

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number:

0 379 848
A1

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: 89850023.6

(51) Int. Cl.⁵: **B63B 21/18**

(22) Date of filing: 26.01.89

(43) Date of publication of application:
01.08.90 Bulletin 90/31(84) Designated Contracting States:
BE DE ES FR GB GR IT NL(71) Applicant: **KOCKUMS MARINE AKTIEBOLAG****S-205 55 Malmö(SE)**(72) Inventor: **Martensson, Harry Egon**
Burlövsvägen 18
S-232 52 Akarp(SE)(74) Representative: **Ström, Tore et al**
Ström & Gulliksson AB Studentgatan 1 P.O.
Box 4188
S-203 13 Malmö(SE)

(54) Arrangement in chain stoppers.

(57) Arrangement in chain stoppers (1) for tightening the anchor chain in order to keep the anchor in close fit-up against an abutment when the anchor is in its stowed position, said chain stopper (1) including a slideway (3) provided with a guide groove (4) in which the anchor chain is guided during anchor lowering and anchor hauling operations. A supporting structure (9) is rigidly attached to the frame (2) of said chain stopper (1) and extends in a direction upwards from said chain stopper, said supporting

structure (9) pivotably supporting an extendable and retractable, pressure medium operated chain tightening means (10), which is pivotable between an inoperative position above said guide groove (4) of said slideway (3), and an operative position in which the extendable member (22, 24) of said chain tightening means (10) is in power actuating contact with a chain link (6) of said anchor chain in said guide groove (4) for urging said anchor chain substantially in the hauling direction along said guide groove (4).

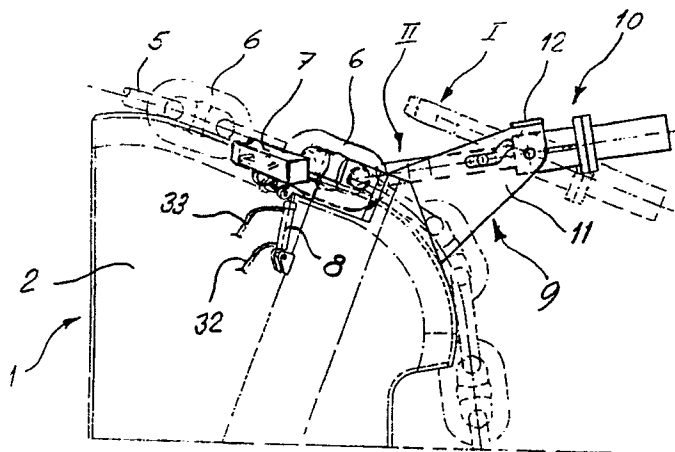


Fig 1

EP 0 379 848 A1

ARRANGEMENT IN CHAIN STOPPERS

The present invention relates to an arrangement in chain stoppers for tightening the anchor chain in order to keep the anchor in close fit-up against an abutment when the anchor is in its stowed position.

Chain stoppers are used onboard ships for locking the anchor chain when the anchor has been lowered, and thus for relieving the anchor windlass when the ship is at anchor. Chain stoppers commonly used include an open slideway supporting the horizontal links of the chain in parallel with the slideway and providing a guide groove for the vertical links of the chain. A previously known chain stopper of this kind is described in British patent No 1 592 884. In the chain stopper described therein, locking of the anchor chain is obtained by means of lock bodies which can be moved to and from locking engagement with a horizontal chain link. In other known chain stoppers the locking action is obtained e.g. by means of a stirdy bar which can be lowered transversally of the anchor chain for locking a vertical chain link against an abutment.

Whereas known chain stoppers commonly used provide a satisfactory locking of the anchor chain, thus relieving the anchor windlass when the ship is at anchor, said chain stoppers can not be used for locking the anchor chain when the anchor is in its stowed position. One reason to this is that the use of stirdy bars or heavy lock bodies for locking the anchor chain when the anchor is in its stowed position, may render impossible such rapid anchoring operations required in emergency conditions. If e.g. the supply of current to the anchor windlass is broken, the anchor chain can not be hawled in the small distance needed for disengaging the lock bodies from the chain and due to this it might be impossible to manually unlock the anchor chain.

Another reason is that in stowed position the anchor must be in close fit-up against an abutment, e.g. against the shell plating, in order to avoid the risk of damage caused by slamming action of the anchor due to violent motion of the ship in heavy sea during bad wether conditions. In order to avoid this the anchor chain must be tightened so that the anchor constantly is held in close fit-up against said abutment. This can not be effected by means of chain locking arrangements commonly used for locking the anchor chain when the ship is at anchor.

