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(54) SWITCH

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Description

TECHNOLOGY

[0001] Embodiments of the present disclosure relate to the field of switch, and more specifically, to a pushbutton switch.

BACKGROUND

[0002] A pushbutton switch refers to a switch whose pushbutton can return to its original position after each press operation. After a press, the pushbutton switch can be switched to the switching-on or switching-off state, and after a next press operation, the pushbutton switch would be switched to the opposite state (switching-off or switching-on) from the switching-on or switching-off state.

[0003] The existing pushbutton switch drives a swing element to swing via a driver, and then the swing element drives the switch bridge to act to achieve the switching on and off operation of the circuit. In such an existing pushbutton switch, the driver needs to return to the intermediate position each time when the pushbutton is released. Thus, when the pushbutton is pressed again to operate the switch, the driver needs to rotate from the intermediate position to tilt for an angle before starting to drive the swing element and further drive the moving contact of the switch to act, causing a delay between the operation of the pushbutton and the switching action of the switch which is adverse to timely and precise control to the switch. Besides, during the rotation process of the driver, friction will be generated on the contact face between the driver and the swing element. On the one hand, if this friction face becomes coarse due to causes like dirt, manufacturing and usage, the driver might be unable to rotate, thereby disabling the switch; on the other hand, the wear caused by long-term friction might change the dimension and shape of the contact point of the driver and the swing element so that the driver cannot match with the swing element accurately to drive the swing element to act, which makes the driver's operation unstable and unreliable. Moreover, the switch of the prior art has many components, and thus has high demand for the precision of manufacturing and fitting the components, which also increases the manufacturing costs of the switch.

[0004] In another aspect, for the pushbutton switch of the prior art as mentioned above, the direction of the press force applied on the pushbutton is usually different from the driving force for directly driving the moving contact to act. Therefore, it is necessary to utilize a particular mechanism to convert the press force applied by the user downward into the driving force for directly driving the moving contact to act. This kind of force conversion generally has poor efficiency and therefore, requires greater press force from the user. In addition, such force conversion is not reliable enough because of factors such as reliability of the particular mechanism, manufacturing precision, abrasion, pollution and so on.

[0005] US 5,924,556 A discloses a push switch device in which a cam member is provided between a movable contact member and a cam shaft.

SUMMARY

[0006] In view of the above, it is the object of the invention to provide a switch of small size and fast switching operation.

[0007] This object is accomplished by the features of claim 1.

[0008] A switch comprises the features of claim 1, amongst them a pushbutton; a driver which can swing relative to the pushbutton between two extreme positions to cooperate with the pushbutton; a swing element that can swing with respect to a first axis, comprising a first contact face and a second contact face located at different sides of the first axis; an elastic element connected between the driver and the swing element; and a first moving contact and a first stationary contact. The driver has a driving face for pressing the first contact face and the second contact face of the swing element, and the driver is configured to, when the pushbutton is pressed down, press one of the first contact face and the second contact face of the swing element with the driving face on one side of the first axis so that the swing element swings to a first position, and when the pushbutton is pressed down again, press the other one of the first contact face and the second contact face of the swing element with the driving face on the other side of the first axis so that the swing element swings to a second position. In one of the first position and the second position, the first moving contact contacts the first stationary contact while in the other one of the first position and the second position, the first moving contact is disconnected from the first stationary contact.

[0009] According to an embodiment of the present disclosure, the driver is configured such that, when the pushbutton is released, the elastic element drives the driving face of the driver to swing from one side of the first axis to the other side.

[0010] According to an embodiment of the present disclosure, the switch further comprises a housing in which a stop is arranged, the stop defining the swing extreme position of the driver.

[0011] According to an embodiment of the present disclosure, there is arranged a stop face on the pushbutton, the stop face defining the swing extreme position of the driver.

[0012] According to an embodiment of the present disclosure, the driving face is a non-planar face so that during the process of pressing the first contact face or the second contact face of the swing element by the driving face, the position on the driving face where the driving face contacts the first contact face or the second contact face varies.

[0013] According to an embodiment of the present disclosure, the driving face is formed in a recess at one end of the driver.

[0014] According to an embodiment of the present disclosure, the swing element comprises a swing piece on which the first moving contact is located and a driving arm the longitudinal direction of which is vertical to the swing piece. The first contact face and the second contact face extend along the longitudinal direction of the driving arm and are distributed symmetrically about the first axis, and the first contact face and the second contact face are located between the driver and the first axis.

[0015] According to an embodiment of the present disclosure, the switch further comprises a switch bridge on which the first moving contact is located. The swing element cooperate with the switch bridge such that the swing element, when swing to the first position or second position, drives the switch bridge to swing to the position where the first moving contact is in contact with or disconnected from the first stationary contact.

[0016] According to an embodiment of the present disclosure, the extension direction of the first contact face and the second contact face from the ends of the first and second contact faces close to each other to the distal ends thereof are tilted with an angle towards one side of the first axis with respect to the direction vertical to the main face of the swing piece. The angle can be between 0 degree and 20 degrees.

[0017] According to an embodiment of the present disclosure, the driver abuts against the pushbutton under the action of the elastic element, and during the swing process of the driver, the engaging point between the driver and the pushbutton varies.

[0018] According to an embodiment of the present disclosure, the elastic element is pivotally connected between the driver and the swing element.

[0019] According to an embodiment of the present disclosure, the driver is pivotally connected to the pushbutton, and a contact rib is arranged on the pushbutton. One end of the elastic element is fixed to the swing element and the other end of the elastic element abuts against the contact rib.

[0020] According to an embodiment of the present disclosure, the switch further comprises a second moving contact and a second stationary contact. In one of the first position and the second position of the swing element, the first moving contact contacts the first stationary contact and the second moving contact is disconnected from the second stationary contact, while in the other one of the first position and the second position, the first moving contact is disconnected from the first stationary contact and the second moving contact contacts the second stationary contact.

[0021] In the switch according to the embodiments of the present disclosure, by connecting an elastic element between the driver and the swing element, the driver does not swing when pressing the swing element to act and is driven to the other swing extreme position by the elastic element during the resetting process. Thus, the number of components of the switch is reduced, and the efficiency of converting the pressing force from the pushbutton 1 into the force for directly driving the moving contact to act is improved, and the accuracy of the position where the driver drives the swing element to act and reliability of the action are improved.

[0022] In the switch according to the embodiments of the present disclosure, during the process of driving the swing element to act by the driver, the engaging position between the driver and the swing element varies while the distance from the point where the driver applies force on the swing element to the swing axis of the swing element remains constant, so that during the whole process of pressing the pushbutton, the driver keeps driving the swing element to swing for the same angle with the same unit travelling stroke. In this manner, the driving mechanism formed by the driver and the swing element shortens the pressing travelling stroke required for the operation of switching the circuit by the pushbutton, thus facilitating user's operation.

[0023] In the switch according to the embodiments of the present disclosure, by arranging the moving contact on the swing element, the swing element serves not only as the actuator for receiving the driving force from the driver but also as the switch bridge for directly driving the moving contact to act, which makes the operation of the driving mechanism of the switch to drive the moving contact to act more efficient and reliable, while reducing the number of components in the switch and simplifying the structure of the switch.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] Through the following detailed description of the example embodiments with reference to the accompanying drawings, the above and other objectives, features, and advantages will become more apparent. In the drawings:

Fig. 1 is an exploded view of a switch according to the first embodiment of the present disclosure;

Fig. 2 is a front view of the pushbutton of Fig. 1;

Fig. 3 is a perspective view of the driver of Fig. 1;

Fig. 4 illustrates the matching between the pushbutton and the driver shown in Fig. 1;

Fig. 5 illustrates an alternative for the matching between the pushbutton and the driver shown in Fig. 4;

Fig. 6 shows another alternative for the matching between the pushbutton and the driver shown in Fig. 4;

Fig. 7 is a perspective view of the swing element

shown in Fig. 1;

Fig. 8 is a front view of the swing element shown in Fig. 1;

Fig. 9 is a sectional view of the switch in the first state shown in Fig. 1;

Fig. 10 is a sectional view of the switch in the second state shown in Fig. 1;

Fig. 11 is a sectional view of the switch in the third state shown in Fig. 1;

Fig. 12 is a sectional view of the switch in the fourth state shown in Fig. 1;

Fig. 13 is a sectional view of the switch in the fifth state shown in Fig. 1;

Fig. 14 is a schematic diagram of the switch according to the second embodiment of the present disclosure;

Fig. 15 is a schematic diagram of the switch according to the third embodiment of the present disclosure;

Fig. 16 is a schematic diagram of the switch according to the fourth embodiment of the present disclosure;

Fig. 17 is a perspective view of the switch shown in Fig. 16.

DETAILED DESCRIPTION

[0025] Various embodiments of the present disclosure will be described in detail only with examples.

[0026] Referring to Fig. 1, Fig. 1 illustrates a switch according to the first embodiment of the present disclosure. The switch can be used in various switch apparatuses for controlling on/off of a circuit. For example, at least one such switch can be mounted in a switch panel to form a switch apparatus adapted to be mounted on a wall to control the switch operation of the light, for instance.

[0027] As shown in Fig. 1, the switch comprises a housing comprised of an upper housing 91 and a lower housing 92. In the housing, there are contained a pushbutton 1, a driver 2, a swing element 3 that can swing about a first axis, an elastic element 4, a first moving contact 81 and a second moving contact 82 located on the swing element 3, a moving contact wiring terminal 83, a first stationary contact 51 and a second stationary contact 52. As shown in Figs. 2-4, there is arranged a pushbutton contact face 11 on the pushbutton 1 and a driver contact face 21 on the driver 2. A fixing recess 23 is further arranged on the driver to pivotally mount one end of the elastic element 4. When the elastic element 4 is connected between the driver 2 and the swing element 3, the elastic recovery force of the elastic element 4 would force the driver contact face 21 of the driver 2 to abut against the pushbutton contact face 11 of the pushbutton 1. The elastic element 4 can be a pressure spring, a torsional spring or others as long as it can apply elastic recovery force to the driver 2 and the swing element 3.

[0028] In the embodiment shown in Figs. 2-3, the pushbutton contact face 11 is a convex curved face while the driver contact face 21 is a planar face, and the pushbutton contact face 11 and the driver contact face 21 are arranged with teeth. In this manner, when the driver contact face 21 abuts against the pushbutton contact face 11, the teeth on the driver contact face 21 will engage with teeth on the pushbutton contact face 11. Such a structure enables the driver 2 to swing relative to the pushbutton 1 when the driver contact face 21 moves with "rolling" (namely, no sliding relative to each other) along the pushbutton contact face 11 in the convex curved shape. During this swing process, the engaging point between the driver contact face 21 and the pushbutton contact face 11 would vary. Particularly, when the driver 2 swings to two extreme positions at the left and right sides, the driver contact face 21 will engage with two ends on the pushbutton contact face 11 respectively at its two ends farthest from each other. The change of the position of the engaging point at two swing extreme positions of the driver is advantageous for the resetting of the driver 2, which will be illustrated in detail in the following text.

[0029] The teeth engaging with each other on the driver contact face 21 and the pushbutton contact face 11 ensure that the driver contact face 21 only engages with the pushbutton contact face 11 by "rolling" during the swing process, without producing sliding therebetween, which is important for swing resetting of the driver 2 each time. To prevent producing relative sliding between the driver contact face 21 and the pushbutton contact face 11, it is also possible not to arrange the teeth and instead, to configure sufficient friction coefficient between the driver contact face 21 and the pushbutton contact face 11 so that under the action of the recovery force from the elastic element 4 on the driver 2, the driver contact face 21 and the pushbutton contact face 11 can only roll rather than slide with respect to each other. This can be implemented by increasing surface coarseness of the driver contact face 21 and the pushbutton contact face 11 or by applying a slid-resistant coating thereon.

[0030] To cause the driver 2 to swing relative to the pushbutton 1 such that the positions of the engaging points on the driver contact face 21 and the pushbutton contact face 11 are different when the driver 2 swings to the two extreme positions at the left and right sides, the driver contact face 21 and the pushbutton contact face 11can also be configured as other shapes. For example, the driver contact face 21 can be configured as a convex curved face while the pushbutton contact face 11 is configured as a planar face, or both the driver contact face

21 and the pushbutton contact face 11 are configured as convex curved shapes.

