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(54) Hydraulic mechanism for door opening

(57) Of the kind fixed to a structure, such as a wall, frame or floor of the type comprising a base (8) with two covers (9) between which covers the door is fixed by securing means (10), characterised in that it comprises: an eccentric shaft (1), a first piston (2), connected to at least one spring (22) and to the eccentric shaft (1) and a closed circuit with lubricant fluid or oil that moves in function of whether the referred spring (22) is compressed or decompressed, thus regulating the door-opening or closing speed.

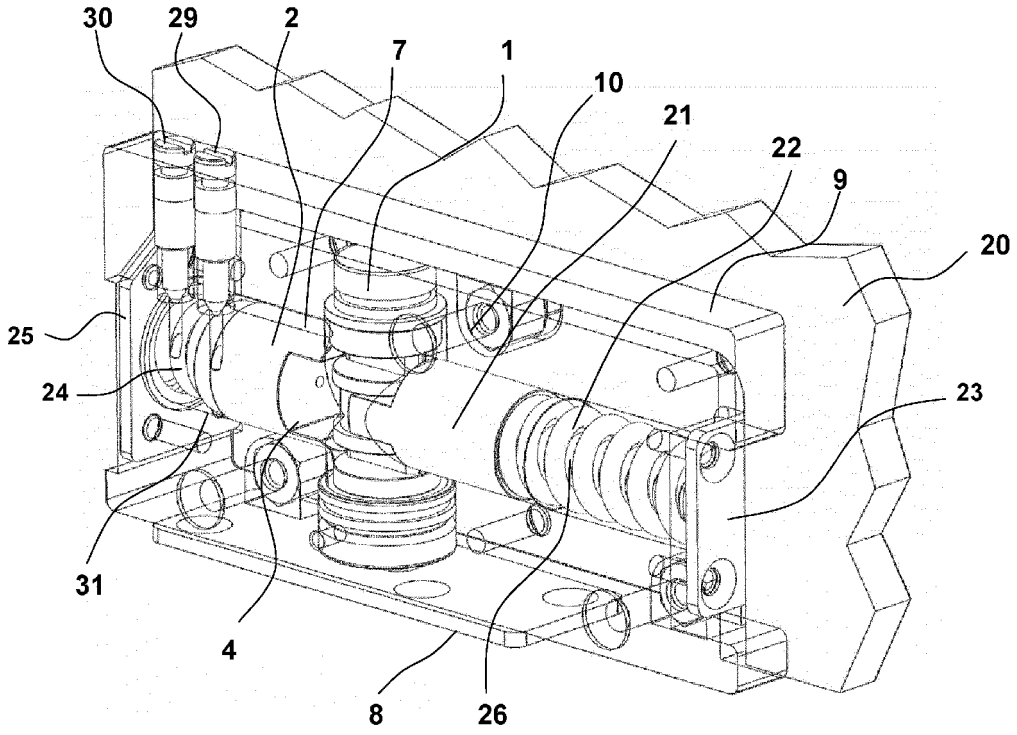

FIG. 3

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Description

[0001] Hydraulic mechanism for door opening of the kind fixed to a structure, such as a wall, frame or floor of the type comprising a base with two covers between which covers the door is fixed by securing means, **characterised in that** it comprises: an eccentric shaft, a first piston, connected to at least one spring and to the eccentric shaft and a closed circuit with lubricant fluid or oil that moves in function of whether the referred spring is compressed or decompressed, thus regulating the door-opening or closing speed.

BACKGROUND OF THE INVENTION

[0002] Various mechanisms are known in the start of the art for opening doors.

[0003] Thus, Utility Model number No 9402508, "BISAGRA HIDRAULICA COMPENSADA", in known from 1994, in the name of FERRO-FRIO, S.A., which refers to a compensated hydraulic hinge, of the type used to raise glass pane doors, especially those employed in refrigerated glass cases, enabling them to be supported at the desired angle, especially **characterised in that** they consist of an assembly that is completely independent of the glass case structure, formed of a basically rectangular parallelepiped support piece that contains a hydraulic piston articulated by a base to a rear part, a support piece by means of a shaft and firmly connected by its opposite far end corresponding to the operating head to a jaw-clip which, in turn, articulates with the front rectangular support piece by a second shaft so that the jaw-clip can tilt up or down while the piston operating head is extended or folded.

