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(54) Winch with overload sensing device

(57) A winch with overload sensing device comprising a body (10) that is centered in a supporting plate (2) and is provided with a flange (11) in which coupling means (21,23) for coupling the plate (2) to the flange (11) engage, the coupling means (21,23) allowing rotary movement of the plate (2) with respect to the flange (11), a load cell means (28,29) that acts between the plate (2) and the flange (11) and can be connected to means for indicating when the load on the cell means (28,29) exceeds a preset limit.

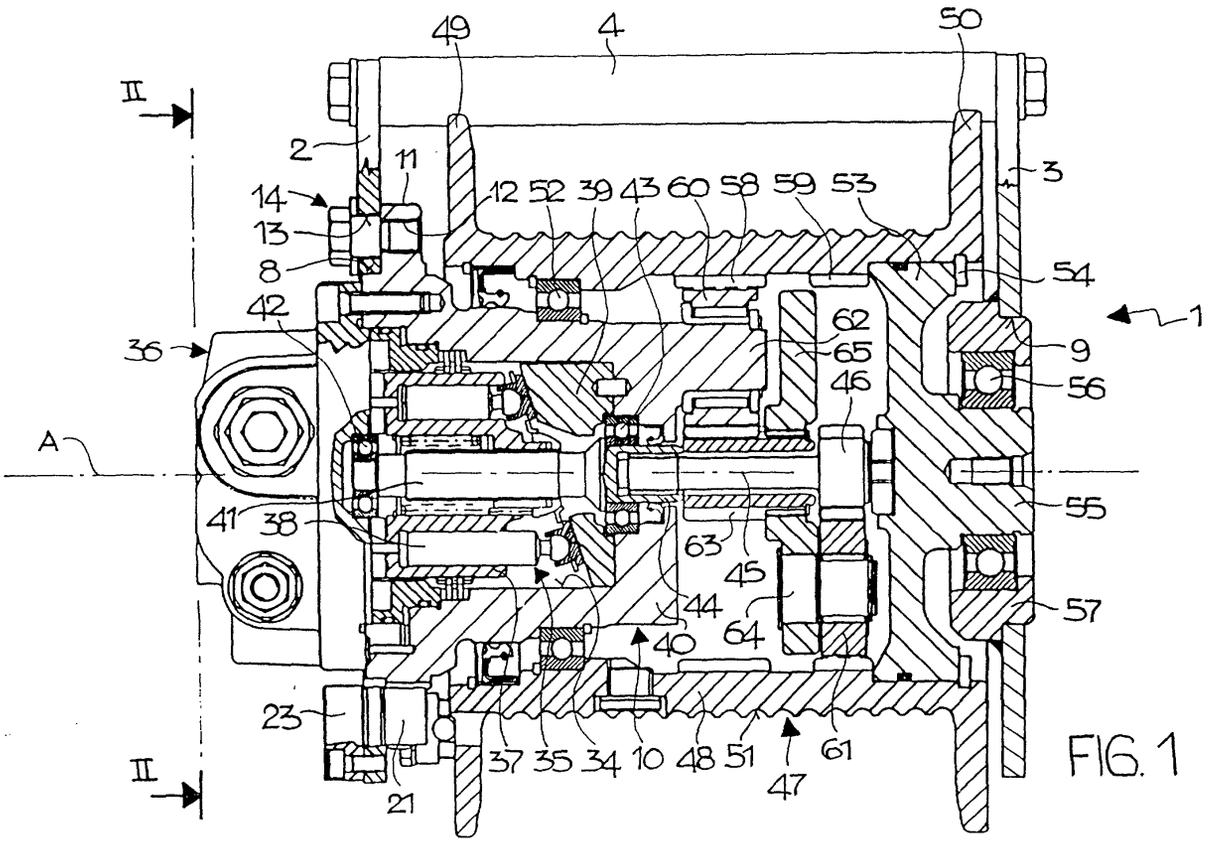

FIG. 1

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Description

[0001] The present invention relates to a winch with overload sensing device.

