which extends vertically in the figures.

[0018] The parts cited above of the demolition hammer 1 are of the conventional type and are therefore neither described nor shown in detail.

[0019] The demolition hammer 1 furthermore has a storage unit that is fixed to the body 2, an outer enclosure for covering and protection and a handle at the body 2 to be gripped by the user, which are not shown in the figures.

[0020] The body 2 and the support 4 are aligned along the percussion direction, with the actuator 3 interposed between them.

[0021] The tool 5 can be the type of a chisel that extends along the percussion direction, but on the demolition hammer 1 tools having a different shape may also be mounted.

[0022] The demolition hammer 1 further comprises a plurality of tension members 6 for the connection of the body 2 and the support 4. Generally there are four tension members 6 arranged at the corners of the support 4, which has a substantially quadrangular transverse cross-section, but alternative embodiments that have a different number or a different configuration of the tension means 6, also according to the geometry of the body 2 and of the support 4, are not excluded.

[0023] The tension members 6 are constituted by rectilinear elements that are arranged parallel to the percussion direction and each one is provided with a first end 6a that is associated with the body 2 and a second end 6b that is opposite the first end and is associated with the support 4 by means of respective connection assemblies 7.

[0024] More precisely, each tension member 6 is inserted through a corresponding through hole 11 formed in the body 2, so that the first end 6a protrudes from said body at the end opposite to the one directed toward the actuator 3 and so that the second end 6b is inserted in a corresponding dead hole 12 provided in the support 4.

[0025] The body 2 is provided with an abutment surface 13, which surrounds perimetrically the end of each through hole 11 that is open at the first end 6a of the corresponding tension member 6.

[0026] At least one of the connecting assemblies 7 that are interposed between the ends 6a and 6b of each tension member 6 and, respectively, the body 2 and the support 4 is of the obstacle type 7', as an alternative to traditional threaded connections.

[0027] Conveniently, the demolition hammer 1 has obstacle connection assemblies 7' that are interposed between the second end 6b of each tension member 6 and the support 4, since it has been found that this region is subjected to the highest stresses.

[0028] The demolition hammer 1 can have obstacle connection assemblies 7' that are interposed also between the first end 6a of each tension member 6 and the body 2.

[0029] Each obstacle connection assembly 7' is composed of at least one preferably cylindrical pin 8, called grub or dowel, which is arranged transversely to a corresponding tension member 6 and is engaged in a corresponding seat 9 associated with at least said tension member.

[0030] The seat 9 can have a recess 9a provided laterally on the tension member 6, if the pin 8 is arranged so as to protrude partially laterally with respect to it, or a through hole if the pin 8 passes entirely through the cross-section of the tension member 6.

[0031] In order to obtain a better stability of the connection, the seat 9 is preferably associated also with the body 2 or with the support 4 and comprises a receptacle 9b that is formed or applied on one of them. However, the seat 9 might also be provided exclusively on the tension member and the pin 8 might abut simply against the body 2 or against the support 4, without the provision of dedicated receptacles thereon.

[0032] Depending on the specific configuration of the body 2 or of the support 4, the receptacle 9b can be formed directly on one of them or can be provided on an annular element 10 that is fitted along the tension member 6 until it abuts against the body 2 or against the support 4.

[0033] In order to obtain a higher resistance of the connection without weakening the tension member 11, preferably each obstacle connection assembly 7' has two pins 8 that are arranged parallel to each other on opposite sides of the corresponding tension member 6 and two corresponding seats 9 formed by respective lateral recesses 9a provided in the tension member in addition optionally to a receptacle 9b associated with the body 2

or with the support 4.

[0034] In a first embodiment (Figures 1-4), the demolition hammer 1 has obstacle connection assemblies 7' at both ends 6a and 6b of each tension member 6.

[0035] At the first ends 6a, each obstacle connection assembly 7' comprises an annular element 10 that has a face adapted to abut against the corresponding abutment surface 13 and is provided, on the opposite face, with a pair of parallel grooves that form the receptacles 9b for the end portions of the pins 8.

[0036] At the second ends 6b, instead, each obstacle connection assembly 7' comprises a pair of receptacles 9b formed by the lateral wings of a slot 14 that is conveniently T-shaped and provided in the support 4.

[0037] The assembly of the demolition hammer 1 provides for the insertion of each tension member 6 through the corresponding through hole 11 until the second end 6b abuts against the bottom of the corresponding dead hole 12, the positioning of the pins 8 through the slot 14 at the second ends, the insertion of the annular element 10 along the tension member 6 until it is positioned so as to rest against the abutment surface 13, the tensioning of the tension member 6 engaged at the first end 6a that protrudes from the body 2 by means of a conventional pre-tensioning device, the placement of the pins 8 so as to rest on the receptacles 9b and the release of the tension member 6, which, by contracting, moves the recesses 9a into abutment against the pins, tightening the connection.

[0038] In a second embodiment (Figures 5-8), the demolition hammer 1 has assemblies 7 for connection by means of threaded elements at the first ends 6a and obstacle connection assemblies 7' at the second ends 6b, which are very similar to the ones described above.

[0039] Each connecting assembly 7 has an external thread 15 that is provided at the first end 6a of the corresponding tension member 6 and a lock nut 16 that is coupled thereto and abuts against the abutment surface 13, to which a preset tightening torque is applied so as to obtain the desired preloading of said tension member.

[0040] In a third embodiment (Figures 9-12), the demolition hammer 1 has assemblies 7 for connection by means of threaded elements of the type described above at the first ends 6a of each tension member 6 and obstacle connection assemblies 7' at the second ends 6b.

[0041] In this case, each obstacle connection assembly 7' is provided with receptacles 9b on the support 4.

[0042] In particular, the support 4 is provided with an opening 17 that is connected to each dead hole 12 and can be accessed from the outside and in which an annular element 10 is inserted which is shaped complementary to the portion of the opening that is directed toward the actuator 3 and in which the receptacles 9b are formed.

[0043] In a fourth embodiment (Figures 13-16), the demolition hammer 1 comprises obstacle connection assemblies 7' for both ends 6a and 6b of each tension member 6. More precisely, the obstacle connection assemblies 7' at the first ends 6a are of the type described for the first embodiment, whereas the ones provided at the second ends 6b are identical with those of the third embodiment.

[0044] It is noted that the various versions of the demolition hammer described above have been studied so that provision of the obstacle connection assemblies 7' is possible without the necessity of intervening with the shape of the body 2 and of the support 4 already in use and until now intended for the fitting of threaded tension members.

[0045] In this sense, the present invention can be included also in existing demolition hammers by replacement of the threaded tension members with tension members provided with recesses 9a and by introduction of the pins 8 and the annular elements 10 that might be necessary.

[0046] Operation of the present invention is very similar to that of conventional demolition hammers, since its fundamental functional assemblies are not modified.

[0047] In practice it has been found that the described invention achieves the intended aim and objects and in particular the fact is stressed that the demolition hammer according to the invention allows a substantial reduction, if not elimination, of fatigue failure of tension members at the ends, increasing their durability and reliability.

[0048] Furthermore, the invention can be incorporated in newly manufactured demolition hammers or by operating on existing demolition hammers simply by replacing their tension members and connecting elements.

[0049] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

[0050] All the details may furthermore be replaced with other technically equivalent elements.

[0051] In practice, the materials used, as well as the contingent shapes and dimensions, may be any according to the requirements without thereby abandoning the protective scope of the claims that follow.

[0052] The disclosures in Italian Patent Application No. MO2012A000194 from which this application claims priority are incorporated herein by reference.