When the anchor is in its stowed condition it is nevertheless necessary to provide a tightening action on the anchor chain, and according to common practice this is obtained by using one or several

rigging screws which by means of chains or wires are attached to the anchor chain and by means of which tighening of the anchor chain can be effected manually. This again involves the disadvantage that before anchoring can take place the rigging screws must be disconnected, and this involves a heavy and time-consuming manual operation. It might thus be quite impossible to carry out rapid emergency anchoring. Another disadvantage is that this known tightening arrangement does not allow for remote control from the bridge.

One object of the present invention is to provide an arrangement in chain stoppers of the kind mentioned initially including means for exerting a tightening action on the anchor chain when the anchor is in its stowed position, and which may be rapidly and easily disengaged from tightening engagement with the chain when anchoring shall be carried out. Another object of the invention is to provide an arrangement of the kind mentioned which during normal conditions may be remotely controlled from the bridge of the ship. Still another object of the invention is to provide an arrangement in which the means for tightening the anchor automatically are brought into inoperative position when anchoring shall take place.

According to the present invention these objects are obtained by means of an arrangement as specified in the appended claims.

The invention will be described below in more detail with reference to the enclosed drawings illustrating preferred embodiments according to the invention.

Fig 1 is a schematical side view of an arrangement according to the invention.

Fig 2 is a plan view of the arrangement in fig 1.

Fig 3 is an enlarged side view of the chain tightening means in operative position and in inoperative position.

Fig 4 is a partial sectional view taken as indicated at I-I in fig 3.

As appears in the figures, particularly in fig 1, the arrangement according to the invention includes a chain stopper generally designated 1, of the kind known e.g. from British patent 1 592 884. This chain stopper includes a rigid frame 2 mounted on the ship's deck by welding and including an open slideway 3 supporting the horizontal links 5 of the 36 anchor chain. Said slideway is further provided with a guide groove 4 for the vertical links 6 of said anchor chain. For locking the anchor chain when the ship is at anchor and thus relieving the anchor windlass, the chain stopper is provided with two lock bodies 7 which by means of hydraulically

operated cylinder-piston means 8 may be swung from inoperative positions on opposite sides of the slideway 3 into locking engagement with a horizontal link 5 supported on the slideway. Rigidly attached to the frame 2 of the chain stopper 1, e.g. by welding, is a supporting structure 9, which protrudes above the slideway 3 of the chain stopper and at the upper end thereof pivotably supports extendable and retractable pressure medium operated chain tightening means 10, which may be swung between an inoperative position I above said slideway 3 and guiding groove 4, as indicated by dash-and-dot lines in figures 1 and 3, and an operative position II in power actuating contact with a vertical chain link in the guiding groove 4 of said slideway 3. The supporting structure 9 includes two side walls 11 disposed in parallel with and opposite each other on opposite sides of said slideway 3. At the upper ends said side walls 11 are interconnected transversally by means of a rigid cover plate 12.

As appears in more detail in figures 3 and 4, the chain tightening means 10 include a double acting hydraulic ram 13 mounted in a cradle-like structure 14, which in turn is pivotably supported between the side walls 11 of said supporting structure 9 for swinging movement about a horizontal axis. Said cradle-like structure 14 comprises a cylindrical portion 15 and a bottom portion 16, said cylindrical portion being open at the upper end and is provided at this end with an annular flange 17. The cylindrical portion 15 is provided with diametrically opposite transversally extending shafts 18, which are journaled in bearings in the opposite side walls 11 of said supporting structure 9, so that the cradle like structure may be pivoted with respect to the supporting structure about the axis of shafts 18.

The cylinder 19 of the hydraulic ram 13 is provided with a flange 20 disposed at the piston end thereof. By means of said flange 20 the hydraulic ram 13 is attached to the flange 17 of the cradle-like structure by means of screws or bolts 21. As appears from fig 4 the end of the piston rod 22 of the hydraulic ram 13 is provided with an internal thread 23 for axially attaching an extension rod 24 which is provided with a corresponding thread at the end. This extension rod thus forms an extension of the piston rod 22 through the bottom 16 of the cradle-like structure 14. The length of said extension rod is such that the end thereof may be brought into contact with a standing chain link 6 in the guide groove 4 when tightening of the anchor chain shall be effected. At the end said extension rod 24 is provided with a yoke-like member 25, the internal surface of which being formed so as to substantially correspond to the form of the contact surface with the chain link 6. Outside the

bottom 16 of the cradle-like structure 14, the rod extension 24 is provided with two guide rods 26, rigidly clamped on said rod extension 24 and extending transversally in diametrically opposite directions in a substantially horizontal plane. The free ends of the guide rods 26 extend into guide grooves 27 provided in each of the side plates 11 of the supporting structure for guiding said guide rods 26 therein when the hydraulic ram 13 is being extended or retracted.

