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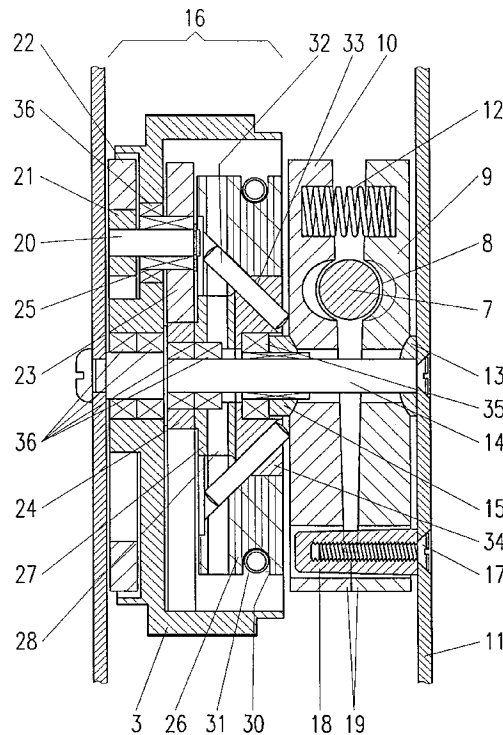
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(54) **MECANISME DE FREINAGE POUR DISPOSITIF DE LEVAGE A CORDE**

(54) **BRAKE MECHANISM FOR DEVICE FOR HAULING UP/DOWN BY ROPE**



(57) Cette invention concerne un mécanisme de freinage pour dispositif de levage à corde conçu expressément pour le levage/abaissement sécuritaires de personnes et de charges. Le dispositif comprend une poulie munie de préférence un antidériveur l'empêchant de tourner en cours de manoeuvre d'abaissement. Le mécanisme de freinage de la corde comporte un détecteur de vitesse de défilement de la corde qui agit sur le frein pour ralentir la corde lorsque la vitesse détectée dépasse la limite maximum admissible.

(57) A brake mechanism for a device for hauling up/down by rope, in particular one for the safe hauling up and down by rope of persons and loads. The device has a pulley which preferably has a back stop that prevents the pulley from turning during the roping down. The rope brake mechanism has a rope speed measuring device that cooperate with a rope brake, which acts upon the rope to exert a braking force onto the rope when the rope speed increases above a maximum predetermined speed.

Abstract

A brake mechanism for a device for hauling up/down by rope, in particular one for the safe hauling up and down by rope of persons and loads. The device has a pulley which preferably has a back stop that prevents the pulley from turning during the roping down. The rope brake mechanism has a rope speed measuring device that cooperate with a rope brake, which acts upon the rope to exert a braking force onto the rope when the rope speed increases above a maximum predetermined speed.

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the priority of European Patent Application No. 97810359.6 filed June 9, 1997, the subject matter of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

The present invention relates to a brake mechanism for a device for hauling up/down by rope, in particular one for the safe hauling up and down by rope of persons and loads. The device has a pulley which preferably has a back stop that prevents the pulley
5 from turning during the roping down.

In accordance with the European published patent EP-A-0 480 117 by the applicant, such devices for hauling up/down by rope are preferably used for hauling persons or loads up and down on a rope. The preferred area of application is for rescue services or in
10 general as mobile equipment. The devices for hauling up/down by rope essentially function to reduce the retaining force during the roping down in connection with a safety to prevent an uncontrolled dropping of the person or load attached to the rope.

These known devices for hauling up/down by rope have a large-
15 volume pulley equipped with a back stop. In most cases, a rope is placed with 2.5 windings around this pulley. The device is operated such that when pulling up, the pulley is running freely

and represents only a low resistance. During the roping down, on the other hand, the pulley is blocked by the back stop and the rope slides over the surface of the pulley. The resulting friction takes over a large portion of the load attached to the rope.

5 As a safeguard during the roping down, the International Patent Application WO-A-9 717 107 suggests providing a self-activating rope stop on the pull side of the device for hauling up/down by rope. The advantage of this arrangement is that the rope stop only needs to take over a portion of the load since the
10 device for roping up/down accepts the largest portion of the pull.