[0053] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A demolition hammer (1) with optimized resistance, comprising a body (2) for the containment of valve means for distributing a fluid medium to a linear actuator (3) provided with a piston which can move in a reciprocating manner along a percussion direction and operates on a demolition tool (5) which is guided

so as to slide in a reciprocating manner by a support (4), the body (2) and the support (4) being substantially aligned along the percussion direction with the actuator (3) interposed between them, a plurality of tension members (6) for the connection of said body (2) and said support (4) being further provided, each of which has a first end associated with said body (2) and a second end associated with said support (4) by respective connection assemblies (7; 7'), **characterized in that** at least one of said connection assemblies is of the obstacle type (7').

2. The demolition hammer (1) according to claim 1, **characterized in that** said at least one obstacle connection assembly (7') comprises at least one pin (8) which is arranged transversely to a corresponding tension member (6) and is engaged in a corresponding seat (9) which is associated with at least said tension member.

3. The demolition hammer (1) according to claim 2, **characterized in that** said seat (9) is also associated with said body (2) or with said support (4).

4. The demolition hammer (1) according to claim 2, **characterized in that** said seat (9) comprises a transverse hole that passes through said tension member.

5. The demolition hammer (1) according to claim 2, **characterized in that** said seat (9) comprises a lateral recess (9a) which is formed transversely in said tension member (6).

6. The demolition hammer (1) according to claim 3, **characterized in that** said seat (9) comprises a receptacle (9b) which is associated with said support (4) or with said body (2).

7. The demolition hammer (1) according to one or more of the preceding claims, **characterized in that** said at least one obstacle connection assembly (7') comprises an annular element (10) which is fitted on said tension member (6) and supports said receptacle (9b), which is associated with said body (2) or with said support (4), the receptacle (9b) being provided on the body (2) or on the support (4).

8. The demolition hammer (1) according to one or more of claims 1-3 and 5-7, **characterized in that** said at least one obstacle connection assembly (7') comprises two of said pins (8), which are mutually parallel on opposite sides of said tension element (6), and two corresponding seats (9), each one of said seats (9) comprising a lateral recess (9a) which is formed in said tension member (6).

9. The demolition hammer (1) according to one or more of the preceding claims, **characterized in that** it comprises one of said obstacle connection assemblies (7') at the second ends (6b) of each one of said tension members (6).

10. The demolition hammer (1) according to one or more of the preceding claims, **characterized in that** it comprises one of said obstacle connecting assemblies (7') at the first ends (6a) of each one of said tension members (6).

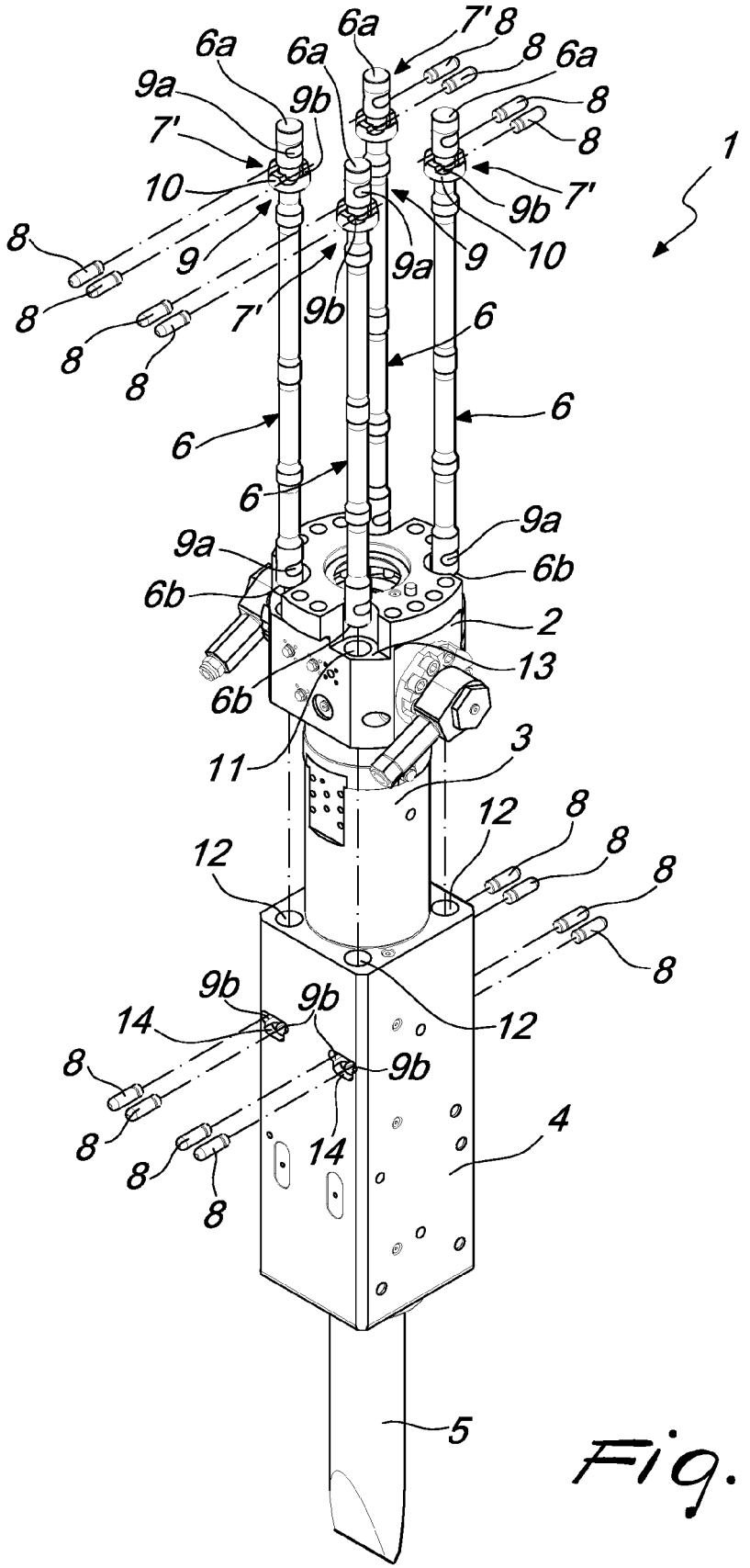

Fig. 1

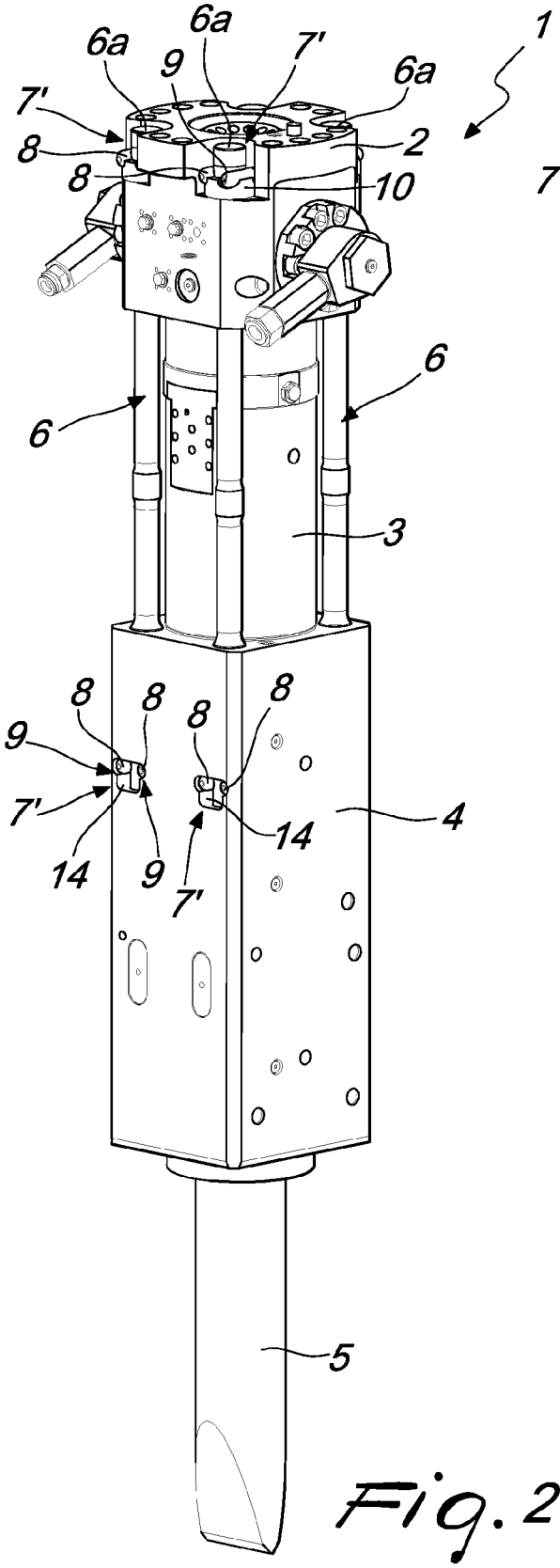
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Fig. 2