As best seen in fig 3 each of said guide grooves 27 comprises an upper curved part, the upper end of which being positioned in line with the position taken by the guide rods 26 when said hydraulic ram 13 is in its inoperative position. The curvature of this upper part of each guide groove is formed such that a tangent of said guide groove forms an obtuse angle with the centre line of the hydraulic ram 13. Due to cooperation between the guide rods 26 and said curved part of the guide grooves 27, the hydraulic ram 13 is caused to swing in direction downwards when said hydraulic ram 13 is being extended. This swinging motion continues until the guide rods 26 have reached the lower end of said curved part of the guide groove 27, which is positioned so that when the guide rods 26 have reached said lower end, the centre line of the hydraulic ram 13 is directed towards a standing chain link 6 in the guide groove 4 of the slideway. From this position the guide groove 27 extends in a linear direction in an inclination with respect to the slideway which is determined so that when the end of the extension rod 24 is brought into contact with a standing chain link 6, the centre line of said extension rod 26 is directed to the centre point of the half circular end of the standing chain link 6 and so that the centre line of the extension rod 26 is directed through said centre point of the chain link also during displacement thereof in tightening direction in the guide groove 4. When the hydraulic ram 13 is being retracted, cooperation between the guide rods 26 and the guide grooves 27 causes the hydraulic ram to swing in direction upwards, back into the inoperative position.

At the end of the extension rod 24 which is attached to the end of the piston rod 23, said extension rod 24 is provided with an annular flange 28, the outer diameter of which being slightly less than the inner diameter of the cylinder 15. Disposed between said flange 28 and the bottom 16 of the cylinder 15 is a compression spring 29 constantly exerting a retracting force on the hydraulic ram 13. In a condition in which free flow of oil to and from the hydraulic ram 13 is permitted, said compression spring 29 automatically causes the hydraulic ram to swing in a direction upwards into inoperative position.

The double-acting hydraulic ram 13 as well as

the cylinder-piston means 8 are supplied with hydraulic pressure medium from a hydraulic power plant, not shown in the figures. For this purpose the hydraulic ram 13 as well as the cylinder-piston means are connected to the hydraulic system by means of flexible hoses 30, 31 and 32, 33 respectively. Said power plant including hydraulic pump unit, oil tank, oil filters, valves etc, preferably is disposed underneath the deck on which the anchor windlass and chain stoppers are mounted. The control valves for controlling the supply of hydraulic pressure medium to and from the double-acting ram 13 and to the cylinder piston means 8 are preferably electrically controlled, which allows for remote control from the bridge of the operation. An electrically controlled four-way valve thus controls the supply of hydraulic pressure medium to and from the double-acting hydraulic ram 13. In the arrangement according to the invention the line supplying pressure medium to the chamber above the piston in the cylinder 19 of the hydraulic ram 13, is also connected to a pneumatic/hydraulic pressure accumulator, thus ensuring supply of hydraulic pressure medium to the hydraulic ram 13 for constantly urging the piston rod 23 and the rod extension 28 into power actuated engagement with a chain link, thus keeping the anchor chain tightened when the anchor is in its stowed position. When the anchor has been brought into close fit-up against an abutment, e g the shell plating, the supply of pressure medium to the hydraulic ram 13 from the pump is shut off, and the hydraulic pressure acting on the piston of the hydraulic ram 13 then is supplied from the pneumatic/hydraulic pressure accumulator. Said accumulator is provided with a pressure governor which is electrically connected with control means on the bridge and may be surveyed at the bridge. If the pressure in the accumulator should fall below a predetermined minimum level, the hydraulic pump unit is started in order to recharge the accumulator.