[0031] It is also possible to arrange the pushbutton contact face 11 as a profiled curved surface and arrange the driver contact face 21 as at least having a part complementary with the shape of two ends of the profiled curved surface of the pushbutton contact face 11. For example, as shown in Fig. 5, the pushbutton contact face 11 is concave at two ends while convex in the center, and the driver contact face 21 at least has a convex part complementary with the shapes of the concave parts on the two ends. As a result, with the rolling of the driver contact face 21 from one end to the other end along the pushbutton contact face 11, the driver contact face 21 cooperates with the pushbutton contact face 11 properly at least at two swing extreme positions at the right side and left side so that the driver 2 can successfully swing around different engaging points at the two swing extreme positions. As a matter of course, it is advantageous that the intermediate part of the driver contact face 21 is also complementary with the intermediate part of the pushbutton contact face 11 so that, when the driver 2 swings to the intermediate position, the intermediate part of the driver contact face 21 also cooperates with the intermediate part of the pushbutton contact face 11 to facilitate the driver 2 swinging from one end to the other end stably.

[0032] As shown in Fig. 6, the pushbutton contact face 11 can also be an inwardly concave trapezium with rounded angles at the upper vertexes, while the driver contact face 21 at least has straight sides and rounded angles complementary with the shapes of the bevels and rounded angles of the inwardly concave trapezium, thus also enabling the driver 2 to swing from one end to the other smoothly.

[0033] Fig. 7 illustrates the swing element 3 shown in Fig. 1. The swing element 3 comprises a swing piece 34 and a driving arm 35. A first moving contact 81 and a second moving contact 82 are located on two opposite sides of the swing piece 34. The bottom of the swing piece 34 is a swing support 31 which is swingingly supported on an electrical conductive seat 84 electrically connected to the moving contact wiring terminal 83, so that the swing element 3 can swing with respect to the first axis. The swing piece 34 is further arranged with a protrusion 36 to support the elastic element 4 pivotally. The longitudinal direction of the driving arm 35 is perpendicular to the swing piece 34, and the first contact face 32 and the second contact face 33 extend on the driving arm 35 and are distributed on different sides of the first axis symmetrically about the first axis and. The swing element 3 is made of electrical conductive material at least in the swing piece 34 so that the first moving contact 81 and the second moving contact 82 on the swing piece 34 are electrically connected to the moving contact wiring terminal 83 by the swing piece 34 and the electrical conductive seat 84.

[0034] In an embodiment, the extension directions of the first contact face 32 and the second contact face 33 from an end where the two contact faces are close to each other to a distal end are titled towards one side of the first axis for an angle A with respect to the direction vertical to the main face of the swing piece 34, so that the extension directions of the first contact face 32 and the second contact face 33 are no longer perpendicular to the main face of the swing piece 34 (shown clearly in Fig. 8), which is particularly advantageous in the operation process of the switch for reducing the stroke of the pushbutton 1 and the driver 2, as will be illustrated in detail in the following text. Advantageously, the tilting angle is between 0 and 20 degrees. For example, the tilting angle is 5 degrees.

[0035] Returning to Fig. 3, there is arranged a driving arm 24 on the driver 2, and on the end of the driving arm there is formed a driving face 22 to contact the first contact face 32 and the second contact face 33 on the swing element 3 so as to drive the swing element 3 to swing. In one embodiment, the driving face 22 is formed in a recess at one end of the driver 2 so that the driving face 22 keeps contacting the first contact face 32 or the second contact face 33 constantly during the process of driving the swing element 3 to swing and will not be disengaged therefrom.

[0036] In one embodiment, the driving face 22 on the driver 2 is non-planar, particular a convex curved face at the end of the driving arm 24 so that the position on the driving face 22 where the driving face 22 contacts the first contact face 32 or the second contact face 33 varies during the process of pressing the first contact face 32 or the second contact face 33 of the swing element 3 by the driving face 22, which is particularly advantageous in the operation process of the switch to reduce the stroke of the pushbutton 1 and the driver 2, as will be illustrated in detail in the following text.

[0037] As shown in Fig. 1 and Fig. 9, the housing is arranged with a stop 6 which is located on two sides of the driver 2 to define two swing extreme positions of the driver 2. Alternatively or additionally, as shown in Fig. 2 and Fig. 9, it is possible to arrange a stop face 12 on the pushbutton 1 which can also limit the swing extreme position of the driver 2.

[0038] The pushbutton 1, driver 2, elastic element 4 and swing element 3 of the switch are assembled together in the state as shown in Fig. 9 so that in the natural state where the pushbutton 1 is not pressed down, the elastic element 4 abuts against the driver 2 at one end to cause it to remain in an swing extreme position at one side (the right side in Fig. 9) under constraint of the stop 6 and/or stop face 12, while the other end of the elastic element 4 forces the swing element 3 to remain in the swing extreme position at the other side (namely, first position) opposite to the swing direction of the driver 2, so that the first moving contact 81 at one side of the swing element 3 (the left side of the swing element 3 in Fig. 9) is in the left swing position and contacts the first stationary contact 51 (not shown in Fig. 9) on the left side of the

swing element 3, and the second moving contact 82 on the other side of the swing element 3 (the right side of the swing element 3 in Fig. 9) is also in the left swing position to be disconnected from the second stationary contact 52 (not shown in Fig. 9) on the right side of the swing element 3. As such, in this state, the swing element 3 of the switch conducts the circuit (namely, a first circuit) between the moving contact wiring terminal 83, which is associated with the swing element 3 and the electrical conductive seat 84, and the first stationary contact wiring terminals, which is associated with the first stationary contact 51, and meanwhile, disconnects the circuit (namely, a second circuit) between the moving contact wiring terminal 83, which is associated with the swing element 3 and the electrical conductive seat 84, and the second stationary contact wiring terminals which is associated with the second stationary contact 52. At this time, the driving face 22 of the driver 2 is distanced from and does not contact the second contact face 33 on the right side of the swing element 3, or just barely contacts the second contact face 33 without applying force to the second contact face 33 and the swing element 3.

[0039] In the state shown in Fig. 9, as the driver 2 is in the swing position on the rightmost side, the driver contact face 21 on the driver 2 engages with the pushbutton contact face 11 of the pushbutton 1 at its rightmost point. At this time, the connection point of the elastic element 4 and the driver 2 is on the right side of the line connecting the connection point of the elastic element 4 and the swing element 3 and the engaging point of the driver contact face 21 and the pushbutton contact face 11, while the elastic element 4, pivotally connected between the driver 2 and the swing element 3, keeps applying recovery force to the driver 2 along the direction of the line connecting the connection point of the elastic element 4 and the swing element 3 and the connecting point of the elastic element 4 and the driver 2. Therefore, the recovery force applied by the elastic element 4 on the driver 2 will apply to the driver 2 a torque counterclockwise with respect to the engaging point of the driver contact face 21 at the rightmost side and the pushbutton contact face 11. In this way, the toque forces the driver 2 to abut against the stop 6 and/or stop face 12 so that the driver 2 remains in the swing limit position.

[0040] As shown in Fig. 10, when the button 1 is pressed, the driver 2 will move downward under the effect of pushbutton 1. As bearing the counterclockwise toque applied by the elastic element 4 and the constraint of the stop 6 and/or stop face 12, the driver 2 will not swing relative to the pushbutton 1 during the process of moving downwards, and therefore, the position of the engaging point of the driver contact face 21 and the pushbutton contact face 11 will not change but remains at the rightmost end of the driver contact face 21 and the pushbutton contact face 11. During this pressing process, when the driving face 22 of the driver 2 contacts the second contact face 33 of the swing element 3, it will continue to press the second contact face 33 to cause the swing element 3 to swing to the right side. As the driver 2 does not swing during the pressing process while the swing element 3 swings towards the right side during the pressing process, the relative posture of the driver 2 and the swing element 3 will change during the pressing process after the contact of the driver 2 and the swing element 3. Namely, the position on the second contact face 33 of the swing element 3 where the swing element 3 is pressed by the driving face 22 of the driver 2 moves gradually close to an end where the first contact face 32 and the second contact face 33 are adjacent to each other, namely, close to the center of the swing element 3.

[0041] As shown in Fig. 11, when the pushbutton 1 continues to be pressed, the swing element 3 would swing through its intermediate position relative to the housing to a swing extreme position (namely, the second position) on the side (the right side in Fig. 11) opposite to the previous side. During this process, once the swing element 3 swings to the position in which the connection point of the swing element 3 and the elastic element 4 is on the right side of the connection point of the elastic element 4 and the driver 2, the recovery force of the elastic element 4 drives the swing element 3 to swing in acceleration rightward to the swing extreme position on the right side. At this time, the second moving contact 82 on the right side of the swing element 3 contacts the second stationary contact 52 right beside the swing element 3 to conduct the second circuit. Meanwhile, the first moving contact 81 on the left side of the swing element 3 is disconnected from the first stationary contact 51 left beside the swing element 3 to disconnect the first circuit, thereby achieving the on/off switching operation to the first circuit and the second circuit by the switch.

[0042] During the above process of pressing the pushbutton 1, with the swing of the swing element 3, the driver 2 does not swing. As a result, the position on the second contact face 33 where the second contact face 33 contacts the driving face 22 vary gradually while the length of the arm of force between the force applied by the driver 2 to the swing element 3 and the swing axis of the swing element 3 (namely, the first axis) maintains unchanged. In this way, during the whole process of pressing the pushbutton 1, the driver 2 keeps driving the swing element 3 to swing for the same angle with the same unit stroke without moving away gradually from the swing axis of the swing element 3 as the swing element 3 swings, which otherwise would cause the need of a greater unit stroke for driving the swing element 3 to swing for the same angle. Thus, the driving mechanism formed by the driver 2 and the swing element 3 shortens the pressing stroke of the pushbutton 1 of the switch required for the operation of switching the circuit, thus facilitating the operation of the user.

[0043] In the case that the extension direction of the first contact face 32 and the second contact face 33 from an end where the two contact faces are close to each other to a distal end is tilted toward one side of the first axis for an angle A with respect to the direction vertical

to the main face of the swing piece 34, with the swing of the swing element 3, the driving face 22 of the driver 2 can move faster toward the center of the swing element 3 during the process of the moving relative to the second contact face 33 of the swing element 3, which makes it possible for the driver 2 to press the swing element 3 to move for a shorter stroke in order that the swing piece 3 can swing for the same angle to reach the operating position for switching on/off of the circuit. Therefore, the tilting angle further shortens the pressing stroke of the pushbutton of the switch required for the operation of switching the circuit, thereby facilitating user's operation.

[0044] In the case that the driving face 22 of the driver 2 is non-planar, particularly a convex curved face around the end of the driving arm 24, with the swing of the swing element 3, during the process that the driving face 22 of the driver 2 moves relative to the second contact face 33 of the swing element 3, the part of the second contact face 33 of the swing element 3 located on the side of the driving face 22 closer to the center of the swing element 3 (the left side of the driving face 22 in Fig. 10) contacts earlier the part of the side of the driving face 22 closer to the center of the swing element 3, which further makes it possible for the driver 2 to press the swing element 3 to move for a shorter stroke in order that the swing piece 3 can swing for the same angle to reach the operation position of switching on/off the circuit. Therefore, the non-planar driving face 22 further shortens the pressing stroke of the pushbutton 1 of the switch required for the operation of switching the circuit, thereby facilitating user's operation.

[0045] When the pushbutton 1 is released from the state shown in Fig. 11, as the swing element 3 at that time has swung to the swing extreme position on the right side, namely, the connection point between the elastic element 4 and the swing element 3 has tilted to the other side (the right side in Fig. 11) of the swing element 3, the connection point of the elastic element 4 and the driver 2 becomes to locate on the left side of the line connecting the connection point of the elastic element 4 and the swing element 3 and the engaging point of the driver contact face 21 and the pushbutton contact face 11. Therefore, the recovery force applied by the elastic element 4 on the driver 2 will apply on the driver 2 a torque clockwise with respect to the engaging point of the driver contact face 21 on the rightmost side and the pushbutton contact face 11. The clockwise torque drives the driver contact face 21 of the driver 2 to "roll" along the pushbutton contact face 11 of the pushbutton 1 to cause the driver 2 to swing to the left side, as shown in Fig. 12. During this "rolling" process, the engaging point between the driver contact face 21 and the pushbutton contact face 11 will move gradually to the left.

