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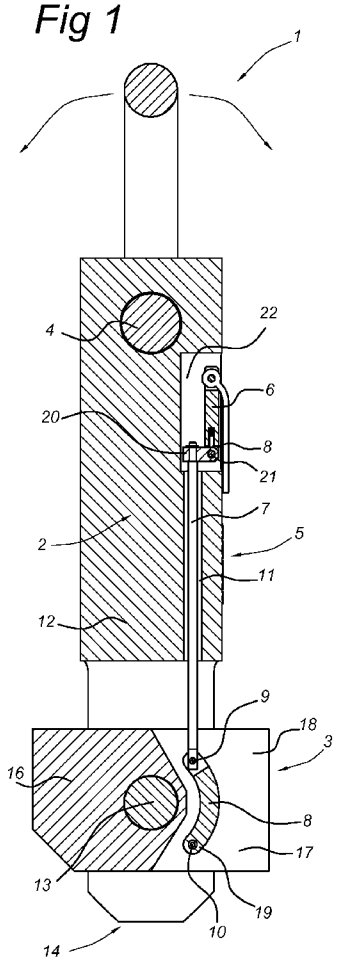
(54) Title: LIFTING MEANS

(57) Abstract: A lifting means (1) comprises a carrying body (2) which can be inserted through a through- hole (24) in an object (23) to be lifted, a tiltable hook (3) at one end of the carrying body, an engagement means (4.25) which is located at the opposing end of the carrying body and with which a hoisting cable (27) and the like can engage, and also operating means (5) for displacing the hook between an inactive position wherein the hook can pass through the hole and an active position wherein the hook can engage with the object.

Fig 1



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— *with international search report (Art. 21(3))*

Lifting means

The invention relates to a lifting means comprising a carrying body which can be inserted through a through-hole in an object to be lifted, a tiltable hook at one end of the carrying body, an engagement means which is located at the opposing end of the carrying body and with which a hoisting cable and the like can engage, and also operating means for displacing the hook between an inactive position wherein the hook can pass through the hole and an active position wherein the hook can engage with the object.

A lifting means of this type is known from US patent specification 4,447,085. This known lifting device has a cylindrical housing which can be inserted into a conically tapering hole. The hooks, which protrude outward with respect to the cylindrical housing, are initially pushed inward, and issue outward at the rear edge of the hole. Furthermore, this known lifting means has operating rods which can be operated by levers. As the cylindrical housing is inserted further into the hole, these levers also enter into contact with the cone, in such a way that the hooks tilt inward and the lifting means can be removed from the hole.

This known lifting means has various drawbacks. First of all, there are no interlocking arrangements by means of which the hooks can be reliably kept in interaction with the object in question. Furthermore, the cylindrical housing has a relatively large diameter, as a result of which the lifting means is not suitable for use in objects wherein merely a small hole can be formed. Examples include the cutter heads of cutter suction dredgers, which articles do have a high weight, but on the other hand have fairly narrow, elongate arms wherein merely small holes can be formed.

A further drawback is the fact that the ratio between the carrying capacity and the diameter of this known lifting means is fairly small. As a result, it is not readily possible to handle large loads using a relatively small lifting means. The term "large loads" refers to the loads which are for example in practice hoisted with the aid of hoisting chains and hoisting links. Furthermore, it is not readily possible to raise the hoisting loads in various hoisting directions. As a consequence of the conical shape of

the hole wherein the known lifting means is mounted, the hoisting direction must be almost centered with respect to the axis of that hole and it may not deviate laterally or be directed obliquely.

The objective of the invention is therefore to provide a lifting means which is suitable for large loads and which can also be subjected to obliquely directed hoisting loads. That objective is achieved in that the operating means comprise an articulated rod assembly with an operating rod which is guided so as to be able to slide in the longitudinal direction with respect to the carrying body and a coupling rod which is coupled between the operating rod and the hook.

The rod assembly according to the invention necessitates a compact construction of the lifting means, wherein the carrying body can have fairly small cross-sectional dimensions. As a result, the lifting means according to the invention can be made to interact effectively with relatively small holes. Furthermore, the carrying body can have, owing to its compact construction, high strength and rigidity, and for example be embodied in a solid manner. The carrying body can be mounted in a fairly long hole having a constant cross section. As a result, bending moments can also be transmitted between the carrying body and the object, meaning that obliquely directed hoisting loads are also acceptable.

Preferably, the hook and the rod assembly can be interlocked in their outermost positions. For this purpose, provision may be made for the rod assembly to comprise a lock which is coupled to the operating rod at the end thereof which is remote from the coupling rod. By means of said lock, the rod assembly can be interlocked in the outermost slid positions which the rod assembly assumes when the hook is in the active position or the inactive position respectively of the hook. Preferably, said lock is operated manually.

The lock can be embodied in various ways, for example in the form of a pin which can be inserted into lock holes which are located in the rod assembly and in various positions in the carrying body. In connection with manual operation and a non-detachable embodiment of the lock, preference is given to an embodiment wherein the

lock is rotatably connected to the operating rod. In addition, the carrying body has a locking chamber wherein the lock can be received in two different outermost rotational positions for interlocking the rod assembly in the outermost sliding positions thereof.