[0002] Winches provided with overload sensing devices, which indicate or block the actuation of the winch when the load exceeds a preset limit, are already known.

[0003] Known sensing devices, however, suffer drawbacks, particularly a considerable constructive complexity that makes them expensive, troublesome to adjust and sensitive to changes in setting.

[0004] The aim of the present invention is to provide a winch with an overload sensing device that is capable of offering a higher performance than known devices, in that it has a simple structure and is highly reliable in any operating condition.

[0005] Within this aim, an object of the present invention is to provide a device that can be set easily to different overload values.

[0006] This aim and this object are achieved with a winch with overload sensing device characterized in that it comprises a body that is centered in a supporting plate and is provided with a flange in which coupling means for coupling said body to said flange engage, said means being suitable to allow a rotary movement of said body with respect to said flange, there being also a load cell that acts between said body and said flange and can be connected to means for indicating when the load on said cell exceeds a preset limit.

[0007] Further advantages and characteristics of the present invention will become better apparent from the following description of a preferred but not exclusive embodiment thereof, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is an axial sectional view of a winch according to the invention;
Figure 2 is a sectional view, taken along the line II-II of Figure 1;
Figure 3 is an enlarged-scale view of a detail of the winch of Figure 1;
Figure 4 is a view of the support of the load cell; and
Figure 5 is a sectional view, taken along the line V-V of Figure 4.

[0008] With reference to Figure 1, the reference numeral 1 designates the winch as a whole. Said winch comprises a frame that is composed of two flat and parallel plates 2 and 3, which are mutually connected by two bars 4 and 5 that have a rectangular cross-section and by two cylindrical bars 6 and 7. The bars 4 and 5 allow to mount the winch on a maneuvering support, for example the arm of a crane.

[0009] Two respective circular openings 8 and 9 are formed in the plates 2 and 3 and are mutually coaxial along the axis A. The opening 8 constitutes a centering seat for a cylindrical body 10 provided with a flange 11 that adheres to the inner face of the plate 2.

[0010] Holes 12 and 13, respectively, are formed in the flange 11 and in the annular region of the plate 2 that lies opposite the flange 11. The holes 12 and 13 are angularly equidistant around the axis A, so that they can be arranged mutually opposite. Furthermore, the holes 12 have a smaller diameter than the holes 13 and are threaded in order to receive screws 14 by means of which the body 10 is coupled to the plate 2.

[0011] The screws (Figure 3) comprise a cylindrical portion 15 that has a larger diameter than the threaded portion 16 that engages the holes 12, so that together with the threaded portion 16 a shoulder 17 is defined which, when the screw 14 is screwed in, abuts against the flange 11, allowing to lock the screw 14.

[0012] The portion 15 has a smaller diameter than the hole 13 and a length that does not exceed the thickness of the plate 2 plus the thickness of a washer 18 that is interposed between the plate 2 and the head of the screw 14. In this manner, by tightening the screw 14 it is not possible to mutually clamp the plate 2 and the flange 11, and therefore the body 10, by remaining centered in the seat 8, can perform short angular strokes whose extent is equal to the play between the portion 15 and the hole 13.

[0013] In the flange 11, between two adjacent holes 12, there is a circular opening 19 that is aligned with a circular opening 20 of the plate 2. A coupling means provided as a cylindrical stem 21 is inserted in the opening 19 and is provided with a collar 22 and with a cylindrical head 23 that is eccentric with respect to the axis of the stem.

[0014] The stem 21 is inserted through the openings 19 and 20 up to the position in which the head 23 abuts against the plate 2 and is fixed by means of a pair of screws 24 that pass through the head 23 and engage in the plate 2. The opening 19 has a larger diameter than the stem 21, so that said stem, inside the opening 19, forms an annular interspace 25.