[0046] Even when the driver 2 swings to the intermediate position with respect to the housing as shown in Fig. 12, namely, when both the engaging point of the driver contact face 21 and the pushbutton contact face 11 and the connection point of the driver 2 and the elastic element 4 are in the intermediate position with respect to the housing, as the connection point of the swing element 3 and the elastic element 4 remains on the right side as a result of the swing element 3 staying in the swing extreme position to the right, the connection point of the elastic element 4 and the driver 2 is still on the left side of the line connecting the connection point of the elastic element 4 and the swing element 3 and the engaging point of the driver contact face 21 and the pushbutton contact face 11. Therefore, the recovery force applied by the elastic element 4 on the driver 2 will still apply on the driver 2 a torque clockwise with respect to the engaging point of the driver contact face 21 in the intermediate position and the pushbutton contact face 11 so that the driver 2 continues to swing to the left and pass through the swing axis (namely, the first axis) of the swing element 2 until the driver 2 abuts against the stop 6 and/or stop face 12 on the left side of the swing axis of the swing element 2 and forces the driver 2 to remain in the swing extreme position, as shown in Fig. 13. At this time, the engaging point of the driver contact face 21 and the pushbutton contact face 11 has moved to the leftmost side of the driver contact face 21 and the pushbutton contact face 11.

[0047] In the above swing process of the driver 2, as the pushbutton 1 has been released, the recovery force of the elastic element 4, while driving the driver 2 to swing, further drives the driver 2 and pushbutton 1 to move upwards together away from the swing element 3. Therefore, during the swing process of the driver 2, the driver 2 does not contact and press the swing element 3 anymore. In other words, during the swing process of the driver 2, the movement of the driver 2 will not be affected by the swing element 3. Meanwhile, the swing element 3 will also always remain in the extreme swing position to the right under the elastic recovery force of the elastic element 4 and keep the operation state of disconnecting the first circuit and conducting the second circuit. The driver 2 will also stay in the swing extreme position on the leftmost side under the constraint of the stop 6 and/or stop face 12 and the effect of the recovery force of the elastic element 4. In this manner, the resetting action of the pushbutton 1 is completed and the driver 2 is also ready for the next press operation of the pushbutton 1.

[0048] When the pushbutton 1 is pressed again, the driver 2 will be driven by the pushbutton 1 to move downwards to contact and press the first contact face 32 on the left side of the swing element 3 to cause the swing element 3 to swing to the left side. Meanwhile, the driver 2 remains not swinging relative to the pushbutton 1 so that the first moving contact 81 on the left side of the swing element 3 contacts the first stationary contact 51 again while the second moving contact 82 on the right side of the swing element 3 is disconnected again from the second stationary contact 52. In this way, the switch conducts the first circuit again and disconnects the second circuit, thereby achieving again the on/off switching operation by the switch for the first circuit and the second

circuit. During this pressing process, the driving face 22 of the driver 2 will also move relative to the first contact face 32 of the swing element 3 gradually close to the center of the swing element 3, and similar to the case when the driving face 22 drives the second contact face 33, the effect of shortening the stroke of the driver 2 is also achieved.

[0049] When the pushbutton 1 is released again, the driver 2 will swing to the swing extreme position on the rightmost side again according to a process similar to that described with reference to Figs. 11-13, and meanwhile, the engaging point of the driver contact face 21 and the pushbutton contact face 11 also changes to the rightmost end of the driver contact face 21 and the pushbutton contact face 11 again to be ready for the driver 2 to drive the swing element 3 to act and the driver 2 to swing for resetting for the next time.

[0050] In the embodiments of the switch described above, as the driver 2 does not swing or rotate during the process of driving the swing element 3, the distance between the driver 2 and the swing axis of the swing element 3 remains unchanged. Therefore, the driver 2 can drive the swing element 3 to swing for the same angle with a constant unit stroke, thereby making the stroke of driver 2 (and the stroke of the pushbutton 1) even smaller. Thus, the user can operate the pushbutton 1 more easily to achieve reliable switching operation of the switch. Furthermore, since the deciding factor for the driver 2 to drive the swing element 3 to swing in place is the distance between the driver 2 and the swing axis of the swing element 3, it is possible that by means of simply arranging the distance between the driver 2 and the swing axis of the swing element 3, the switch can obtain the expected strokes of the driver 2 and pushbutton 1. For example, by configuring this distance small enough, the stroke of the driver 2 and pushbutton 1 can be smaller.

[0051] In the embodiments of the switch described above, the direction of the force applied by the driver 2 on the swing element 3 is substantially the same as the direction of the force for pressing the pushbutton 1. Hence, the majority of the force from the user for pressing the pushbutton 1 can be converted directly into effective force for the driver 2 to drive the swing element 3 to act to switch the position of the moving contact. Thus, the switch exhibits high converting efficiency of the force, thereby lowering the requirement on the force from the user for pressing the pushbutton 1.

[0052] In addition, by directly arranging the moving contact on the swing element 3, the swing element 3 serves not only as the actuator for receiving driving of the driver 2 but also as a switch bridge for directly driving the moving contact to act, which not only enables less number of components in the switch but also makes it possible to apply the driving force from the driver 2 directly on the moving contact without being converted by other components. Thus, the driving force of the driver 2 can drive the moving contact to act with higher efficiency and meanwhile, the acting mechanism of the switch is less sensitive to the dimension and the operation of the switch can be more reliable.

[0053] In the embodiments of the switch described above, by connecting the elastic element 4 between the driver 2 and the swing element 3, the same elastic element 4 can drive the swing element 3 to swing to the swing extreme position with greater speed to achieve on/off switching operation on the circuit as quickly as possible, and during the resetting process of the driver 2, provide supporting force to the swing element constantly to keep the swing element 3 in the swing extreme position so as to maintain reliable conduction or disconnection position of the corresponding moving contact and stationary contact. Meanwhile, the same elastic element 4 can also drives the driver 2 to reset, thereby avoiding the use of two different elastic elements to achieve the above two functions respectively. In this way, the number of components in the switch can be reduced and thus, the structure of the switch can be simplified. Besides, when the pushbutton 1 is pressed to the bottom, the elastic element 4 is compressed to the greatest extent, so that the elastic element 4 provides the largest contact force for the moving contact, which enables the moving contact to contact the stationary contact more reliably during the contact and reduces the bounce of the moving contact generated when engaging with the stationary contact.

[0054] In the embodiments of the switch described above, the driver 2 does not swing during the operation process of driving the swing element 3, and during the resetting process of the driver 2, it is directly reset to the swing extreme position where the driver 2 will drive the swing element 3 for the next time. Thus, the driver 2 remains in the swing extreme position where it is ready to press the swing element 3 all the time in the natural state of the switch with the pushbutton 1 being not pressed and there is no intermediate position. Therefore, the driver 2 can accurately drive the swing element 3 to act each time to achieve the operation of the switch for switching the circuit smoothly, precluding the misgiving that the driver 2 cannot accurately reach the predefined position for driving the swing element 3 from its intermediate position during each pressing process.

[0055] In the embodiments of the switch described above, by defining two swing extreme positions of the driver 2 with the stop 6 on the housing and/or the stop face 12 on the pushbutton 1, the position where the driver 2 presses the swing element 3 can be controlled accurately by simply controlling the position of the stop 6 and/or stop face 12 on the housing and/or pushbutton 1, which also facilitates obtaining greater symmetry of the respective driving positions for the driver 2 on two sides of the swing element 3.

[0056] In the embodiments of the switch described above, since the driver 2 achieves swing support of the driver 2 by engagement between the driver contact face 21 and the pushbutton contact face 11 of the pushbutton 1, and the engaging point between the driver contact face 21 and the pushbutton contact face 11 varies during the

swing process of the driver, during the resetting process of the driver 2, the elastic element 4 can not only reset it to the rightmost swing extreme position when the driver 2 is at its leftmost swing extreme position so as to be ready for the next driving action but also reset it to the leftmost swing extreme position when the driver 2 is at its rightmost swing extreme position so as to be ready for the next driving action. Meanwhile, the engagement between the driver contact face 21 and the pushbutton contact face 11 also causes the rotation radius of the driving face 22 of the driver 2 to increase to exceed the distance between the driving face 22 and the connection point of the driver 2 and the pushbutton 1, thereby achieving greater swing amplitude of the driver 2 in a compact inner space of the switch, which also reduces the stroke of the driver 2 and the pushbutton 1 and the size of the switch.

[0057] In the embodiments of the switch described above, as the converting efficiency from the force for pressing the pushbutton 1 to the force for driving the moving contact to act is improved, and moreover, and there is no other mechanism which brings remarkably increased resistance to the movement of the driver 2, as compared to the traditional switch, the switch according to these embodiments does not have significantly greater requirement on the pressing force for pressing the pushbutton 1 during operating the switch.

[0058] Variations can also be made on the basis of the switch according to the first embodiment of the present invention as described above to achieve at least a part of the various advantageous technical effects of the first embodiment according to the present invention.

[0059] In a second embodiment shown in Fig. 14, the switch differs from the switch in the first embodiment in that the swing element 3 only serves as the actuator for receiving the driving from the driver 2. The swing element 3 is not arranged with a moving contact but only has a driving head 37 on the lower end. Between the first contact face 32 and the second contact face 33 of the swing element 3 and the driving head 37, there is arranged an swing shaft 38 which is rotatably supported on the housing. The switch is further arranged with a separate switch bridge 7 which is made of electrically conductive material with two ends serving as the first moving contact 81 and the second moving contact 82 respectively. The center of one side of the switch bridge 7 is swingingly supported on the electrically conductive seat 84 electrically connected to the wiring terminal 83 of the moving contact and the driving head 37 of the swing element 3 contacts the other side of the switch bridge 7. When the pushbutton 1 is pressed, the driver 2 drives the swing element 3 to swing to two different swing extreme positions (namely, the first position and the second position) in the same manner as in the first embodiment, and the driving head 37 on the swing element 3 would press the side of the switch bridge 7 the same as the swing direction of the driving head 37 of the swing element 3 (namely, the side opposite to the swing direction of the first contact face 32 and the second contact face 33 of the swing piece), so that the first contact 81 or the second contact 82 of the switch bridge 7 on the end of this side contacts the corresponding first stationary contact 51 or second stationary contact 52 and meanwhile, the second moving contact 82 or the first moving contact 81 on the other end of the switch bridge 7 is disconnected from the corresponding stationary contact, thereby achieving the operation of the switch for switching the on/off state of the circuit. In this embodiment, as the switch bridge 7 located below the swing axis of the swing element 3 is introduced, the order for the swing element 3 to drive the moving contact to conduct and disconnect the first circuit and second circuit is contrary to that depicted in the first embodiment. When the pushbutton 1 is released, the driver 2 is driven by the elastic element 4 in the same manner as depicted in the first embodiment to swing to the other swing extreme position and thus gets reset.

[0060] In the third embodiment shown in Fig. 15, the switch differs from the switch according to the first embodiment in that the driver 2 has a planar driving face 22', and instead of having the first contact face 32 and the second contact face 33 on the swing element 3, the swing element 3 is provided with a first contact point 36 and a second contact point 37 located on two sides of the swing axis (first axis). When the pushbutton 1 is pressed, the driving face 22' of driver 2 does not swing either, but moves linearly along with the pushbutton 1 to press one of the first contact point 36 and the second contact point 37 to cause the swing element 3 to swing so that the moving contact on the swing element 3 contacts or is disconnected from the first stationary contact 51 and the second stationary contact 52 respectively. During this pressing process, the position on the driving face 22' pressing the first contact point 36 or the second contact point 37 moves gradually close to the edge of the driving face 22'. In other words, similar to the first embodiment, during the pressing process, the contact point between the driver 2 and the swing element 3 also keeps varying, and the distance between the force applying point from the driver 2 to the swing element 3 and the swing axis (the first axis) of the swing element 3 also remains unchanged. When the pushbutton 1 is released, the driver 2 is driven by the elastic element 4 in the same manner as in the first embodiment to swing to the other swing extreme position and thus gets reset.