The lock can now be gripped by hand, and be rotated out of the locking chamber, after which the rod assembly can be slid. As soon as the rod assembly has reached the other desired outermost position, the lock can subsequently be rotated back inward into the locking chamber, in such a way that the desired interlocked position of the rod assembly is obtained.

As stated hereinbefore, the carrying body is preferably embodied at least partly in a solid manner. In that case, the carrying body can have a channel wherein the operating rod is received. Although the operating rod fits snugly in that channel, it has with respect thereto a clearance such that the operating rod is able without much difficulty to slide in that channel in the longitudinal direction.

Preferably, the channel opens into said locking chamber. The lock is preferably connected to the operating rod by means of a hinge, which is directed transversely with respect to the channel, in such a way that in a first outermost rotational position of the lock, the operating rod assumes a first outermost sliding position and in a second outermost rotational position, rotated over substantially 180 degrees with respect to the first outermost rotational position, of the lock, the operating rod assumes a second outermost sliding position.

The carrying body has preferably a fork-shaped end wherein the hook is received. In that case, the hook can be located in the inactive state wholly within the contour of at least the fork-shaped end, whereas it protrudes in the active state with respect to said contour. In the inactive state, the lifting means can therefore be inserted into the hole in question of the object, wherein merely the transverse dimensions of the carrying body and the transverse dimensions of the hole have to be adapted to each other.

Preferably, the hook has a slot. The coupling rod can be received in these slots. The hook can be suspended from the fork-shaped end by means of a hinge pin; in that case,

the coupling rod can be embodied in a curved manner in such a way that the hollow shape thereof is turned toward the hinge pin. In connection with balanced engagement of the hook on both sides of the hole, the hook can have a circumferential contour which, viewed in a plane perpendicular to the hinge pin, is symmetrical with respect to a plane wherein the axis of the hinge pin is located. The loads are then exerted on the object by means of both ends, which protrude with respect to the carrying body, of the hook.

The invention further relates to a combination of a lifting means as described hereinbefore, and also an object to be lifted, wherein the object has at least one through-hole having a cross-sectional contour which is constant over the entire length and corresponds to the cross-sectional contour of the carrying body, and of which the length is smaller than the length of the carrying body. This object can be a large number of different articles, such as for example the cutter head of a cutter suction dredger and the like.

The invention will be described hereinafter in greater detail based on an exemplary embodiment illustrated in the figures, in which:

figure 1 is a longitudinal section through a lifting means according to the invention, in a first position;
figure 2 is a front view of the lifting means;
figure 3 is a transverse view of the lifting means in a second position;
figure 4 shows a first exemplary application of the lifting means;
figure 5 shows a second exemplary application;
figures 6-8 are perspective views of the lifting means; and
figure 9 is a perspective view, partly in cross section, of the lifting means.

The lifting means 1 according to the invention shown in figures 1-9 has a carrying body 2 to which the tiltable hook 3 is fastened. A clasp, to which a hoisting cable can be fastened, is received in the hole 4 of the carrying body. Furthermore, the lifting means 1 has the operating means which are denoted by reference numeral 5 and which can be used to transfer the hook 3 between the active hook position as shown in figure 1,

wherein the hook protrudes outside the contour of the carrying body 2, and the collapsed or inactive position which is represented in figure 3 and wherein the hook 3 is located within the contour of the carrying body 2.

The operating means 5 consist of the lock 6, the operating rod 7 and the coupling rod 8. The lock 6 is connected to the operating rod 7 via a hinge 8, and the operating rod 7 is connected to the coupling rod 8 via a further hinge 9. Finally, this coupling rod 8 is connected to the hook 3 by means of, again, a hinge 10. The operating rod 7 is received in a channel 11 extending through the solid portion 12 of the carrying body 2. This means that the operating rod 7 can be displaced back and forth merely in its longitudinal direction.

The hook 3 is rotatably suspended by means of the hinge pin 13 from the fork-shaped end 14 of the carrying body 2 which has two fork parts 15. The hook 3 has a solid portion 16 and also two cheeks 17 which form an entity connected thereto and mutually enclose a gap 18. The bottom end of the operating rod 7 reaches into the gap 18 between the cheeks 17 of the hook 3. The coupling rod 8, which is coupled to the hook 3 via a pin 19 which is secured in both cheeks 17, is also located in the gap 18.

At the top end, the operating rod 7 has a short transverse arm 20, onto the free end of which the lock 6 is coupled by means of hinges 21. This lock is located in the locking chamber 22 which is hollowed out in the solid portion 12 of the carrying body 2.

During operation, the lifting means is operated as follows. In the state shown in figures 1 and 2, the hook 3 is in the active position wherein the two ends thereof protrude outward with respect to the carrying body 2. In this position, the operating rod 7 is slid downward in the channel 11, in such a way that a rotation of the hook around the hinge pin 13 is brought about by means of the coupling rod 8. The further downward movement of the operating rod 7 is limited by the transverse arm 20 which abuts against the wall of the locking chamber 22. An embodiment wherein the lock 6 abuts against the wall of the locking chamber 22 is also possible. The upward movement of the operating rod 7 is prevented by the lock 6 which abuts against the opposing wall of the locking chamber 22.