[0004] Utility Model number No 200502086 "BISAGRA HIDRÁULICA PERFECCIONADA", in known from 2005, in the name of GRUPO DANKAMI, S.L., which refers to a perfected hydraulic hinge of the type used in the articulation or tilting of glass pane doors or windows or similar, employing a cup located on the glass plane and a hinge body secured to the frame by a support, **characterised in that** the cup is joined to the hinge body by means of an arm between which relative rotation is permitted around the shaft, the rotating arm, a rotating-arm connector and rocker-arm, the damper rocker-arm, the damper cylinder, frame support, connection fixed to the support, dismantling button with a spring for the push-button that operates the connection, with the hinge also incorporating an arm spring: all so that, because of its constitution, the rotating arm, from a determined angle during the closing rotation, is the same arm that forces the door towards closing in counter-position to the resistance of the hydraulic cylinder.

[0005] Utility Model No 0274475 "MECANISMO HIDRAULICO MEJORADO PARA EL CIERRE DE PUERTAS", of 1985, also belongs to the inventors, which refers to an improved hydraulic mechanism for closing doors, of the type that successively produces a first, second and third door-closing speed, which is housed inside a covered box that contains a fluid and arranged in a floor cavity and level with it and which comprises a hydraulic pump geared to discs firmly attached to a rotating shaft protruding from the box and linked to the lower corner of the door articulation, with this frame being able to move forwards or backwards according to the rotation direction and with the door being fitted with springs that tend to maintain it in a position that corresponds to the closing of the door, maintaining the pump piston retracted, essentially **characterised in that** the hydraulic pump is fitted with the means to leave the third closing speed activated or deactivated and in that the box and cover, obtained by moulding plastic material, contains complementary elements to constitute the stop of the cited springs, the means to facilitate the rotation of the referred shaft, self-centring means for the cover over the box, the means to facilitate correct alignment in the transversal direction of the box and the means to obtain correct levelling of this same box.

[0006] The inventors are also aware of the current Utility Model application No 9701789 "PERNIO MEJORADO PARA PUERTAS, VENTANAS Y MARCOS ACRISTALADOS", of 1997, which refers to an improved rising-butt hinge for doors, windows and glazing frames, of the type comprising two plates fitted to the respective sides of the glass pane at the top and bottom, with inter-position of the laminar seals on the corresponding faces, all joined by pass-through screws and nuts, including a carrier part for the orifice, peg or coupling elements with the complementary part of the rising-butt hinge for rotating the actual door or window and, where applicable, to close and brake the same, with the same plates exteriorly covered by covers secured by screws at their ends, essentially **characterised in that** one of the long sides of one of the said plates has an orthogonal carrier elbow for the said coupling element, while the other plate has a coinciding cut-out into which said elbow is fitted and in that one of the sides of each plate has a longitudinal central guide in "C" section and two longitudinal undercuts that define longitudinal reinforcement ribs.

[0007] Hinged mechanisms are also known that have an eccentric shaft that is firmly secured to covers that fix the door with screws or similar elements and, when closed, are fixed in a given position because of the eccentric shaft and the same happens on opening.

BRIEF DISCLOSURE OF THE INVENTION

[0008] This application is associated with the door-opening mechanisms sector, which are fixed to a wall or frame.

[0009] The closest document is the eccentric shaft hinge mentioned in the invention disclosure.

[0010] The problem with this hinge is that it does not regulate the door-opening and closing speed because the hinge suddenly changes position due to the force of a person pushing it.

[0011] This means that the hinge speed has to be controlled with the same hand, firmly gripping the surface to prevent such sudden opening and closing position changes.

[0012] The first two utility models provide solutions to this problem. The only drawback is that they require a complicated installation process and, at the same time, they do not regulate that at the door opening moment, it must move faster because the person is pushing it and must move somewhat slower to ensure it does not strike the person passing through.

