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(54) AUTOMATIC DISCONNECTION MECHANISM FOR SWITCHES

(57) The invention discloses an automatic disconnection mechanism for switches, comprising a housing and a mechanism main shaft that penetrates the housing and is integrated with a switch knob, wherein the front end surface of the housing is provided with a first hole that is matched with the mechanism main shaft, and the rear end surface of the housing is provided with a second hole that is matched with the mechanism main shaft; the inside of the housing is provided with a shaft pin, a rotating shaft sleeve, a spring, a locking mechanism, a locking mechanism reset spring, and a trigger mechanism. The invention enables that when the circuit system of the inverter encounters special working conditions such as overload and short circuit, the purpose of remotely disconnecting the circuit of the inverter system can be realized without manual operation; the switch with an automatic disconnection mechanism will not be affected by the automatic disconnection mechanism during related electrical life, mechanical life and other tests; the invention adopts a spring to provide the rotation torque of the rotating shaft sleeve, and the mechanism main shaft spring inside the switch controls the rotation torque of the switch; when the switch is disconnected due to abnormal conditions, it needs more torque to re-screw it to the working position to realize the distinction between normal and abnormal switch disconnection.

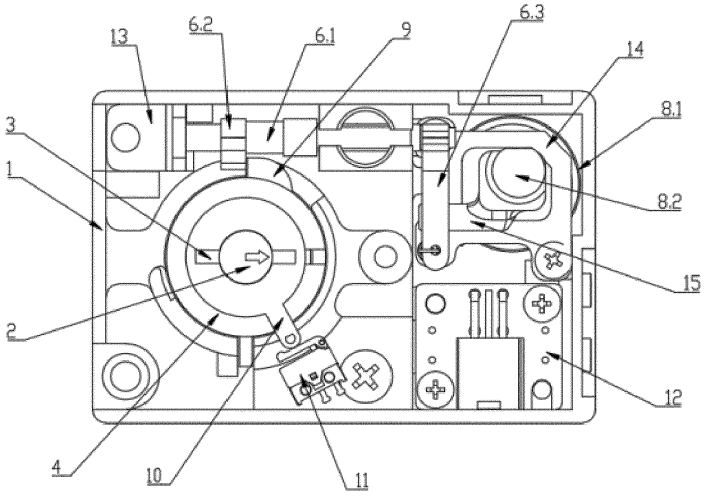

FIG. 1

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Description

FIELD OF THE INVENTION

[0001] The invention relates to the technical field of circuit protection, in particular to an automatic disconnection mechanism for switches.

BACKGROUND OF THE RELATED ART

[0002] Photovoltaic, short for solar photovoltaic power generation system, is a new type of power generation system that uses the photovoltaic effect of solar cell semiconductor materials to directly convert solar radiation energy into electrical energy, which has two modes of independent operation and grid-connected operation. With the extensive construction of photovoltaic systems, the safety of photovoltaic systems has gradually attracted the attention of the general public and has become a hot issue in the industry in recent years. The photovoltaic DC switch in the photovoltaic system is used in the inverter to control the working status of multiple core components. The reliability of photovoltaic DC switches is not only related to the good operation of the entire photovoltaic system, but also related to the stable development of the photovoltaic industry.

[0003] Looking back on the development history of the photovoltaic industry in the past few years, the industry has gradually formulated standards for the use of photovoltaic switches. Major manufacturers have also been studying to enhance the arc extinguishing capability and breaking speed of the switch contacts. However, the knob-type photovoltaic switches currently used in the market are basically manually operated, and the operator needs to manually disconnect the photovoltaic switch after a fault is found, which undoubtedly increases the safety risk of the operator. At the same time, it cannot realize the automatic disconnection when encountering problems, which will easily cause the inverter to burn out and fire, and seriously threaten the safe operation of the photovoltaic power station. Therefore, when a problem occurs in the circuit, how to quickly cut off the DC switch has become an urgent problem for those skilled in the photovoltaic system technology field.

SUMMARY OF THE INVENTION

[0004] In order to solve the technical problems above, the invention provides the technical solutions as follows: an automatic disconnection mechanism for switches, comprising a housing and a mechanism main shaft that penetrates the housing and is integrated with a switch knob, wherein the front end surface of the housing is provided with a first hole that is matched with the mechanism main shaft, and the rear end surface of the housing is provided with a second hole that is matched with the mechanism main shaft; the inside of the housing is provided with a shaft pin, a rotating shaft sleeve, a spring, a locking mechanism, a locking mechanism reset spring, and a trigger mechanism; the shaft pin is fixedly connected to the mechanism main shaft; the rotating shaft sleeve is sleeved on the mechanism main shaft and one side of the outer ring thereof is provided with a guide pin; the rotating shaft sleeve is provided with a sector hole that cooperates with the shaft pin to realize unidirectional linkage with the mechanism main shaft; the spring is sleeved on the mechanism main shaft between the rotating shaft sleeve and the housing, one end of which is fixedly connected to the housing, and the other end thereof is fixedly connected to the rotating shaft sleeve; the locking mechanism comprises a latch component, a trigger component, and a rotating component; the latch component of the locking mechanism and the guide pin are correspondingly arranged to lock the rotating shaft sleeve, the trigger component thereof and the trigger mechanism are correspondingly arranged to trigger the locking mechanism, and the rotating component thereof drives the locking mechanism to rotate to unlock the rotating shaft sleeve, wherein the end of the trigger component is connected to the housing through the locking mechanism reset spring; the trigger mechanism comprises a magnetic flux converter, an electromagnet, and a motor;

[0005] when the switch knob is switched from the OFF position to the ON position, the switch knob drives the mechanism main shaft to rotate so that the rotating shaft sleeve is locked by the latch component of the locking mechanism through the guide pin; at this time, the spring is turned from a free state to an energy storage state, and the linkage between the rotating shaft sleeve and the mechanism main shaft is released; when the trigger mechanism hits the trigger component of the locking mechanism, the trigger component drives the rotating component to rotate, so that the latch component releases the lock on the rotating shaft sleeve, which in turn enables the mechanism main shaft to drive the switch knob from the ON position to the OFF position under the action of the spring;

[0006] the rotating shaft sleeve is provided with a groove and the rotating shaft sleeve is sleeved with a micro switch trigger lever; the outside of the rotating shaft sleeve is provided with one or more micro switches corresponding thereto; when the rotating shaft sleeve is locked by the locking mechanism, the rotating shaft sleeve and the micro switch trigger lever prompt the micro switch to switch signals or switch states; the housing is further provided with a wiring PCB board.

[0007] As an improvement, the angle of the sector hole on the rotating shaft sleeve is not less than 90°; the guide pin is in an inverted wedge structure, and one side of the contact locking with the trigger component is a flat surface, and the other side thereof is a streamlined arc surface.

[0008] As an improvement, the rotating component of the locking mechanism is a latch lever, the latch component thereof is a latch block, and the trigger component thereof is a trigger lever; the two ends of the latch lever

are connected to the housing through a latch lever bracket, one end thereof is connected to the latch block, and the other end thereof extends out of the latch lever bracket to be connected to the trigger lever; when the trigger mechanism hits the trigger component, the rotating component drives the latch component to rotate around its central axis to release the lock on the rotating shaft sleeve.

[0009] As an improvement, the arm of force of the unlocking of the trigger component is more than twice that of the locking of the latch component; the unlocking surface of the trigger component and the rotation center of the latch component are staggered.

[0010] As an improvement, the rotating component of the locking mechanism is a short shaft, the latch component thereof is a stop plate, and the trigger component thereof is a horizontal plate; the short shaft is connected to the housing; the stop plate and the horizontal plate are integrated and hinged on the short shaft; when the trigger mechanism hits the trigger component, the trigger component drives the latch component to rotate around the rotating component to release the lock on the rotating shaft sleeve.

[0011] As an improvement, the rotating component of the locking mechanism is a fulcrum, the latch component thereof is a transverse plate, and the trigger component thereof is a trigger circular plate; the fulcrum is connected to the housing; the transverse plate is rotatably connected to the fulcrum and one end thereof is connected to the trigger circular plate; when the trigger mechanism hits the trigger component, the trigger component drives the latch component to rotate around the rotating component to release the lock on the rotating shaft sleeve.

[0012] As an improvement, when the trigger mechanism is a magnetic flux converter, the trigger mechanism is arranged at the lower part of the trigger component and connected to the housing, and a reset button is correspondingly provided on or on one side thereof; one end of the reset button is connected to the magnetic flux converter through a reset button spring or directly, and the other end thereof extends out of the front end face of the housing; the front end of the housing is provided with a protective cover component corresponding to the protruding end of the reset button; the protective cover component comprises a threaded sleeve sleeved on the outside of the reset button, a protective cap and a compression nut fitted on the threaded sleeve; the protective cap and the housing are connected via a connecting piece.

[0013] As an improvement, when the trigger mechanism is an electromagnet, the trigger mechanism is arranged at the upper or lower part of the trigger component and connected to the housing; the locking mechanism reset spring is arranged on one side of the electromagnet or sleeved on the electromagnet or arranged on one side of the trigger component.

[0014] As an improvement, when the trigger mechanism is a motor, the upper part of the motor is drivingly connected with a trigger cam; the lower part of the trigger component is provided with an ejector rod; the ejector rod is connected to the housing through an ejector rod base, and moves up and down along the ejector rod base under the action of the trigger cam; an ejector rod reset spring is further provided between the outside of the ejector rod and the ejector rod base.

[0015] As an improvement, the spring may be a spring or a tension spring sleeved inside the rotating shaft sleeve, or a combination spring used together with a spring and a tension spring.

[0016] After adopting the above structure, the invention has the following advantageous: the invention has simple structure and convenient operation, so that when the circuit system of the inverter encounters special working conditions such as overload and short circuit, the purpose of remotely disconnecting the circuit of the inverter system can be realized without manual operation. At the same time, the switch with an automatic disconnection mechanism will not be affected by the automatic disconnection mechanism during related electrical life, mechanical life and other tests. The invention adopts a spring to provide the rotation torque of the rotating shaft sleeve, and the mechanism main shaft spring inside the switch controls the rotation torque of the switch; when the switch is disconnected due to abnormal conditions, it needs more torque to re-screw it to the working position to realize the distinction between normal and abnormal switch disconnection.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

FIG 1 is a schematic diagram of the structure of Embodiment 1 of an automatic disconnection mechanism for switches of the invention.

FIG 2 is a schematic diagram of the structure of the rotating shaft sleeve in Embodiment 1 of an automatic disconnection mechanism for switches of the invention.

FIG. 3 is a schematic diagram of the internal structural of Embodiment 1 of an automatic disconnection mechanism for switches of the invention.

FIG. 4 is a schematic diagram of the front part of the housing in Embodiment 1 of an automatic disconnection mechanism for switches of the invention.

FIG. 5 is a schematic diagram of the rear part of the housing in Embodiment 1 of an automatic disconnection mechanism for switches of the invention.

FIG. 6 is a schematic diagram of the protective cover component in Embodiment 1 of an automatic disconnection mechanism for switches of the invention.

FIG. 7 is a schematic diagram of the open state of the protective cover component in Embodiment 1 of an automatic disconnection mechanism for switches of the invention.

FIG. 8 is a schematic diagram of an automatic disconnection mechanism for switches of the invention when multiple micro switches are adopted.

FIG. 9 is a schematic diagram of an automatic disconnection mechanism for switches of the invention when a tension spring is adopted.

FIG. 10 is a schematic diagram of the structure of Embodiment 2 of an automatic disconnection mechanism for switches of the invention.

FIG. 11 is a schematic diagram of the internal structural of Embodiment 2 of an automatic disconnection mechanism for switches of the invention.

FIG. 12 is a schematic diagram of the front part of the housing in Embodiment 2 of an automatic disconnection mechanism for switches of the invention.