However, the disadvantage of this solution is that upon reaching the critical roping down speed, the roping down operation is stopped completely. In particular if a roping down speed near the permissible limit, e.g. 2 m/s, is required, a brief exceeding
15 of this speed limit can trigger the stopping of the rope.

SUMMARY OF THE INVENTION

It is the object of the present invention to specify a device, which prevents an increase in the roping down speed above a
20 predetermined limit value during the roping down operation.

In accordance with the present invention, the rope brake mechanism comprises rope speed measuring means that cooperates with a rope brake, which acts upon the rope to exert a braking force

onto the rope when the rope speed increases above a maximum predetermined speed.

A brake mechanism is installed on the pull side of a device for hauling up/down by rope, which mechanism forces the engagement of a frictional brake on the rope, preferably only during the roping down, if a predetermined rope speed is exceeded. In particular, the brake mechanism increases the braking effect of the frictional brake with increasing rope speed, so that the roping down speed does not reach an unacceptable, uncontrollable speed, even for heavy loads.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a top view from above of a device for hauling up/down by rope, which device has the brake mechanism according to the invention;

Fig. 2 is a section through the brake mechanism according to II-II in Figure 1.

Fig. 3 is a top view of a brake jaw for the rope brake of the brake mechanism.

Fig. 4 is a top view of the centrifugal unit.

Fig. 5 is a section along the rope guide formed by the brake jaws, according to V-V in Figure 3, in the position where the brake jaws are pressed together.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The design of the actual device for hauling up/down by rope corresponds to the design described in the WO-A-9 717 107, the subject matter of which is incorporated into the description by
5 reference.

Figure 1 shows a rope brake mechanism 1 according to the invention on a device 2 for hauling up/down by rope, e.g. a device according to the WO-A-9 717 107. The rope brake mechanism 1 comprises a frictional wheel 3 with knurled running surface, which
10 is pressed against a rope 4. The frictional wheel 3 moves in roping up 5 direction as well as roping down 6 direction. The pull end 7 of the rope passes through a rope guide 8 (see Figure 2), which consists of two jaws 9, 10, having an essentially mirror-inverted design (Figure 3). The stationary jaw 9 in this case is
15 fixedly connected to the housing 11, while the other jaw 10 can be moved.

In the position shown here, the two jaws 9, 10 are pushed by a spring 12 into the opened resting position. In this position, the guide 8 is opened to the maximum and has the largest cross section,
20 so that the rope 7 essentially glides without resistance through the guide.

The jaws 9, 10 are held on the one hand by a fixed cone 13 or a cone 15 that can be displaced along the axis 14 and is coupled

with the centrifugal unit 16 while, on the other hand, the jaws are secured against turning by a screw 17. A bolt 18 with internal thread is screwed onto the screw 17, which bolt extends through the bore at the back end of the brake jaws 9, 10, near the plateaus 19, and has a slightly conical shape to allow a movement of the brake jaw 10. During the braking operation, the movable jaw 10 tilts slightly over the front edges of the plateau if the movable cone 15 is moved by the centrifugal unit in the direction of the fixed cone 13.

The centrifugal unit 16 consists of the frictional wheel 3, inside of which a shaft 20 is positioned such that it can rotate. A planet pinion 21 fits on the outer end of shaft 20 and meshes with a fixed toothed ring 22 with internal tothing. An additional, inside planet pinion 23 fits on the other end of the shaft 20 and meshes with the central gear 24. This planet pinion 23 is attached to the shaft 20 by means of a freewheel mechanism 25. The freewheel mechanism blocks during the roping down, so that the center gear 24 is put in motion via the frictional wheel 3 and the planet gear, consisting of toothed ring 22 and the toothed gears 21 and 23.

In roping up direction, the freewheel mechanism 25 uncouples the two toothed gears 21 and 23, so that the center gear 24 is not driven and the frictional wheel can move freely, without problems

and at any speed without causing a braking of the rope.