[0013] Utility Model No 0274475 is another closely relevant document.

[0014] This Utility Model resolves the speed-regulation problem on closing the door.

[0015] The problem is that its installation requires a hole in the floor in order to locate the part of the door opening and closing mechanisms. This means that when employing a reliably operating solution, in certain locations, taking into account the thin floors existing between apartments nowadays, installation can be quite unfeasible because there is insufficient space to install the mechanism in the floor.

[0016] Installing the mechanism on top of the floor is the solution; however this can require so much space that it is not aesthetically acceptable.

[0017] Therefore, with this application, the inventors move a step forward and resolve the previously mentioned problems.

[0018] On the one hand, they solve the drawback of the closest document, because a hydraulic mechanism has been designed that hardly requires any installation, in other words, a hole in the floor is no longer necessary to house the installation, instead the mechanism base is simply fixed to the floor and this mechanism is then fully operational.

[0019] On the other, it also resolves the question of installation size by configuring the installation outside via the spring and hydraulic circuit. In this way, installation size is only slightly larger than that of the glass door to which it is fitted, so that it is visually hidden and aesthetically acceptable.

[0020] It is necessary to point out that this combination can provide effects for those doors that have to be fixed to a frame as those directly secured to the floor since the advantage of all the small mechanism is fitted to the actual door and makes said mechanisms ideal because of its simple rapid installation without any large-scale installation work required.

[0021] One object of this invention is a hydraulic mechanism for door opening of the kind fixed to a structure, such as a wall, frame or floor of the type comprising a base with two covers, between which covers the door is fixed by securing means, **characterised in that** it comprises: an eccentric shaft, a first piston, connected to at least one spring and to the eccentric shaft and a closed circuit with lubricant fluid or oil that moves in function of whether the referred spring is compressed or decompressed, thus regulating the door-opening or closing speed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] In order to facilitate the description, this report is accompanied by five sheets of drawings that illustrate a practical embodiment case, which is provided as a non-limiting example of the scope of this invention.

- Figure 1 is a perspective view of the object of this invention, when referring to a hinge.
- Figure 2 is a sectional view through line 11-11 of Figure 1.
- Figure 3 is a perspective view of the object of this invention with a slide, when referring to a hinge.
- Figure 4 is a lateral view of Figure 1 and
- Figure 5 provides details of the pistons, with a slide of one of them, referring to Figures 3 and 4.

SPECIFIC EXEMPLARY EMBODIMENT OF THIS INVENTION

[0023] Thus Figure 1 illustrates base 8, covers 9, fixing means 10 and eccentric shaft 1.

Figure 2 represents eccentric shaft 1 with its bushings 11, first piston 2, first spring 3, second spring 12, non-return valve 5, oil chamber 4, connection tube 7, flow rate regulator 6, O-rings 13, 14 and fixing means 15.

Figure 3 illustrates door 20, cover 9, eccentric shaft 1, fixing means 10, second cover of spring 23, and third spring 26 , base 8, first piston 2, first chamber 4, second chamber 31, tube 7, first spring 24, with first spring cover 25, second piston 21 with second spring 22, first regulator 29 and second regulator 30.

Figure 4 shows door 20, cover 9, eccentric shaft 1 with bushing 3 and axial bearing 6, fixing means 10, second piston 21 with second spring 22, second cover of spring 23 and third spring 26, base 8, first piston 2, first chamber 4, second chamber 31, tube 7, first spring 24 with first cover of spring 25 first regulator 29 and second regulator 30.

[0024] Lastly, Figure 5 represents eccentric shaft 1 with bushing 3 and axial bearing 6, second piston 21 with second spring 22, third spring 26, base 8, first piston 2, first chamber 4, first spring 24, non-return valve 16 and connection 28.

[0025] Two installation examples are given below, one for when installed on a door frame and the other for the option to install on the actual floor.

[0026] Even when basically identical, in essence the mechanism is the same by being the mechanism to open and close the door, but different by either standard or rising-butt hinges, two examples are described, one for each type, but without essentially changing the invention.

[0027] Thus, in a specific exemplary embodiment, for the supposition of a hinge, which has installed a door the position of Figures 1 and 2 would be with the door closed.