During normal conditions the entire anchoring operation may be remotely controlled from the bridge. The sequence of the anchoring operation is as follows. The anchor windlass is started as well as the hydraulic pump unit for the chain tightener 10 and for operating the lock bodies 7 of the chain stopper. The anchor windlass is actuated to exert traction in the anchor chain, and the pressure on the anchor chain tightener 10 is released, resulting in that said anchor chain tightener automatically is retracted, at the same time automatically being brought into the inoperative position thus leaving the passage of the anchor chain free so that the anchor may be lowered. By means of the anchor windlass the anchor is then lowered the desired distance. The lowering of the anchor is then stopped and the lock bodies 7 of the chain stopper are

brought into locking position with the anchor chain. The brake of the anchor windlass is then actuated and the operation terminates in that the hydraulic pump units are shut off.

When the anchor shall be hawled in, the procedure is as follows. The anchor windlass and the hydraulic pump units are started. The brake of the anchor windlass is released. By means of the anchor windlass the anchor is hawled in so that the lock bodies 7 of the chain stopper may be moved into inoperative position. The anchor hawling operation is continued until the anchor abuts the shell plating. Then the brake of the anchor windlass is actuated. The control valve of the anchor chain tightener 10 is then adjusted into a position in which hydraulic pressure medium is supplied to the hydraulic ram, which then extends and automatically is swung into engagement with a standing chain link 6 in the guide groove 4 of the slideway, thus exerting a tightening action on the anchor chain so that the anchor is brought into close fit-up against an abutment, e g the shell plating. The hydraulic pump units are then shut off and the hydraulic pressure in the hydraulic ram is secured by means of the pneumatic/hydraulic pressure accumulator. The anchor chain tightener 10 thus constantly exerts a tightening action on the anchor chain so that the anchor is kept in close fit-up with the shell plating.

Anchoring may also be effected manually in case the supply of electric current has been broken (black out). This manual procedure is as follows. The hydraulic pressure acting on the hydraulic ram 14 is released by manually adjusting a valve. The anchor chain tightener then automatically moves to its inoperative position under the influence of the force of the compression spring 29. The anchor may then be lowered by manually releasing the brake of the anchor windlass. When the desired length of the anchor chain has been paid out, the brake of the anchor windlass is actuated manually and then the lock bodies 7 of the chain stopper are manually brought into locking engagement with the anchor chain.

Claims

1. Arrangement in chain stoppers (1) for tightening the anchor chain in order to keep the anchor in close fit-up against an abutment when the anchor is in its stowed position, said chain stopper (1) including a slideway (3) provided with a guide groove (4) in which the anchor chain is guided during anchor lowering and anchor hauling operations, characterized by a supporting structure (9) rigidly attached to the frame (2) of said chain stopper (1)

and extending in a direction upwards from said chain stopper, said supporting structure (9) pivotably supporting an extendable and retractable, pressure medium operated chain tightening means (10), which is pivotable between an inoperative position above said guide groove (4) of said slideway (3), and an operative position in which the extendable member (22, 24) of said chain tightening means (10) is in power actuating contact with a chain link (6) of said anchor chain in said guide groove (4) for urging said anchor chain substantially in the hauling direction along said guide groove (4).

2. Arrangement as claimed in claim 1, **characterized** in that the extendable member (22, 24) of said chain tightening means (10) is provided with transversally extending guide rods (26) which cooperatively engage guiding slots (27) provided in said supporting structure (9), said guiding slots (27) being formed such that when extending said extendable and retractable chain tightening means (10), cooperation between said guide rods (26) and said guiding slots (27) causes said chain tightening means (10) to swing from its inoperative position above the guide groove (4) for said anchor chain into power actuating contact with a chain link (6) in said guide groove (4), and when retracting said chain tightening means (10), cooperation between said guide rods (26) and said guiding slots (27) causes said chain tightening means (10) to swing in the opposite direction into inoperative position.

3. Arrangement as claimed in any of claims 1 or 2, **characterized** in that said chain tightening means (10) comprises a double-acting hydraulic ram (13) which is rigidly mounted at the upper end of a cradle-like structure (14), which is pivotably supported in said supporting structure (9) for swinging movement about an horizontal axis, the piston rod (22) of said hydraulic ram (13) extending through the end wall (16) of said cradle-like structure (14) and being provided with transversally extending guide rods (26), which cooperate with guiding grooves (27) in said supporting structure for imparting a swinging movement between an upper inoperative position and a lower operative position when said hydraulic ram (13) is being extended and retracted.