[0015] In the stem 21, in diametrically opposite positions that are aligned tangentially to the circumference centered on the axis A, there are two recesses 26 and 27, which accommodate load cell means such as two load cells 28 and 29 that protrude from the recesses 26 and 27 into the annular interspace 25, substantially in contact with the internal surface of the opening 19.

[0016] The load cells 28 and 29, by way of appropriate cables guided through the channels 30 and 31 and the chamber 33 of the head 23, are connected to an acoustic and/or visual indication device D, which is suitable to be activated when one of the two cells 28 and 29 is subjected to stresses that exceed a preset value and are produced by the torque that the body 10 discharges onto the plate 2 during the operation of the winch.

[0017] The body 10 has a cavity 34 that accommodates a hydraulic motor 35 with axial pistons, which is powered by means of a distribution unit and a connection box 36 by a source of pressurized liquid. The motor

35 is of a known type and is described hereinafter only as regards the elements that are useful to understanding the present invention.

[0018] The motor 35 comprises a rotor 37 that can rotate about the axis A and contains the chambers for accommodating the axial pistons 38 in sliding engagement on the inclined surface of a plate 39 that rotates rigidly with the bottom 40 of the cavity 34.

[0019] The rotor 37 is rotationally coupled to a driving shaft 41, whose opposite ends are supported, by virtue of bearings 42 and 43, in the box 36 and in the bottom 40 of the body 10.

[0020] The end of the shaft 41 that is supported in the bearing 43 is shaped like a cup 44 that passes through the bottom 40 and is provided with internal teeth for rotary coupling to an end of an auxiliary shaft 45 that is coaxial to the driving shaft 41, to the opposite end of which a pinion 46 is rigidly coupled.

[0021] The pinion 46 is part of a planetary reduction gearing, which is accommodated in the compartment formed between the body 10, a plate 53 and a tube 48, which transmits the rotary motion received from the driving shaft 41 to a drum 47 for winding the tow cable of the winch.

[0022] The drum 47 is composed of a tube 48 in the outer surface of which, between two rings 49 and 50, there is a cylindrical helical slot 51 that is meant to receive the tow cable.

[0023] The drum 47, on the side of the ring 49, is supported on the body 10 by a bearing 52 and, on the side of the ring 50, is closed by the plate 53 that is centered therein and is retained by an elastic ring 54.

[0024] The plate 53 has an axial tang 55, on which the bearing 56 is mounted; said bearing constitutes the second supporting point of the drum 47 and is accommodated in a bush 57, which is inserted in the opening 9 and is fixed to the plate 2.

[0025] The tube 48 is provided internally with two ring gears 58 and 59, with which two respective sets of three planet gears 60 and 61 of the planetary reduction gearing mesh.

[0026] The planet gears of each set of three are angularly equidistant at 120° to each other and only one of them is shown in the drawing.

[0027] In particular, each one of the planet gears 60 that compose a set of three can rotate on a respective pivot 62 that protrudes parallel to the axis A from the bottom 40 of the body 10 and meshes not only with the ring 58 and with a toothed bush 63 that is coaxial to the auxiliary shaft 45 that passes axially through it.

[0028] The planet gears 61 of the second set of three mesh internally with the pinion 46 and externally with the ring gear 59 and maintain the centering of the pinion 46 and of the auxiliary shaft 45 with said ring gear.

[0029] The planet gears 61 can rotate on respective pivots 64 that are supported in a cantilevered fashion by a disk 65 that is rotationally coupled to the toothed bush 63.

[0030] The operation of the winch is fully intuitive from the above description. The pressurized liquid conveyed through the connection box 36 to the motor 35 in fact causes the rotation of the rotor 37 and, by means of the reduction gearings 58-61, drives the cable winding drum 47.