During the transferring of the hook 3 to the collapsed position as shown in figure 3, the lock 6 is first of all extended outward from the locking chamber 6. Subsequently, the operating rod 7 can be slid upward in the channel 11, wherein the coupling rod 8 can also move upward and the hook 3 can tilt around the hinge pin 13 in the process. Finally, the position shown in figure 3 is reached, in which position the sliding-downward of the operating rod 7, and thus the re-extending of the hook 3, is prevented by pressing the lock 6, which is now rotated over 180 degrees with respect to the previous position, into the locking chamber 6.

Figure 4 shows the combination of the lifting means according to the invention and an object 23 to be lifted. This object 23 to be lifted has 1 through-hole 24, on the back of which the hook 3 rests. The forces which are in this case exerted on the object 23 by the hook are indicated by arrows. A hoisting eye 25, on which hoisting forces can be exerted which are directed obliquely with respect to the longitudinal dimension of the carrying body 2 of the lifting means 1, is coupled to the eye 4. These oblique hoisting forces can be accommodated as a result of the occurrence of the indicated reaction moments between the carrying body 2 and the wall of the hole 24 in the object 3.

The example of figure 5 shows that the lifting means 1 is coupled to the cutter head 26, in such a way that the cutter head can be raised by the hoisting cable 27.

Figure 6 is a perspective view of the collapsed or inactive state of the hook 3, the lock 6 being collapsed in such a way that it prevents the extending of the hook 3. In figure 7, the lock 6 is extended, in such a way that the operating rod 7 and the coupling rod 8 can be slid in the channel 11 in the solid portion 2 of the carrying body 2, as a result of which the hook 3 tilts outward. The partial sectional view in figure 9 shows that the lock 6 is engaged in the locking chamber 22, in such a way that the protruded position of the hook 3 can be maintained.

As shown in figure 1, the hook 3 has a substantially symmetrical shape with respect to the hinge pin 13. In particular, the hook has a roughly rectangular contour, two ends of which are beveled.

List of reference numerals

1. Lifting means
2. Carrying body
3. Hook
4. Eye
5. Operating means
6. Lock
7. Operating rod
8. Coupling rod
9. Hinge
10. Hinge
11. Channel
12. Carrying body, solid portion
13. Hook, hinge pin
14. Carrying body, fork-shaped end
15. Fork parts
16. Hook, solid portion
17. Hook, gap
18. Hook, cheek
19. Hinge
20. Transverse arm
21. Hinge
22. Locking chamber
23. Object
24. Hole in object
25. Hoisting eye
26. Cutter head
27. Hoisting cable

Claims

1. A lifting means (1), comprising a carrying body (2) which can be inserted through a through-hole (24) in an object (23) to be lifted, a tiltable hook (3) at one end of the carrying body (2), an engagement means (4, 25) which is located at the opposing end of the carrying body and with which a hoisting cable (27) and the like can engage, and also operating means (5) for displacing the hook (3) between an inactive position wherein the hook can pass through the hole and an active position wherein the hook can engage with the object, characterized in that the operating means (5) comprise an articulated rod assembly (7, 8) with at least one operating rod (7) which is guided so as to be able to slide in the longitudinal direction with respect to the carrying body (2) and a coupling rod (8) which is coupled between the operating rod (7) and the hook (3).

2. The lifting means (1) as claimed in claim 1, wherein the rod assembly comprises a lock (6) which is coupled to the operating rod (7) at the end thereof remote from the coupling rod (8) for interlocking the rod assembly in the outermost sliding positions which the rod assembly assumes when the hook (3) is in the active position or the inactive position respectively.

3. The lifting means (1) as claimed in claim 2, wherein the lock (6) has an end which is rotatably connected to the operating rod (7) and a free end, and the carrying body (2) has a locking chamber (22) wherein the lock (6) can be received in two different outermost rotational positions for interlocking the rod assembly in the outermost sliding positions thereof.

4. The lifting means (1) as claimed in one of the preceding claims, wherein the carrying body (2) is embodied at least partly in a solid manner (12) and has a channel (11) wherein the operating rod (7) is received.

5. The lifting means (1) as claimed in claims 3 and 4, wherein the channel (11) opens into the locking chamber (22), and the lock (6) is connected to the operating rod (7) by means of a hinge (21), which is directed transversely with respect to the channel (11), in such a way that in a first outermost rotational position of the lock (6), the

operating rod (7) assumes a first outermost sliding position and in a second outermost rotational position, rotated over substantially 180 degrees with respect to the first outermost rotational position, of the lock (6), the operating rod (7) assumes a second outermost sliding position.

6. The lifting means (1) as claimed in claim 5, wherein the axes of the hinge connections (21, 9, 19) are parallel between the lock (6), the operating rod (7) and the coupling rod (8).

7. The lifting means (1) as claimed in one of the preceding claims, wherein the carrying body (2) has a fork-shaped end (14) and the hook (13) is received in the fork-shaped end (14).

8. The lifting means (1) as claimed in claim 7, wherein the hook (3) is located in the inactive state wholly within the contour of at least the fork-shaped end (14) and protrudes in the active state with respect to said contour.