FIG. 13 is a schematic diagram of the structure of Embodiment 3 of an automatic disconnection mechanism for switches of the invention.

FIG. 14 is a schematic diagram of the internal structural of Embodiment 3 of an automatic disconnection mechanism for switches of the invention.

FIG. 15 is a schematic diagram of the front part of the housing in Embodiment 3 of an automatic disconnection mechanism for switches of the invention.

FIG. 16 is a schematic diagram of the structure of Embodiment 4 of an automatic disconnection mechanism for switches of the invention.

FIG. 17 is a schematic diagram of the front part of the housing in Embodiment 4 of an automatic disconnection mechanism for switches of the invention.

FIG. 18 is a schematic diagram of the structure of Embodiment 5 of an automatic disconnection mechanism for switches of the invention.

FIG. 19 is a schematic diagram of the front part of the housing in Embodiment 5 of an automatic disconnection mechanism for switches of the invention.

FIG. 20 is a schematic diagram of the structure of Embodiment 6 of an automatic disconnection mechanism for switches of the invention.

FIG. 21 is a schematic diagram of the front part of the housing in Embodiment 6 of an automatic disconnection mechanism for switches of the invention.

FIG. 22 is a schematic diagram of the structure of Embodiment 7 of an automatic disconnection mechanism for switches of the invention.

FIG. 23 is a schematic diagram of the front part of the housing in Embodiment 7 of an automatic disconnection mechanism for switches of the invention.

[0018] As shown in the figures: 1 refers to the housing; 1.1 refers to the first hole; 1.2 refers to the second hole; 2 refers to the mechanism main shaft; 3 refers to the shaft pin; 4 refers to the rotating shaft sleeve; 4.1 refers to the sector hole; 5 refers to the spring; 6 refers to the locking mechanism; 6.1 refers to the latch lever; 6.2 refers to the latch block; 6.3 refers to the trigger lever; 6.4 refers to the trigger plate; 6.5 refers to the short shaft; 6.6 refers to the stop plate; 6.7 refers to the horizontal plate; 6.8 refers to the fulcrum; 6.9 refers to the transverse plate; 6.10 refers to the trigger circular plate; 7 refers to the locking mechanism reset spring; 8 refers to the trigger mechanism; 8.1 refers to the magnetic flux converter; 8.2 refers to the reset button; 8.3 refers to the electromagnet; 8.4 refers to the motor; 8.5 refers to the trigger cam; 9 refers to the guide pin; 10 refers to the micro switch trigger lever; 11 refers to the micro switch; 12 refers to the wiring PCB board; 13 refers to the latch lever bracket; 14 refers to the magnetic flux pressing plate; 15 refers to the trigger shaft; 16 refers to the ejector rod; 17 refers to the ejector rod base; 18 refers to the ejector rod reset spring; 16 refers to the second short shaft; 20 refers to the reset button spring; 21 refers to the protective cover component; 21.1 refers to the threaded sleeve; 21.2 refers to the protective cap; 21.3 refers to the compression nut; 21.4 refers to the connecting piece; 22 refers to the tension spring.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0019] Embodiment 1, with reference to FIG. 1 to FIG. 9.

[0020] An automatic disconnection mechanism for switches, comprising a housing 1 and a mechanism main shaft 2 that penetrates the housing 1 and is integrated with a switch knob, wherein the front end surface of the housing 1 is provided with a first hole 1.1 that is matched with the mechanism main shaft 2, and the rear end surface of the housing 1 is provided with a second hole 1.2 that is matched with the mechanism main shaft 2; the inside of the housing 1 is provided with a shaft pin 3, a rotating shaft sleeve 4, a spring 5, a locking mechanism 6, a locking mechanism reset spring 7, and a trigger mechanism 8; the shaft pin 3 is fixedly connected to the mechanism main shaft 2; the rotating shaft sleeve 4 is sleeved on the mechanism main shaft 2 and one side of

the outer ring thereof is provided with a guide pin 9; the rotating shaft sleeve 4 is provided with a sector hole 4.1 that cooperates with the shaft pin 3 to realize unidirectional linkage with the mechanism main shaft 2; the spring 5 is sleeved on the mechanism main shaft 2 between the rotating shaft sleeve 4 and the housing 1, one end of which is fixedly connected to the housing 1, and the other end thereof is fixedly connected to the rotating shaft sleeve 4; the locking mechanism 6 comprises a latch component, a trigger component, and a rotating component; the latch component of the locking mechanism 6 and the guide pin 9 are correspondingly arranged to lock the rotating shaft sleeve 4, the trigger component thereof and the trigger mechanism 8 are correspondingly arranged to trigger the locking mechanism 6, and the rotating component thereof drives the locking mechanism 6 to rotate to unlock the rotating shaft sleeve 4, wherein the end of the trigger component is connected to the housing 1 through the locking mechanism reset spring 7; the trigger mechanism 8 comprises a magnetic flux converter, an electromagnet, and a motor;

when the switch knob is switched from the OFF position to the ON position, the switch knob drives the mechanism main shaft 2 to rotate so that the rotating shaft sleeve 4 is locked by the latch component of the locking mechanism 6 through the guide pin 9; at this time, the spring 5 is turned from a free state to an energy storage state, and the linkage between the rotating shaft sleeve 4 and the mechanism main shaft 2 is released; when the trigger mechanism 8 hits the trigger component of the locking mechanism 6, the trigger component drives the rotating component to rotate, so that the latch component releases the lock on the rotating shaft sleeve 4, which in turn enables the mechanism main shaft 2 to drive the switch knob from the ON position to the OFF position under the action of the spring 5;

the rotating shaft sleeve 4 is provided with a groove and the rotating shaft sleeve 4 is sleeved with a micro switch trigger lever 10; the outside of the rotating shaft sleeve 4 is provided with one or more micro switches 11 corresponding thereto (the schematic diagram of the multiple micro switches is shown in FIG. 8.); when the rotating shaft sleeve 4 is locked by the locking mechanism 6, the rotating shaft sleeve 4 and the micro switch trigger lever 10 prompt the micro switch 11 to switch signals or switch states; the housing 1 is further provided with a wiring PCB board 12;

the angle of the sector hole 4.1 on the rotating shaft sleeve 4 is not less than 90°; the guide pin 9 is in an inverted wedge structure, and one side of the contact locking with the trigger component is a flat surface, and the other side thereof is a streamlined arc surface;

In the embodiment, the rotating component of the locking mechanism 6 is a latch lever 6.1, the latch component thereof is a latch block 6.2, and the trigger component thereof is a trigger lever 6.3; the two ends of the latch lever 6.1 are connected to the housing 1 through a latch lever bracket 13, one end thereof is connected to the latch block 6.2, and the other end thereof extends out of the latch lever bracket 13 to be connected to the trigger lever 6.3; the trigger lever 6.3 is arranged corresponding to the trigger mechanism 8; when the trigger mechanism 8 hits the trigger lever 6.3, the latch lever 6.1 drives the latch block 6.2 to rotate around its central axis to release the lock on the rotating shaft sleeve 4.

[0021] In the embodiment, the trigger mechanism 8 is a magnetic flux converter 8.1; the magnetic flux converter 8.1 is arranged at the lower part of the trigger lever 6.3 and connected to the housing 1 through a magnetic flux pressing plate 14, and a reset button 8.2 is correspondingly provided thereon; one end of the reset button 8.2 is connected to the magnetic flux converter 8.1 directly, and the other end thereof extends out of the front end face of the housing 1; the front end of the housing 1 is provided with a protective cover component 21 corresponding to the protruding end of the reset button 8.2; the protective cover component 21 comprises a threaded sleeve 21.1 sleeved on the outside of the reset button 8.2, a protective cap 21.2 and a compression nut 21.3 fitted on the threaded sleeve 21.1; the protective cap 21.2 and the housing 1 are connected via a connecting piece 21.4.

[0022] Moreover, one end of the reset button 8.2 is provided with a trigger shaft 15, and the trigger shaft 15 is arranged at the lower part of the trigger lever 6.3; one end of the trigger lever 6.3 away from the latch lever 6.1 is connected to the housing 1 through the locking mechanism reset spring 7.

[0023] The arm of force of the unlocking of the trigger component is more than twice that of the locking of the latch component; the unlocking surface of the trigger component and the rotation center of the latch component are staggered. The radius of rotation of the unlocking surface is increased to realize faster movement.

[0024] The spring 5 may be a spring 5 or a tension spring 22 sleeved inside the rotating shaft sleeve 4, or a combination spring used together with a spring 5 and a tension spring 22 (the schematic diagram of using the tension spring is shown in FIG. 9).

[0025] Embodiment 2, with reference to FIG. 10 to FIG. 12.

[0026] The difference between the embodiment and Embodiment 1 is:

in the embodiment, the trigger mechanism 8 is an electromagnet 8.3; the trigger mechanism 8 is arranged at the upper or lower part of the trigger component, namely, the trigger lever 6.3, and connected to the housing 1; the locking mechanism reset spring 7 is arranged on one side of the electromagnet 8.3 or sleeved on the electromagnet 8.3; the trigger lever 6.3 is further provided with a trigger plate 6.4 extending to the upper part of the electromagnet 8.3.

[0027] Embodiment 3, with reference to FIG. 13 to FIG. 15.

[0028] The difference between the embodiment and Embodiment 1 is:

in the embodiment, the trigger mechanism 8 is a motor 8.4; the upper part of the motor 8.4 is drivingly connected with a trigger cam 8.5; the lower part of the trigger component 8 is provided with an ejector rod 16; the ejector rod 16 is connected to the housing 1 through an ejector rod base 17, and moves up and down along the ejector rod base 17 under the action of the trigger cam 8.5; an ejector rod reset spring 18 is further provided between the outside of the ejector rod 16 and the ejector rod base 17.

[0029] Embodiment 4, with reference to FIG. 16 to FIG. 17.

[0030] The difference between the embodiment and Embodiment 1 is:

in the embodiment, the rotating component of the locking mechanism 6 is a short shaft 6.5, the latch component thereof is a stop plate 6.6, and the trigger component thereof is a horizontal plate 6.7; the short shaft 6.5 is connected to the housing 1; when the trigger mechanism 8 hits the horizontal plate 6.7, the horizontal plate 6.7 drives the stop plate 6.6 to rotate around the short shaft 6.5 to release the lock on the rotating shaft sleeve 4; there is an angle between the stop plate 6.6 and the horizontal plate 6.7.

[0031] In the embodiment, the trigger mechanism 8 is a magnetic flux converter 8.1; the magnetic flux converter 8.1 is arranged at the lower part of the horizontal plate 6.7 and fixedly connected to the housing 1; the locking mechanism reset spring 7 is arranged on one side of the magnetic flux converter 8.1 below the horizontal plate 6.7, one end thereof is fixedly connected to the housing 1, and the other end thereof is fixedly connected to the end of the horizontal plate 6.7 away from the stop plate 6.6; the reset button 8.2 is arranged above the horizontal plate 6.7, and is slidably connected to the second short shaft 19 fixedly connected to the housing 1; the reset button spring 20 is sleeved on the second short shaft 19.

[0032] Embodiment 5, with reference to FIG. 18 to FIG. 19.

[0033] The difference between the embodiment and Embodiment 4 is:

in the embodiment, the trigger mechanism 8 is an electromagnet 8.3; the trigger mechanism 8 is arranged at the upper or lower part of the horizontal plate 6.7 and connected to the housing 1; the locking mechanism reset spring 7 is arranged below the horizontal plate 6.7, one end thereof is fixedly connected to the housing 1, and the other end is fixedly connected to the end of the horizontal plate 6.7 away from the stop plate 6.6.

[0034] Embodiment 6, with reference to FIG. 20 to FIG. 21.