[0031] It should be noted that the torque reaction applied by the motor 35 to the body 10 is discharged, by means of the load cells 28 and 29, onto the plate 2 by virtue of the possibility of the flange 11 to perform small angular strokes in the seat 8. The screws 14, as mentioned, in fact do not clamp the flange 11 to the plate 2 but keep it only in sliding contact, so that the play of the portions 15 of the screws in the holes 13 allows the flange 11 to act on the load cells with a thrust that is proportional to the load on the drum 47.

[0032] If the load on the drum 47 exceeds a preset limit, the load cells 28 and 29 send a signal that indicates that the winch is being stressed beyond the intended safety limit. This signal can be processed to generate an acoustic and/or visual warning.

[0033] It is evident that the described winch fully achieves the intended aim and object. Advantageously, the signal detected by the cells can be processed to give a momentary indication of the load.

[0034] The disclosures in Italian Patent Application No. BO2001A000654 from which this application claims priority are incorporated herein by reference.

[0035] 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 scope of each element identified by way of example by such reference signs.

Claims

1. A winch with overload sensing device, **characterized in that** it comprises a body (10) that is centered in a supporting plate (2) and is provided with a flange (11) in which coupling means (21, 23) for coupling said body (10) to said flange engage, said coupling means (21, 23) being adapted to allow a rotary movement of said body (10) with respect to said flange (11), load cell means (28, 29) being further provided that act between said body (10) and said flange (11) and can be connected to indicating means (D) for indicating when the load on said cell means exceeds a preset limit.

2. The winch according to claim 1, **characterized in that** it comprises two flat and parallel plates (2, 3), which are connected to a supporting structure, a first one (2) of said plates being provided with a circular opening (8) for the centering of said body (10), a drum (47) that on one side is supported rotatably

on said body (10) and on the other side is supported rotatably on the second (3) one of said plates, said body (10) having a cavity (34) for accommodating a hydraulic motor (35) and forming, together with said drum, a compartment for accommodating a reduction gearing (46, 60-65) that is suitable to transmit the rotary motion from said motor to said drum.

3. The winch according to claim 2, **characterized in that** mutually opposite holes (12, 13) are formed in the flange (11) of said body (10) and in the annular region of said first plate (2) that lies opposite said flange (11), the holes (12) of the flange being threaded and having a smaller diameter than the holes (13) of said first plate (2) in order to receive screws (14) for the coupling of said flange (11) to said first plate (2), said screws (14) having a head, a cylindrical portion (15) that passes with play through the holes (13) of said plate (2), and a threaded portion (16) that engages in said threaded holes (12) and forms, with said cylindrical portion, a shoulder (17) that abuts on said flange (11), said cylindrical portion (15) having a length that keeps, in the tightened position of said screws, said flange (11) in sliding contact with said plate (2).

4. The device according to one of the preceding claims 2 and 3, **characterized in that** said coupling means comprise a stem (21) that is provided with a collar (22) and is guided through circular openings (19, 20) of said plate (2) and of said flange (11) so that said stem (21) engages with play in the opening (19) of said flange (11) and said collar (22) is centered in the opening (20) of said plate (2), said stem (21) being provided with a head (23) for fixing to said plate (2) which has recesses (26, 27) for accommodating said load cell means (28, 29) adapted to abut against the internal surface of the opening (19) of said flange.

5. The winch according to claim 4, **characterized in that** it comprises a pair of load cells (28, 29) that are diametrically opposite and aligned tangentially to the circumference that is concentric to the centering opening (19) of said flange (11).

6. The winch according to one of claims 2 to 5, **characterized in that** a washer (18) is interposed between the head of said screws (14) and said plate (2).