As a rule and to prevent the parts 26 that react to the centrifugal force from being too heavy or too large, it is advantageous to have a transmission, so that the speed of the center gear, for example, is 8 times higher than that of the frictional wheel 3.

The center gear 24 is fixedly connected to the core 27, into which core radially outward-pointing pins 28 are inserted. A sector-shaped flyweight 26 is positioned on each pin 28, in such a way that it can glide. The flyweights have respectively one bore 29 for one pin 28 for this.

The 4 flyweights 26 surround the core 27 in a symmetrical arrangement (Figure 4), wherein each covers a 90° sector. A spiral spring 31, positioned inside groove 30 on the outside, keeps the flyweights pushed against the core 27 and forms the antagonistic force to the centrifugal force.

Respectively two pins 32 are inserted at an angle into the flyweights 26 and project from the flyweights 26 in the direction of axis 14. The pins 32 glide inside bores 33 in the thrust collar 34. Finally, the movable cone 15, positioned rotatably on a rolling bearing 35, sits on the thrust collar.

All rotating parts of the centrifugal unit are positioned with little friction in suitable bearings 36 on the axis 14. Shaft 20

is positioned in the same way inside frictional wheel 3. Pins 32 and pins 28 are composed of steel, which ensures good gliding qualities in the flyweights 26 of brass and the thrust ring 32 that is also made of brass.

5 During the roping down, the rope 4 puts into motion the frictional wheel 3 and, via the planet gear, also the core 27 and the surrounding flyweights 26 since the freewheel mechanism 25 blocks in this direction. Starting with a certain speed, the flyweights 26 start to move toward the outside, against the force
10 of spiral spring 31, or to exert a net force directed toward the outside onto the pins 32. The pins 32 convert this movement and force, directed toward the outside, into an axially directed force onto the pressure disk and thus the cone 15. The cone 15 pushes the movable jaw 10 in the direction of the fixed jaw 9 and thus
15 narrows the cross section of guide 8, as a result of which an increasingly stronger frictional braking force is exerted onto the pull end 7 that is positioned inside the guide 8. In addition, convexities 38 are located inside grooves 37 in jaws 9, 10, which jaws together form the guide 8, so that the rope 7 is forced into
20 an increasingly S-shaped course inside the guide 8 (figure 5), which further increases the friction.

It is a common design criteria for the brake mechanism to avoid roping down speeds exceeding 2 m/s for a load of 150 kg. The

operating threshold and strength of the brake is achieved through a suitable selection of the various component parts, such as transmission of the planet gear 21 - 24, weight of the flyweights 26, strength and characteristic of the spiral spring 31, form of
5 the brake jaws 9, 10 and the guide 8, etc.

It will be understood that the above description of the present invention is susceptible to various modifications, changes and adaptations, and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.

For example, it is conceivable to use a combination of conical and tapered surfaces in place of the angled pins 32, possibly by also using roll bodies. With higher requirements, e.g. for higher loads, the blocking effect of the freewheel mechanism 25 can be overtaxed. However, it is possible to provide more than one planetary shaft 20 with, respectively, one freewheel mechanism 25, as a result of which the load will be distributed over the existing freewheel mechanisms. It is furthermore conceivable to have a different number of flyweights with a different form or different angle. Also, a different material can be selected for producing the flyweights and pins 32 and pins 28, as long as displacement on the latter is ensured.

Patent Claims

1. A brake mechanism for a device for hauling up/down by rope, in particular one for the safe hauling up and down by rope of persons and loads, said device having a pulley, which preferably has a back stop that prevents the pulley from turning during the roping down, the rope brake mechanism comprising rope speed measuring means that cooperate with a rope brake, which acts upon the rope to exert a braking force onto the rope when the rope speed increases above a maximum predetermined speed.

2. A brake mechanism according to claim 1, wherein the rope speed measuring means comprise a frictional wheel, that can be made to frictionally engage with a rope wound around a pulley of the device for hauling up/down by rope.

3. A brake mechanism according to claim 1, wherein the rope speed measuring means contain a centrifugal unit, comprising a rotatable arrangement of flyweights, and coupling means for transferring the effect of the centrifugal force onto the flyweights, onto the rope brake, in order to cause an increased braking effect of the rope brake on a rope, which increases with increasing rotational speed.