[0028] When a person pushes the door to open it, eccentric shaft 1 rotates and pushes first piston 2 and first spring 3 and second spring 12 downwards, compressing the space in oil chamber 4, which forces the oil upwards inside second spring 12 and through non-return valve 5, filling tube 7.

[0029] When the door closes, the opposite situation occurs, in other words, eccentric shaft 1 rotates again, but no longer pushes first piston 2 and springs 3, 12 return to their original positions. Then, a vacuum is produced in oil chamber 4, which is filled with oil from tube 7 and dispensed by flow-rate regulator 6. The oil must follow this route because non-return valve 5 prevents the oil from circulating in the opposite direction.

[0030] Depending on the oil flow rate as determined by flow-rate regulator 6, the door-closing speed will be higher or lower.

[0031] Assuming the use of a hydraulic rising-butt hinge, the rising-butt hinge with the glass door installed in the position shown in Figures 3, 4 and 5 would be with the door closed.

[0032] When a person pushes door 20 to open it, eccentric shaft 1 rotates and pushes second piston 21, compressing second spring 22 and third spring 26 against the second cover of spring 23.

[0033] At the same time, the opposite effect is produced on first piston 2. Here, when door 20 is pushed, eccentric shaft 1 rotates and stops first piston 2 from pushing on first spring 24 allowing first spring 24 to decompress.

[0034] From here, it can be said that eccentric shaft 1 is double because it contains two eccentric elements at the same time, one for first piston 2 and one for second piston 21, so that completely opposite effects are produced on the springs.

[0035] Moreover, on first piston 2 movement of the oil or other lubricant fluid is produced and moves inside a circuit.

[0036] So, when door 20 is pushed, first spring 24 is decompressed, which produces a vacuum in second chamber 31. In this way, first regulator 29 and second regulator 30 supply oil inside tube 7 and to first chamber 4. Non-return valve prevents 16 prevents the oil from being transferred from first chamber 4 to second chamber 31 via connection 28.

[0037] When the door is closed, double eccentric shaft 1 rotates again and compresses first spring 24 and decompresses second spring 22 and third spring 26.

[0038] Thus, when the door closes, first piston 2 produces the opposite effect, first spring 24 is compressed and reduces the space in second chamber 31. An oil transfer then occurs from second chamber 31 to the first chamber 4 via non-return valve 16. At the same time oil is supplied to second chamber 31 via regulators 29 and 30 at a lower flow rate than that transferred from second chamber 31 to first chamber 4.

[0039] There is a moment during which first piston 2, on moving back, blocks first regulator 29, so that oil is only supplied to second regulator 30, which produces a flow rate that is much lower than that to first regulator 29.

[0040] This is because the inventor has achieved two speeds when door 20 closes so that it does not impact against the frame if the user has pushed it too hard. So, when the door closes and regulators 29, 30 supply oil, the door closes at a higher speed. When only second regulator 30 is supplying oil the door speed decreases.

[0041] Said regulators 29, 30 can be calibrated so that they establish the door opening and closing speeds.

[0042] This invention patent describes a hydraulic mechanism for door opening. The examples mentioned here do not limit this invention and thus, can have various applications and/or adaptations, all of which are within the scope of the following claims.

Claims

1. Hydraulic mechanism for door opening of the kind fixed to a structure, such as a wall, frame or floor of the type comprising a base (8) with two covers (9) between which covers (9) the door (20) is fixed by securing means (10), **characterised in that** it comprises:

   - an eccentric shaft (1),
   - a first piston (2), connected to at least one spring (3, 24) and to the eccentric shaft (1) and a
   - closed circuit with lubricant fluid or oil that moves in function of whether the referred spring (3, 24) is compressed or decompressed, thus regulating the door (20) opening or closing speed.

2. Mechanism in accordance with claim 1, **characterised in that**:

   - eccentric shaft (1) articulates with covers (9),
   - first piston (2), connected to said eccentric shaft (1), comprising at least first spring (3) that is compressed when the door is opened,
   - the closed circuit with lubricant liquid or oil that comprises chamber (4) containing the oil or other lubricant liquid connected inside first spring (3) to non-return valve (5), which is connected by interior tube (7) to mentioned chamber (4) via flow-rate regulator (6).