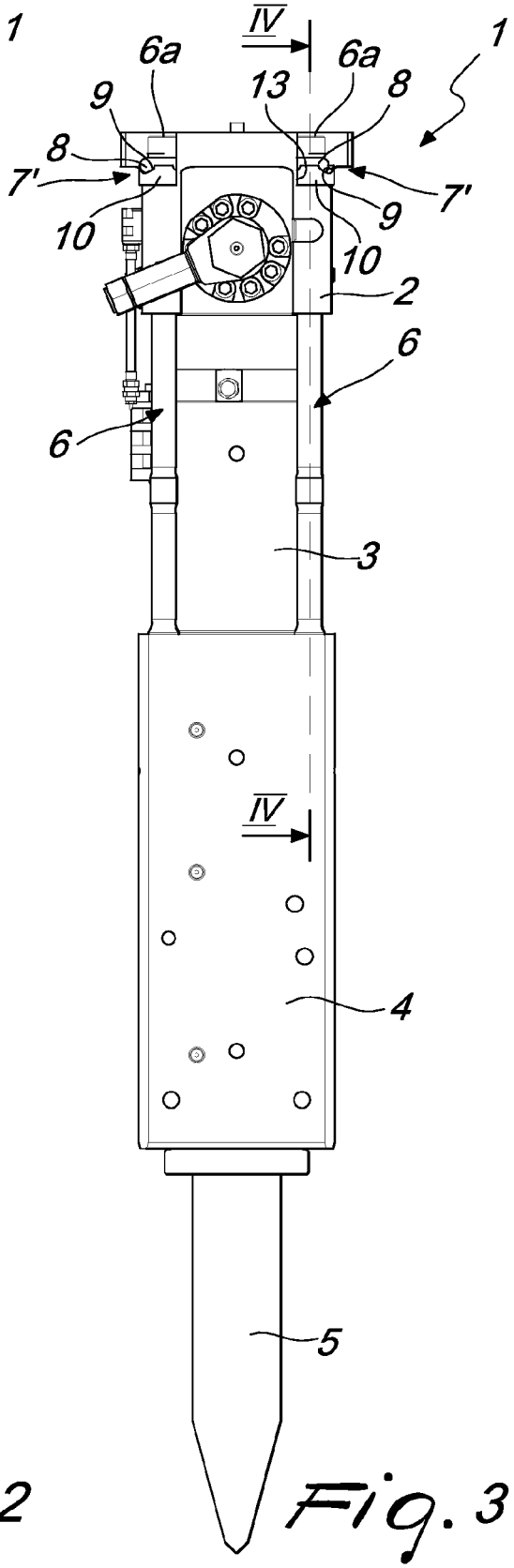
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Fig. 3

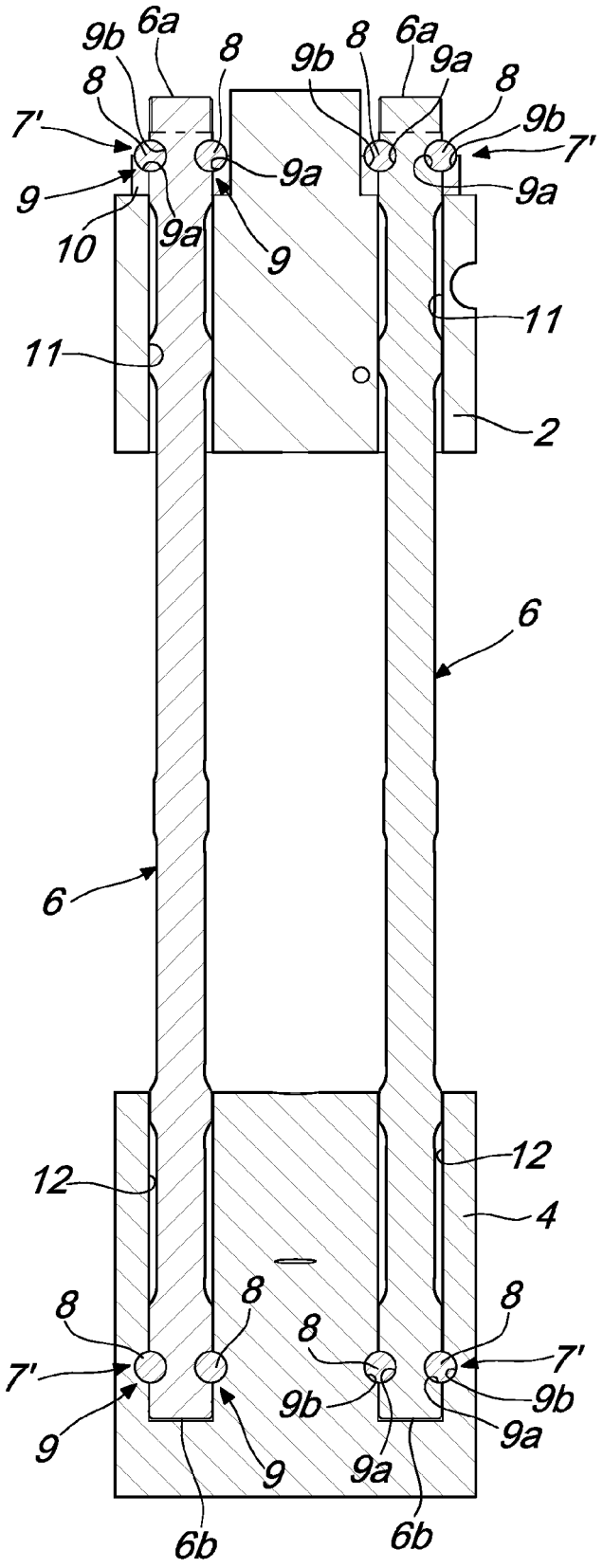
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Fig. 4

