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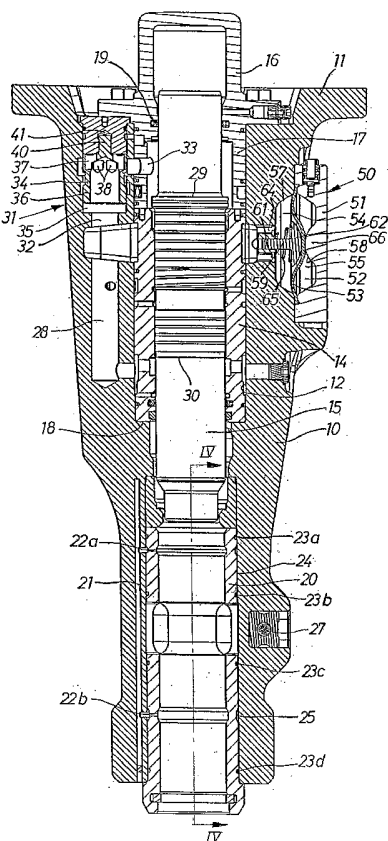
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(54) Title: **HYDRAULIC BREAKING HAMMER WITH LUBRICATED IMPLEMENT GUIDE SLEEVE**



(57) Abstract: A hydraulic breaker hammer comprises a housing (10) with a longitudinal bore (12), and a hammer piston (15) reciprocally powered in bore (12). A working implement inserted in a guide sleeve (20) is received in the forward end of the bore (12). A working implement retaining means (26a, b) is arranged to axially lock the guide sleeve (20) as well. A lubricant supply passage (21) in the housing (10) is communicating with the inside of said guide sleeve (20) via radial openings (22a, b) in the guide sleeve (20). Circumferentially extending annular seal elements (23a-d) on the outside of the guide sleeve (20) form at least one annular compartment (24, 25). Lubricant is supplied to the inside of the guide sleeve (20) via the annular compartment (24, 25) and the radial openings (22a, b), thereby supplying lubricant to the outside surface of the guide sleeve (20) within the annular compartment (24, 25).



Published:

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Hydraulic breaking hammer with lubricated implement sleeve.

The invention relates to a hydraulic breaking hammer type having a housing with a longitudinal bore, a piston reciprocally powered in the bore, a guide sleeve receiving a working implement, and a lubricant supply passage in the housing communicating with radial openings in the guide sleeve for communicating lubricant to the inside of the guide sleeve.

In prior art hydraulic breaker hammers of this type, for instance US 5,445,232, there is well known to supply lubricant grease to the inside of the working implement sleeve, but there is also a problem with the guide sleeve being seized in the housing. This means that after operation time there is a tendency that the guide sleeve gets seized in the housing bore due to frictional forces under vibration movement of the guide sleeve. This results in a difficulty to remove the guide sleeve from the housing for service, replacement etc. Costly time and effort have to be spent just to remove the guide sleeve from the housing, which is most undesirable.

The main object of the invention is to create a breaker hammer of the above described type wherein the guide sleeve is prevented from getting seized in the housing bore so that removal of the guide sleeve from housing bore is facilitated.

Further object and advantages of the invention will appear from the following specification and claims.

A preferred embodiment of the invention is described with reference to the accompanying drawing.

Fig. 1 shows a longitudinal section through a hydraulic breaking hammer according to the invention.

Fig. 2 shows on a larger scale a section through a distribution valve of the breaking hammer in Fig. 1.

Fig. 3 shows on a larger scale a fractional section through the implement sleeve arrangement of the breaking hammer in Fig. 1.

Fig. 4 shows a longitudinal section along line I-I in Fig. 1.

The hydraulic breaking hammer illustrated in the figures comprises a housing 10 formed with a rear shoulder 11 for attachment to a mechanical carrier excavator arm. The housing 10 is provided with a longitudinal through bore 12 which in its rear part supports a cylinder sleeve 14 for sealingly guiding a piston 15. At the rear end of the housing 10 there is bolted on an end cover 16 which forms an end closure of the bore 12. This end cover 16 is formed as a one-piece member with a tube-shaped neck portion 17 which extends into the bore 12 and contacts the rear end of the sleeve 14. The latter is clamped in its proper position in the bore 12 between the end cover neck portion 17 and a shoulder 18 in the bore 12. The neck portion 17 also serves as a guide means for the hammer piston 15 and carries a seal ring 19 for co-operation with the rear end of the piston 15.

In its front part the bore 12 carries a working implement guide sleeve 20 which is intended to receive the end of a working implement (not shown). The working implement as well as the guide sleeve 20 are axially retained relative to the housing 10 by means of two lock bolts 21 and 24 which extend perpendicularly to the guide sleeve 20 and which are kept in place by a transverse dowel 27.