[0035] The difference between the embodiment and Embodiment 1 is:

in the embodiment, the rotating component of the locking mechanism 6 is a fulcrum 6.8, the latch component thereof is a transverse plate 6.9, and the trigger component thereof is a trigger circular plate 6.10; the fulcrum 6.8 is connected to the housing 1; the transverse plate 6.9 is rotatably connected to the fulcrum 6.8 and one end thereof is connected to the trigger circular plate 6.10; when the trigger mechanism 8 hits the trigger circular plate 6.10, the trigger circular plate 6.10 drives the transverse plate 6.9 to rotate around the fulcrum 6.8 to release the lock on the rotating shaft sleeve 4.

[0036] In the embodiment, the trigger mechanism 8 is a magnetic flux converter 8.1; the magnetic flux converter 8.1 is arranged between the trigger circular plate 6.10 and the housing 1, and is fixedly connected to the housing 1; the locking mechanism reset spring 7 is sleeved on the magnetic flux converter 8.1; the reset button 8.2 is arranged above the trigger circular plate 6.10, and is slidably connected to the second short shaft 19 fixedly connected to the housing 1; the reset button spring 20 is sleeved on the second short shaft 19.

[0037] Embodiment 7, with reference to FIG. 22 to FIG. 23.

[0038] The difference between the embodiment and Embodiment 6 is:

in the embodiment, the trigger mechanism 8 is an electromagnet 8.3; the trigger mechanism 8 is arranged between the trigger circular plate 6.10 and the housing 1; the electromagnet 8.3 is fixedly connected to the housing 1; the locking mechanism reset spring 7 is sleeved on the electromagnet 8.3, one end thereof is fixedly connected to the housing 1, and the other end is fixedly connected to the trigger circular plate 6.10.

[0039] When the invention is specifically implemented: when the switch knob is switched from the OFF position to the ON position for the first time, the mechanism main shaft controls the spring through the shaft sleeve, so that the spring is turned from a releases state to a working state, which enables the energy storage of the spring to be completed when the switch is closed for the first time. At the end of the rotation, the rotating shaft sleeve linked with the mechanism main shaft is fixed and locked by the locking mechanism to prevent it from rotating and releasing energy under the huge torque of the spring.

[0040] After the energy storage of the spring is completed, the rotating shaft sleeve is jammed by the locking mechanism and fixed in the energy storage position. At this time, the switch main shaft can still rotate inside the shaft sleeve, that is, the switch can be switched on and off manually. When an overload or short circuit occurs in the inverter, the control center can send a signal to the magnetic flux converter or electromagnet or motor of the DC switch, and the magnetic flux converter or electromagnet immediately produces a hit action and hits the locking mechanism after energized, which enables it to move or rotate away from the rotating shaft sleeve and finally to leave the shaft sleeve. The shaft sleeve lacks the restriction of the locking mechanism and rotates counterclockwise under the drive of the spring force. The stored energy torque of the spring is greater than the operating torque of the switch main shaft, so the switch knob can be driven to switch from the ON position to the OFF position to complete the disconnection operation of

the DC switch. After the disconnection operation is completed, the shaft sleeve clamps the mechanism main shaft in the disconnection position.

[0041] When the power supply is restored after troubleshooting, the switch knob should be forcibly turned from the OFF position to the ON position; this process is a process of re-energizing for the switch, and a process of storing energy for the automatic disconnection mechanism. The operator can be reminded that when the knob needs to be turned forcibly, some kind of malfunction must have occurred.

[0042] The invention and embodiments thereof have been described hereinabove, and this description is not restrictive; what is shown in the drawings is only one of the embodiments of the invention, and the actual structure is not limited thereto. In summary, any structural modes and embodiments similar to the technical solution of the invention made by those of ordinary skill in the art without deviating from the inventive purpose of the invention without creative efforts shall all fall within the protection scope of the invention.

Claims

1. An automatic disconnection mechanism for switches, comprising a housing and a mechanism main shaft that penetrates the housing and is integrated with a switch knob, wherein the front end surface of the housing is provided with a first hole that is matched with the mechanism main shaft, and the rear end surface of the housing is provided with a second hole that is matched with the mechanism main shaft; the inside of the housing is provided with a shaft pin, a rotating shaft sleeve, a spring, a locking mechanism, a locking mechanism reset spring, and a trigger mechanism; the shaft pin is fixedly connected to the mechanism main shaft; the rotating shaft sleeve is sleeved on the mechanism main shaft and one side of the outer ring thereof is provided with a guide pin; the rotating shaft sleeve is provided with a sector hole that cooperates with the shaft pin to realize unidirectional linkage with the mechanism main shaft; the spring is sleeved on the mechanism main shaft between the rotating shaft sleeve and the housing, one end of which is fixedly connected to the housing, and the other end thereof is fixedly connected to the rotating shaft sleeve; the locking mechanism comprises a latch component, a trigger component, and a rotating component; the latch component of the locking mechanism and the guide pin are correspondingly arranged to lock the rotating shaft sleeve, the trigger component thereof and the trigger mechanism are correspondingly arranged to trigger the locking mechanism, and the rotating component thereof drives the locking mechanism to rotate to unlock the rotating shaft sleeve, wherein the end of the trigger component is connected to the housing through the locking mechanism reset spring; the trigger mechanism comprises a magnetic flux converter, an electromagnet, and a motor;
when the switch knob is switched from the OFF position to the ON position, the switch knob drives the mechanism main shaft to rotate so that the rotating shaft sleeve is locked by the latch component of the locking mechanism through the guide pin; at this time, the spring is turned from a free state to an energy storage state, and the linkage between the rotating shaft sleeve and the mechanism main shaft is released; when the trigger mechanism hits the trigger component of the locking mechanism, the trigger component drives the rotating component to rotate, so that the latch component releases the lock on the rotating shaft sleeve, which in turn enables the mechanism main shaft to drive the switch knob from the ON position to the OFF position under the action of the spring;
the rotating shaft sleeve is provided with a groove and the rotating shaft sleeve is sleeved with a micro switch trigger lever; the outside of the rotating shaft sleeve is provided with one or more micro switches corresponding thereto; when the rotating shaft sleeve is locked by the locking mechanism, the rotating shaft sleeve and the micro switch trigger lever prompt the micro switch to switch signals or switch states; the housing is further provided with a wiring PCB board.

2. The automatic disconnection mechanism for switches according to claim 1, wherein the angle of the sector hole on the rotating shaft sleeve is not less than 90°; the guide pin is in an inverted wedge structure, and one side of the contact locking with the trigger component is a flat surface, and the other side thereof is a streamlined arc surface.

3. The automatic disconnection mechanism for switches according to claim 1, wherein the rotating component of the locking mechanism is a latch lever, the latch component thereof is a latch block, and the trigger component thereof is a trigger lever; the two ends of the latch lever are connected to the housing through a latch lever bracket, one end thereof is connected to the latch block, and the other end thereof extends out of the latch lever bracket to be connected to the trigger lever; when the trigger mechanism hits the trigger component, the rotating component drives the latch component to rotate around its central axis to release the lock on the rotating shaft sleeve.

4. The automatic disconnection mechanism for switches according to claim 3, wherein the arm of force of the unlocking of the trigger component is more than twice that of the locking of the latch component; the unlocking surface of the trigger component and the

rotation center of the latch component are staggered.

5. The automatic disconnection mechanism for switches according to claim 1, wherein the rotating component of the locking mechanism is a short shaft, the latch component thereof is a stop plate, and the trigger component thereof is a horizontal plate; the short shaft is connected to the housing; the stop plate and the horizontal plate are integrated and hinged on the short shaft; when the trigger mechanism hits the trigger component, the trigger component drives the latch component to rotate around the rotating component to release the lock on the rotating shaft sleeve.

6. The automatic disconnection mechanism for switches according to claim 1, wherein the rotating component of the locking mechanism is a fulcrum, the latch component thereof is a transverse plate, and the trigger component thereof is a trigger circular plate; the fulcrum is connected to the housing; the transverse plate is rotatably connected to the fulcrum and one end thereof is connected to the trigger circular plate; when the trigger mechanism hits the trigger component, the trigger component drives the latch component to rotate around the rotating component to release the lock on the rotating shaft sleeve.

7. The automatic disconnection mechanism for switches according to any one of claims 3-6, wherein when the trigger mechanism is a magnetic flux converter, the trigger mechanism is arranged at the lower part of the trigger component and connected to the housing, and a reset button is correspondingly provided on or on one side thereof; one end of the reset button is connected to the magnetic flux converter through a reset button spring or directly, and the other end thereof extends out of the front end face of the housing; the front end of the housing is provided with a protective cover component corresponding to the protruding end of the reset button; the protective cover component comprises a threaded sleeve sleeved on the outside of the reset button, a protective cap and a compression nut fitted on the threaded sleeve; the protective cap and the housing are connected via a connecting piece.

8. The automatic disconnection mechanism for switches according to any one of claims 3-6, wherein when the trigger mechanism is an electromagnet, the trigger mechanism is arranged at the upper or lower part of the trigger component and connected to the housing; the locking mechanism reset spring is arranged on one side of the electromagnet or sleeved on the electromagnet or arranged on one side of the trigger component.

9. The automatic disconnection mechanism for switches according to any one of claims 3-6, wherein when the trigger mechanism is a motor, the upper part of the motor is drivingly connected with a trigger cam; the lower part of the trigger component is provided with an ejector rod; the ejector rod is connected to the housing through an ejector rod base, and moves up and down along the ejector rod base under the action of the trigger cam; an ejector rod reset spring is further provided between the outside of the ejector rod and the ejector rod base.

10. The automatic disconnection mechanism for switches according to claim 1, wherein the spring may be a spring or a tension spring sleeved inside the rotating shaft sleeve, or a combination spring used together with a spring and a tension spring.