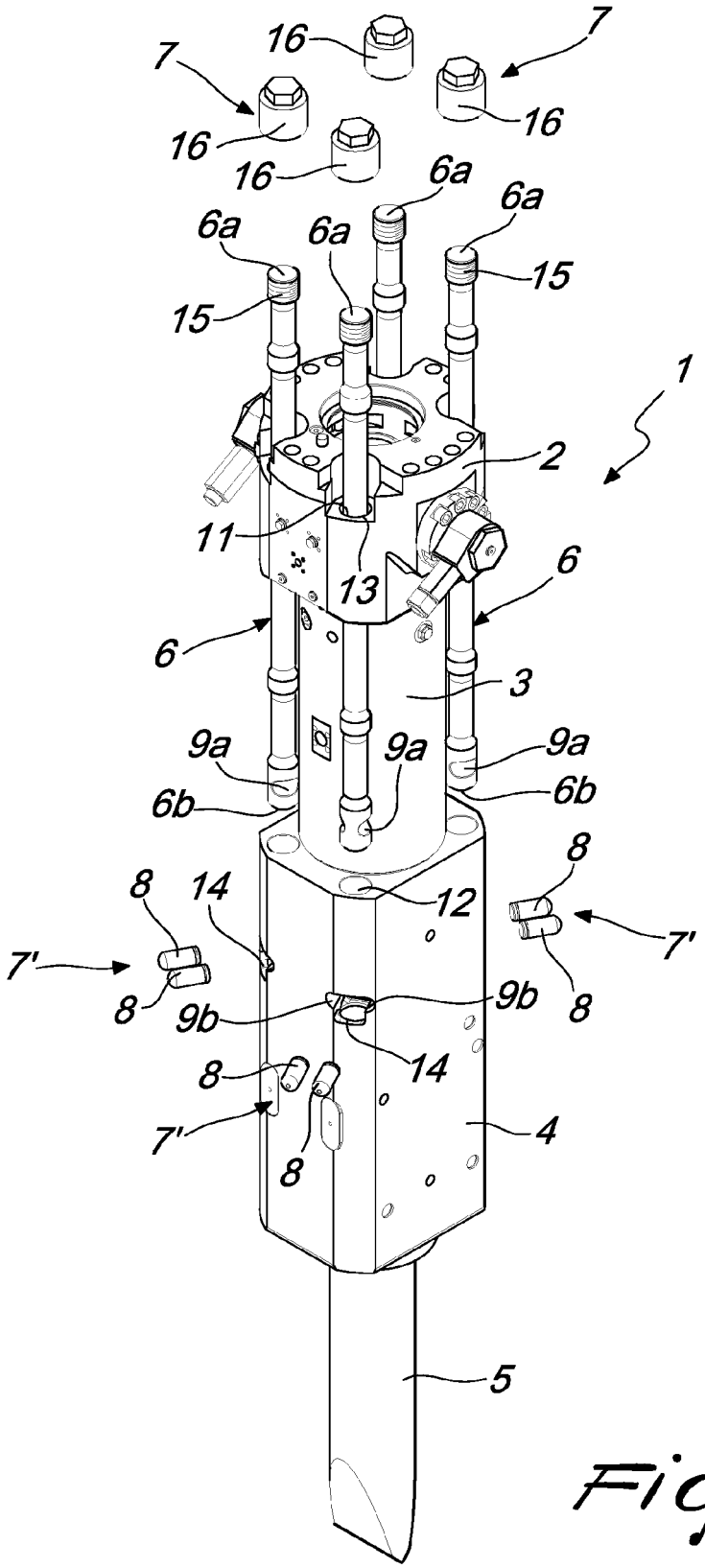
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Fig. 5

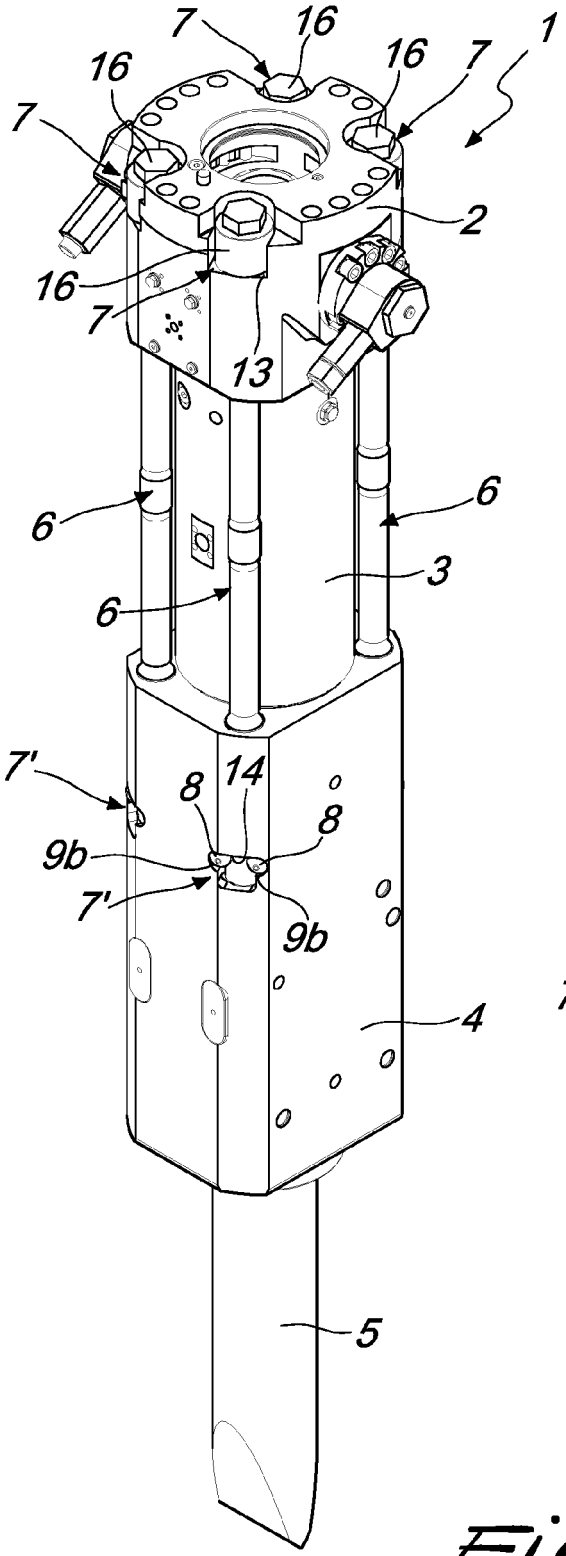
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Fig. 6

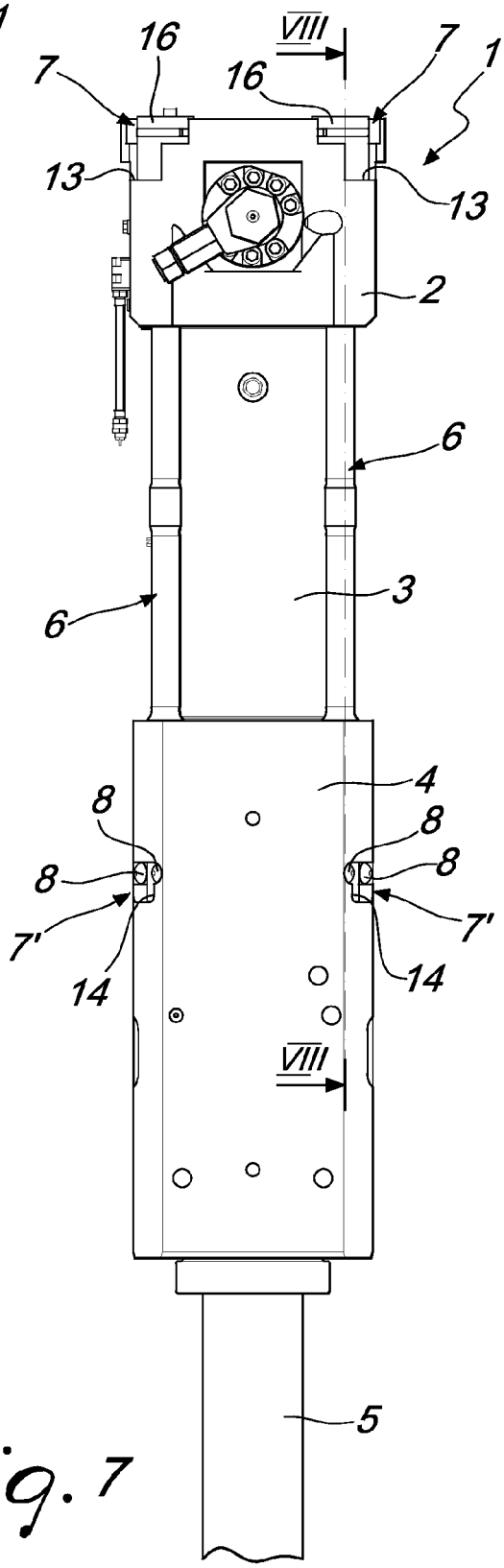
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Fig. 7