1 and 4. For lubricating the sleeve 20 on its inner

which via radial openings 22 a,b in the guide sleeve communicates with the inside of the guide sleeve. Moreover, the guide sleeve 20 is provided with features 23 a-d on its outside the purpose of which is to form between them two annular compartments 24,25 located on opposite sides of the lock bars 26a,b. The radial openings 22 a,b in the guide sleeve 20 are located between the rings 23 a,b and 23 c,d, respectively, such that fluid has to pass through the compartments 24,25 to reach the radial openings 22 a,b and the guide sleeve 20 in Fig. 3. Accordingly, the compartments 24,25 are filled with lubricant (grease), and due to the relative extension of the compartments 24,25 lubricant is present over a substantial part of the outside surface of sleeve 20, thereby, preventing seizure of the guide sleeve 20 relative to the bore 12.

The guide sleeve 20 is in fact non-reciprocating during tool operation, but due to the influence of impact pressure waves transferred via the lock bars 26a,b, there are small local vibrational movements in the guide sleeve 20, which tend to cause a sort of friction welding between the guide sleeve 20 and the housing 10. Without a lubrication this will cause a seizure of the guide sleeve 20 in the housing 10, which results in a difficulty to remove the guide sleeve 20 from the housing 10 during service operations.

The housing 10 has a pressure fluid inlet passage supplying motive pressure fluid to the cylinder so as to drive the hammer piston 15 in its reciprocating movement for delivering blows to a working implement inserted in the guide sleeve 20. The piston 15 has oppositely facing drive surfaces 29,30, whereof the lower surface 30 is continuously connected to the pressure source, whereas the upper surface 29 is intermittent

distribution valve 31 has a fluid inlet 32 common with the pressure fluid inlet passage 28, and a fluid outlet 33 communicating with the upper drive surface of the hammer piston 15. Moreover, the distribution valve comprises a valve bore 35 and a valve element 34 guided in the bore 35. The valve element 34 comprises a tubular guide portion 36 guided in the bore 35, an end wall 37. In the end wall 37 there are through openings for connecting the inside of the guide portion 36 with the fluid inlet 32 with the outer surface of the end wall 37. The end wall 37 is provided with a reduced diameter activation portion 40 which extends co-axially in a direction opposite the guide portion 36 and is recessed into an intermittently pressurised activation bore 41.

The end wall 37 has a slightly larger cross section than the guide portion 36, and since the valve element 34 is open ended the fluid pressure will act constantly on the surface area formed by the guide portion 36 and the openings 38 on the outer surface of the end wall 37. In a position where the activation bore 41 is connected to the fluid inlet 32, i.e. no pressure acting on the activation portion 40, the remaining part of the end wall 37 is smaller than the surface area resulting in a closing force on the valve element 34. When instead the activation bore 41 is connected to the pressure fluid inlet passage 28, the total area of the end wall 37 plus the activation portion 40 will generate a force that will dominate the force generated by the pressure acting on the surface area of the guide portion 36. This means that the valve element 34 is shifted to its open position. (Not shown).

The valve element 34 is provided to control the communication between the inlet 32 and the outlet 33. For that purpose the valve element 34 is formed with a double seal function, namely both a clearance seal and a seat seal. The clearance seal function is obtained

with the valve bore 35 as illustrated in the closed position of the valve shown in Fig. 1. The seat is accomplished by an annular seat 45 at the end of 35 in co-operation with an annular contact surface the end wall 37. By a combined clearance seal and as described above there is obtained a high degree of tightness and, hence, a high efficiency of the hammer.

The breaker hammer shown in the drawing also comprises a pressure peak absorbing accumulator 50 which is formed by the hammer housing 10 and partly by a cover 11 attached to the housing 10. The accumulator 50 comprises an expansion chamber 52 which in a conventional way is formed by a flexible membrane 53 into a pressure fluid compartment 54 and a gas cushion compartment 55. The expansion chamber 52 is defined by an inner wall 57 and an outer wall 58 wherein the outer wall 58 is formed by the cover 11.

There is also provided a movable membrane support consisting of a stem portion 61 and a membrane end head 62. The latter is located inside the pressure fluid compartment 54, whereas the stem portion 61 is slidably guided in a bore in the inner wall 57. Openings 63 are provided in parallel with the stem portion 61 to communicate pressure fluid into the expansion chamber 52 and the head 62 of the membrane support 59 is arranged to cover these openings 63 at low pressure levels when the membrane 53 is pressed against the inner wall 57. A spring 65 is provided to exert a bias force on the membrane support 59 in the direction of the membrane 53. In order to limit the length of the guiding stem portion 61 there is provided a stop means in the form of a bulge shaped projection 66 on the outer expansion chamber wall. The projection 66 is formed integrally as a one piece with the cover 51. This movement limiting arrangement of the membrane support 59 is simple in design as it

The guide sleeve lubricating arrangement according to the invention means an improved and facilitated handling of the guide sleeve at service and replacement. However, the embodiments of the invention are not limited to the described example but can be freely varied within the scope of the claims.