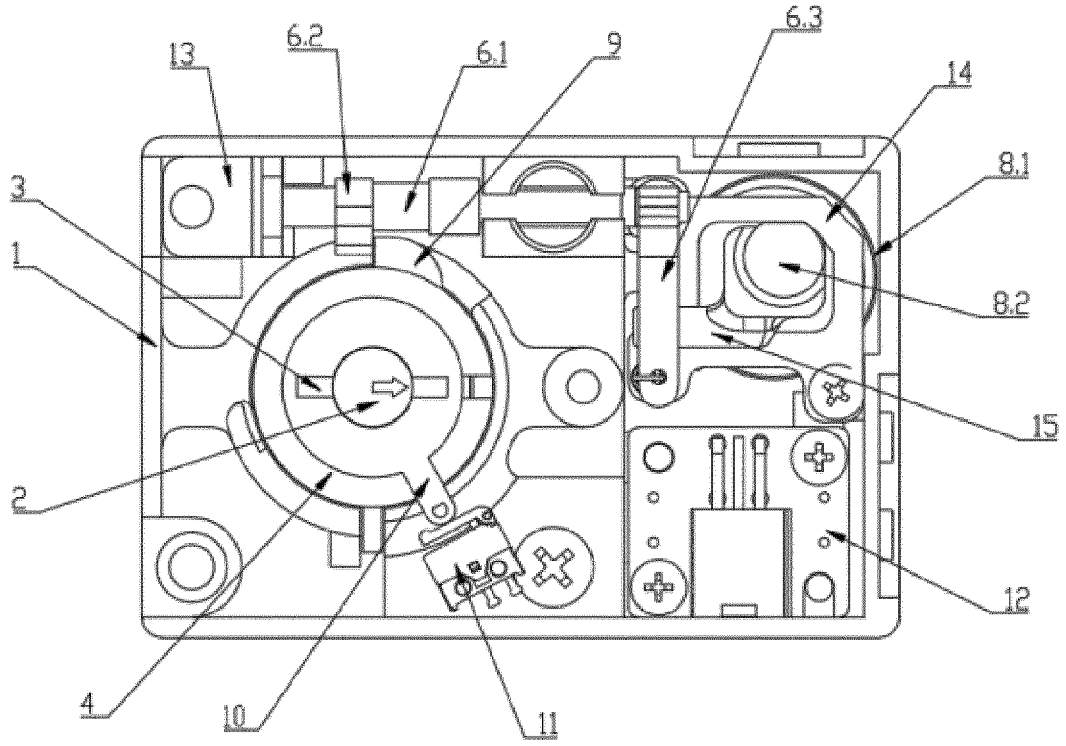


FIG. 1

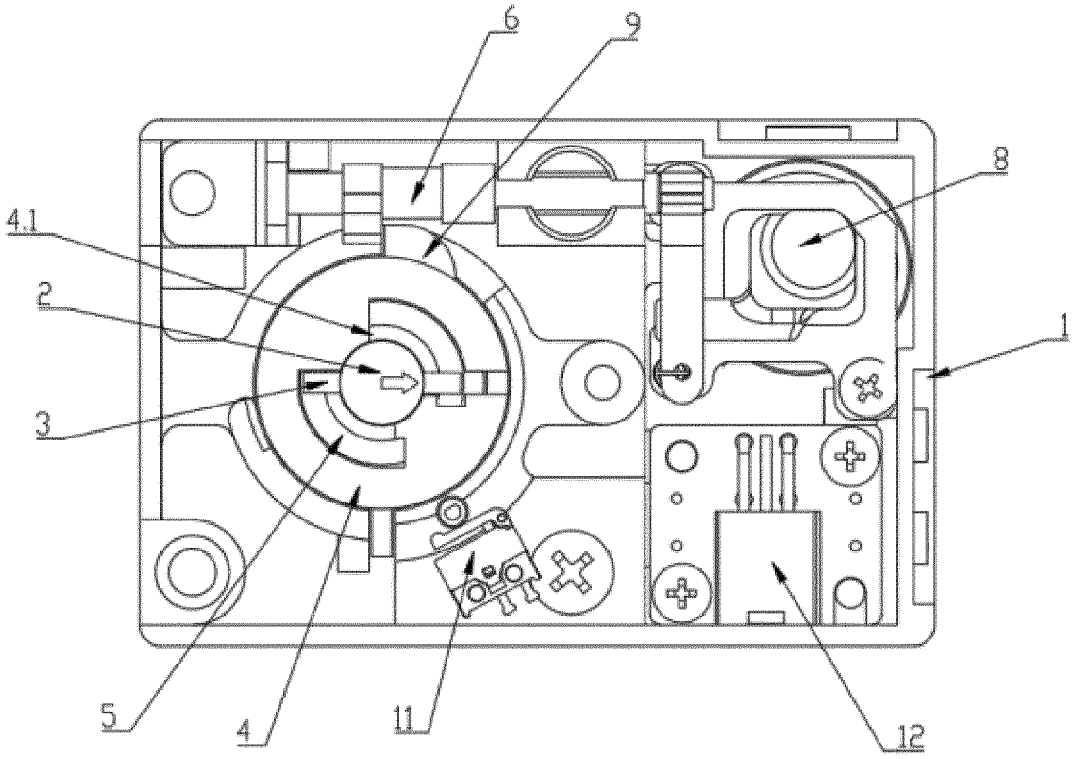


FIG. 2

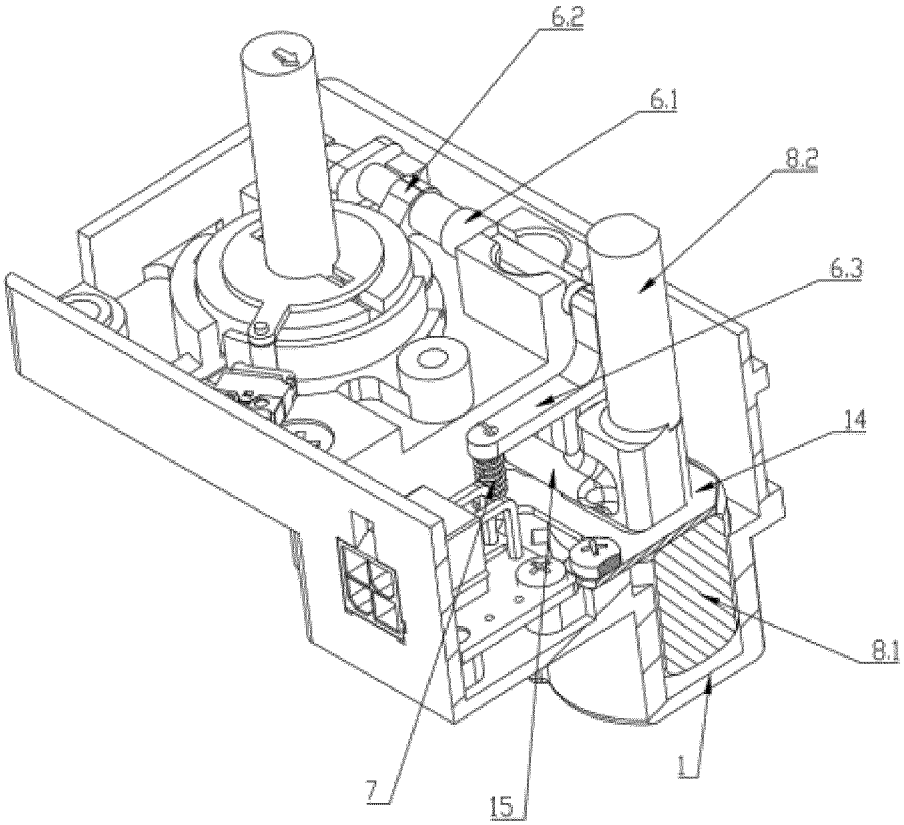


FIG. 3

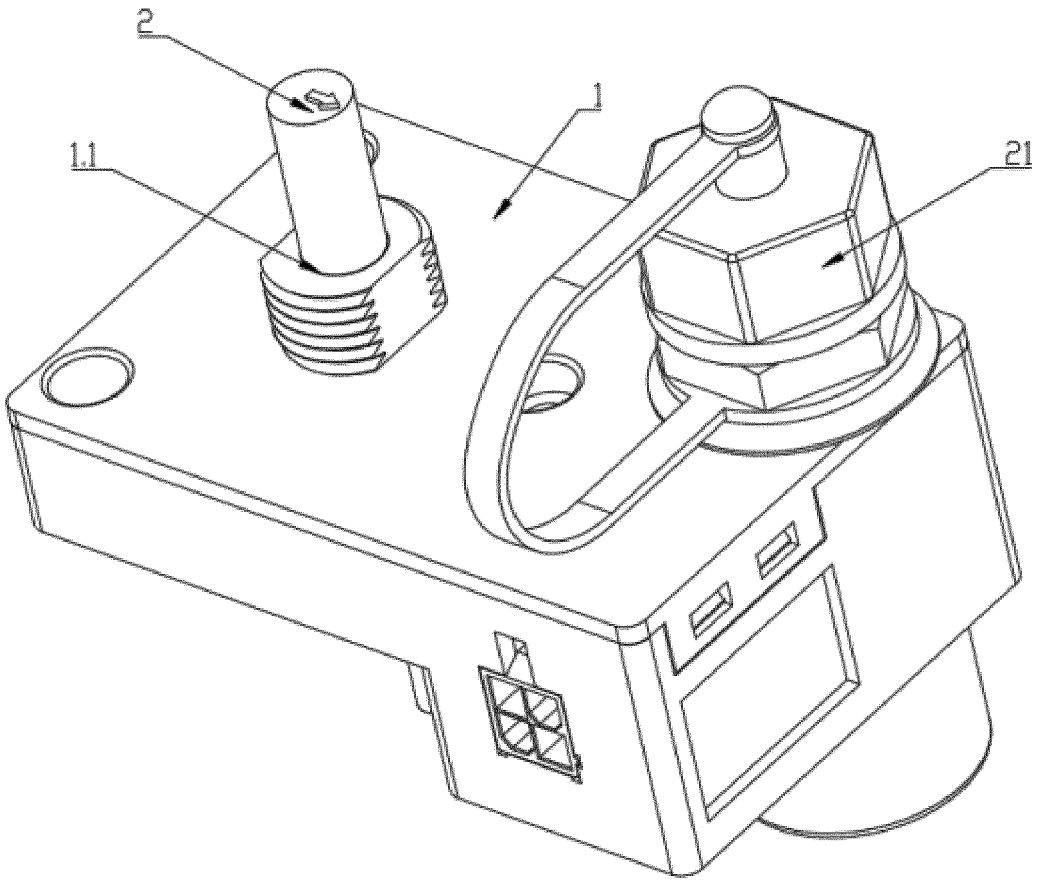


FIG. 4

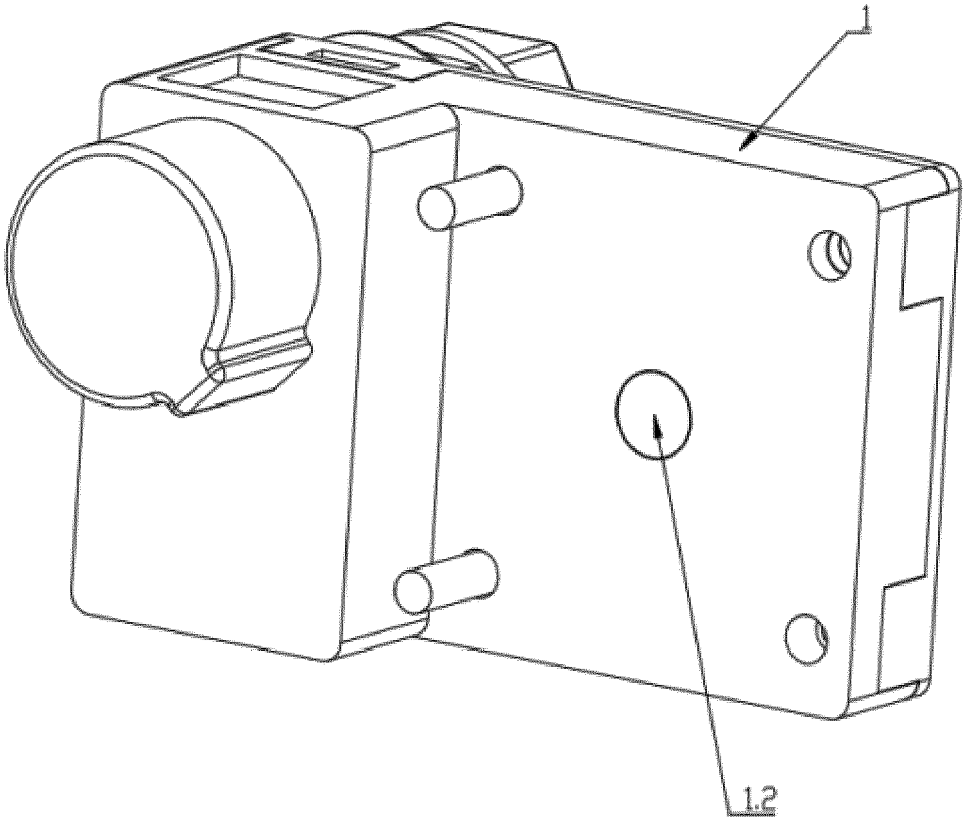


FIG. 5

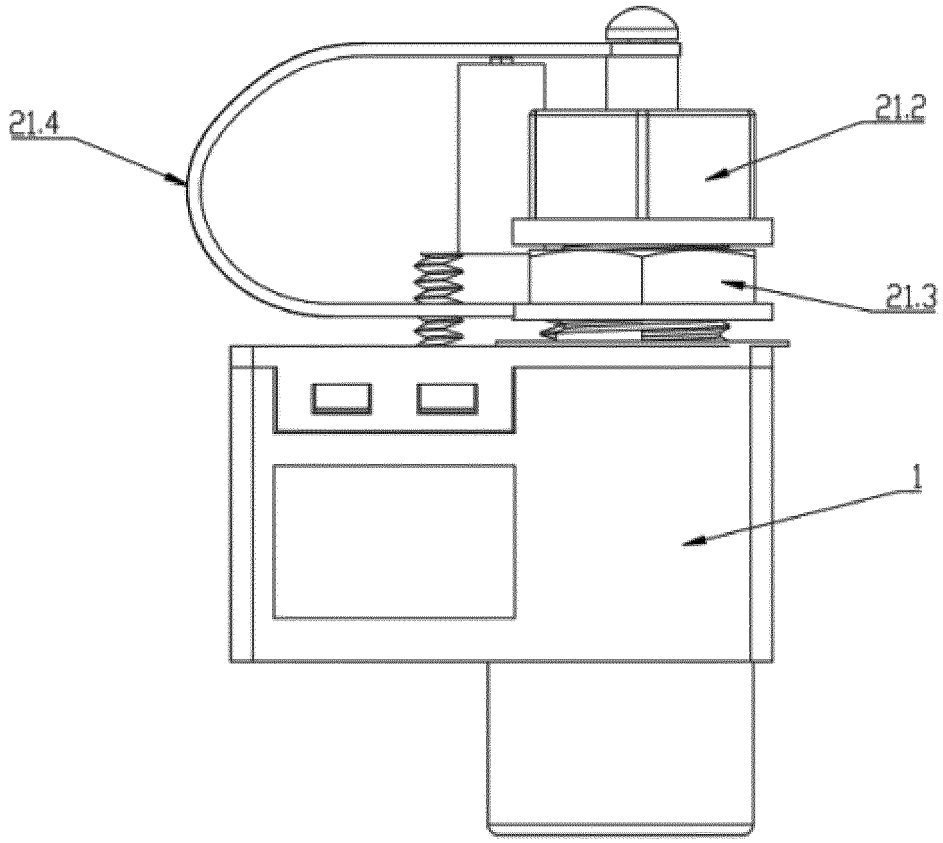
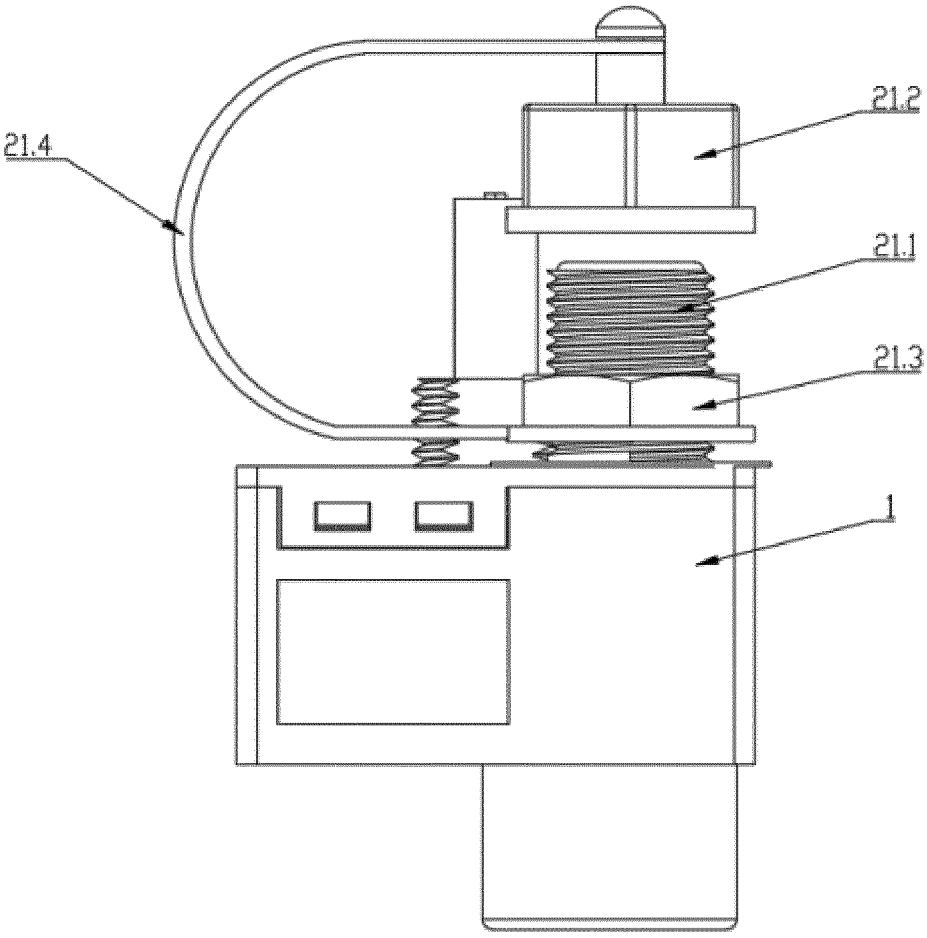


FIG. 6