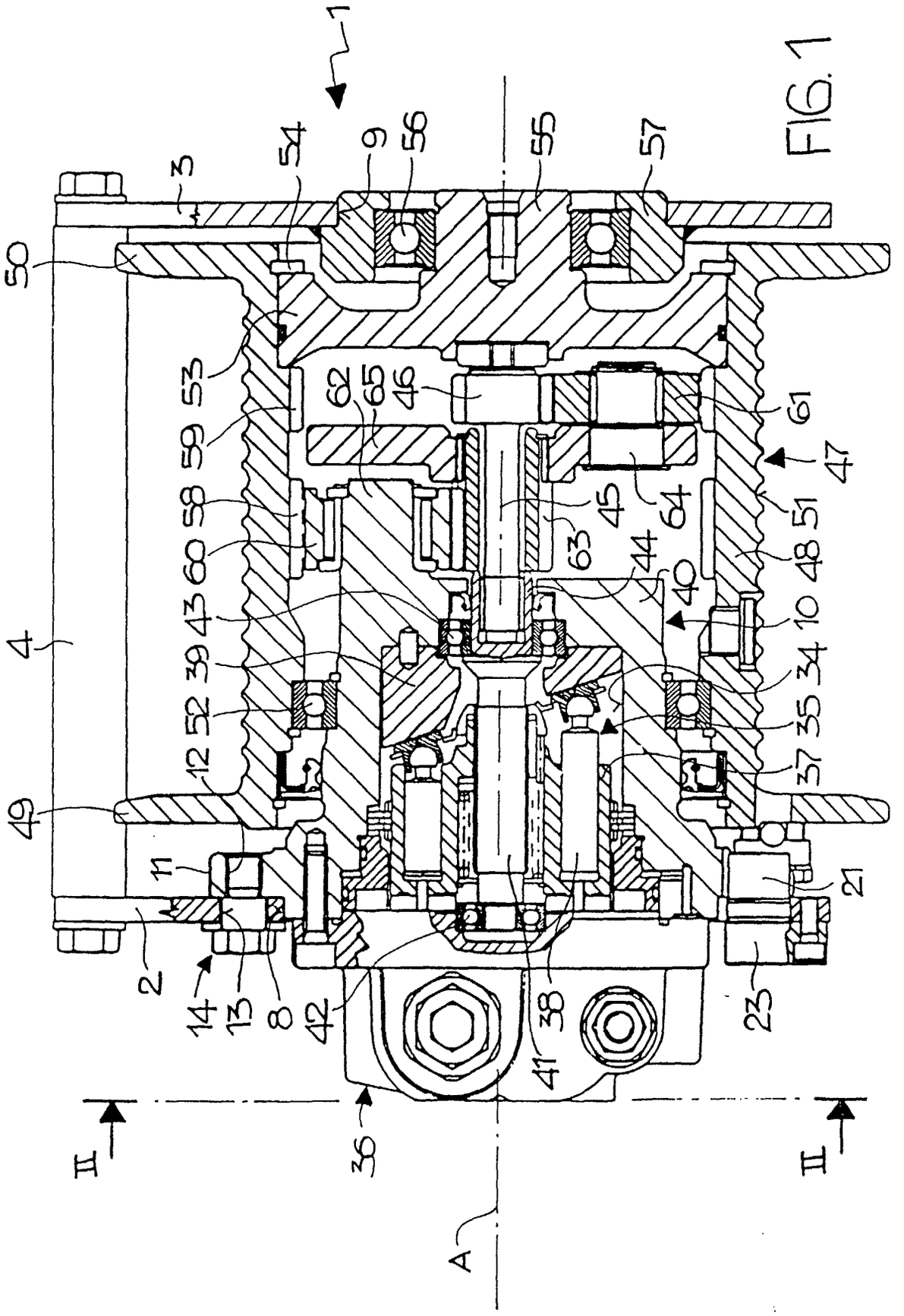
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FIG. 1