9. The lifting means (1) as claimed in one of the preceding claims, wherein the hook (3) has a slot (18), and the coupling rod (8) is received in the slot (18).

10. The lifting means (1) as claimed in claims 8 and 9, wherein the hook (3) is suspended from the fork-shaped end (14) by means of a hinge pin (13), and the coupling rod (18) is embodied in a curved manner in such a way that the hollow shape thereof is turned toward the hinge pin (13).

11. The lifting means (1) as claimed in claim 10, wherein the hook (3) has a circumferential contour, viewed in a plane perpendicular to the hinge pin (13), which is symmetrical with respect to a plane wherein the axis of the hinge pin is located.

12. The lifting means (1) as claimed in claim 11, wherein the hook (3) has a substantially rectangular circumferential contour.

13. The lifting means (1) as claimed in one of the preceding claims, wherein the

carrying body (2) has a substantially circular cross section.

14. In combination, a lifting means (1) as claimed in one of the preceding claims and also an object (23, 26) to be lifted, wherein the object has at least one through-hole (24), of which the cross-sectional contour corresponds substantially to the cross-sectional contour of the carrying body (2), and of which the length is smaller than the length of the carrying body.

Fig 1

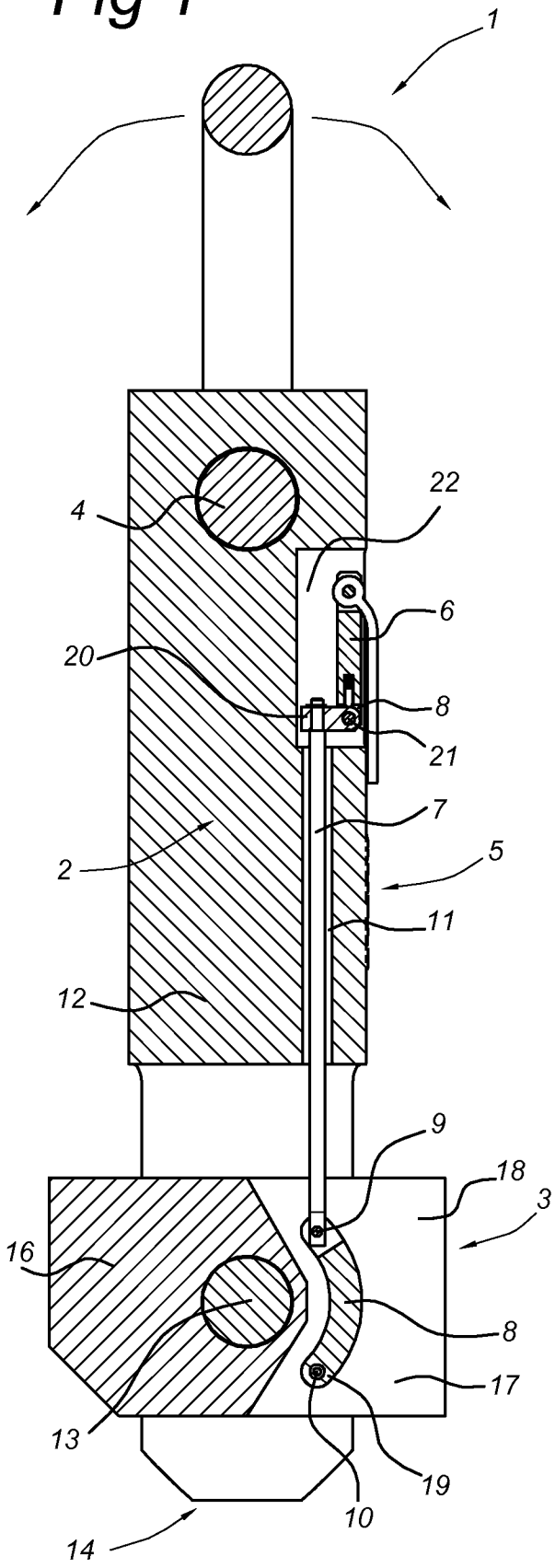
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Fig 2

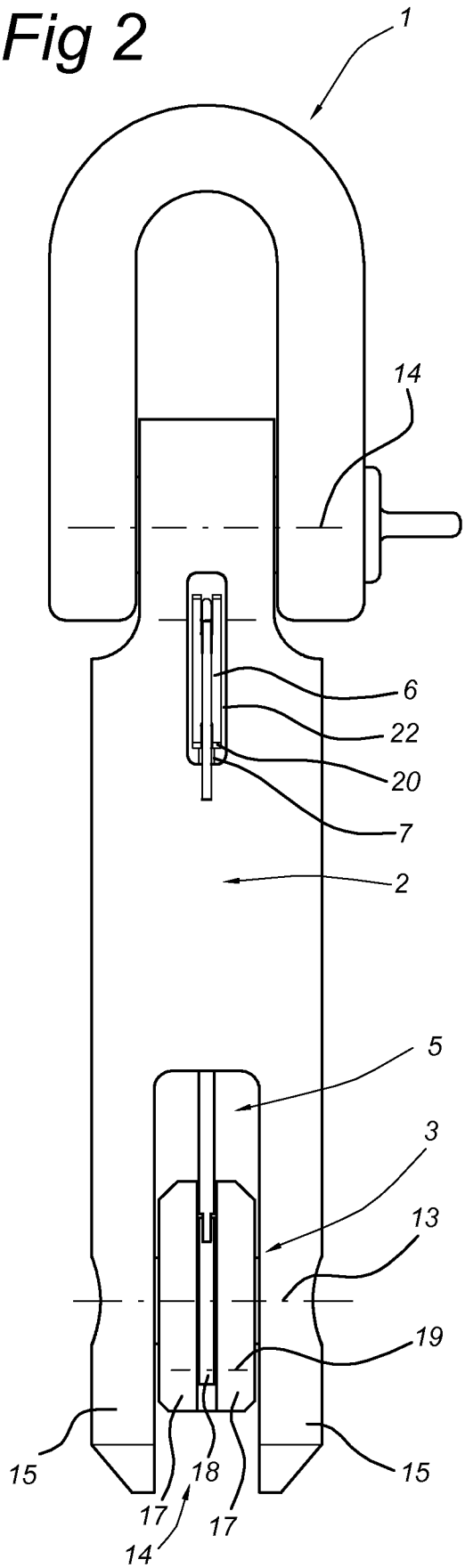
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Fig 3