[0061] In the fourth embodiment shown in Fig. 16-Fig. 17, the switch differs from the switch in the first embodiment in that the driver 2 is pivotally mounted on the pushbutton 1 through a pivot 25 and a contact rib 26 is provided on the lower side of the driver 2. The swing element 3 has a fastening post 38 at one end and a driving lever 39 at the other end. The elastic element 4 is mounted on the fastening post 38 at one end to be fixedly connected to the swing element 3 and abuts against the contact rib 26 of the driver 2 at the other end. The driving lever 39 of the swing element 3 is coupled to the switch bridge 7. The first moving contact 81 and the second moving con-

tact 82 are located on two sides of the switch bridge 7, rather than on the swing element 3. When the pushbutton 1 is pressed, the pushbutton 1 drives the driver 2 to move downwards. However, the driver 2 does not swing or rotate either. The driver 2 drives the first contact face 32 and the second contact face 33 of the swing element 3 in the same manner as depicted in the first embodiment to cause the swing element 3 to swing to the swing extreme position, so that the driving lever 39 on the swing element 3 drives the switch bridge 7 to cause the first moving contact 81 or second moving contact 82 on the switch bridge 7 to contact or disconnect from the corresponding stationary contact. When the pushbutton 1 is released, the elastic element 4 will push the driver 2 to move upwards. At this time, as the elastic element 4 abuts against and contacts the contact rib 26 of the driver 2 and the driver 2 is still in the swing extreme position when the pushbutton 1 is just released, the contact rib 26 is tilted relative to the end of the elastic element 4. As a result, the elastic element 4 applies a recovery force on the driver 2 only at one end of the contact rib 26. Furthermore, since the swing direction of the swing element 3 is the same as that of the driver 2 when the pushbutton 1 is just released (see Fig. 11), the elastic element 4 will apply a recovery force on the driver 2 at a lower end of the contact rib 26 so that the driver 2 rotates to the swing extreme position on the other side, thereby completing resetting. In this embodiment, it is also possible not to arrange the switch bridge 7 but only to configure the moving contact directly on the swing element 3, as in the first embodiment.

[0062] It should be appreciated that although the switch according to the above embodiments can connect two paths of circuits and alternative on/off switching operation of these two paths of circuits can be achieved with the operation of the switch, it is also possible for the switch to connect only one of the first stationary contact 51 and the second stationary contact 52 with a path of circuit while the other one of the first stationary contact 51 and the second stationary contact 52 does not connect with a circuit. In this manner, each pressing operation of the switch only conducts or disconnects this one path of circuit. Furthermore, the switch according to the above embodiments can provide only one moving contact and one stationary contact so that the switch can only conduct or disconnect a path of circuit by each pressing operation.

[0063] It should be appreciated that for the ease of depiction, the placing location of the switch is illustrated in the text based on the drawings. Directions "up, down, left, right" in the text are all described based on this orientation. Obviously, the switch can be arranged in various directions as required. The directional depiction about "up, down, left, right" among features described in the text will change accordingly with the change of orientation of location of the switch. However, the relative positional relation between the features will not change.

Claims

1. A switch, comprising:

   a pushbutton (1);
   a driver (2) that can swing relative to the pushbutton (1) between one extreme position and another extreme position to cooperate with the pushbutton (1);
   a swing element (3) that can swing with respect to a first axis and has a first contact face (32) and a second contact face (33) located on different sides of the first axis;
   an elastic element (4) connected to the driver (2) and to the swing element (3); and
   a first moving contact (81) and a first stationary contact (51);
   wherein the driver (2) has a driving face (22) for pressing in its one extreme position one of the first contact face (32) and the second contact face (33) of the swing element (3), and the driver (2) is configured to, when the pushbutton (1) is pressed, press in its one extreme position one of the first contact face (32) and the second contact face (33) of the swing element (3) with the driving face (22) on one side of the first axis to cause the swing element (3) to swing to a first position, and when the pushbutton (1) is pressed again, press in its other extreme position the other one of the first contact face (32) and the second contact face (33) of the swing element (3) with the driving face (22) on the other side of the first axis to cause the swing element (3) to swing to a second position; and in one of the first position and the second position, the first moving contact (81) contacts the first stationary contact (51), while in the other one of the first position and the second position, the first moving contact (81) is disconnected from the first stationary contact (51),
   characterised in that the elastic element (4) is configured to push, upon release of the pushbutton (1), the driver (2) from its one extreme position into its other extreme position or vice versa.

2. The switch according to Claim 1, wherein the driver (2) is configured such that during the process of pressing the swing element (3) to cause it to swing by the driver (2), the driver (2) does not swing relative to the pushbutton (1), so that during the process of pressing the swing element (3) by the driver (2), the position on the first contact face (32) or the second contact face (33) of the swing element (3) where the swing element (3) is pressed by the driving face (22) of the driver (2) moves gradually close to an end of the first contact face (32) and the second contact face (33) adjacent to each other.

3. The switch according to one of Claims 1-2, further comprising a housing in which a stop (6) is arranged, the stop (6) defining a swing extreme position of the driver (2).

4. The switch according to one of Claims 1-2, wherein there is arranged a stop face (12) on the pushbutton (1), the stop face (12) defining a swing extreme position of the driver (2).

5. The switch according to one of Claims 1-2, wherein the driving face (22) is a non-planar face so that during the process of pressing the first contact face (32) or the second contact face (33) of the swing element (3) by the driving face (22), the position on the driving face (22) where the driving face (22) contacts the first contact face (32) or the second contact face (33) varies.

6. The switch according to Claim 5, wherein the driving face (22) is formed in a recess at one end of the driver (2).

7. The switch according to one of Claims 1-2, wherein the swing element (3) comprises a swing piece (34) on which the first moving contact (81) is located and a driving arm (35) the longitudinal direction of which is vertical to the swing piece (34), the first contact face (32) and the second contact face (33) extend along the longitudinal direction of the driving arm (35) and are distributed symmetrically about the first axis, and the first contact face (32) and the second contact face (33) are located between the driver (2) and the first axis.

8. The switch according to one of Claims 1-2, further comprising a switch bridge (7) on which the first moving contact (81) is located, the swing element (3) cooperates with the switch bridge (7) such that when the swing element (3) swings to the first position or the second position, it drives the switch bridge (7) to swing to the position where the first moving contact (81) is in contact with or disconnected from the first stationary contact (51) .

9. The switch according to one of Claims 1-2, wherein the extension directions of the first contact face (32) and the second contact face (33) from the ends of the first and second contact faces close to each other to the distal ends thereof are tilted towards one side of the first axis with an angle (A) with respect to the direction vertical to the main face of the swing piece (34).

10. The switch according to Claim 9, wherein the angle (A) is between 0 degree and 20 degrees.

11. The switch according to Claim 7 or Claim 8, wherein the driver (2) abuts against the pushbutton (1) under the action of the elastic element (4), and during the swing process of the driver (2), the engaging point between the driver (2) and the pushbutton (1) varies.

12. The switch according to Claim 11, wherein the elastic element (4) is pivotally connected between the driver (2) and the swing element (3).

13. The switch according to Claim 7 or Claim 8, wherein the driver (2) is pivotally connected on the pushbutton (1), and there is arranged a contact rib (26) on the pushbutton (1), and one end of the elastic element (4) is fixed to the swing element (3), and the other end of the elastic element (4) abuts against the contact rib (26).

14. The switch according to one of Claims 1-2, further comprising a second moving contact (82) and a second stationary contact (52), wherein in one of the first position and the second position of the swing element (3), the first moving contact (81) contacts the first stationary contact (51) and the second moving contact (82) is disconnected from the second stationary contact (52), while in the other one of the first position and the second position, the first moving contact (81) is disconnected from the first stationary contact (51) and the second moving contact (82) contacts the second stationary contact (52).

Patentansprüche

1. Schalter, umfassend:

einen Druckknopf (1);
eine Antriebseinrichtung (2), die relativ zu dem Druckknopf (1) zwischen einer Extremposition und einer anderen Extremposition schwenken kann, um mit dem Druckknopf (1) zusammenzuwirken;
ein Schwenkelement (3), das in Bezug auf eine erste Achse schwenken kann und eine erste Kontaktseite (32) und eine zweite Kontaktseite (33) aufweist, die an verschiedenen Seiten der ersten Achse angeordnet sind;
ein elastisches Element (4), das mit der Antriebseinrichtung (2) und dem Schwenkelement (3) verbunden ist; und
einen ersten beweglichen Kontakt (81) und einen ersten stationären Kontakt (51);
wobei die Antriebseinrichtung (2) eine Antriebsseite (22) aufweist, um in ihrer einen Extremposition eine der ersten Kontaktseite (32) und der zweiten Kontaktseite (33) des Schwenkelements (3) zu pressen, und die Antriebseinrichtung (2) derart konfiguriert ist, um, wenn der Druckknopf (1) gepresst ist, in seiner einen Ex-

tremposition eine von der ersten Kontaktseite (32) und der zweiten Kontaktseite (33) des Schwenkelements (3) mit der Antriebsseite (22) auf einer Seite der ersten Achse zu pressen, um ein Schwenken des Schwenkelements (3) in eine erste Position zu bewirken, und, wenn der Druckknopf (1) erneut gepresst wird, in ihrer anderen Extremposition die andere von der ersten Kontaktseite (32) und der zweiten Kontaktseite (33) des Schwenkelements (3) mit der Antriebsseite (22) auf der anderen Seite der ersten Achse zu pressen, um ein Schwenken des Schwenkelements (3) zu einer zweiten Position zu bewirken; und in einer der ersten Position und der zweiten Position der erste bewegliche Kontakt (81) mit dem ersten stationären Kontakt (51) in Kontakt steht, während in der anderen der ersten Position und der zweiten Position der erste bewegliche Kontakt (81) von dem ersten stationären Kontakt (51) getrennt ist, **dadurch gekennzeichnet, dass**
das elastische Element (4) derart konfiguriert ist, bei Freigabe des Druccknopfs (1) die Antriebseinrichtung (2) von ihrer einen Extremposition in ihre andere Extremposition zu drücken oder umgekehrt.

2. Schalter nach Anspruch 1, wobei die Antriebseinrichtung (2) derart konfiguriert ist, dass während des Prozesses des Pressens des Schwenkelements (3), um zu veranlassen, dass es durch die Antriebseinrichtung (2) geschwenkt wird, die Antriebseinrichtung (2) nicht relativ zu dem Druckknopf (1) schwenkt, so dass während des Prozesses zum Pressen des Schwenkelements (3) durch die Antriebseinrichtung (2) die Position an der ersten Kontaktseite (32) oder der zweiten Kontaktseite (33) des Schwenkelements (3), wo das Schwenkelement (3) von der Antriebsseite (22) der Antriebseinrichtung (2) gepresst wird, sich allmählich nahe zu einem Ende der ersten Kontaktseite (32) und der zweiten Kontaktseite (33) benachbart zueinander bewegt.

3. Schalter nach einem der Ansprüche 1 bis 2, ferner mit einem Gehäuse, in welchem ein Anschlag (6) angeordnet ist, wobei der Anschlag (6) eine Schwenkextremposition der Antriebseinrichtung (2) definiert.

4. Schalter nach einem der Ansprüche 1 bis 2, wobei eine Anschlagseite (12) an dem Druckknopf (1) angeordnet ist, wobei die Anschlagseite (12) eine Schwenkextremposition der Antriebseinrichtung (2) definiert.

5. Schalter nach einem der Ansprüche 1 bis 2, wobei die Antriebsseite (22) eine nicht planare Seite ist, so dass während des Prozesses zum Pressen der ersten Kontaktseite (32) oder der zweiten Kontaktseite (33) des Schwenkelements (3) durch die Antriebsseite (22) die Position an der Antriebsseite (22) variiert, an der die Antriebsseite (22) mit der ersten Kontaktseite (32) oder der zweiten Kontaktseite (33) in Kontakt steht.