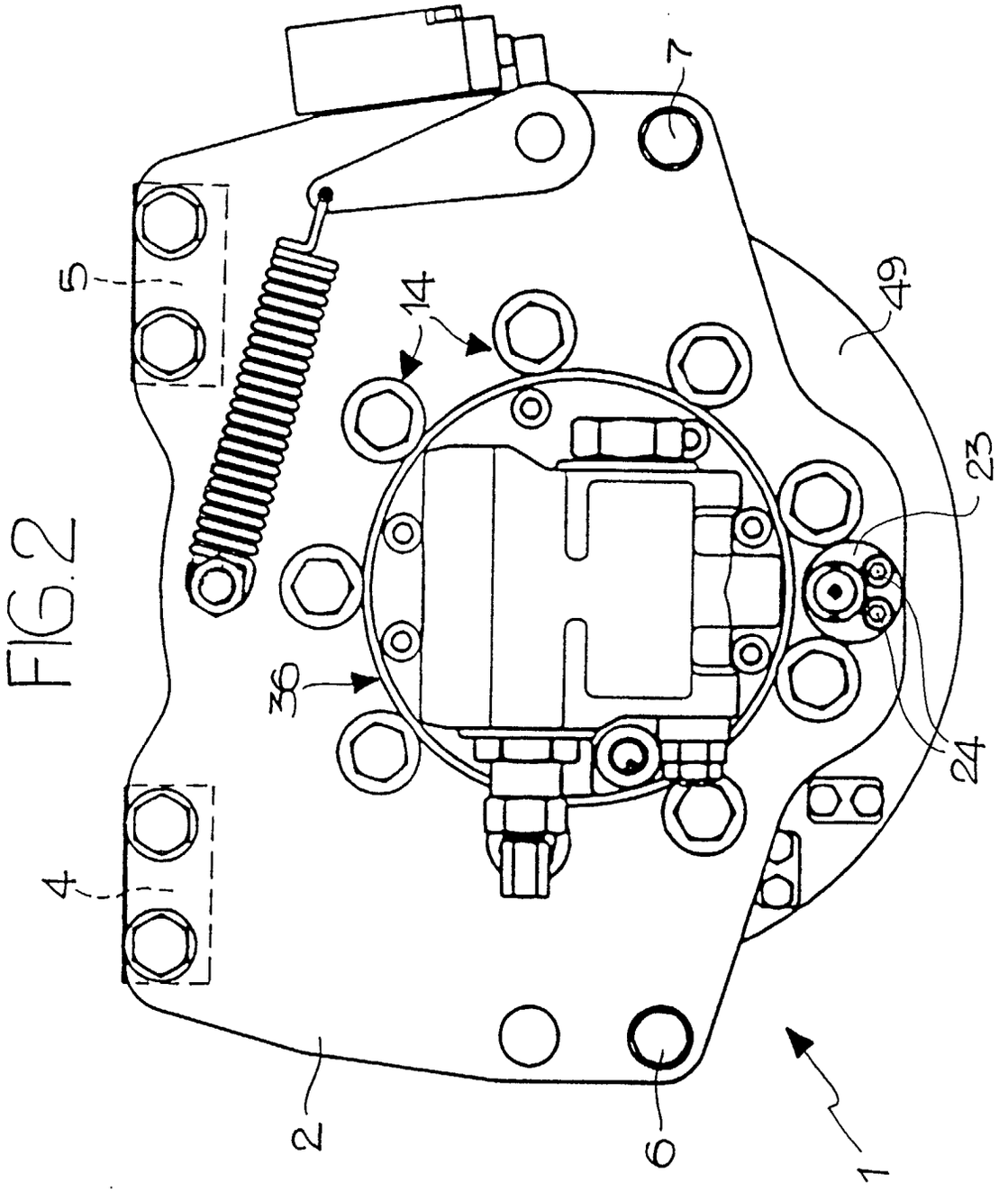
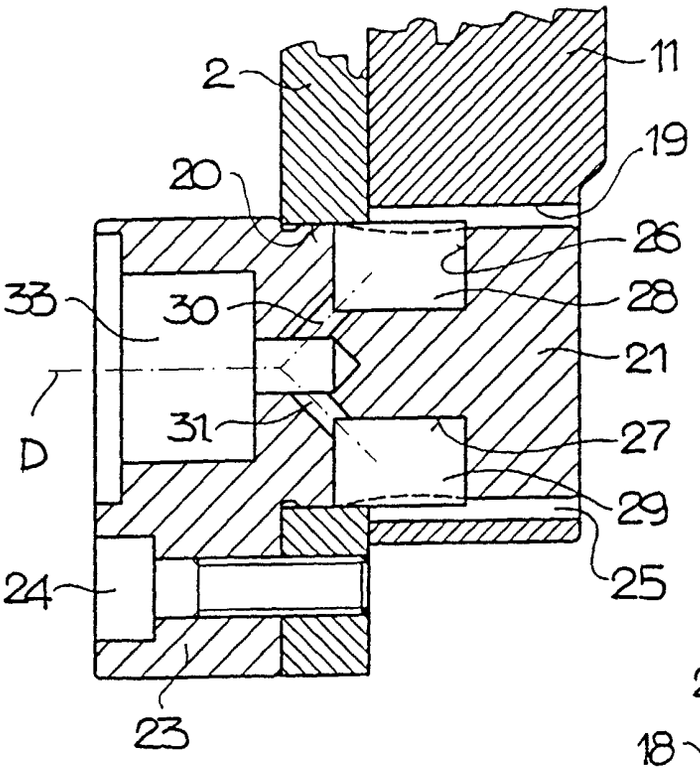