3. Mechanism in accordance with claim 1 or 2, **characterised in that** second spring (12) is comprised inside first spring (3).

4. Mechanism in accordance with claim 1 or 2, **characterised in that**:

- eccentric shaft (1) is double,
- first piston (2) that is supported by one of its ends on said eccentric shaft (1) and by the other of its ends on first spring (24) that ends in a first cover of spring (25),
- the closed circuit with lubricant liquid or oil that comprises first chamber (4), containing oil or other lubricant liquid, connected inside first piston (2) to non-return valve (16) and also said first chamber connected to interior tube (7) which, in turn, is connected to at least one regulator (29) that terminates in second chamber (31) that contains first spring (24) so that, in the closed door position, mentioned first spring (24) is compressed and on opening, first spring (24) is decompressed and the lubricant or oil passes from second chamber (31) to first chamber (4) through non-return valve (16) and when the door is closed again, the lubricant or oil passes through tube (7) into regulator (29), which determined the speed at which the lubricant or oil passes into second chamber (31) and thus, door (20) closing speed and
- second piston (21) is supported by one of its ends on said eccentric shaft (1) and by the other on second spring (22) that terminates on second cover of spring (23) which, in the closed door position, said second spring (22) is decompressed and in the open door position, the referred second spring (22) is compressed.

5. Mechanism in accordance with claim 4, **characterised in that** double eccentric shaft (1) always enables a decompressed position of one of the springs and decompressed position in the other spring.

6. Mechanism in accordance with claim 5, **characterised in that** second spring (22) contains third spring (26).

7. Mechanism in accordance with claim 4 or 5, **characterised in that** it comprises second regulator (30) connected to first regulator (29) that determines a second flow speed of oil in second chamber (31) and thus, a second door-closing speed (20).