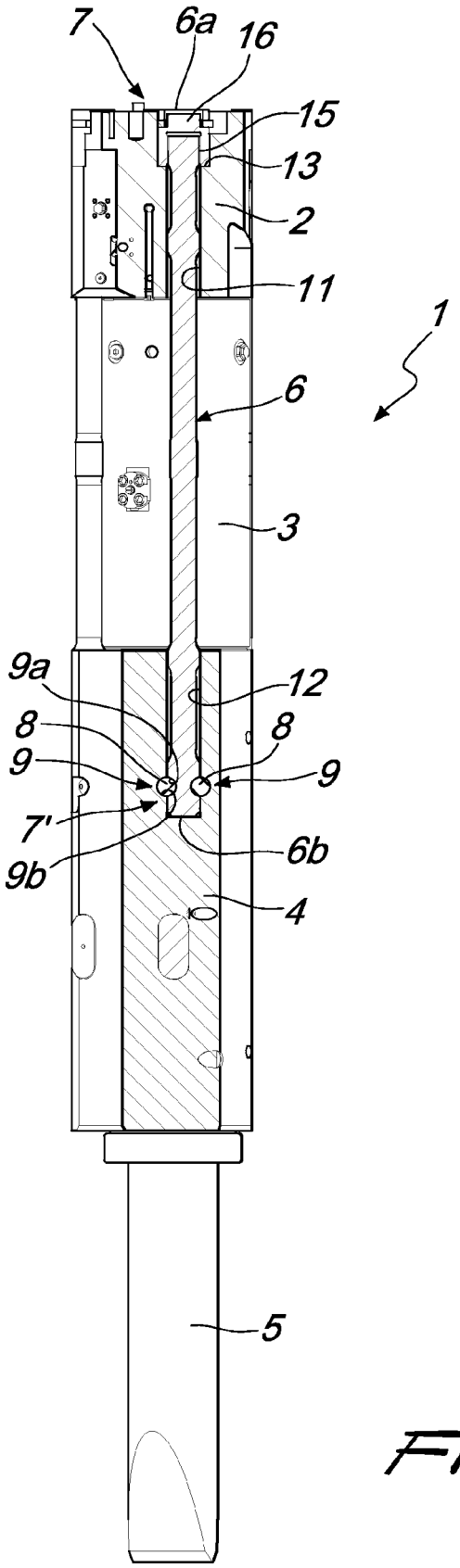

Fig. 8

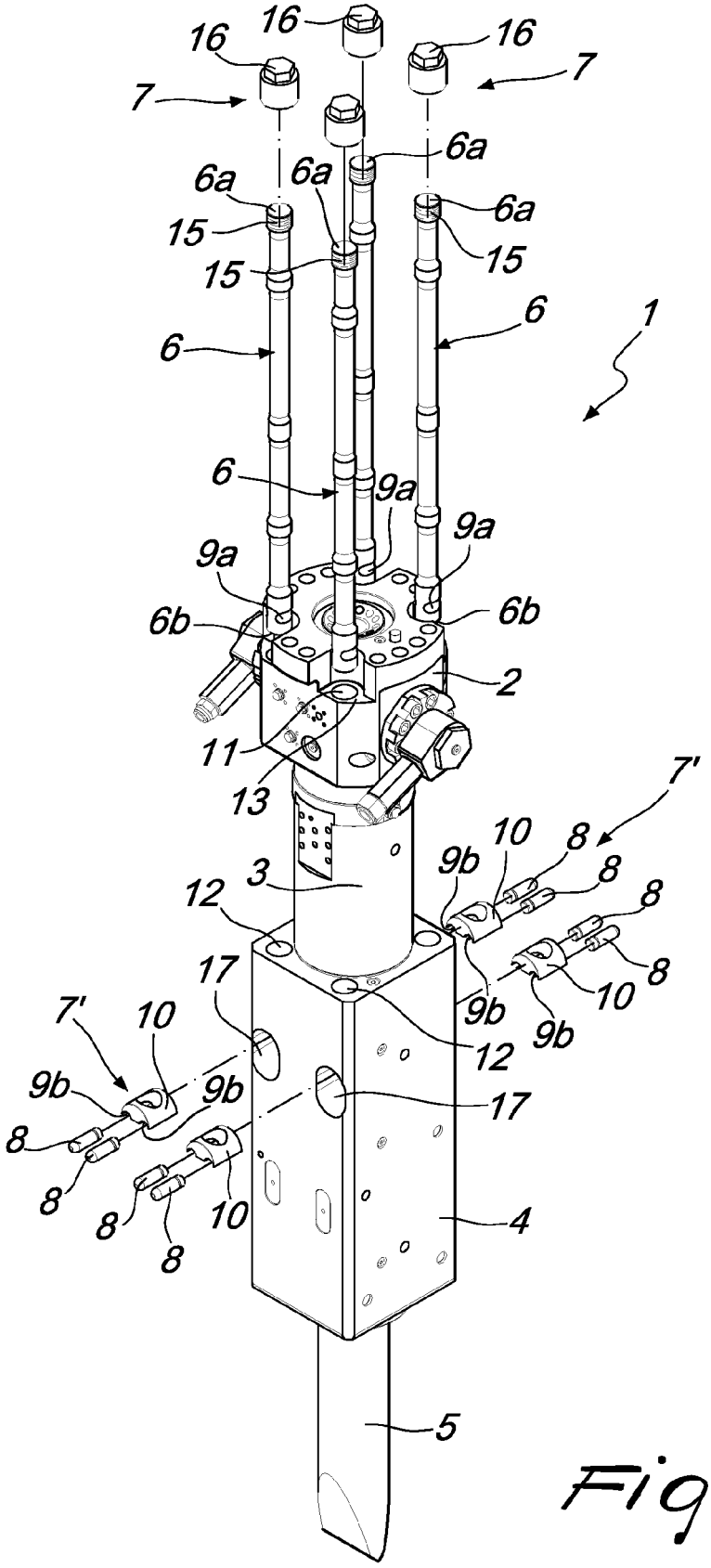
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Fig. 9