6. Schalter nach Anspruch 5, wobei die Antriebsseite (22) in einer Ausnehmung an einem Ende der Antriebseinrichtung (2) geformt ist.

7. Schalter nach einem der Ansprüche 1 bis 2, wobei das Schwenkelement (3) ein Schwenkteil (34), an dem der erste bewegliche Kontakt (81) angeordnet ist, und einen Antriebsarm (35) umfasst, dessen Längsrichtung vertikal zu dem Schwenkteil (34) verläuft, sich die erste Kontaktseite (32) und die zweite Kontaktseite (33) entlang der Längsrichtung des Antriebsarms (35) erstrecken und symmetrisch um die erste Achse verteilt sind, und die erste Kontaktseite (32) und die zweite Kontaktseite (33) zwischen der Antriebseinrichtung (2) und der ersten Achse angeordnet sind.

8. Schalter nach einem der Ansprüche 1 bis 2, mit einer Schalterbrücke (7), an der der erste bewegliche Kontakt (81) angeordnet ist, wobei das Schwenkelement (3) mit der Schalterbrücke (7) derart zusammenwirkt, dass, wenn das Schwenkelement (3) in die erste Position oder die zweite Position schwenkt, es die Schalterbrücke (7) zum Schwenken in die Position antreibt, in der der erste bewegliche Kontakt (81) mit dem ersten stationären Kontakt (51) in Kontakt steht oder von diesem getrennt ist.

9. Schalter nach einem der Ansprüche 1 bis 2, wobei die Erstreckungsrichtungen der ersten Kontaktseite (32) und der zweiten Kontaktseite (33) von den Enden der ersten und zweiten Kontaktseiten nahe zueinander zu den distalen Enden derselben zu einer Seite der ersten Achse unter einem Winkel (A) in Bezug auf die Richtung vertikal zu der Hauptseite des Schwenkstücks (34) geneigt sind.

10. Schalter nach Anspruch 9, wobei der Winkel (A) zwischen 0 Grad und 20 Grad beträgt.

11. Schalter nach einem der Ansprüche 7 oder 8, wobei die Antriebseinrichtung (2) an dem Druckknopf (1) durch die Wirkung des elastischen Elements (4) anliegt und während des Schwenkprozesses der Antriebseinrichtung (2) der Eingriffspunkt zwischen der Antriebseinrichtung (2) und dem Druckknopf (1) variiert.

12. Schalter nach Anspruch 11, wobei das elastische Element (4) schwenkend zwischen der Antriebseinrichtung (2) und dem Schwenkelement (3) verbun-

den ist.

13. Schalter nach einem der Ansprüche 7 oder 8, wobei die Antriebseinrichtung (2) schwenkend an dem Druckknopf (1) verbunden ist, wobei eine Kontaktrippe (26) an dem Druckknopf (1) angeordnet ist und ein Ende des elastischen Elements (4) an dem Schwenkelement (3) befestigt ist und das andere Ende des elastischen Elements (4) an der Kontaktrippe (26) anliegt.

14. Schalter nach einem der Ansprüche 1 bis 2, ferner mit einem zweiten beweglichen Kontakt (82) und einem zweiten stationären Kontakt (52), wobei in einer der ersten Position und der zweiten Position des Schwenkelements (3) der erste bewegliche Kontakt (81) mit dem ersten stationären Kontakt (51) in Kontakt steht und der zweite bewegliche Kontakt (82) von dem zweiten stationären Kontakt (52) getrennt ist, während in der anderen der ersten Position und der zweiten Position der erste bewegliche Kontakt (81) von dem ersten stationären Kontakt (51) getrennt ist und der zweite bewegliche Kontakt (82) mit dem zweiten stationären Kontakt (52) in Kontakt steht.

Revendications

1. Commutateur, comprenant :

un bouton poussoir (1) ;
un entraîneur (2) qui peut basculer par rapport au bouton poussoir (1) entre une première position extrême et une autre position extrême pour coopérer avec le bouton poussoir (1) ;
un élément basculant (3) qui peut basculer par rapport à un premier axe et présente une première face de contact (32) et une seconde face de contact (33) situées sur des côtés différents du premier axe ;
un élément élastique (4) relié à l'entraîneur (2) et à l'élément basculant (3) ; et
un premier contact mobile (81) et un premier contact fixe (51) ;
dans lequel l'entraîneur (2) présente une face d'entraînement (22) pour presser dans sa première position extrême une face parmi la première face de contact (32) et la seconde face de contact (33) de l'élément basculant (3), et l'entraîneur (2) est configuré pour, lorsque le bouton poussoir (1) est pressé, presser dans sa première position extrême une face parmi la première face de contact (32) et la seconde face de contact (33) de l'élément basculant (3) avec la face d'entraînement (22) située du côté du premier axe pour faire basculer l'élément basculant (3) vers une première position, et lorsque le bouton poussoir (1) est pressé à nouveau, presser dans son autre position extrême l'autre face parmi la première face de contact (32) et la seconde face de contact (33) de l'élément basculant (3) avec la face d'entraînement (22) située de l'autre côté du premier axe pour faire basculer l'élément basculant (3) vers une seconde position ; et dans une position parmi la première position et la seconde position, le premier contact mobile (81) est en contact avec le premier contact fixe (51), tandis que dans l'autre position parmi la première position et la seconde position, le premier contact mobile (81) est déconnecté du premier contact fixe (51),
caractérisé en ce que l'élément élastique (4) est configuré pour, lorsque le bouton poussoir (1) est relâché, pousser l'entraîneur (2) de sa première position extrême dans son autre position extrême ou vice versa.

2. Commutateur selon la revendication 1, dans lequel l'entraîneur (2) est configuré de telle sorte que, pendant le processus de pression sur l'élément basculant (3) pour le faire basculer par l'entraîneur (2), l'entraîneur (2) ne bascule pas par rapport au bouton poussoir (1), de sorte que pendant le processus de pression sur l'élément basculant (3) par l'entraîneur (2), la position sur la première face de contact (32) ou la seconde face de contact (33) de l'élément basculant (3) où l'élément basculant (3) est pressé par la face d'entraînement (22) de l'entraîneur (2) se déplace progressivement près d'une extrémité de la première face de contact (32) et de la seconde face de contact (33) adjacente l'une à l'autre.

3. Commutateur selon l'une des revendications 1 à 2, comprenant en outre un boîtier dans lequel est disposé un arrêt (6), l'arrêt (6) définissant une position extrême de basculement de l'entraîneur (2).

4. Commutateur selon l'une des revendications 1 à 2, dans lequel une face de butée (12) est disposée sur le bouton poussoir (1), la face de butée (12) définissant une position extrême de basculement de l'entraîneur (2).

5. Commutateur selon l'une des revendications 1 à 2, dans lequel la face d'entraînement (22) est une face non plane de telle sorte que, pendant le processus de pression sur la première face de contact (32) ou la seconde face de contact (33) de l'élément basculant (3) par la face d'entraînement (22), la position sur la face d'entraînement (22) où la face d'entraînement (22) est en contact avec la première face de contact (32) ou la seconde face de contact (33) varie.

6. Commutateur selon la revendication 5, dans lequel la face d'entraînement (22) est formée dans un évi-

dement à une extrémité de l'entraîneur (2).

7. Commutateur selon l'une des revendications 1 à 2, dans lequel l'élément basculant (3) comprend une pièce basculante (34) sur laquelle le premier contact mobile (81) est situé et un bras d'entraînement (35) dont la direction longitudinale est verticale à la pièce basculante (34), la première face de contact (32) et la seconde face de contact (33) s'étendent dans la direction longitudinale du bras d'entraînement (35) et sont réparties de manière symétrique autour du premier axe, et la première face de contact (32) et la seconde face de contact (33) sont situées entre l'entraîneur (2) et le premier axe.

8. Commutateur selon l'une des revendications 1 à 2, comprenant en outre un pont de commutateur (7) sur lequel le premier contact mobile (81) est situé, l'élément basculant (3) coopère avec le pont de commutateur (7) de telle sorte que, lorsque l'élément basculant (3) bascule vers la première position ou la seconde position, il amène le pont de commutateur (7) à basculer vers la position où le premier contact mobile (81) est en contact avec le premier contact fixe (51) ou est déconnecté de celui-ci.

9. Commutateur selon l'une des revendications 1 à 2, dans lequel les directions d'extension de la première face de contact (32) et de la seconde face de contact (33) des extrémités des première et seconde faces de contact proches l'une de l'autre à leurs extrémités distales sont inclinées vers un côté du premier axe d'un angle (A) par rapport à la direction verticale à la face principale de la pièce basculante (34).

10. Commutateur selon la revendication 9, dans lequel l'angle (A) est compris entre 0 degré et 20 degrés.

11. Commutateur selon la revendication 7 ou la revendication 8, dans lequel l'entraîneur (2) vient en butée contre le bouton poussoir (1) sous l'action de l'élément élastique (4), et, pendant le processus de basculement de l'entraîneur (2), le point de contact entre l'entraîneur (2) et le bouton poussoir (1) varie.

12. Commutateur selon la revendication 11, dans lequel l'élément élastique (4) est relié de manière pivotante entre l'entraîneur (2) et l'élément basculant (3).

13. Commutateur selon la revendication 7 ou la revendication 8, dans lequel l'entraîneur (2) est relié de manière pivotante au bouton poussoir (1), une nervure de contact (26) est disposée sur le bouton poussoir (1), et une extrémité de l'élément élastique (4) est fixée à l'élément basculant (3) et l'autre extrémité de l'élément élastique (4) vient en butée contre la nervure de contact (26).

14. Commutateur selon l'une des revendications 1 à 2, comprenant en outre un second contact mobile (82) et un second contact fixe (52), dans lequel, dans une position parmi la première position et la seconde position de l'élément basculant (3), le premier contact mobile (81) est en contact avec le premier contact fixe (51) et le second contact mobile (82) est déconnecté du second contact fixe (52), tandis que dans l'autre position parmi la première position et la seconde position, le premier contact mobile (81) est déconnecté du premier contact fixe (51) et le second contact mobile (82) est en contact avec le second contact fixe (52).