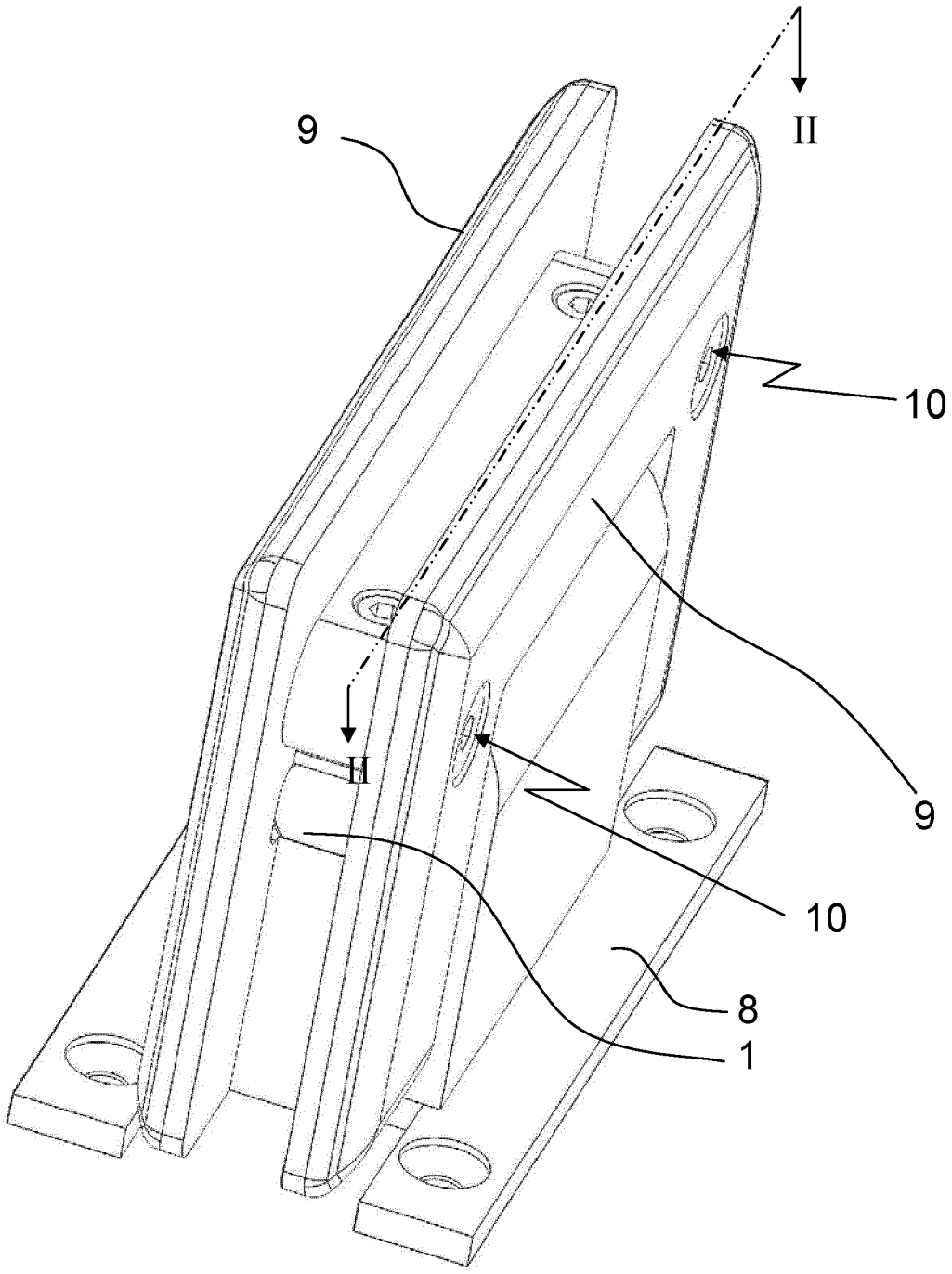

FIG. 1

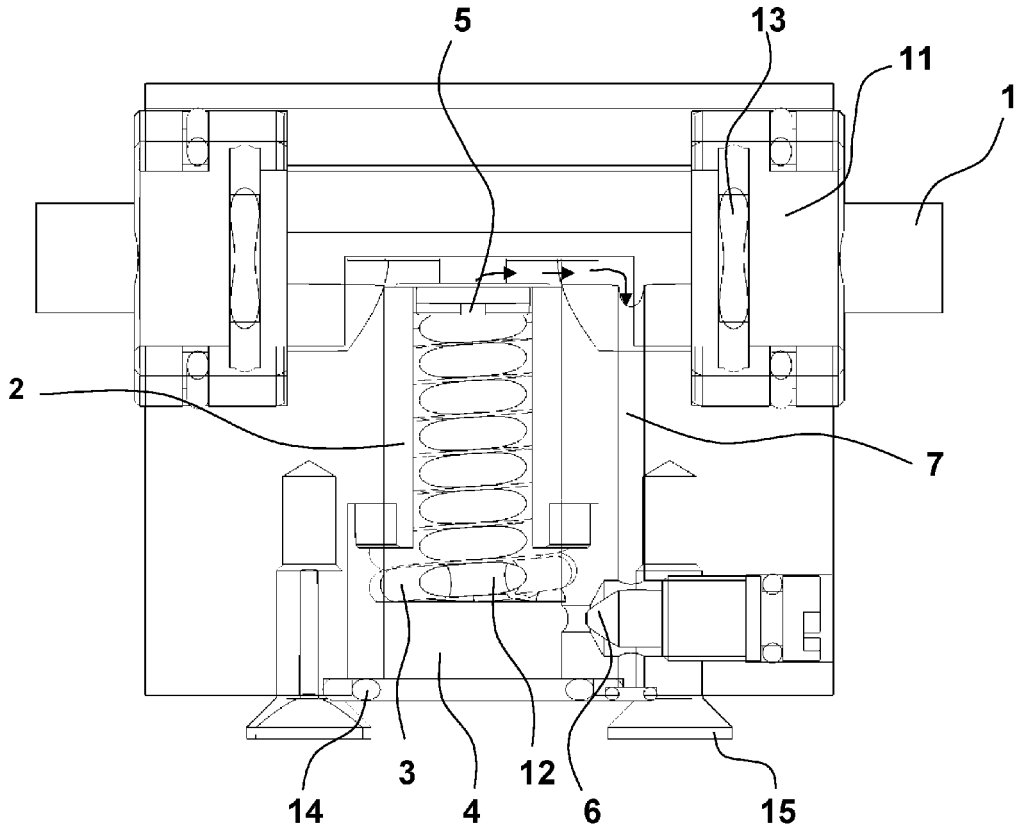