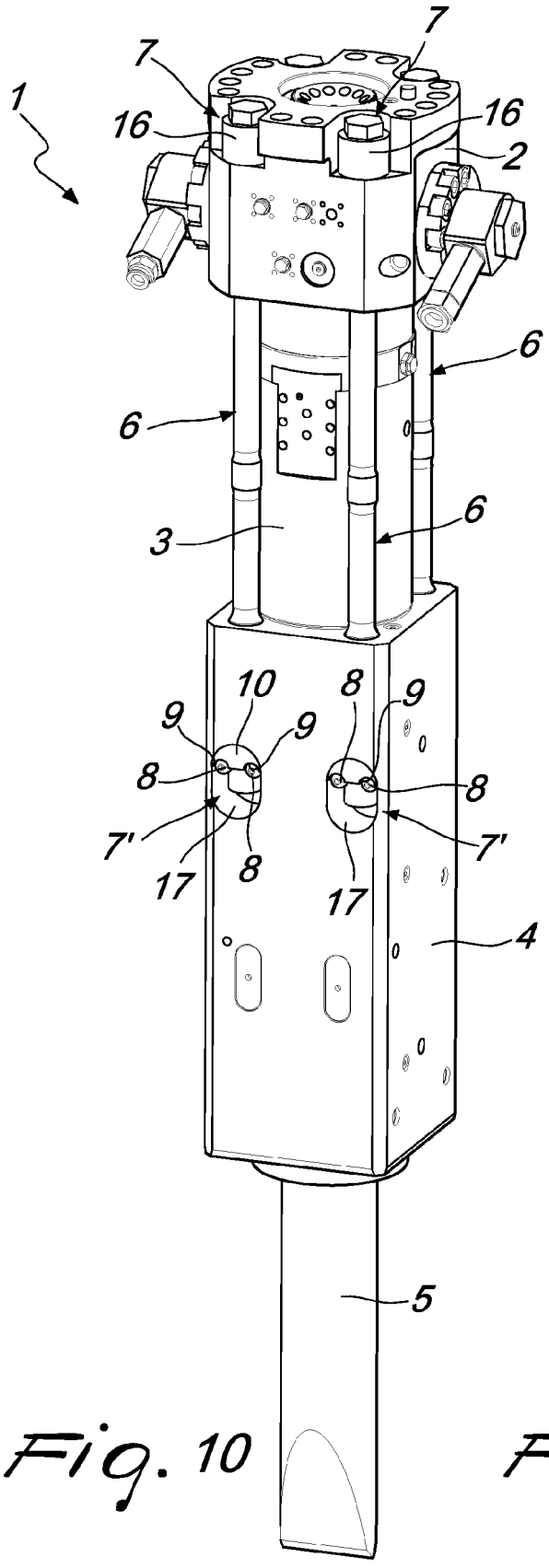
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Fig. 10

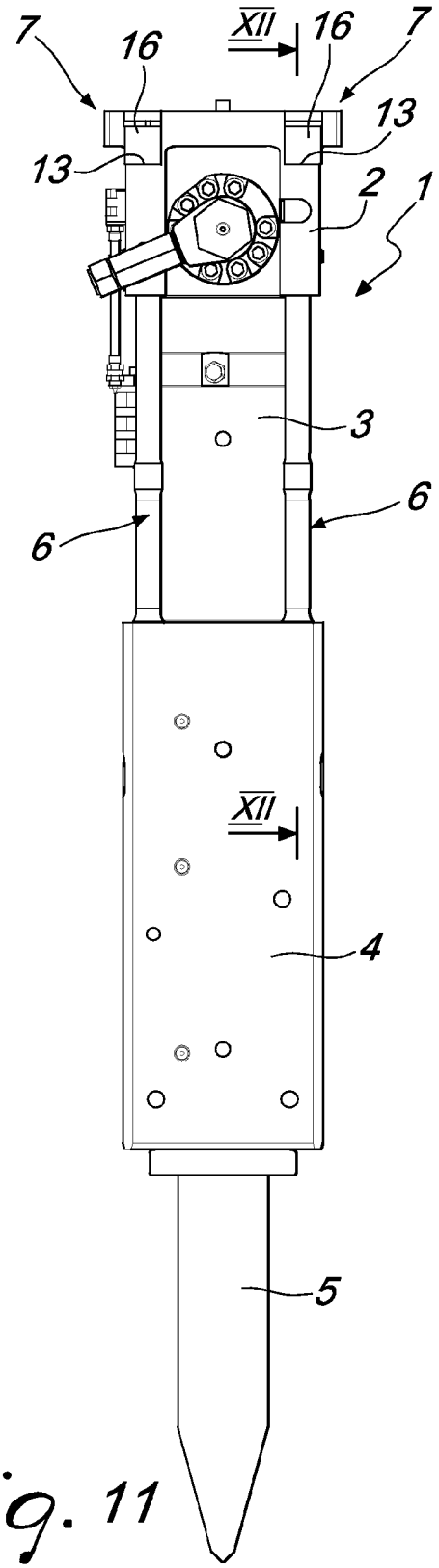
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Fig. 11