Claims.

1. Hydraulic breaking hammer, comprising a housing (10) with a longitudinal bore (12), a hammer piston reciprocally powered in the bore (12), a working implement receiving non-rotating guide sleeve (20) is received at the forward end of the bore (12), a working implement retaining means (26a, b) arranged to axially lock the guide sleeve (20) as well, and a lubricant supply passage (21) in the housing (10) communicating with the inside of said guide sleeve (20) via one or more radial openings (22 a, b) in said guide sleeve (21),
c h a r a c t e r i z e d in that said guide sleeve (20) is provided on its outside with at least two circumferentially extending annular seal elements which are axially spaced apart and which together with the bore (12) form at least one annular compartment (24,25), said one or more radial openings (22 a,b) are located in said at least one annular compartment (24,25), such that lubricant is supplied to the inside of said guide sleeve (20) via said at least one annular compartment (24,25) and said one or more radial openings (22 a,b), thereby supplying lubricant to the outside surface of said guide sleeve (20) within said at least one annular compartment (24, 25).

2. Breaking hammer according to claim 1, where the annular seal elements (23 a-d) are four in number forming two separate annular compartments (24,25) located on opposite sides of the working implement retaining means (26a, b).

FIG 1

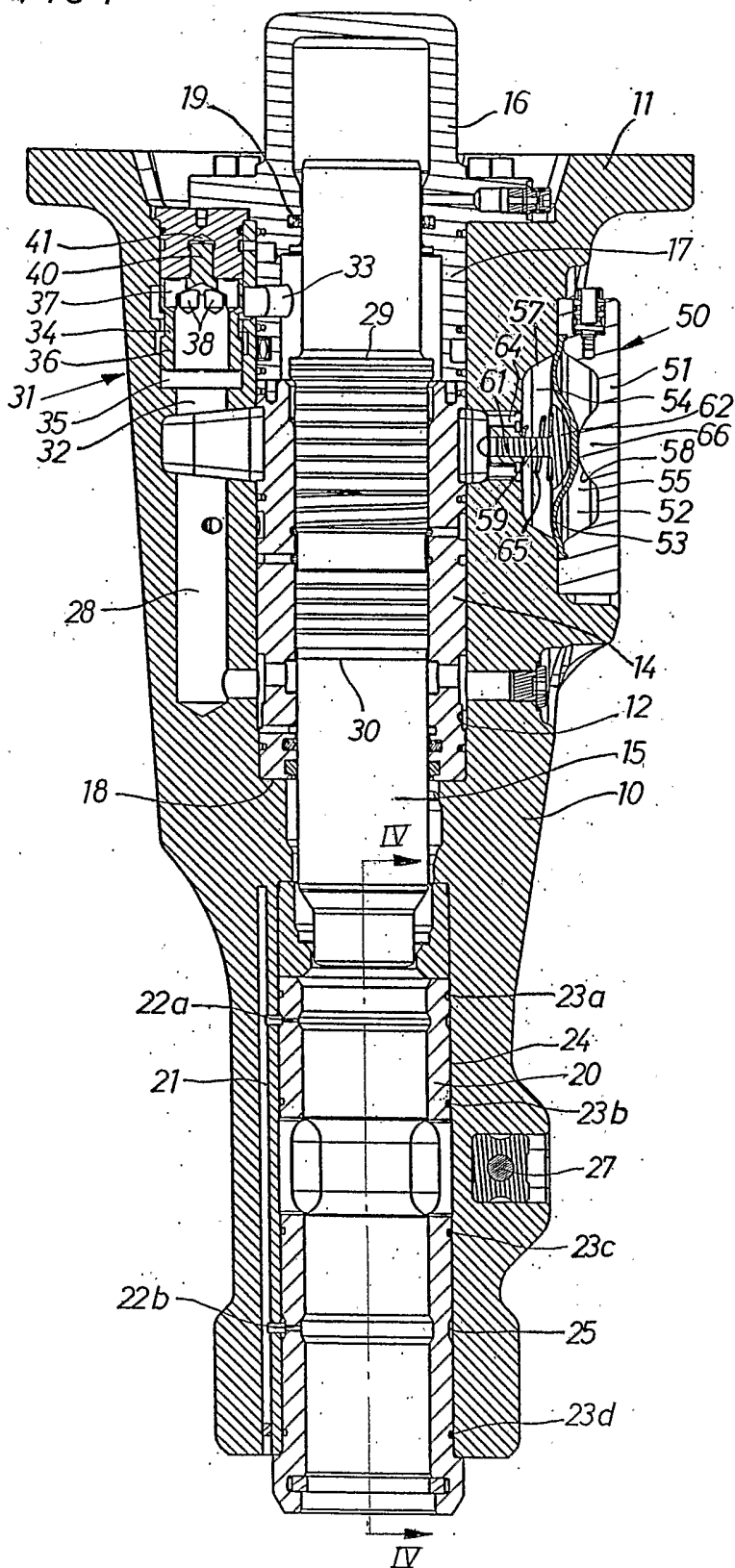


FIG 2

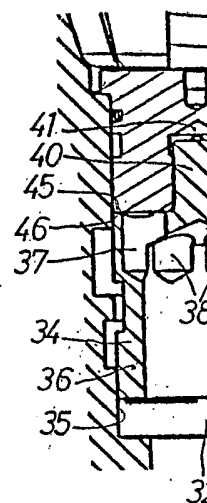


FIG 3

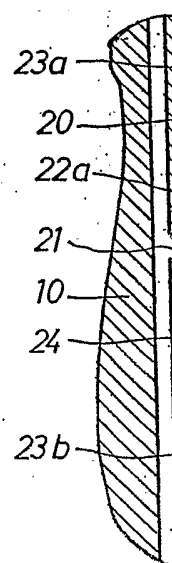
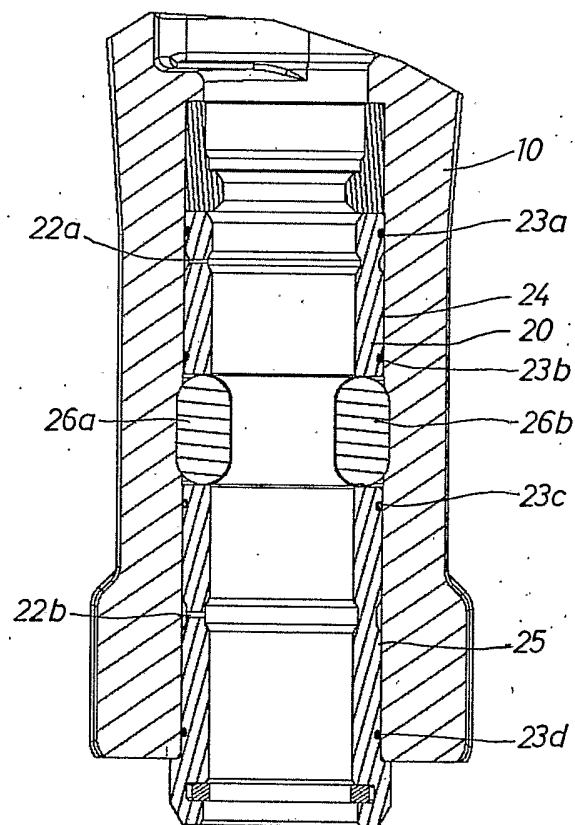


FIG 4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 2005/000328

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B25D 17/26

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)

IPC7: B25D, E21B

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

SE,DK,FI,NO classes as above