4. Arrangement as claimed in any of claims 1-3, **characterized** in that said extendable and retractable chain tightening means (10) includes compression means (29) constantly urging said chain tightening means (10) towards its retracted condition.

5. Arrangement as claimed in claims 4 and 5, **characterized** in that said compression means comprises a compression spring (29) disposed in said cradle-like structure (14) between the bottom

thereof and a flange (28) attached to the piston rod (22) or an extension (28) thereof for constantly urging said piston rod (22) into retracted position.

6. Arrangement as claimed in claim 3, **characterized** in that said hydraulic ram (13) being connected to a pneumatic/hydraulic pressure accumulator for supplying hydraulic pressure medium to said hydraulic ram for constantly urging the piston rod (22) in tightening direction in order to keep the anchor in close fit-up against an abutment.

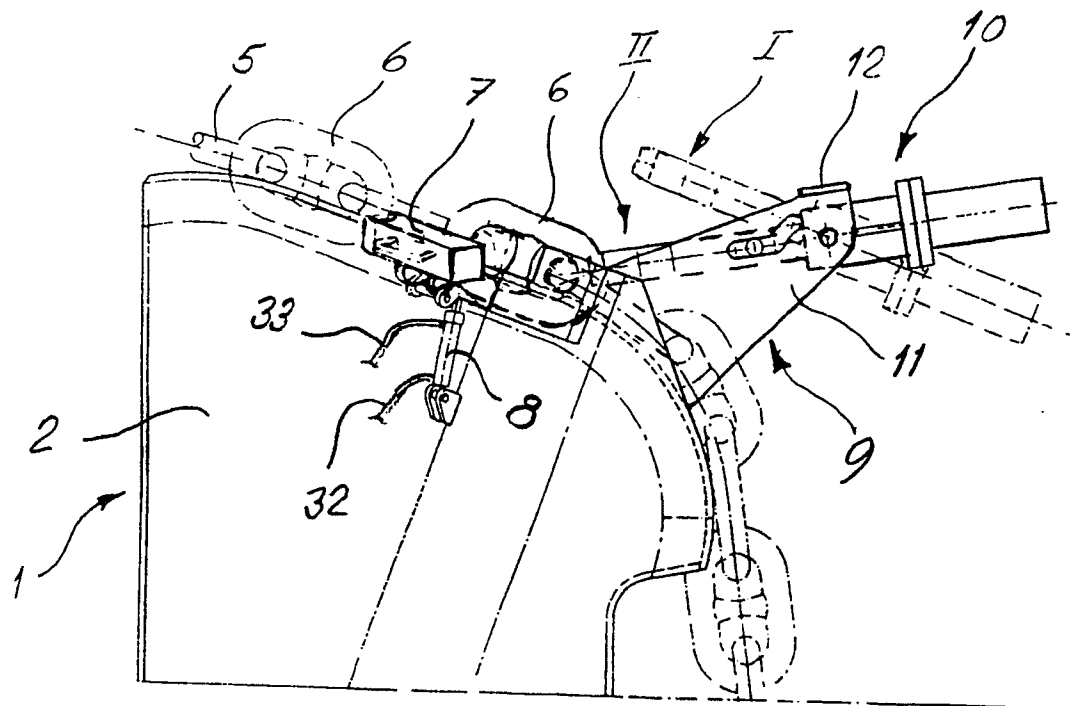


Fig 1

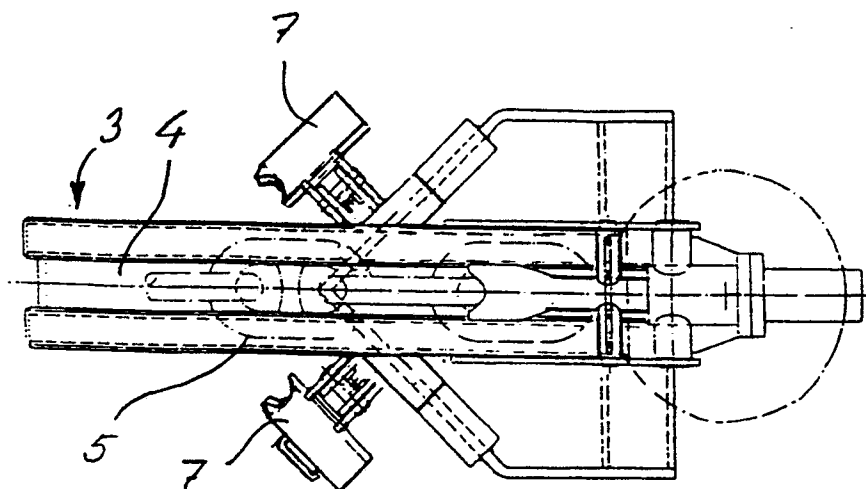
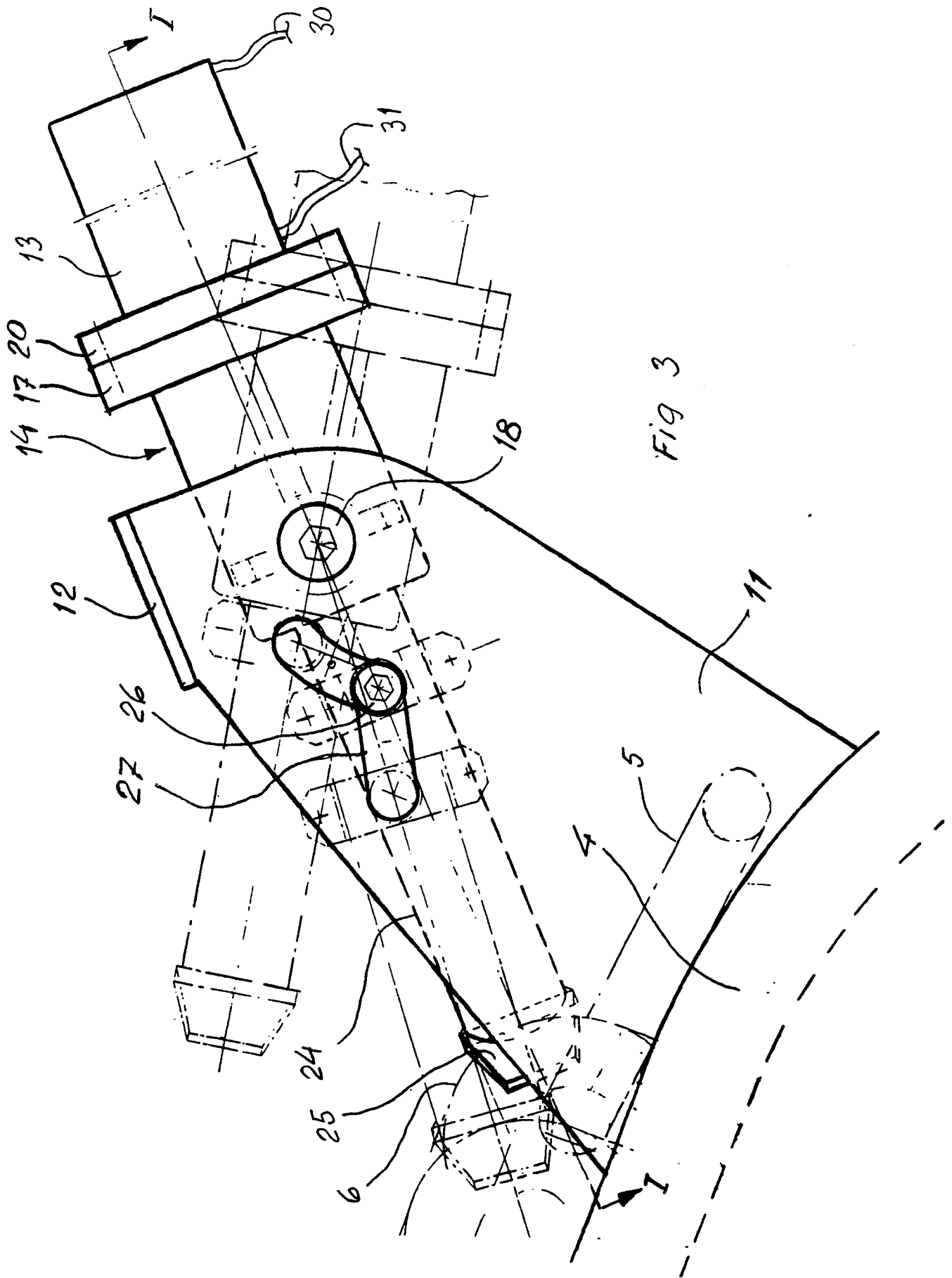