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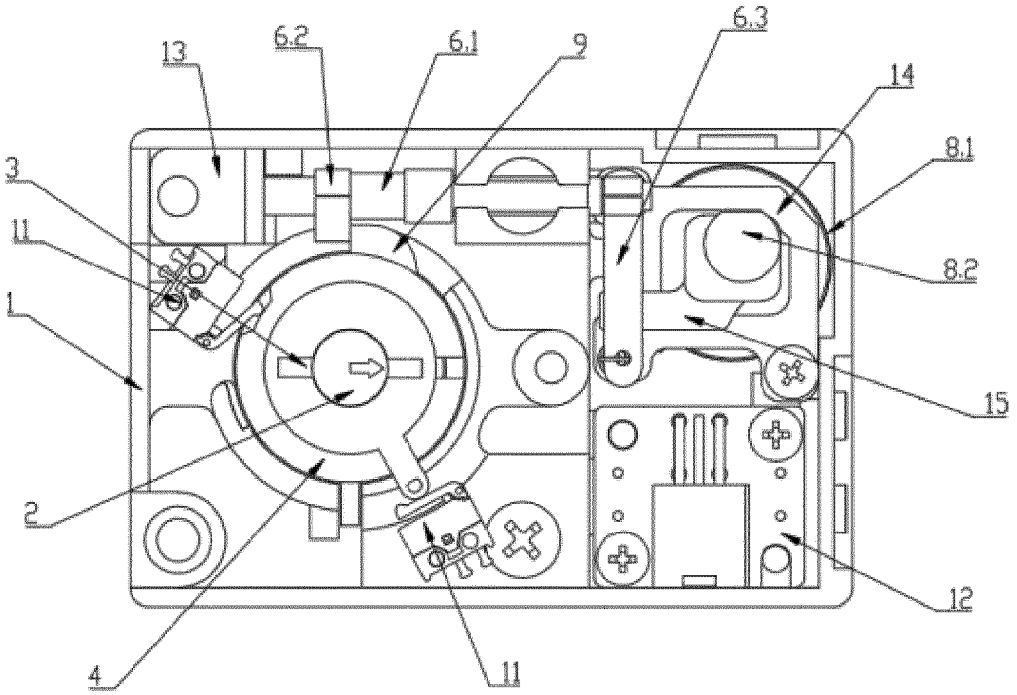
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6.3
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8.1
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8.2
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12
4
11

FIG. 8

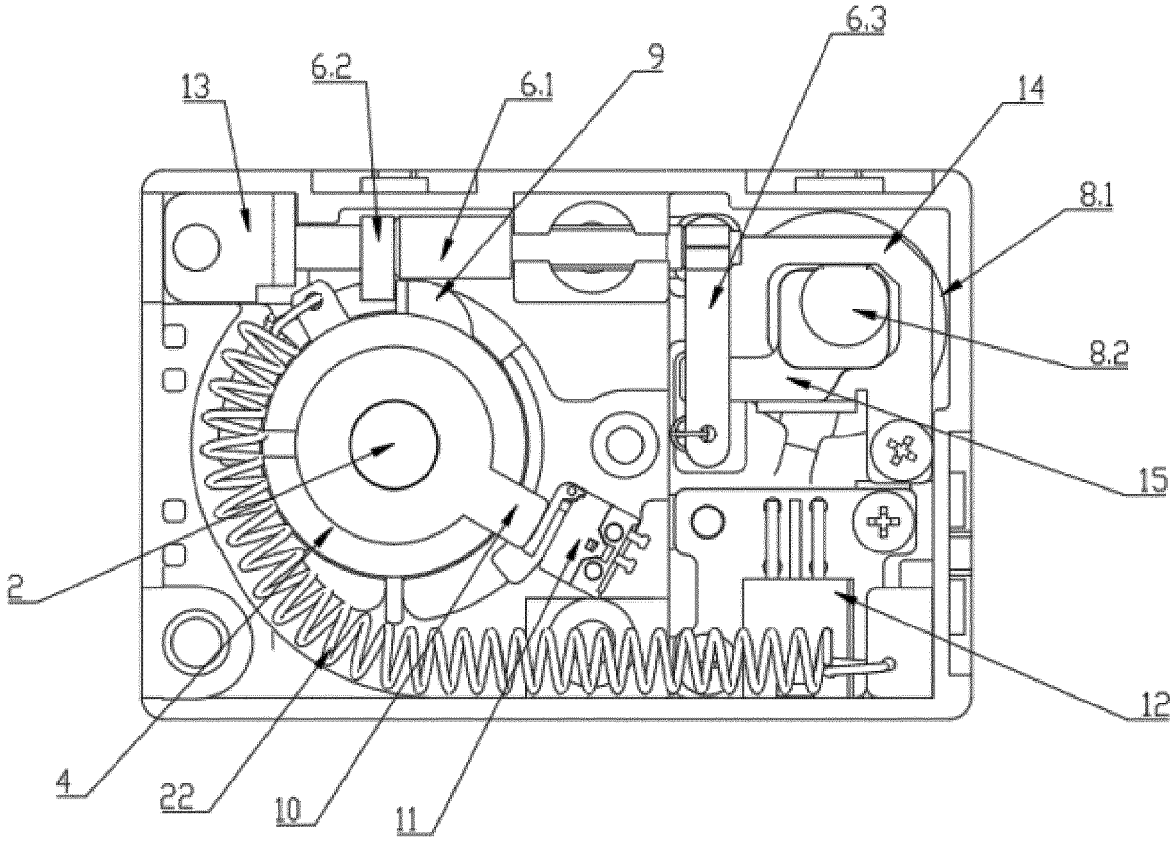
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FIG. 9