4. A brake mechanism according to claim 3, wherein the flyweights surround a rotatable core in a symmetrical arrangement, from which core originate radial guide means, which hold the

flyweights such that they can be moved radially, the arrangement of flyweights surrounding peripherally by a spring-elastic element, which prestresses the flyweights against the core.

5. A brake mechanism according to claim 3, further comprising a gear, arranged between frictional wheel and the arrangement of flyweights, in order to put into motion the arrangement of flyweights.

6. A brake mechanism according to claim 1, characterized in that the rope speed measuring means comprise a device, which interrupts the operational connection to the rope brake.

7. A brake mechanism according to claim 1, wherein the rope brake comprises an essentially tube-shaped rope guide for a rope, the width of which can be changed, said guide having convexities and/or concavities to force the rope into an increasingly S-shaped course during the reduction of the width, so as to increase the braking effect.

8. A brake mechanism according to claim 7, wherein at least a section of the rope guide is movable so as to allow a change in width for the rope guide and wherein the movable section can be moved by the coupling means.

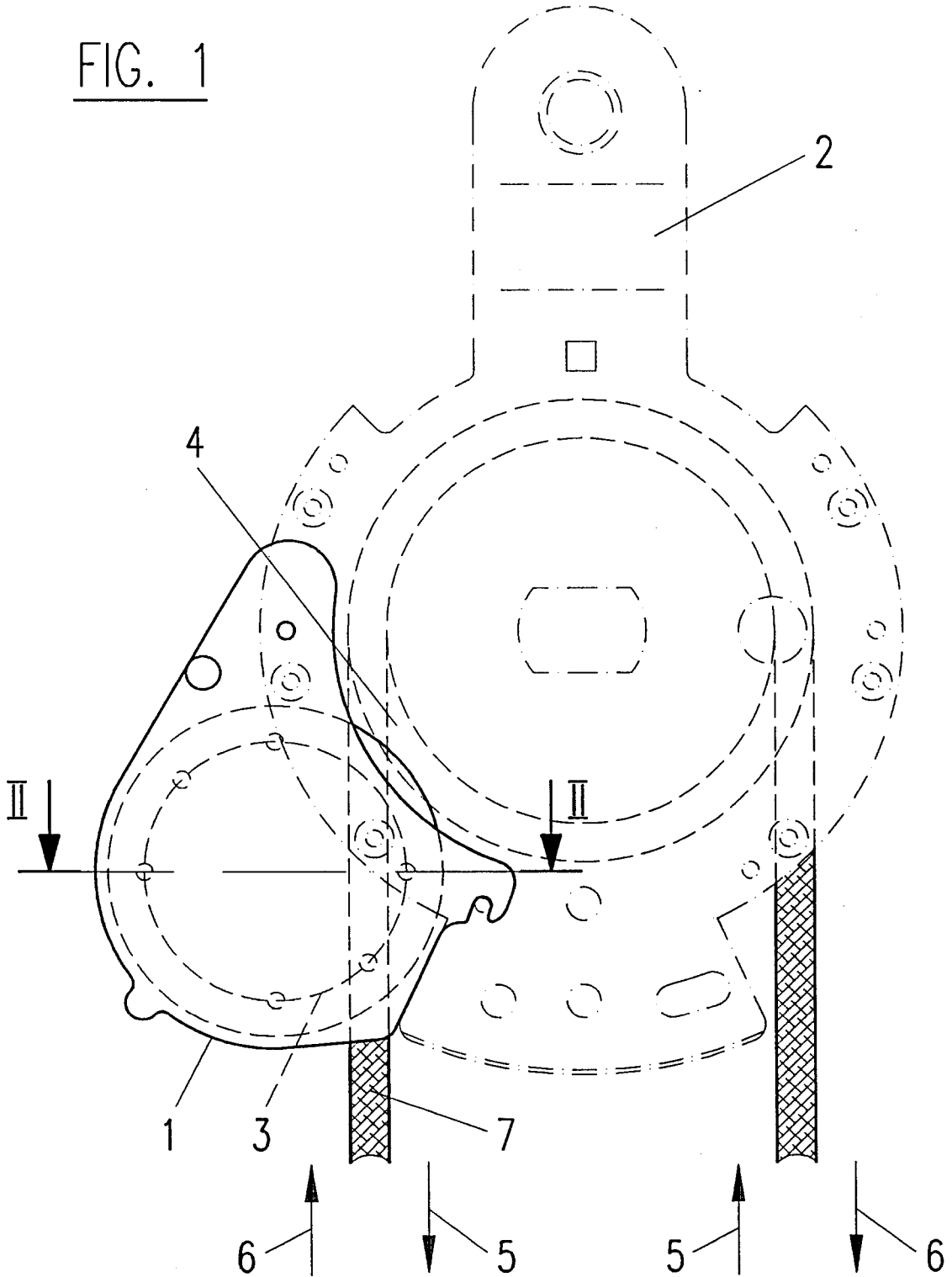
9. A brake mechanism according to claim 3, wherein the coupling means comprise first contact zones, existing on the flyweights, and second contact zones, existing on the coupling