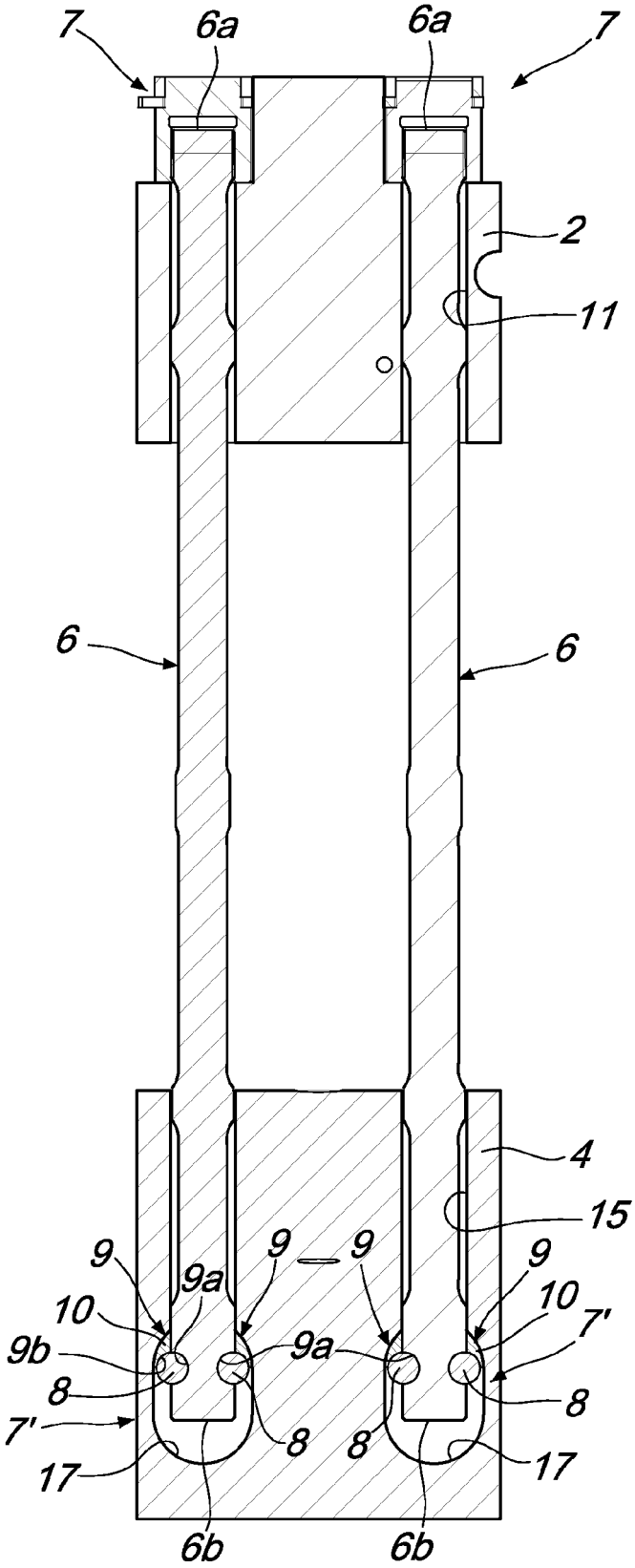

Fig. 12

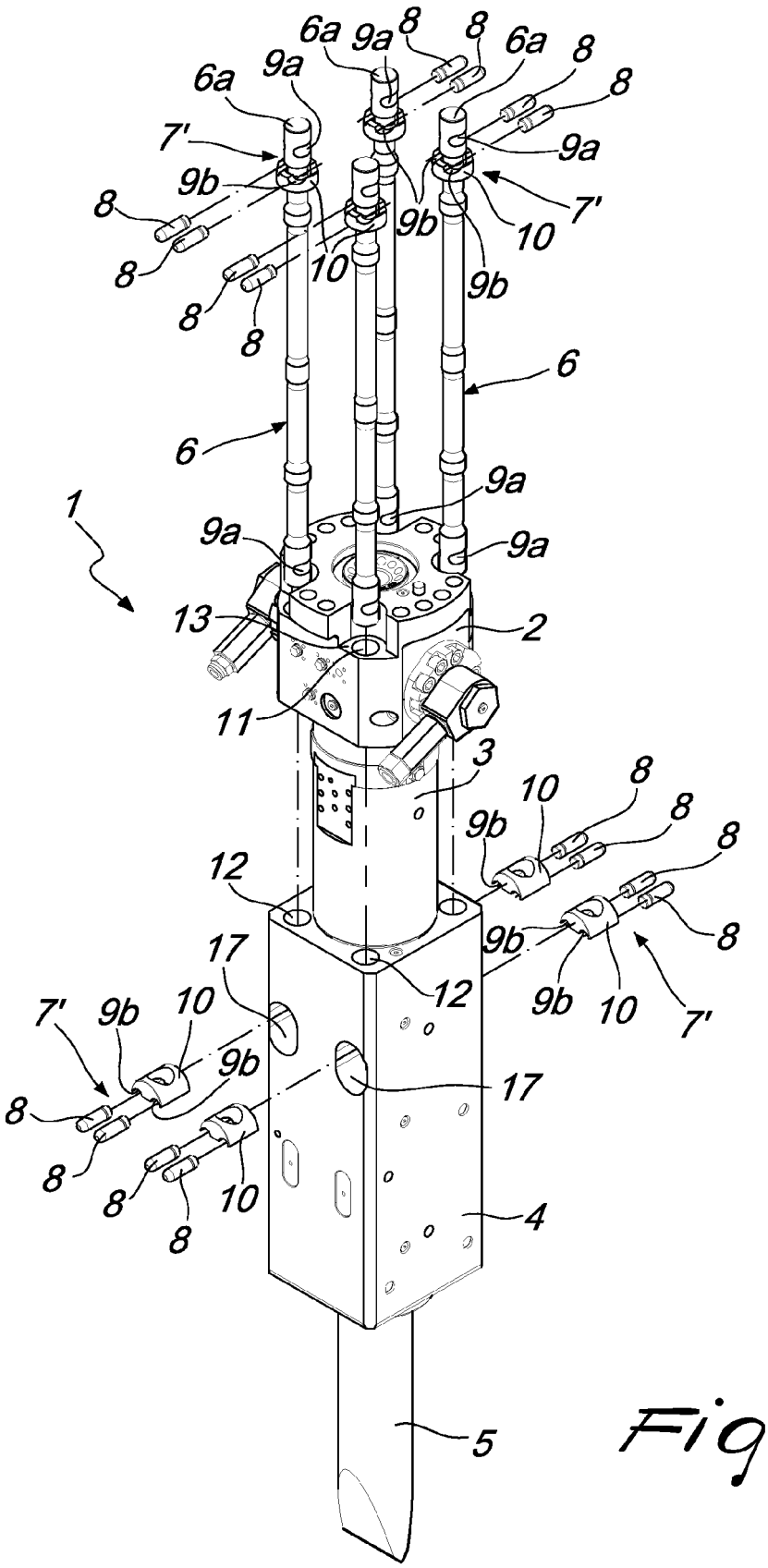
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Fig. 13