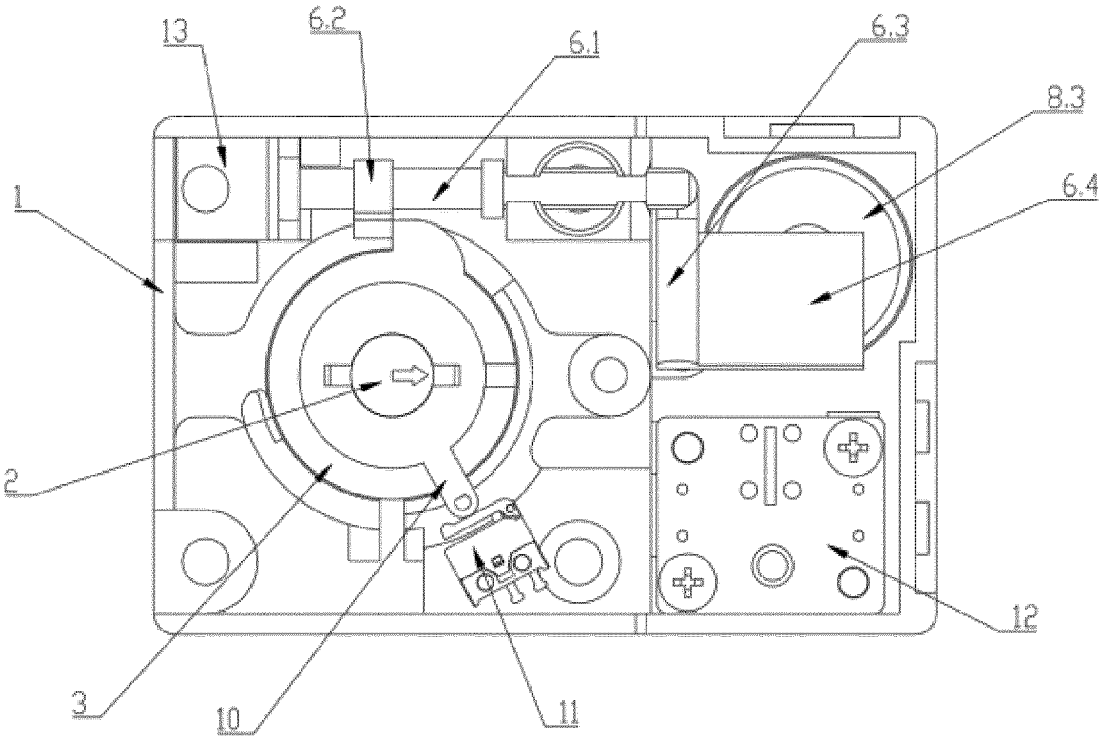

FIG. 10

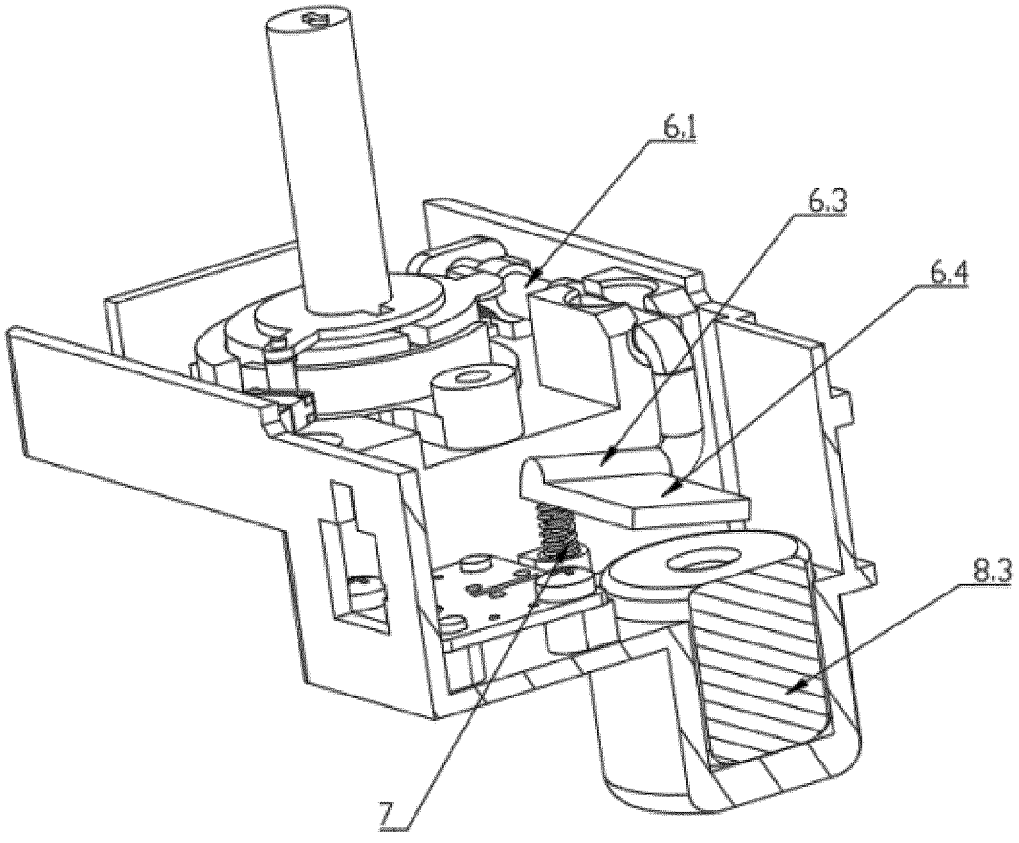

FIG. 11

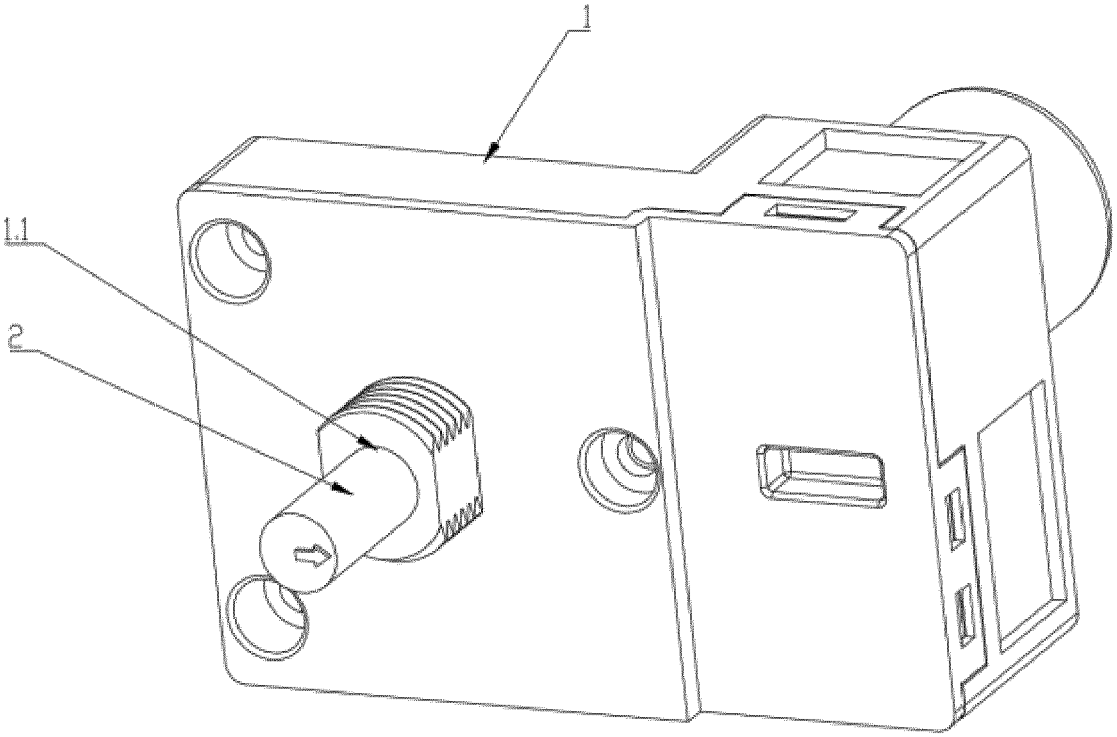

FIG. 12

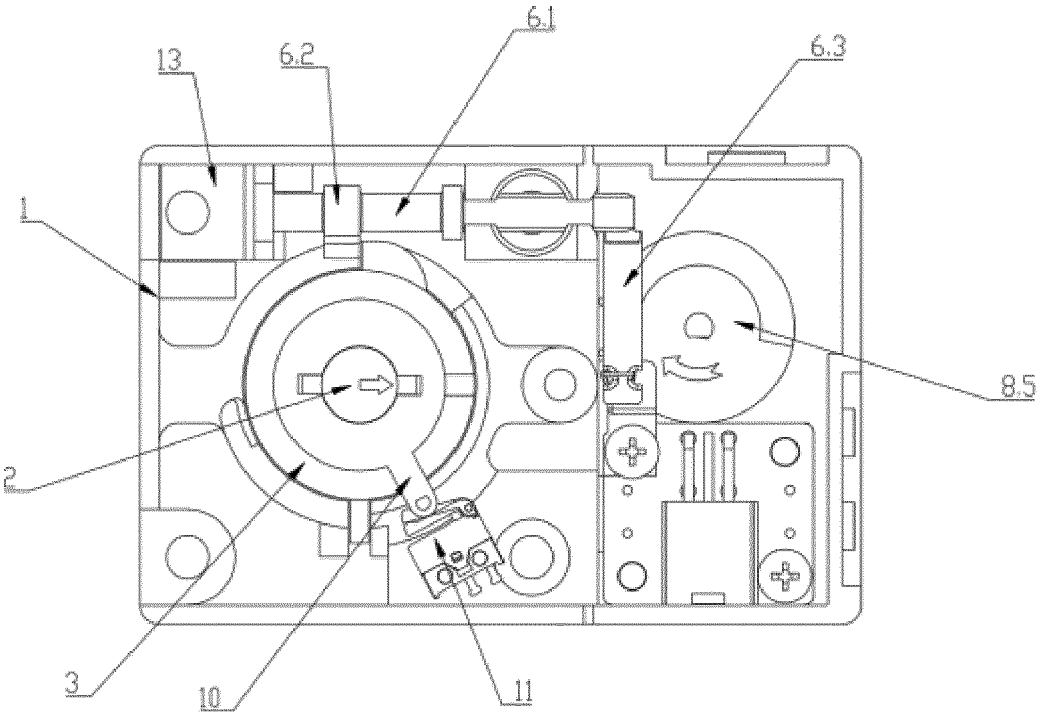

FIG. 13

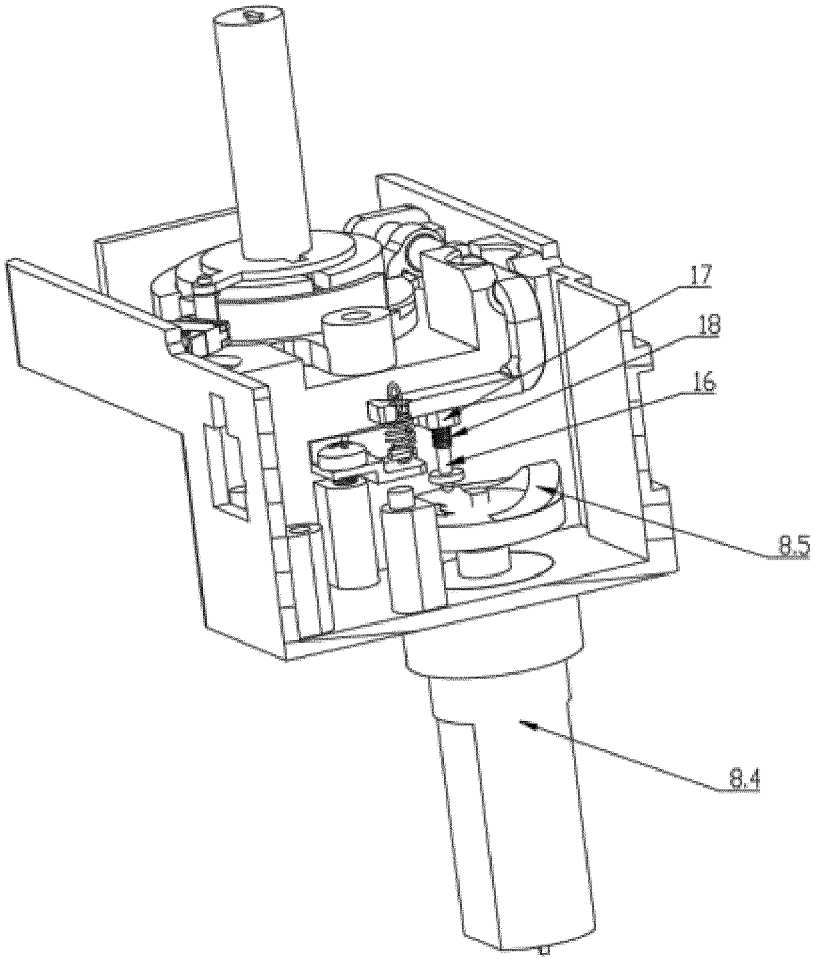

FIG. 14

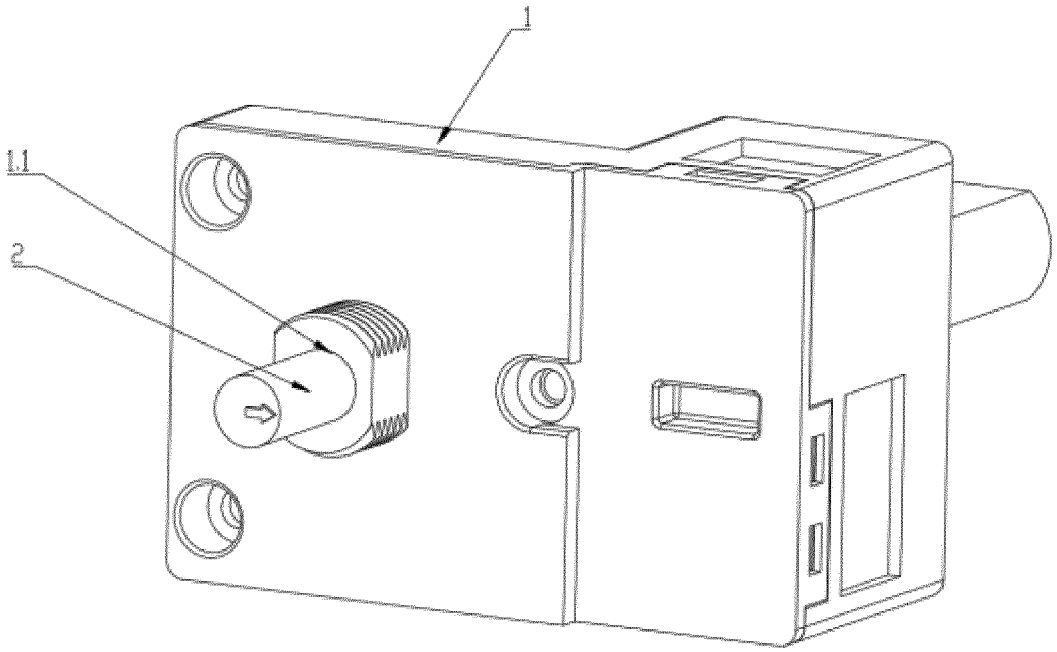

FIG. 15

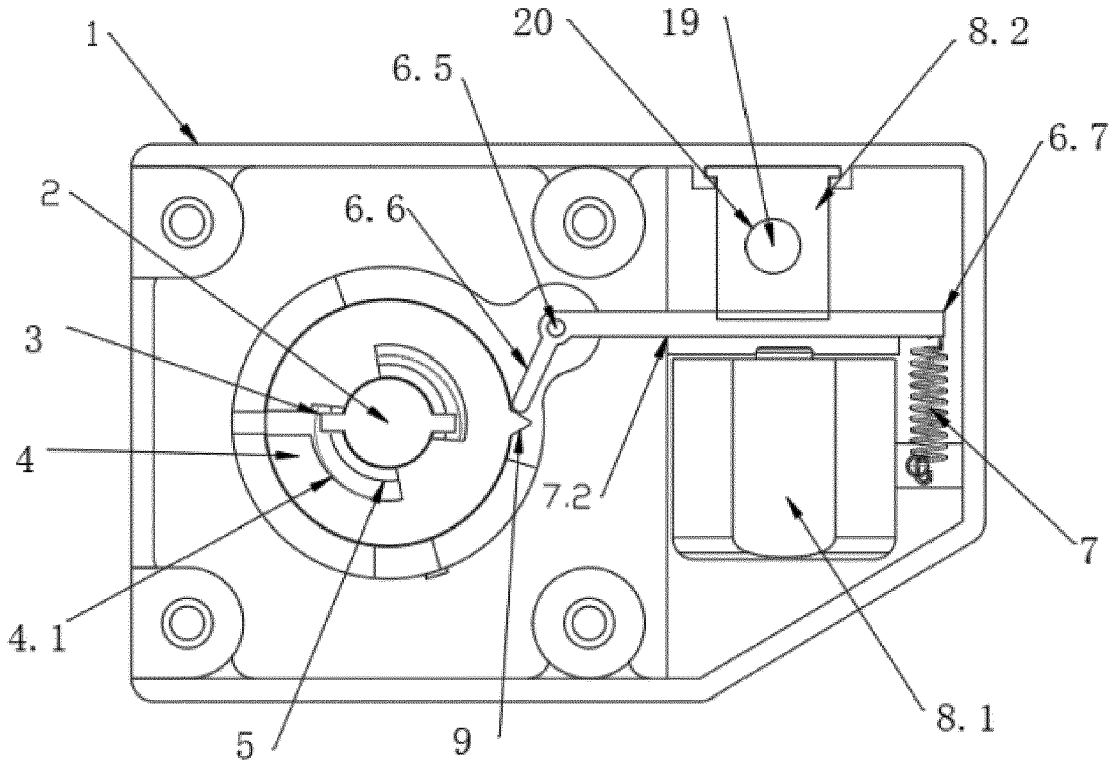

FIG. 16

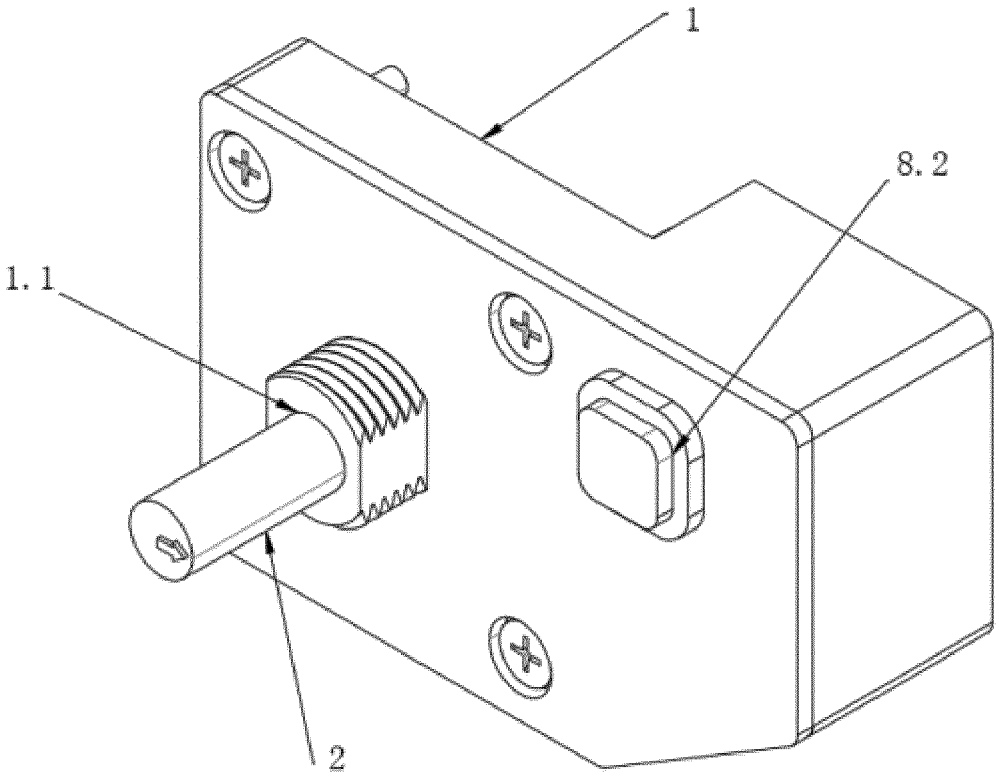

FIG. 17

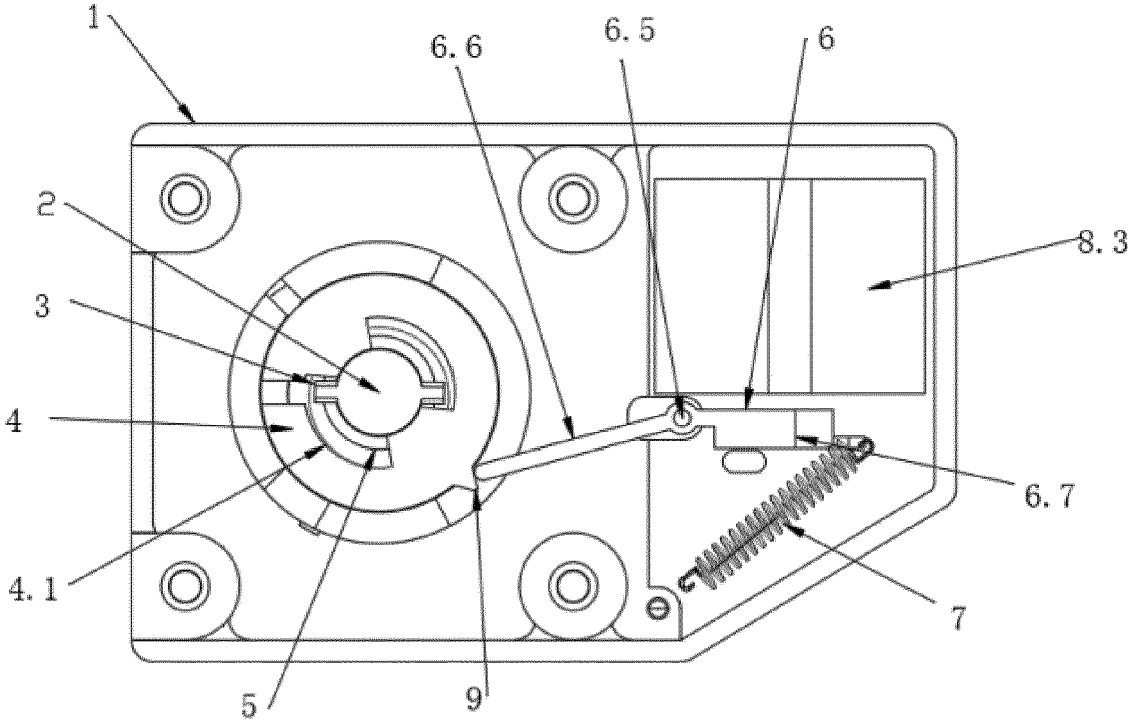

FIG. 18

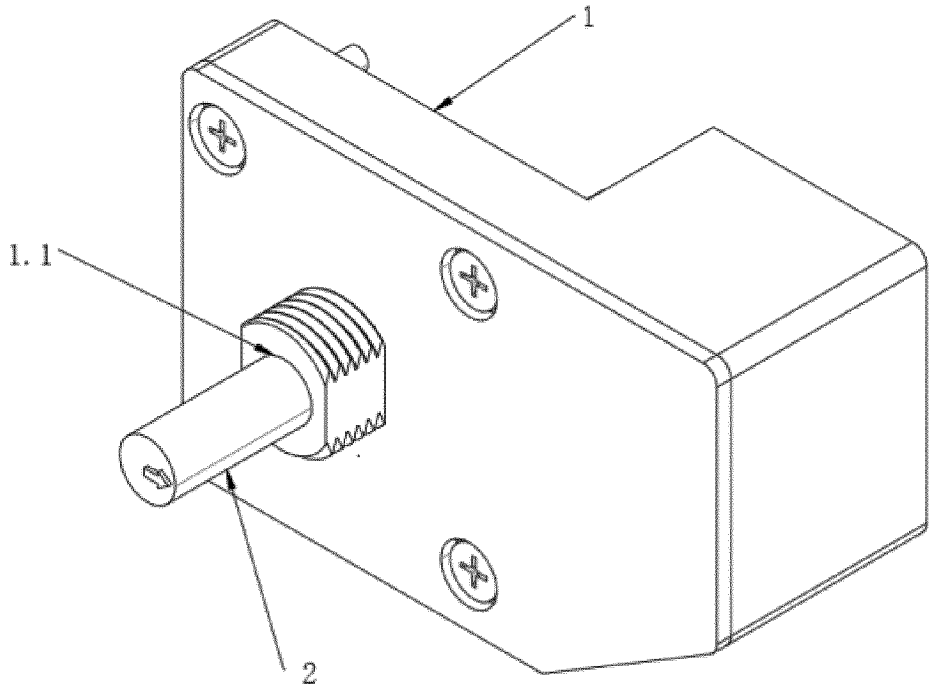