means that can be moved parallel to the rotational axis of the centrifugal unit and which are aligned at an angle, to the rotational axis, wherein the first contact zones are designed for gliding or moving via roll bodies of the first contact zones, disposed between them, on the second contact zones, in order to convert the force and/or radial movement of the flyweights under the effect of a centrifugal force into a force or movement of the coupling means, which is directed essentially along the rotational axis.

10. A device for hauling up/down by rope, having a brake mechanism according to claim 1.

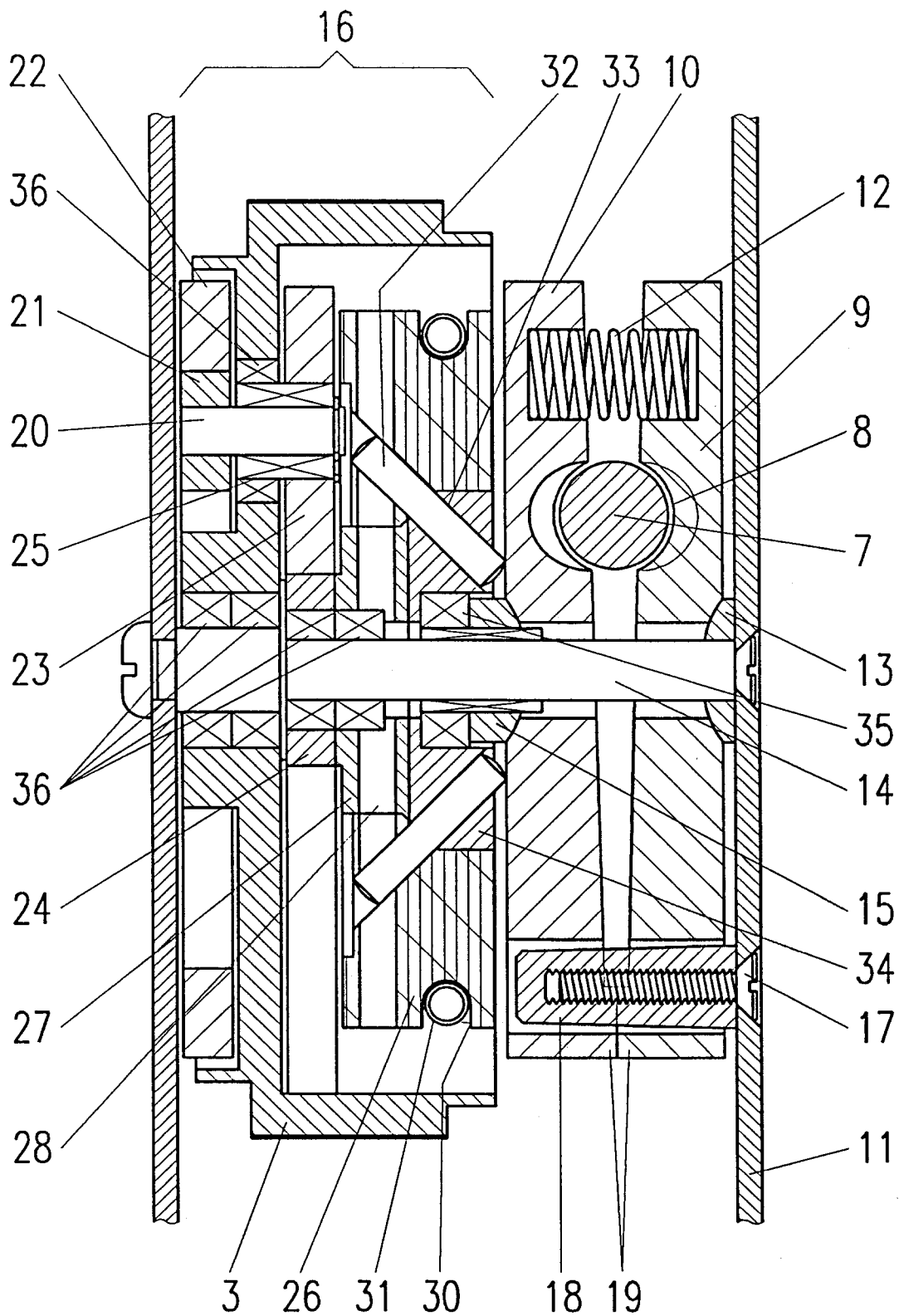
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FIG. 1