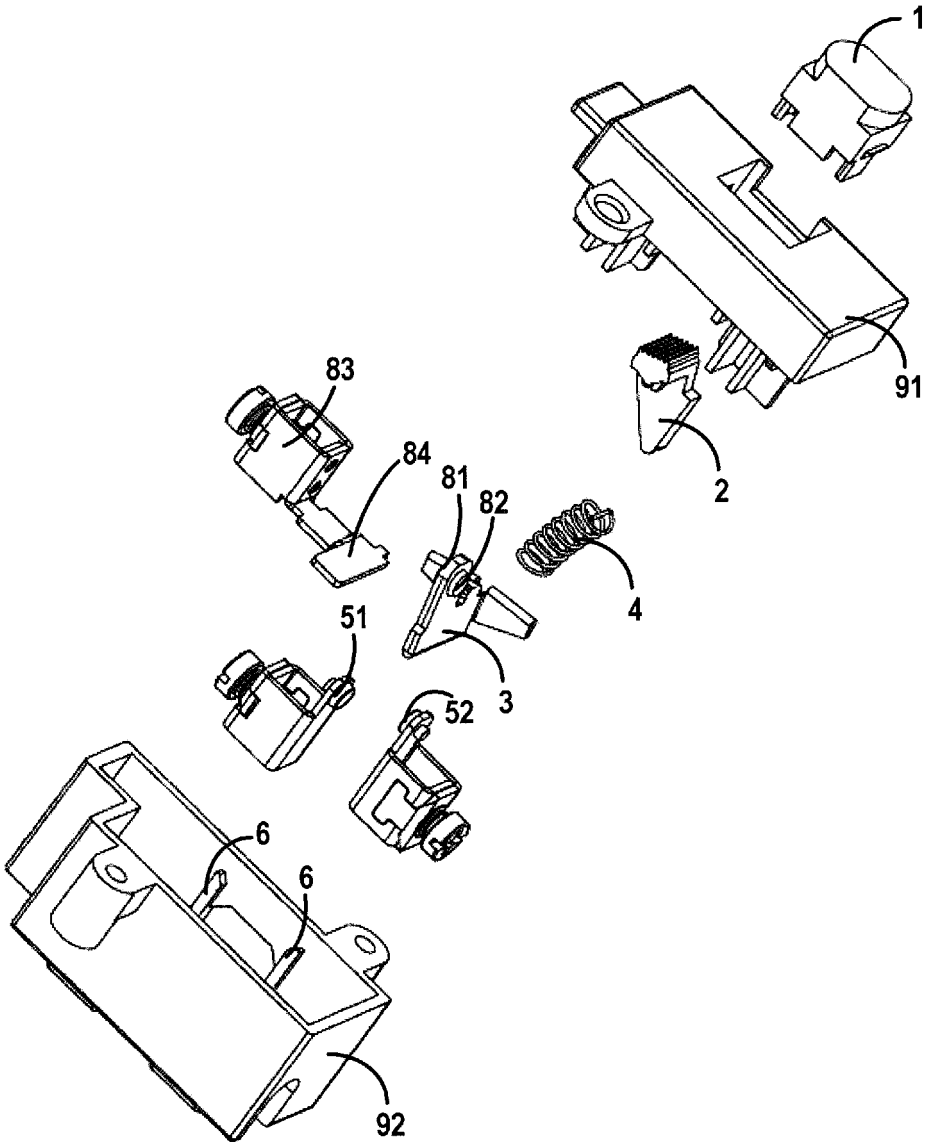

Fig.1

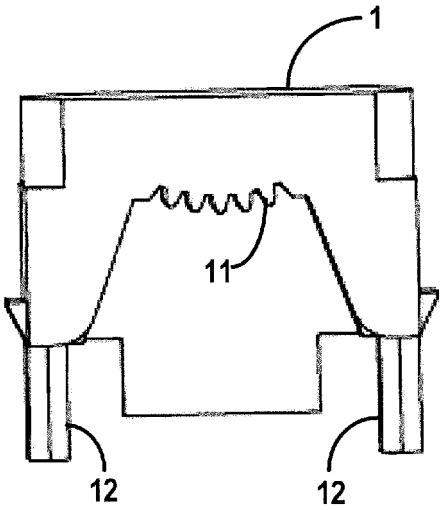

Fig.2

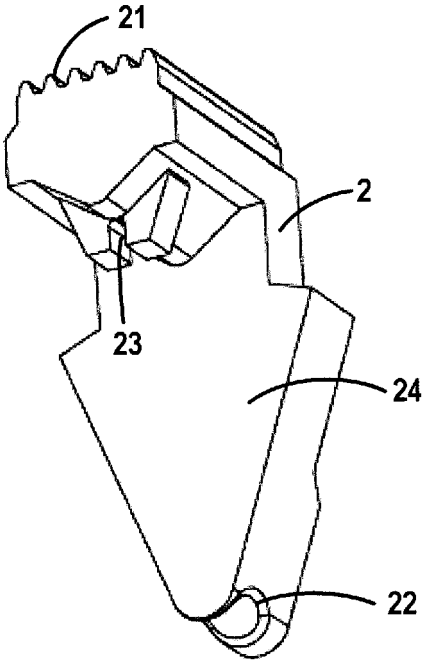

Fig.3

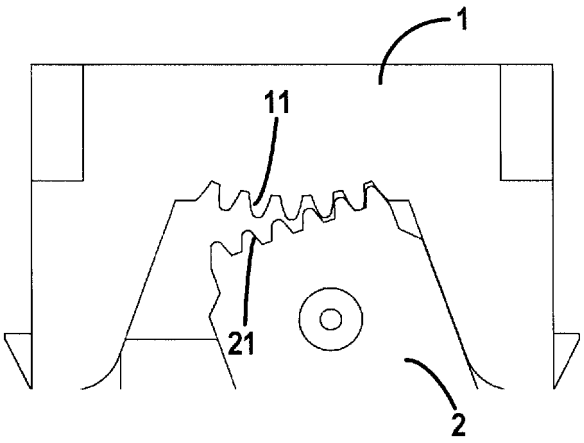

Fig.4

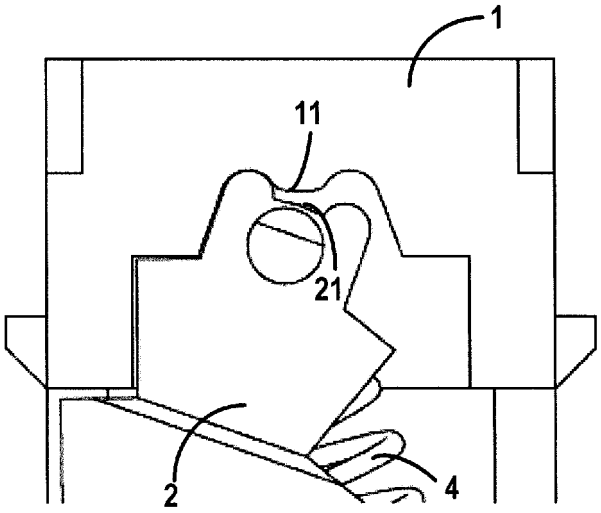

Fig.5

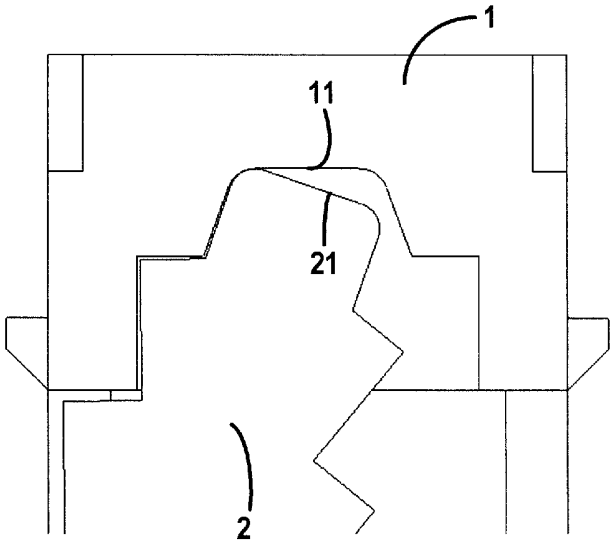

Fig.6