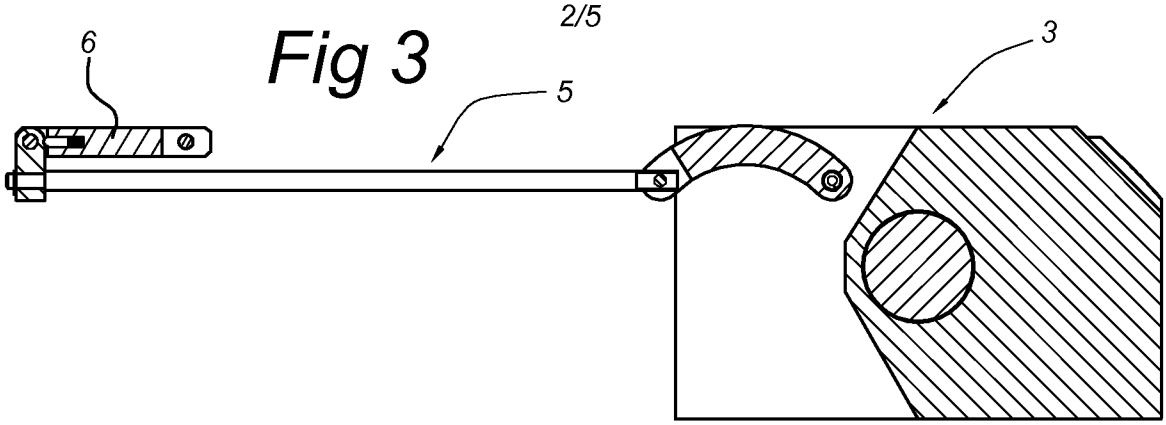


Fig 4

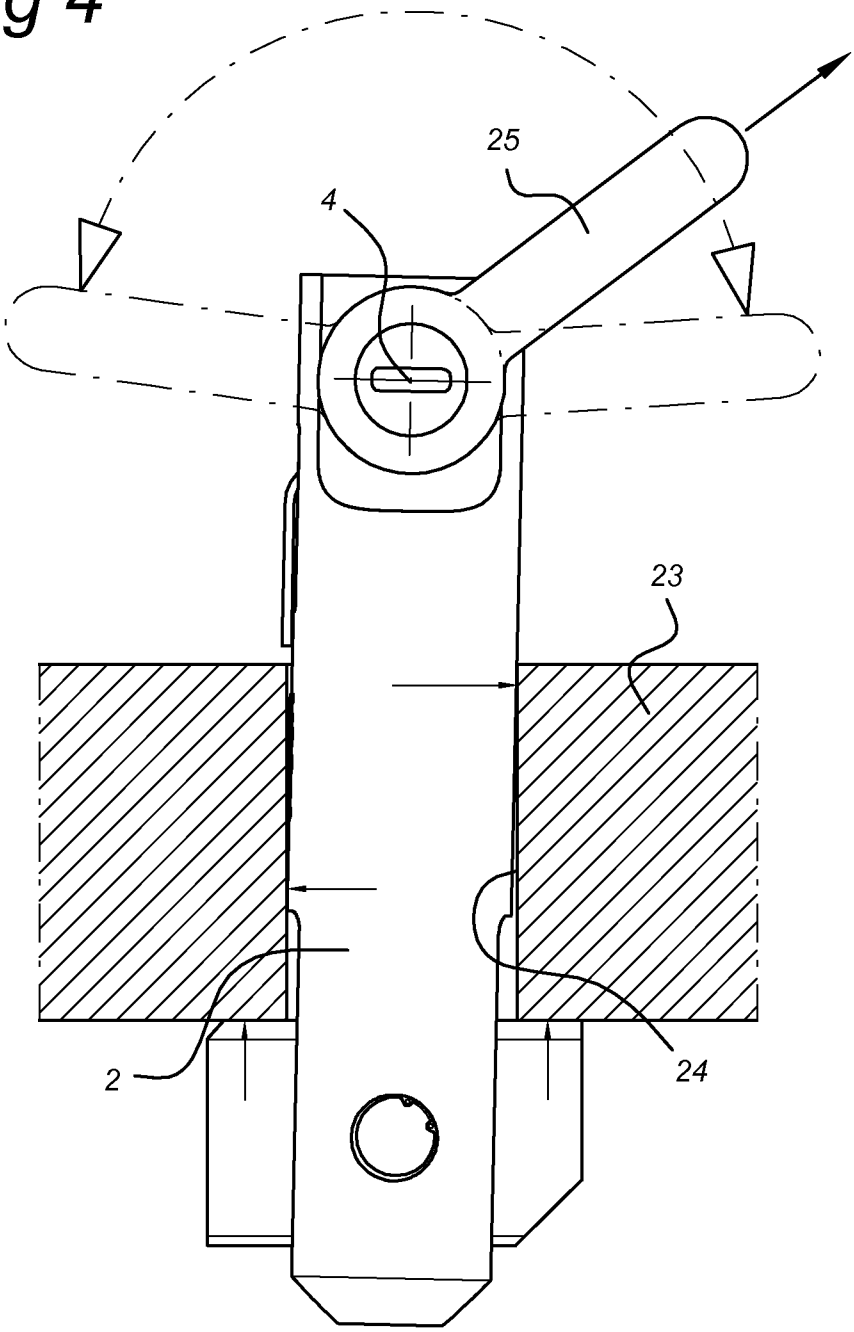


Fig 5

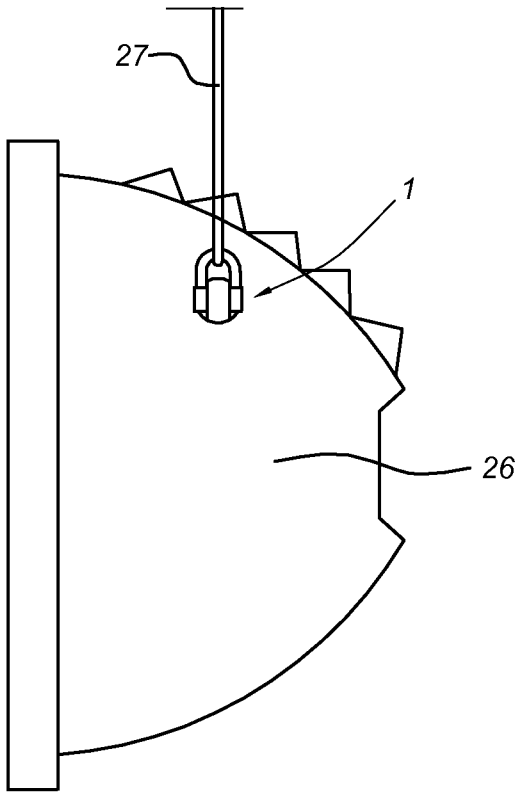


Fig 6

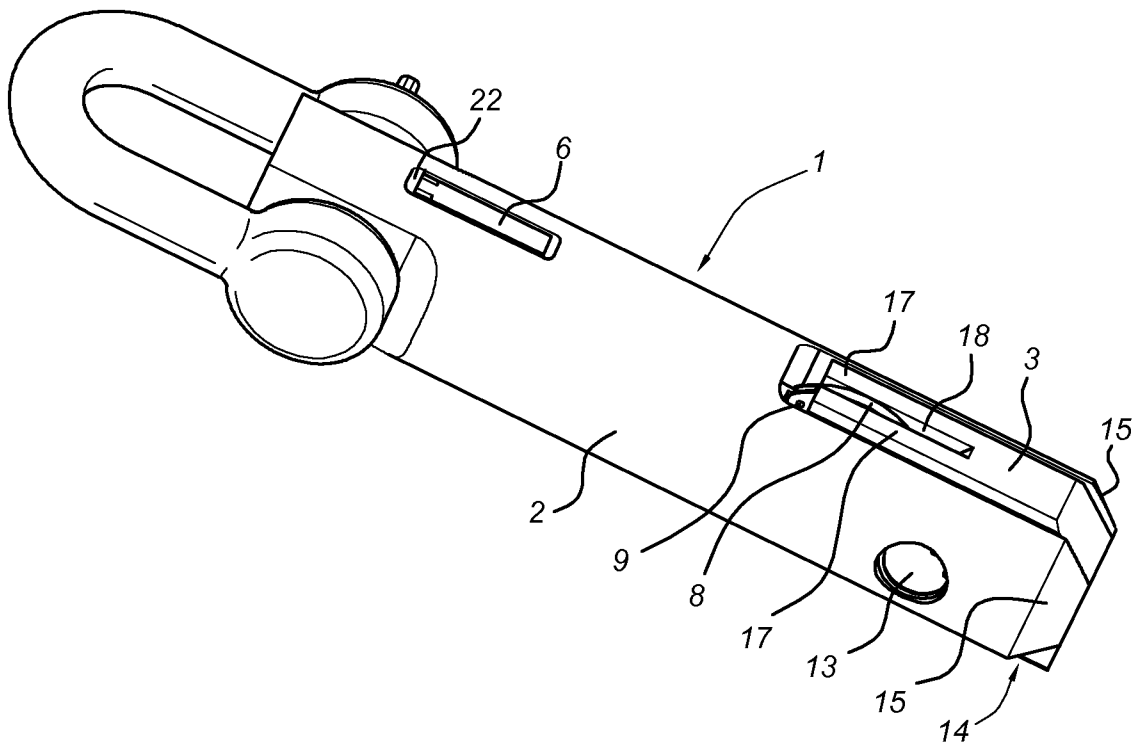


Fig 7

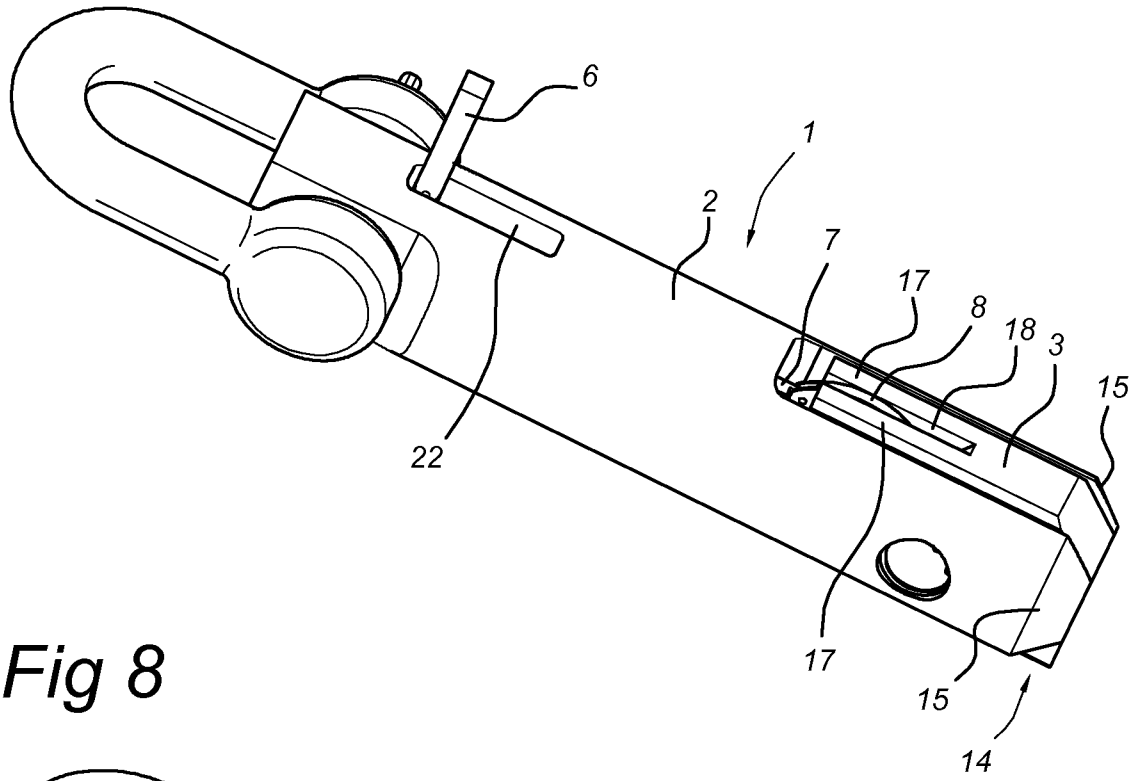


Fig 8

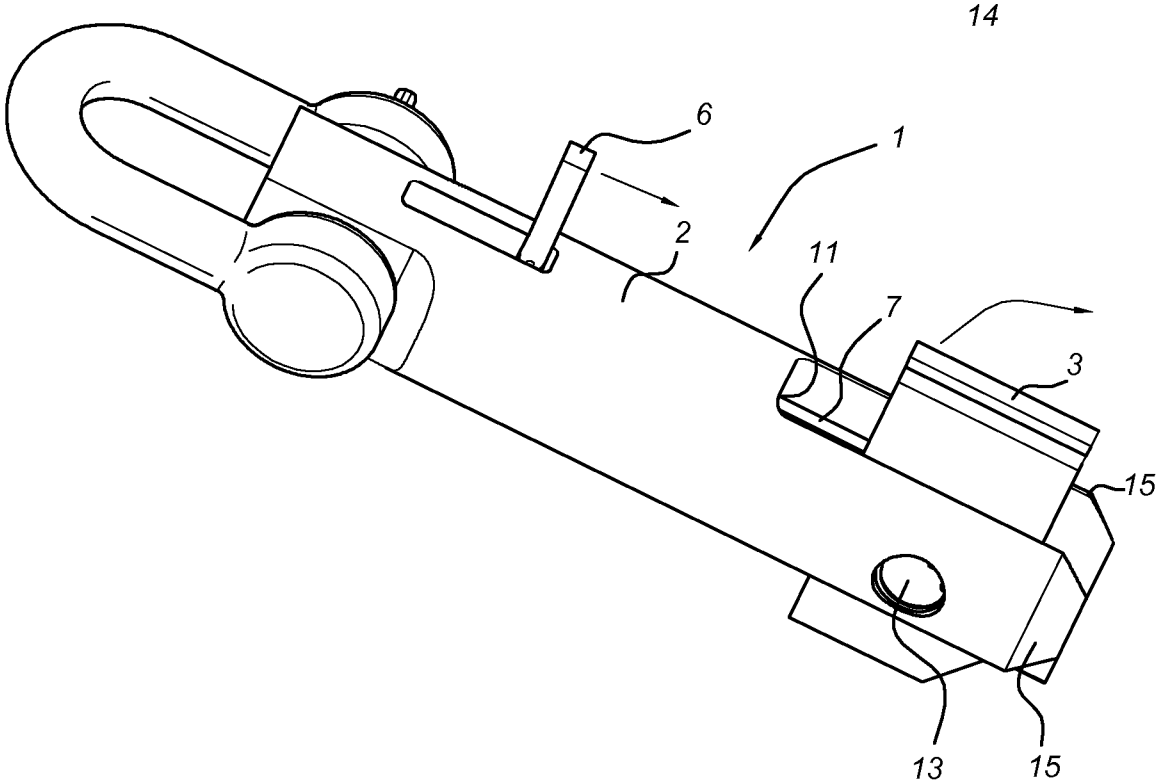
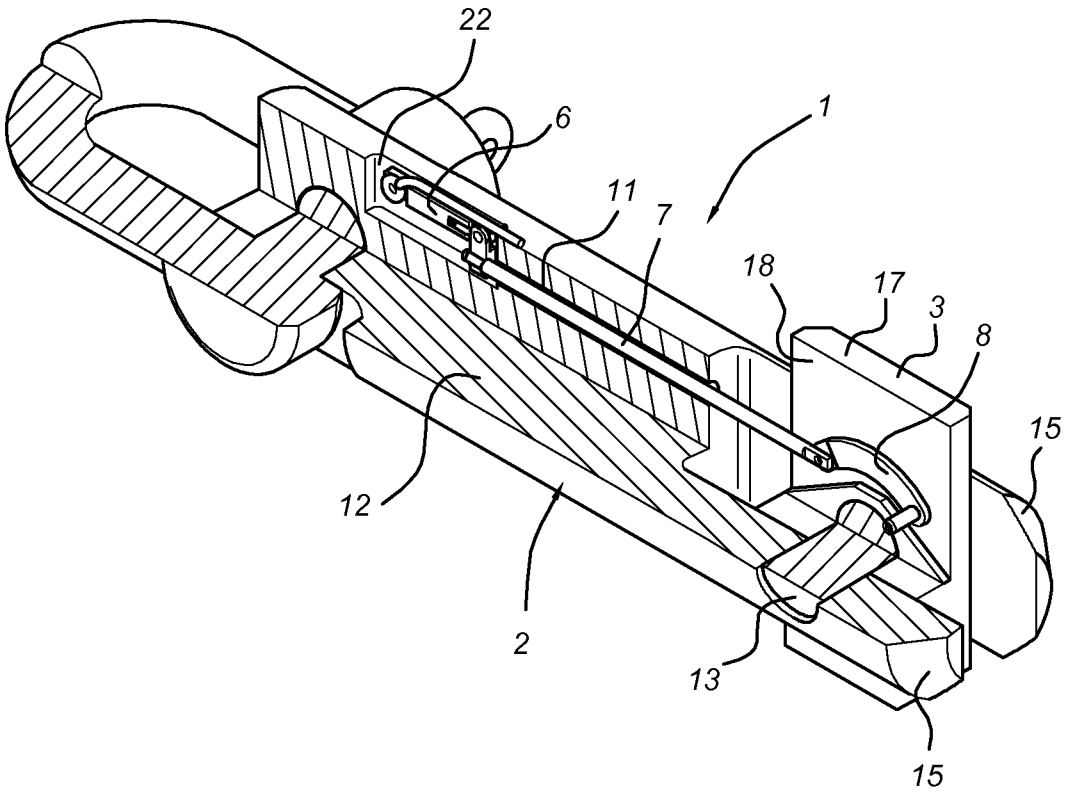


Fig 9



INTERNATIONAL SEARCH REPORT

International application No
PCT/NL2009/050216

A. CLASSIFICATION OF SUBJECT MATTER
INV. B66C1/54

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)
B66C

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 practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 50 118455 A (MEKATOROIKKUSU, BISHIKATEKUNO,MITSUBISHI KASEI) 17 September 1975 (1975-09-17)	1,13,14
A	figures	2,4
A	US 4 447 085 A (SCHMID FREDERICK L [US]) 8 May 1984 (1984-05-08) cited in the application abstract; figures	1,9,13, 14
A	CN 200 984 738 Y (GUILIN LICHUANG RUBBER MACHINE [CN]) 5 December 2007 (2007-12-05) figures	1,4,13
A	JP 01 166012 U (SHINKOU KOUSEN KOUYOU K.K.) 21 November 1989 (1989-11-21) figures	1,4,13

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

☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 July 2009	05/08/2009

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/NL2009/050216

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 50118455 A	17-09-1975	JP 1025102 C JP 55015393 B	18-12-1980 23-04-1980
US 4447085 A	08-05-1984	NONE	
CN 200984738 Y	05-12-2007	NONE	
JP 1166012 U	21-11-1989	JP 2523042 Y2	22-01-1997