Fig 2



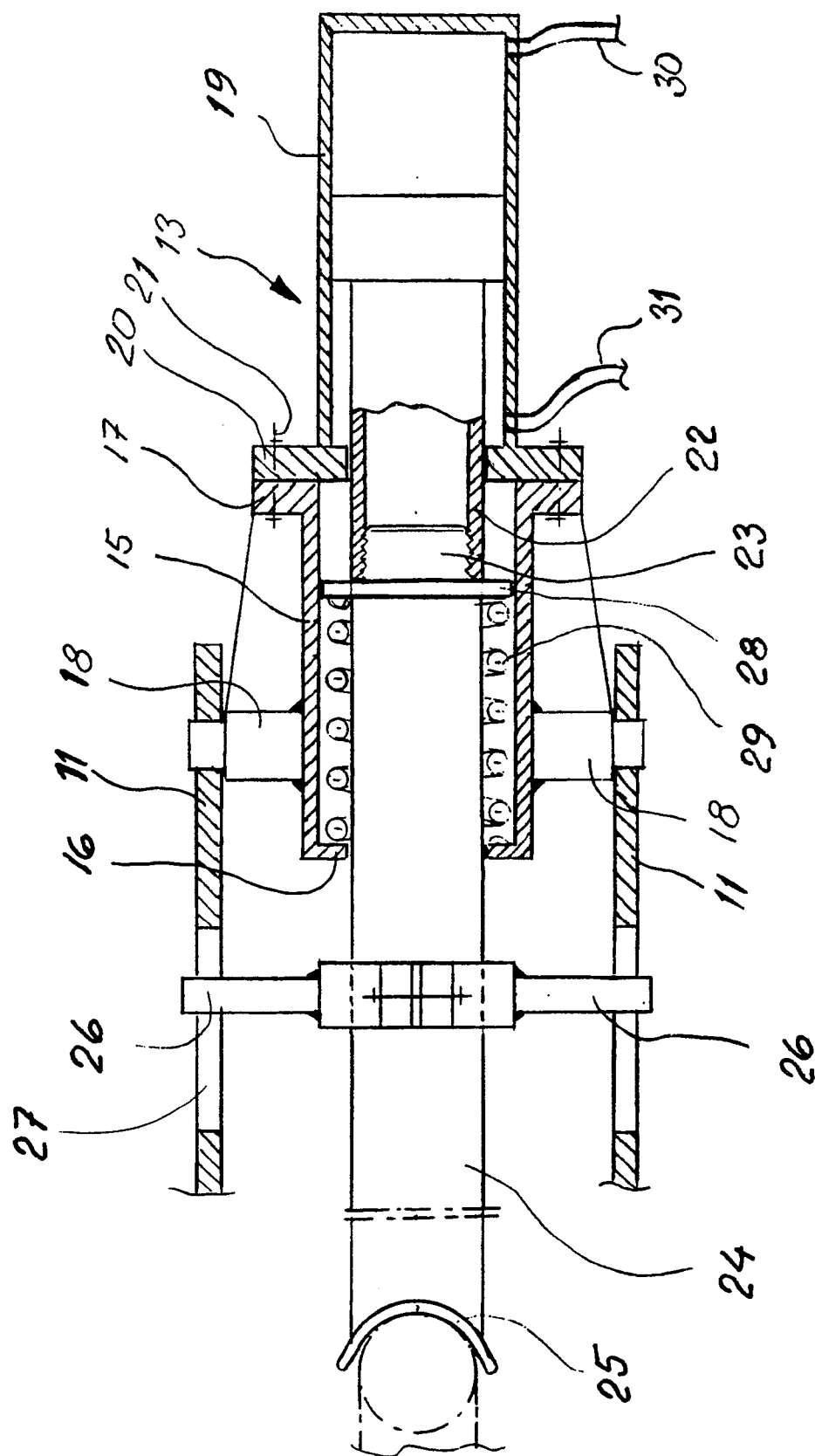


Fig 4



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	FR-A-2 388 714 (PUSNES MEK. VERKSTED A/S) * Page 2, line 18 - page 4, line 22; figures 1-4 *	1-5	B 63 B 21/18
A	---	6	
Y	DE-A- 299 911 (ACTIEN GESELLSCHAFT "WESER") * Page 1, lines 12-16; page 1, line 57 - page 2, line 51; figure 4 *	1-5	
A	---	6	
A	US-A-3 361 035 (HUNTER ROUNTREE) * The whole document *	1-6	

			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 63 B F 16 G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 19-09-1989	Examiner DE SENA Y HERNANDORENA A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			