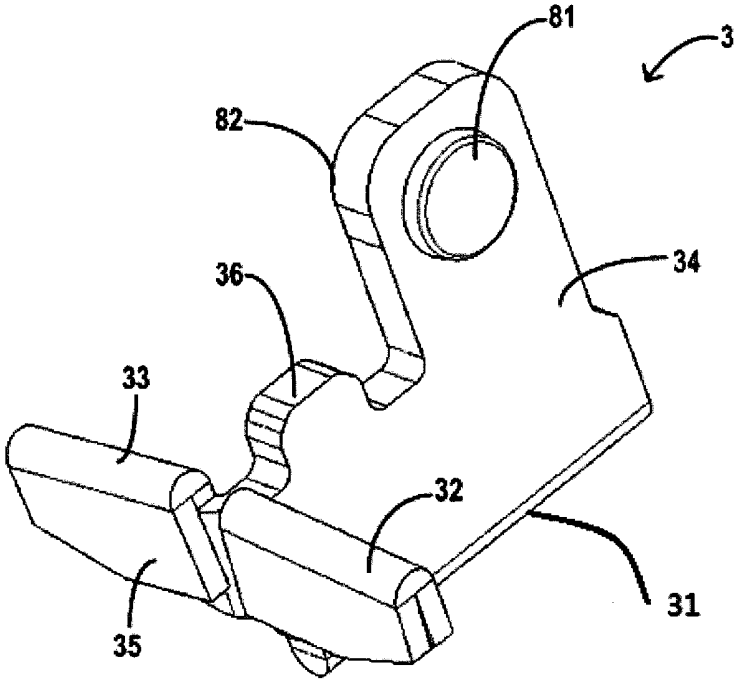

Fig.7

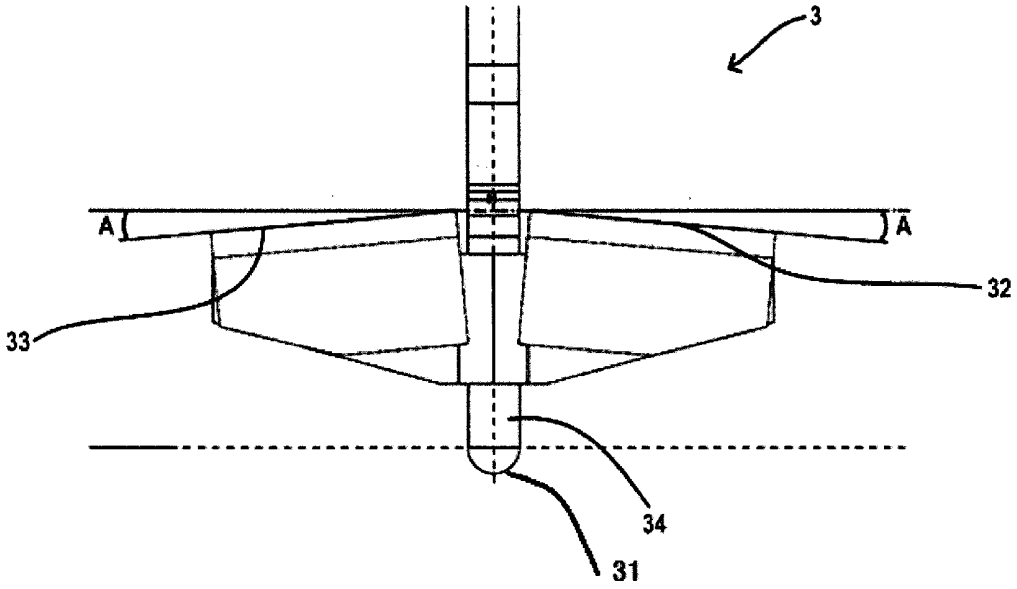

Fig.8

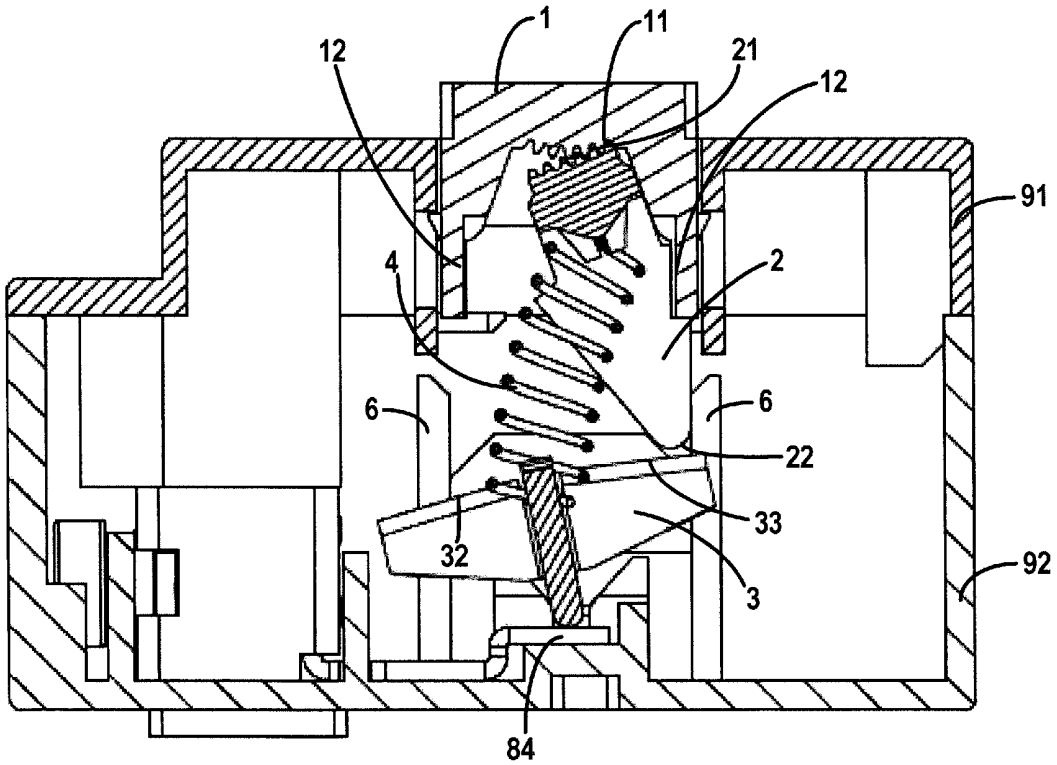

Fig.9

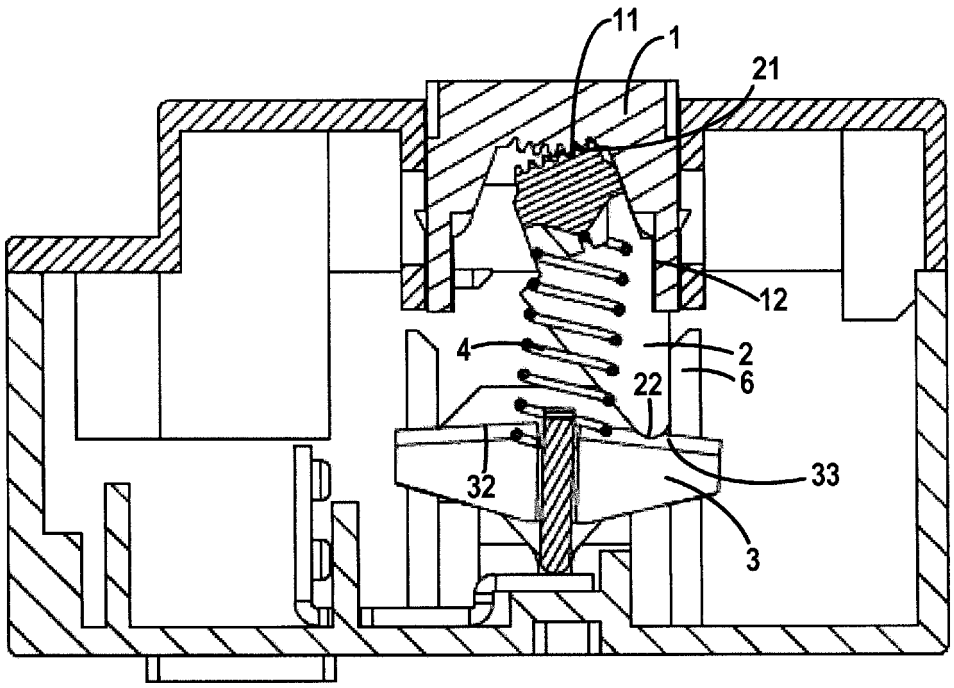

Fig.10

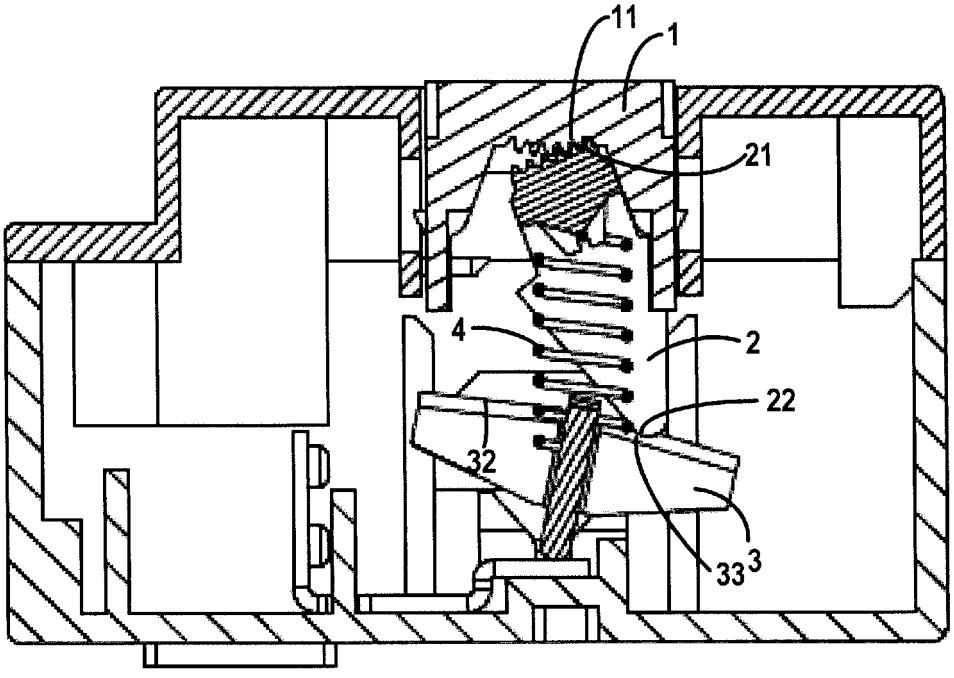

Fig.11

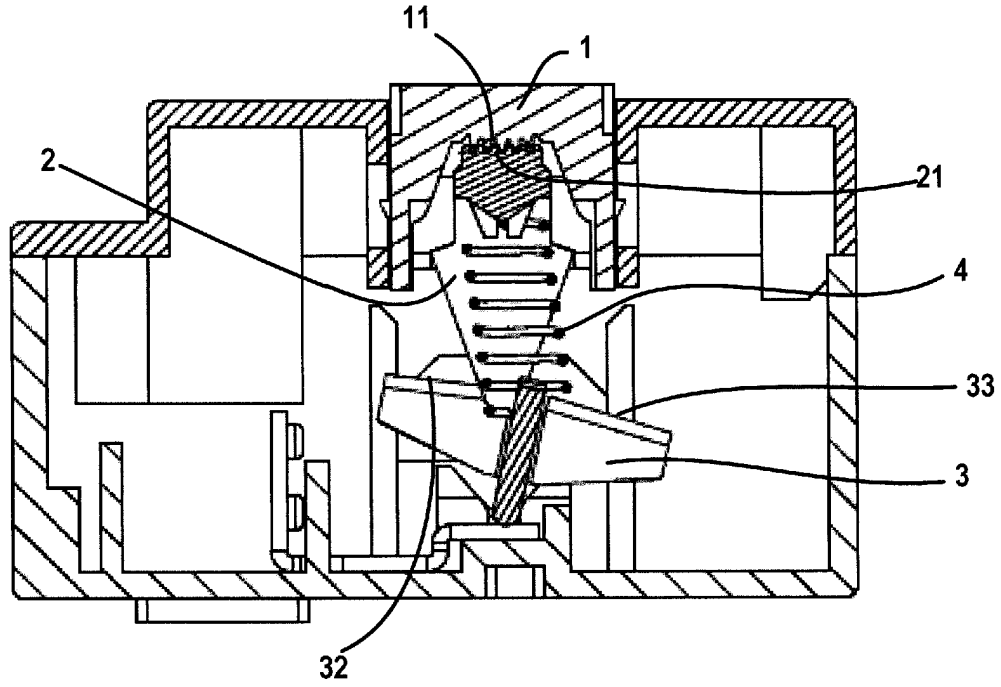

Fig.12

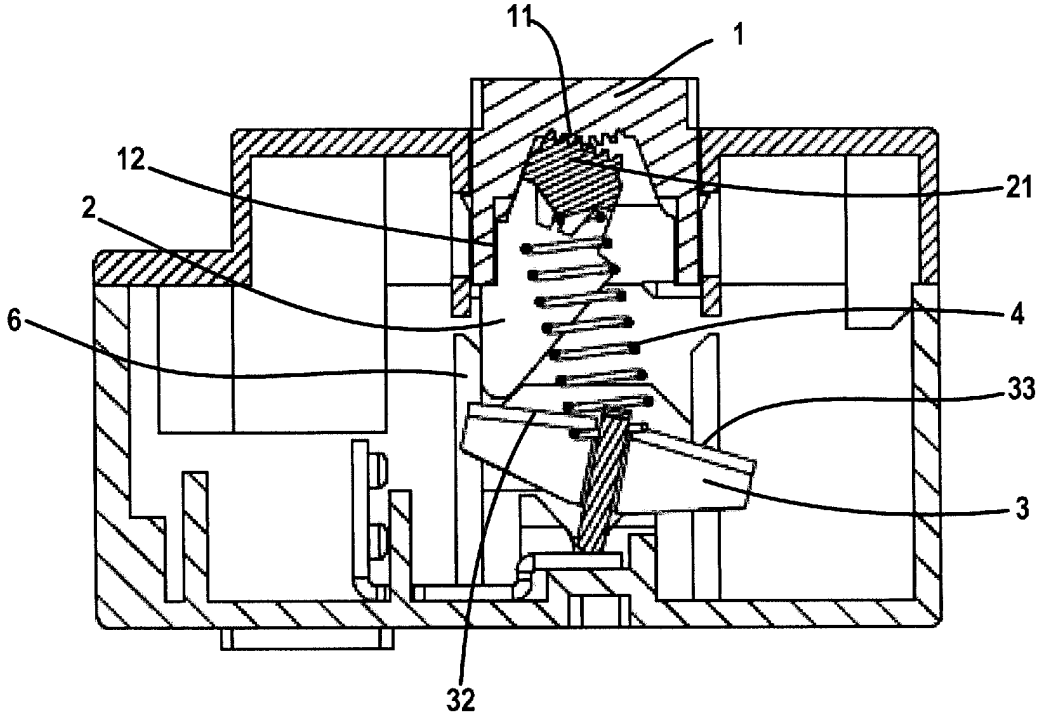