2/3

FIG. 2



3/3

FIG. 3

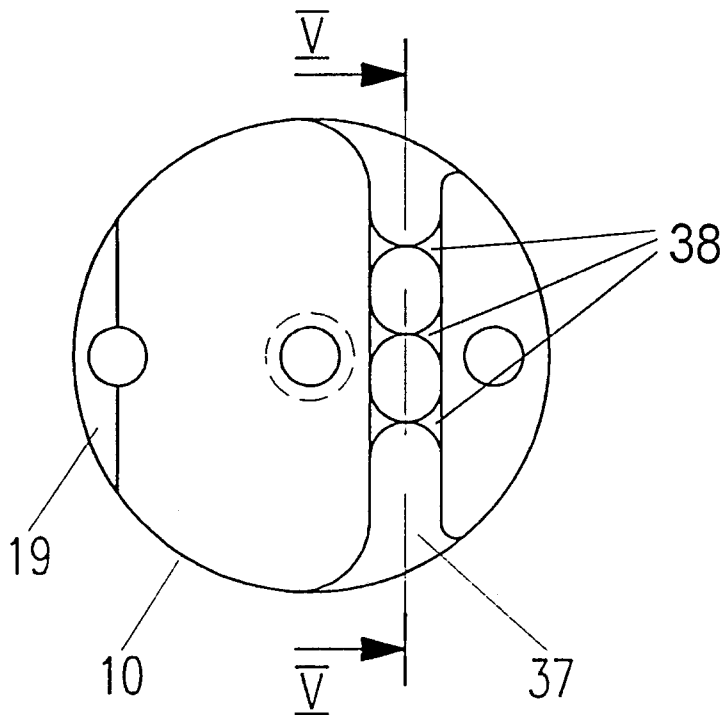


FIG. 5

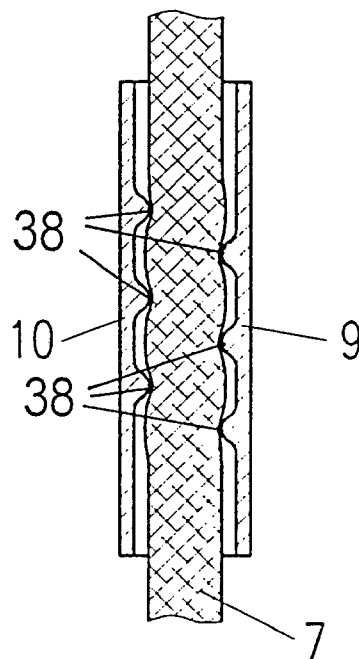


FIG. 4