FIG. 19

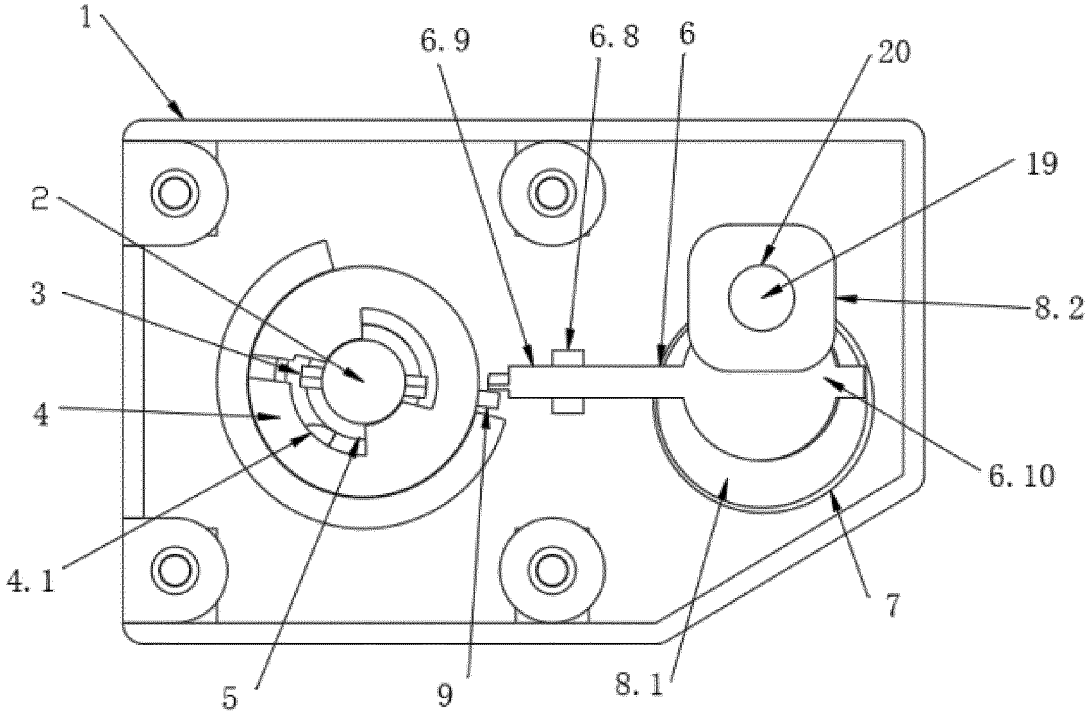

FIG. 20

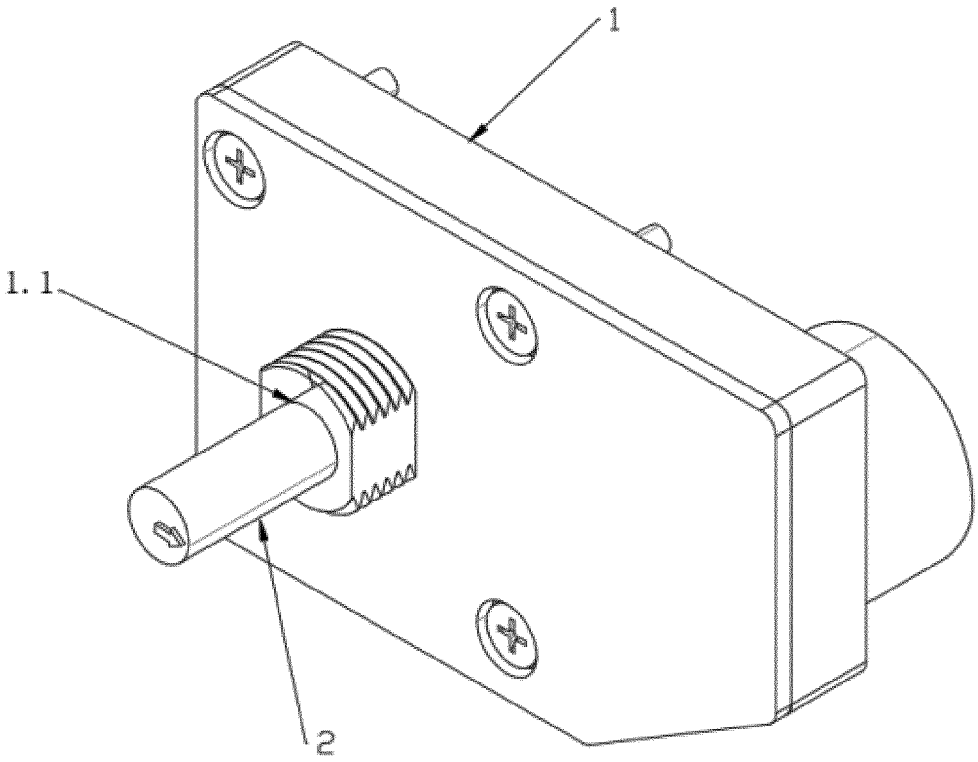

FIG. 21

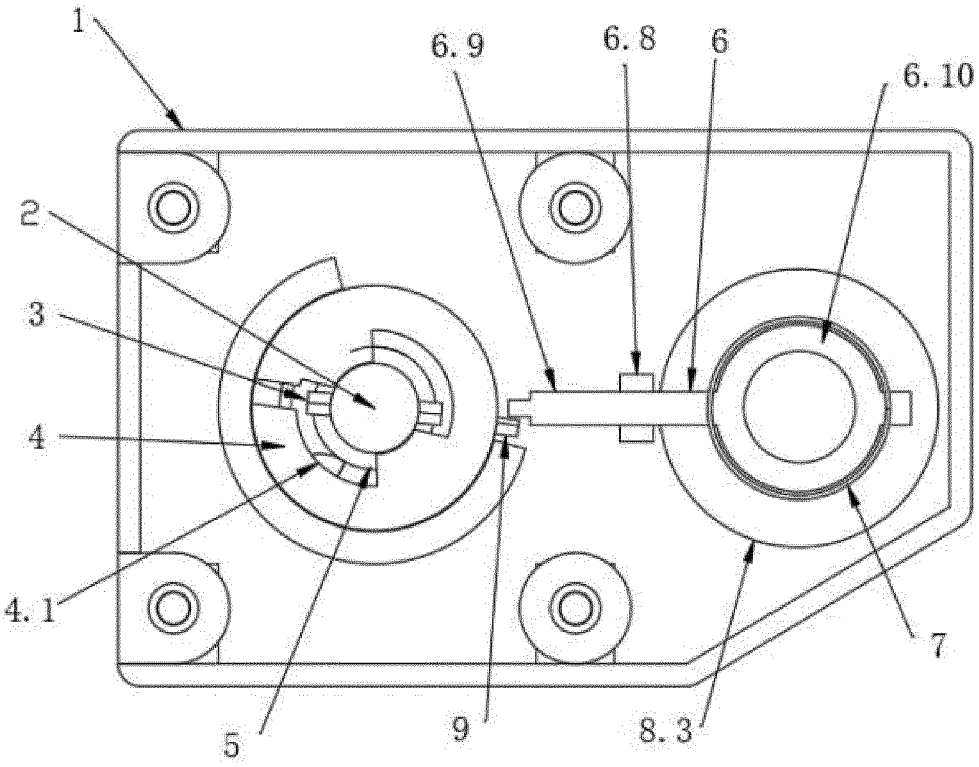

FIG. 22

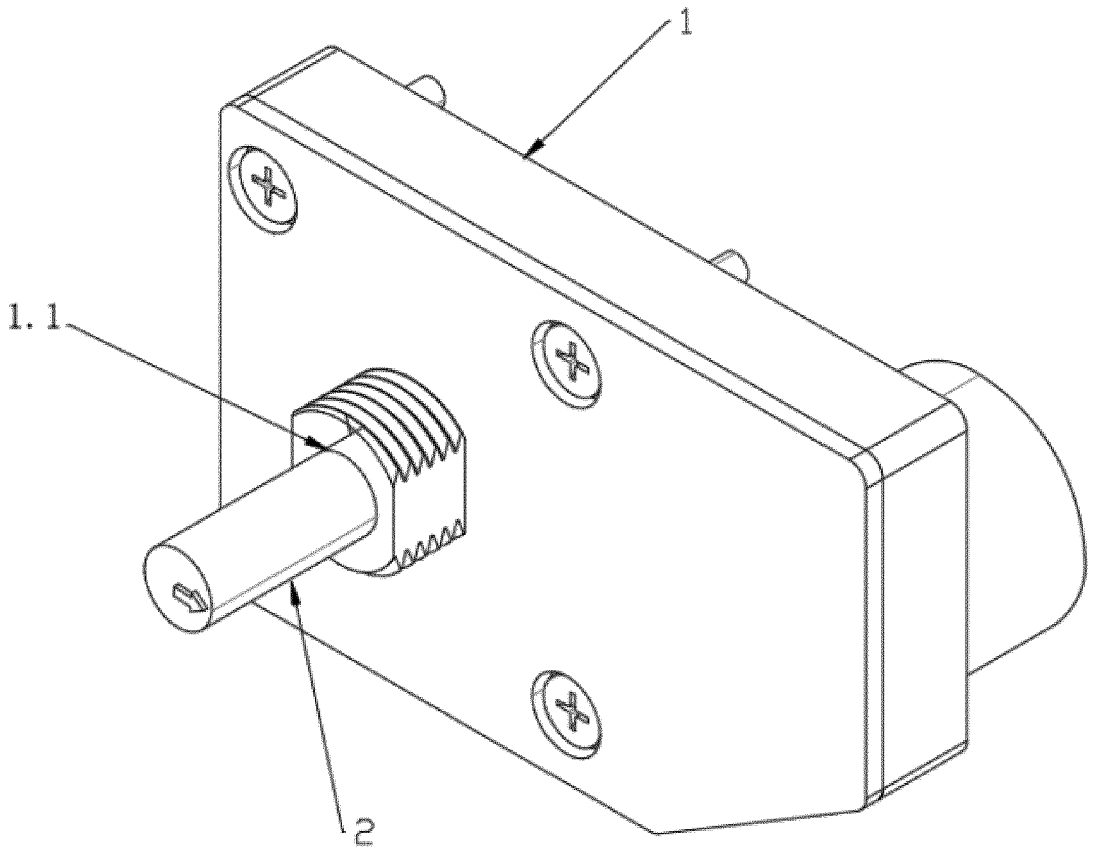

FIG. 23

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EUROPEAN SEARCH REPORT

Application Number
EP 20 21 7721

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CN 110 942 946 A (GREEN CENTURY TECH CO LTD) 31 March 2020 (2020-03-31) * figures *	1-10	INV. H01H3/26 H01H3/28 H01H3/30
A	CN 104 916 504 A (GUIZHOU CHANGZHENG SWITCH MFG CO LTD) 16 September 2015 (2015-09-16) * figures *	1	H01H3/38 H01H3/42 H01H71/46
A	CN 105 895 403 A (WUXI SAHAT ELECTRICAL APPARATUS CO LTD) 24 August 2016 (2016-08-24) * figures *	1	

TECHNICAL FIELDS SEARCHED (IPC)

H01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	18 May 2021	Findeli, Luc

CATEGORY OF CITED DOCUMENTS

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18-05-2021

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82