Fig.13

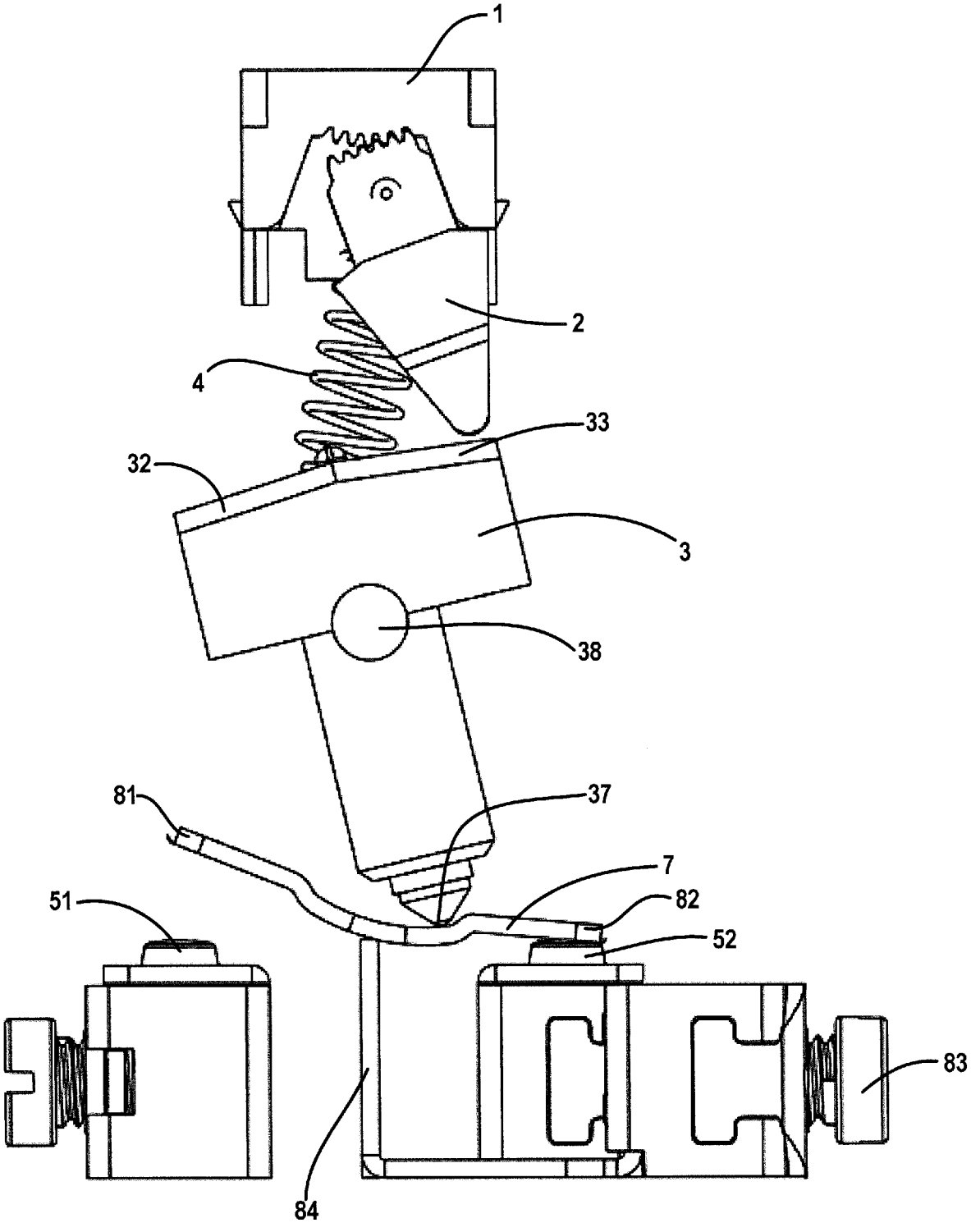

Fig.14

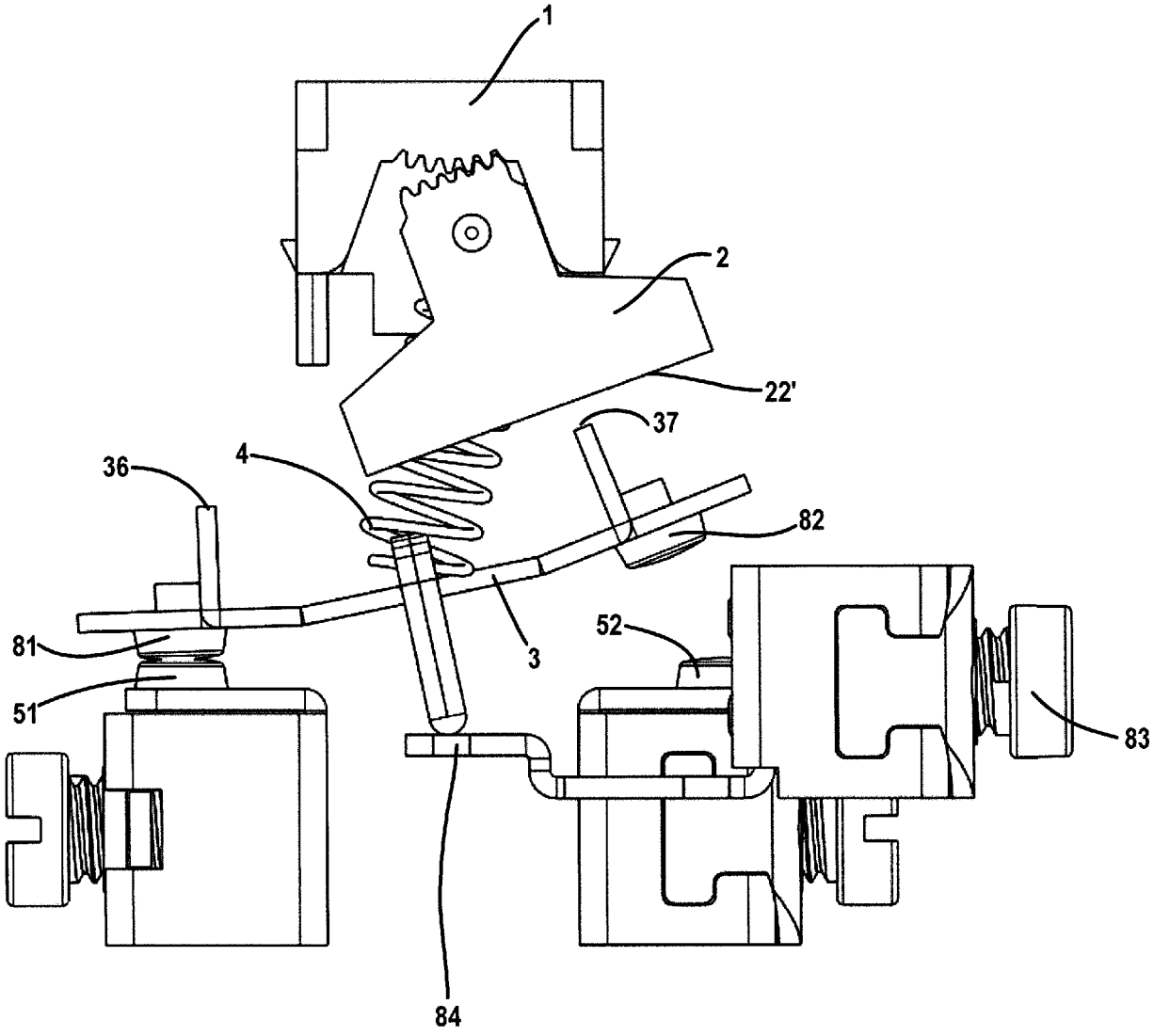

Fig.15

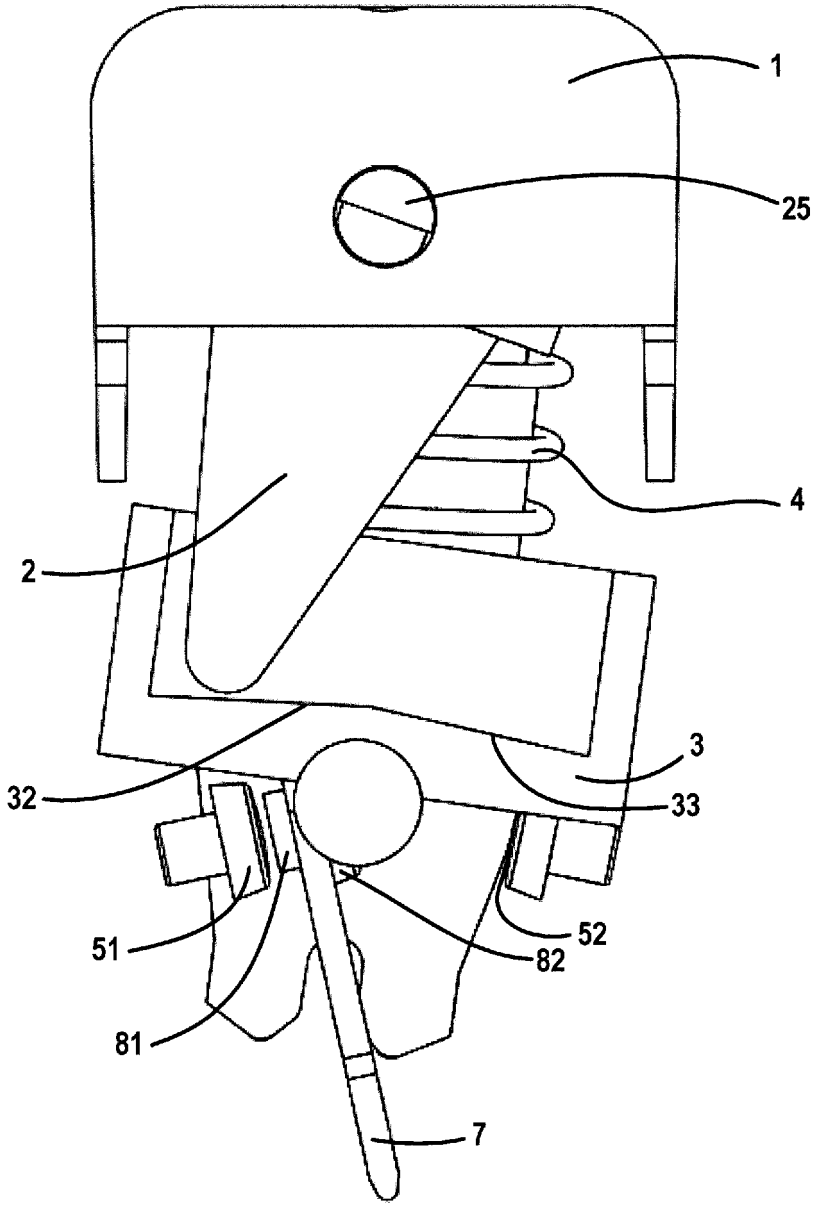

Fig.16

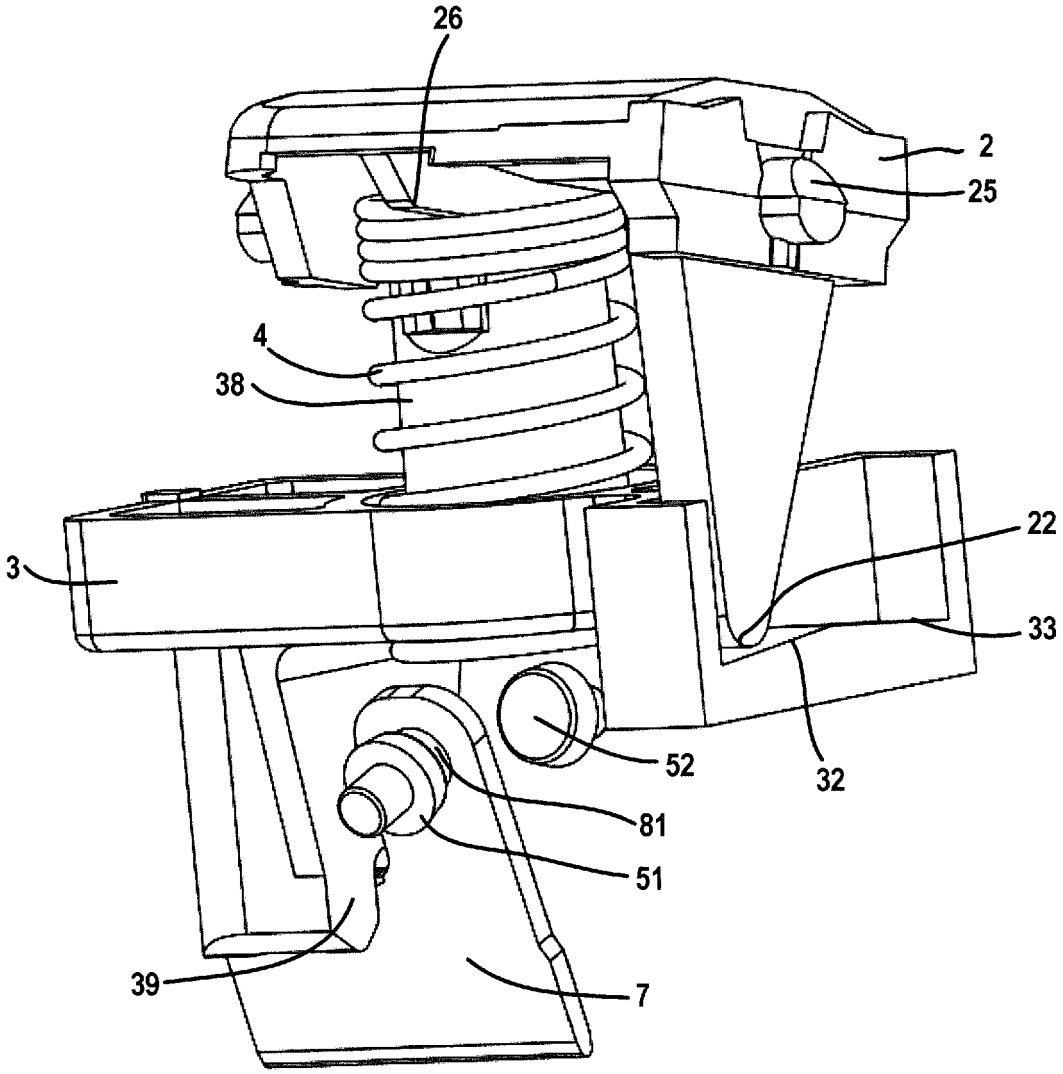

Fig.17

REFERENCES CITED IN THE DESCRIPTION

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