FIG. 2

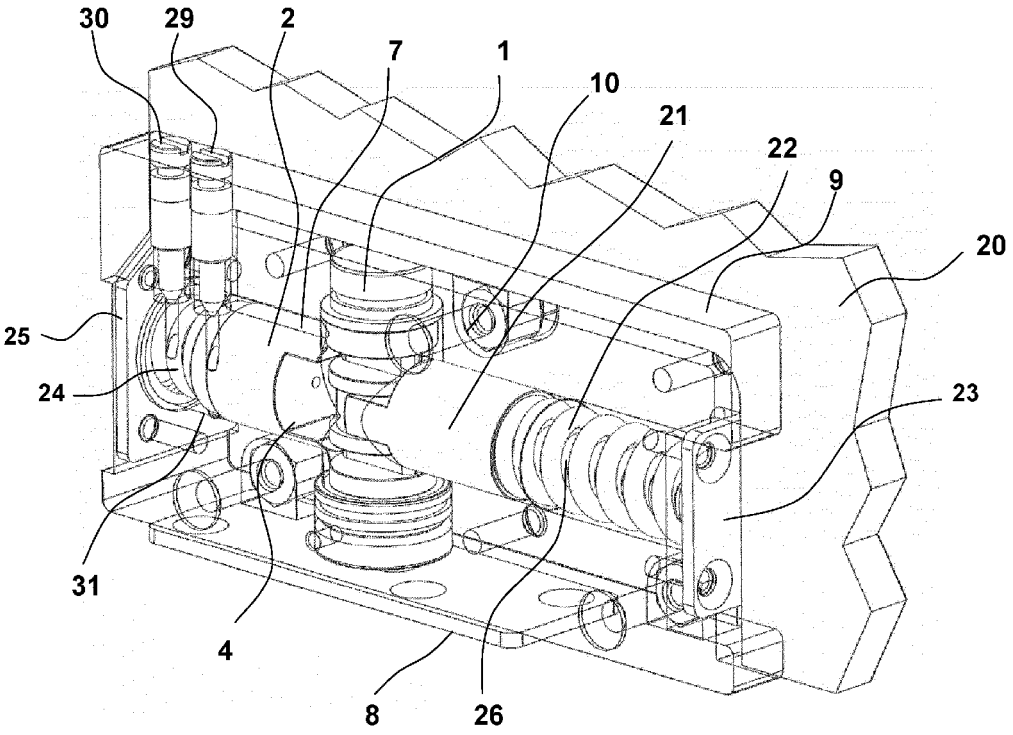

FIG. 3