FIG.2

FIG. 5



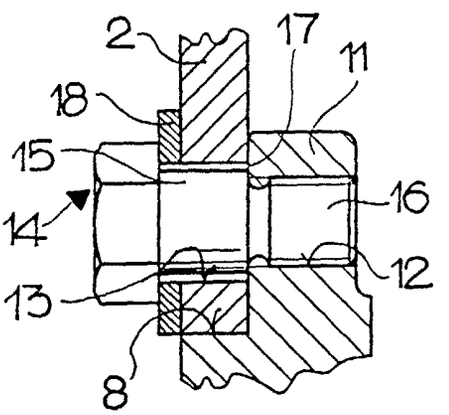
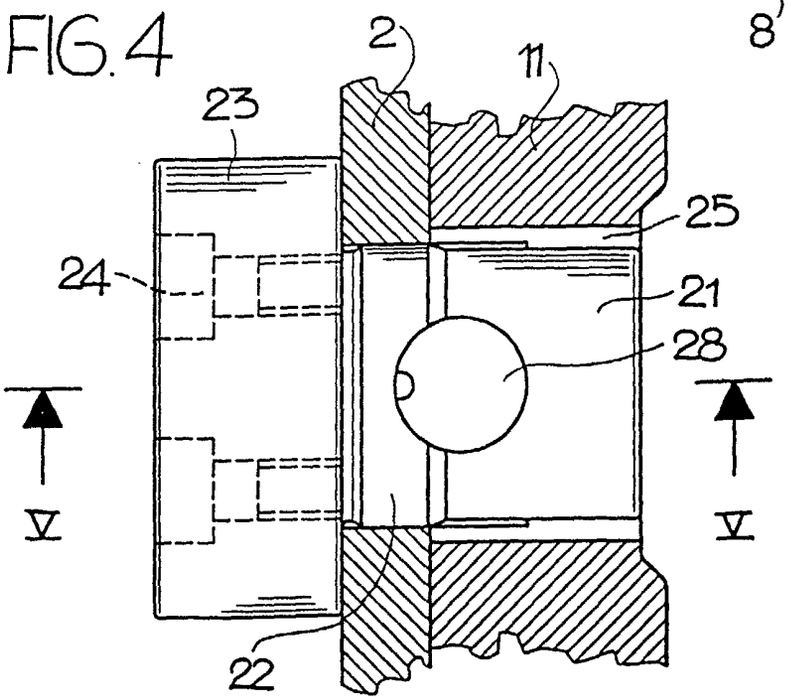


FIG. 3

FIG. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 02 02 2980

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TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	5 February 2003	Sheppard, B

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