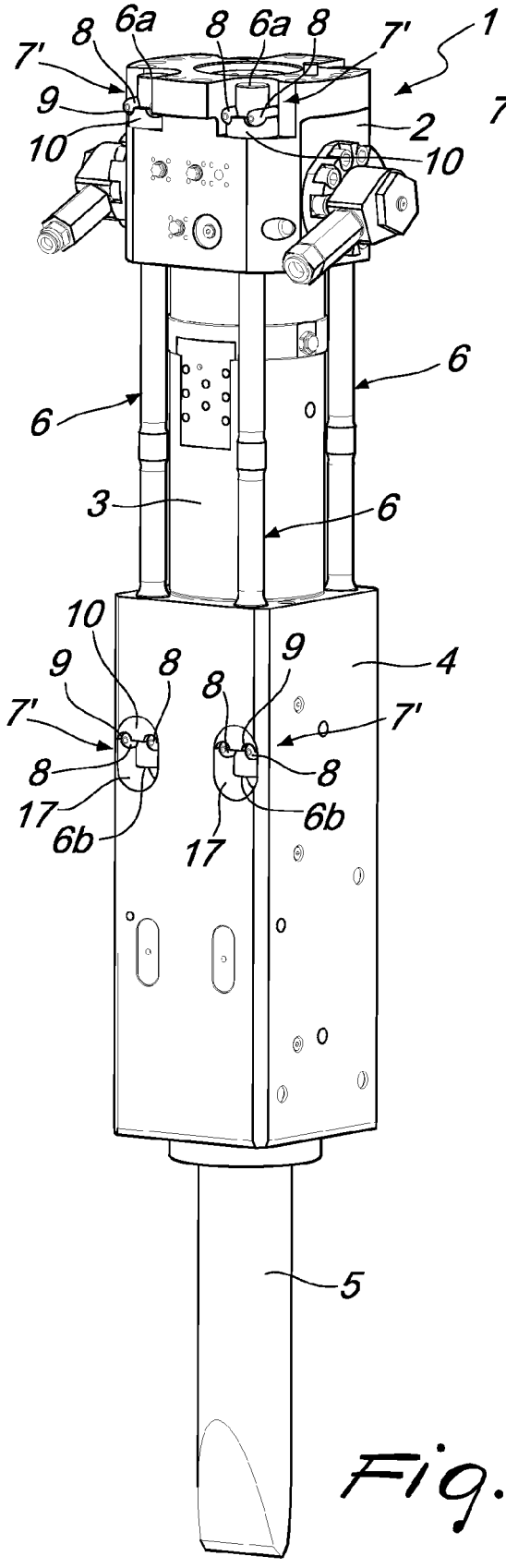


Fig. 14

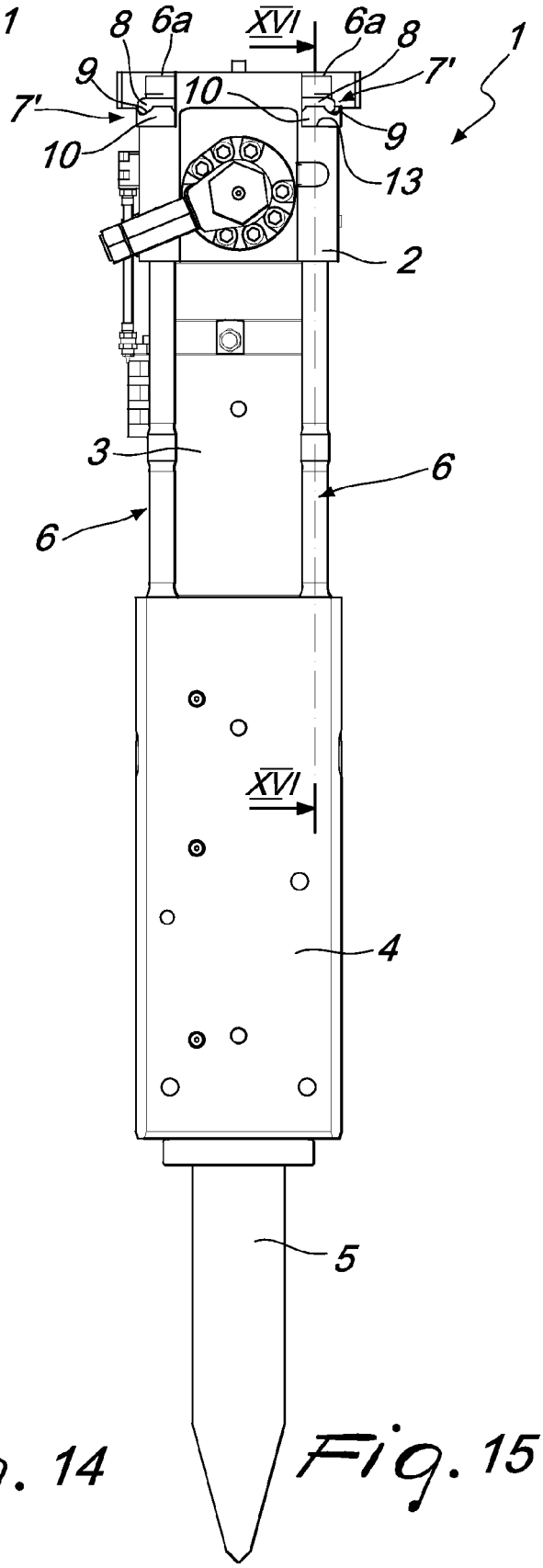
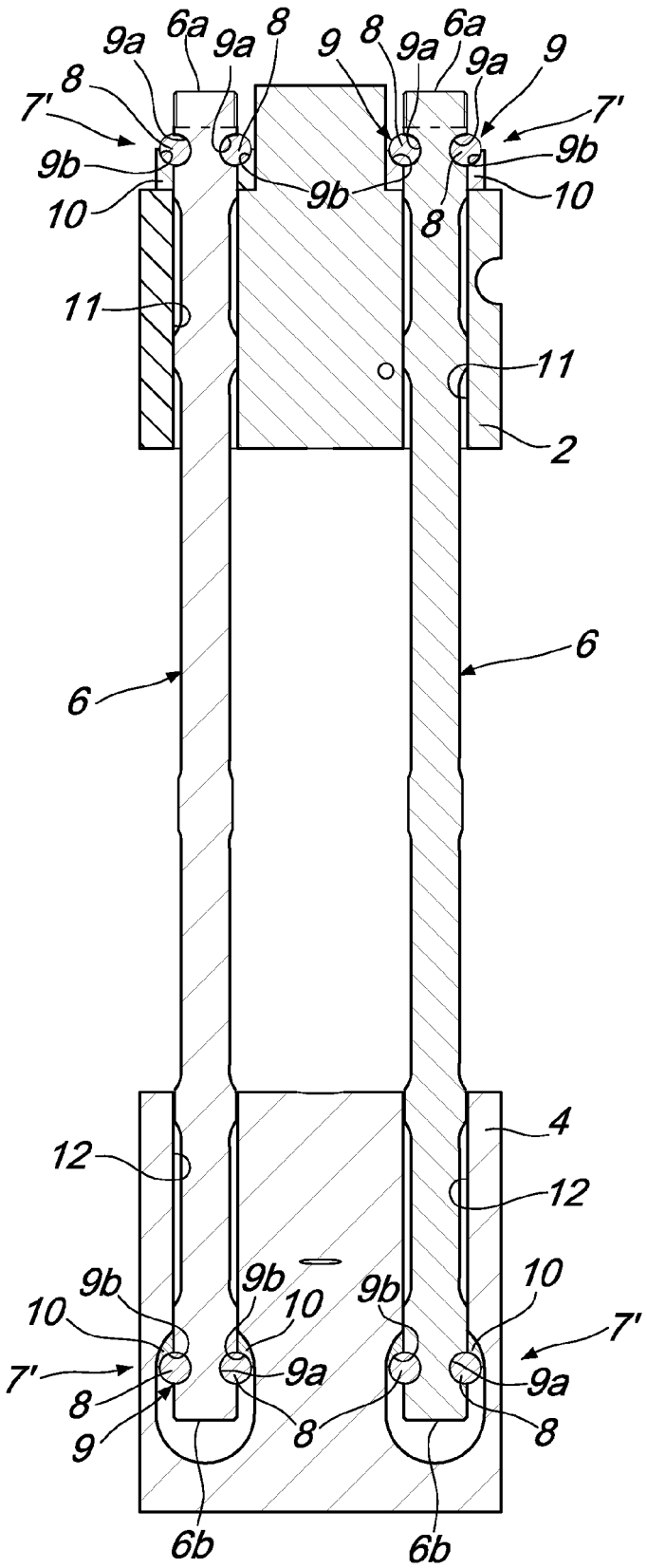


Fig. 15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7'
7'
9a
9a
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6b
6b

Fig. 16

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EUROPEAN SEARCH REPORT

Application Number
EP 13 17 8307

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 0 009 229 A1 (GUNNING SAMUEL DAVID) 2 April 1980 (1980-04-02) * paragraph [0013]; figures 1, 2 *	1,9,10	INV. B25D9/12 B25D17/24
X	US 2 622 562 A (LONGENECKER ERNST A) 23 December 1952 (1952-12-23) * column 1, line 1 - line 3; figure 1 *	1	
Y	EP 0 884 140 A1 (HYUP SUNG HEAVY IND CO LTD [KR]) 16 December 1998 (1998-12-16) * figure 1 *	1-8	
Y	JP 2012 076164 A (NIPPON PNEUMATIC MFG) 19 April 2012 (2012-04-19) * figures 1-5 *	1-8	
Y	US 2008/006426 A1 (FRIEDRICH ANDREAS [DE] ET AL) 10 January 2008 (2008-01-10) * paragraph [0020]; figures 1-4 *	4	
Y	GB 1 402 181 A (DOBSON PARK IND) 6 August 1975 (1975-08-06) * figure 2 *	7	TECHNICAL FIELDS SEARCHED (IPC) B25D B28D E02D
Y	JP 2008 114300 A (FURUKAWA ROCK DRILL CO LTD) 22 May 2008 (2008-05-22) * figures 1, 7 *	8	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	16 October 2013	Bultot, Coralie

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 13 17 8307

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

16-10-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0009229 A1	02-04-1980	CA 1103114 A1	16-06-1981
		EP 0009229 A1	02-04-1980
		JP S5548589 A	07-04-1980
		US 4189917 A	26-02-1980
US 2622562 A	23-12-1952	NONE	
EP 0884140 A1	16-12-1998	EP 0884140 A1	16-12-1998
		US 6095257 A	01-08-2000
JP 2012076164 A	19-04-2012	NONE	
US 2008006426 A1	10-01-2008	AT 482031 T	15-10-2010
		AU 2007202968 A1	17-01-2008
		EP 1872914 A1	02-01-2008
		JP 2008012660 A	24-01-2008
		US 2008006426 A1	10-01-2008
GB 1402181 A	06-08-1975	AU 5232173 A	22-08-1974
		DE 2304495 A1	27-09-1973
		FR 2175814 A1	26-10-1973
		GB 1402181 A	06-08-1975
		JP S48102365 A	22-12-1973
		PL 84847 B1	30-04-1976
		ZA 7300745 A	31-10-1973
JP 2008114300 A	22-05-2008	JP 4855215 B2	18-01-2012
		JP 2008114300 A	22-05-2008

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- IT MO20120194 A **[0052]**