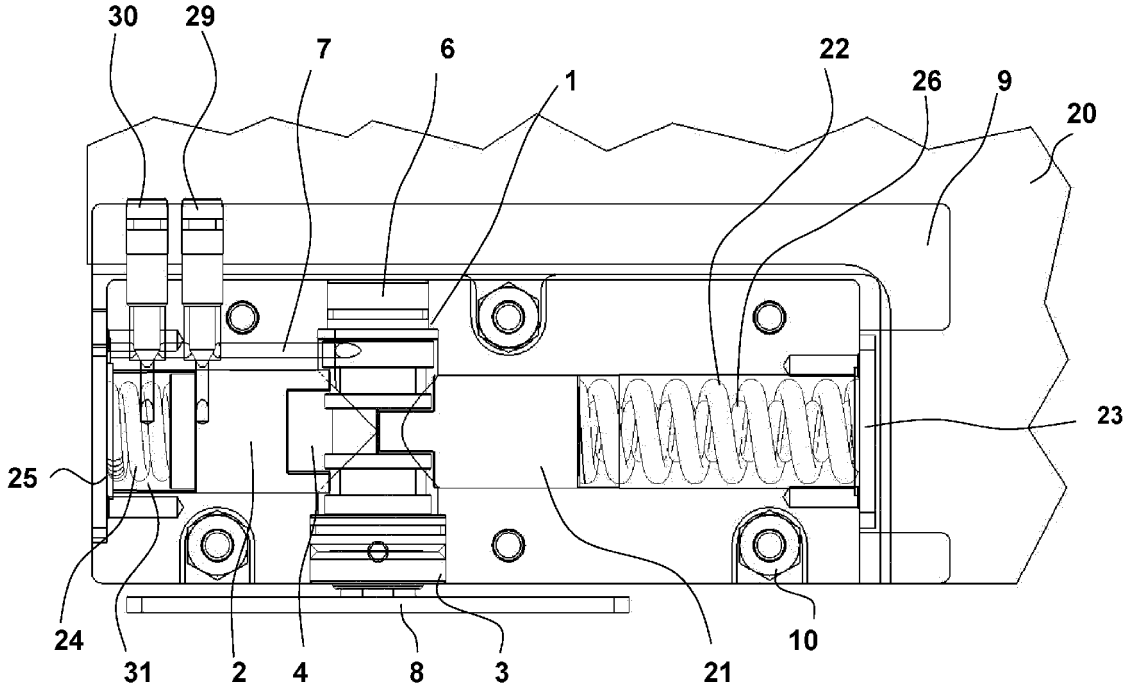

FIG. 4

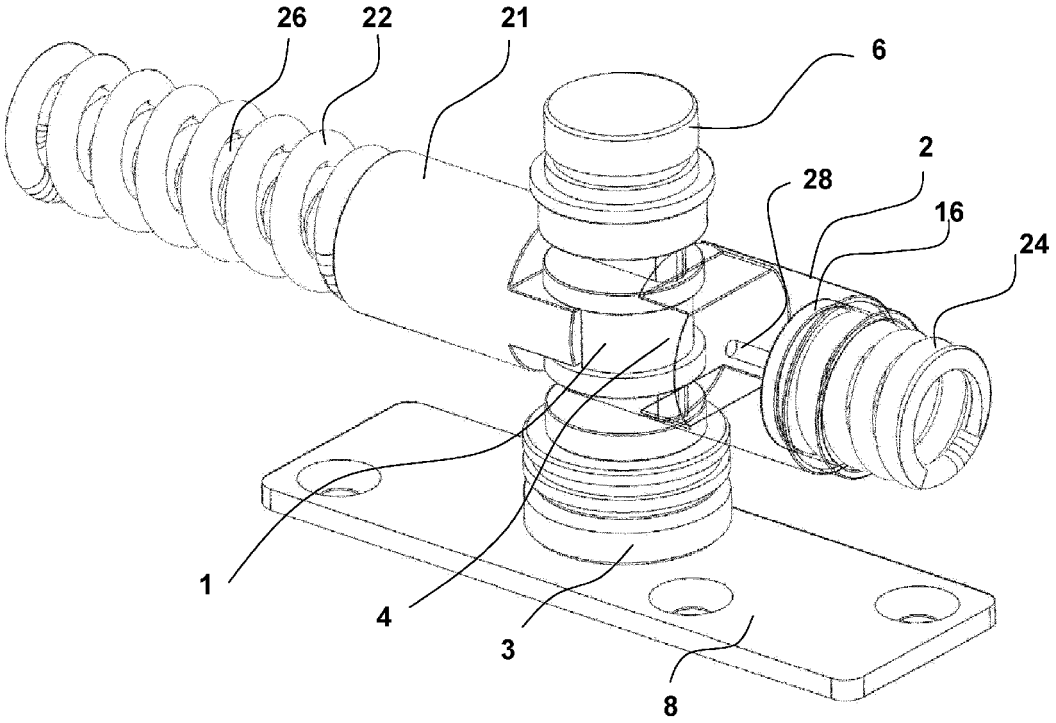

FIG. 5