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

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2122271 A (OY TAMPELLA AB), 11 January 1984 (11.01.1984), figures 1,2,5, abstract --	1,2
A	EP 0525498 A2 (KRUPP MASCHINENTECHNIK GESELLSCHAFT MIT BESCHRÄNKTER HAFTUNG), 3 February 1993 (03.02.1993), figure 3, abstract --	1,2
A	EP 1321245 A1 (SANDVIK TAMROCK OY), 25 June 2003 (25.06.2003), abstract --	1,2
A	DE 19805187 A1 (ROBERT BOSCH GMBH), 12 August 1999 (12.08.1999), figure 2 --	1,2

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

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"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

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Date of the actual completion of the international search

3 May 2005

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 2005/000328

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

International application No.
SE2005/000328

Box No. IV Text of the abstract (Continuation of item 5 of the first sheet)

Hydraulic breaking hammer, comprising a housing (10) with a longitudinal bore (12), and a hammer piston (15) reciprocally powered in the bore (12). A working implement receiving non-rotating guide sleeve (20) is received in the forward end of the bore (12). A working implement retaining means (26 a, b) is arranged to axially lock the guide sleeve (20) as well. A lubricant supply passage (21) in the housing, (10) is communicating with the inside of said guide sleeve (20) via radial openings (22 a, b) in the guide sleeve (20). Circumferentially extending annular seal elements (23 a-d) on the outside of the guide sleeve (20) form at least one annular compartment (24, 25). Lubricant is supplied to the inside of the guide sleeve (20) via the annular compartment (24, 25) and the radial openings (22 a, b), thereby supplying lubricant to the outside surface of the guide sleeve (20) within the annular compartment (24, 25).