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(54) **RESIDUAL CURRENT OPERATED CIRCUIT BREAKER**

(57) The present invention discloses a residual current operated circuit breaker, belonging to the technical field of low-voltage electrical appliances. The residual current operated circuit breaker includes an electric leakage tripping pole module, and an L-pole circuit breaker module and an N-pole circuit breaker module disposed on both sides of the electric leakage tripping pole module, wherein the L-pole circuit breaker module includes an L-pole moving contact mechanism; the N-pole circuit breaker module includes an N-pole moving contact mechanism; the electric leakage tripping pole module includes an electric leakage jump buckle, an electric leakage lock buckle, a resetting member, a rocker arm, an assembling shaft and a tripping device; the rocker arm abuts against the resetting member; the assembling shaft is in linkage with the L-pole moving contact mechanism and the N-pole moving contact mechanism; the rocker arm is connected to one side of the electric leakage lock buckle; at least one of the rocker arm and the electric leakage lock buckle can abut against the assembling shaft; and when the electric leakage jump buckle is separated from the electric leakage lock buckle, the resetting member drives the rocker arm to rotate, so that at least one of the rocker arm and the electric leakage lock buckle pushes the assembling shaft. The L-pole circuit breaker module and the N-pole circuit breaker module are disconnected at the same time, and thus the disconnection capacity is improved.

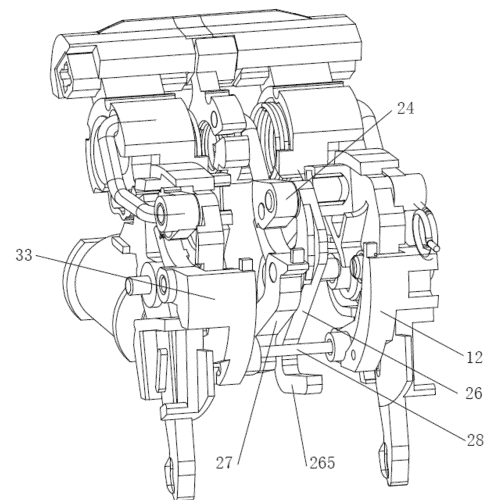


Fig.9

Description

TECHNICAL FIELD

[0001] The present invention relates to the technical field of low-voltage electrical appliances, and more particularly to a residual current operated circuit breaker.

BACKGROUND ART

[0002] Electric leakage circuit breakers may be used to distribute electrical energy and protect overloads and short circuits of lines and power equipment, and also be used for infrequent line conversion and infrequent motor starting. With the continuous development of Internet of Things technology and artificial intelligence technology, small size and modularity have become the trend of electric leakage circuit breakers. Electric leakage circuit breakers usually have electric leakage protection functions. In the traditional 1P + N leakage circuit breaker, an N-pole circuit breaker module does not have an independent closed and opened driving mechanism, instead of being integrated on an L-pole circuit breaker module. An electric leakage tripping device drives an L-pole moving contact mechanism to trip. The L-pole moving contact mechanism in the tripping process drives the N-pole circuit breaker module to trip, which leads to a relatively long breaking time of the N-pole circuit breaker module and a poor breaking capability of the electric leakage circuit breaker, and also affects the life of the electric leakage circuit breaker.

SUMMARY OF THE INVENTION

[0003] An object of the present invention is to provide a residual current operated circuit breaker, which solves the problems of a relatively long breaking time of an N-pole circuit breaker module, a poor breaking capability of an electric leakage circuit breaker and short life of the electric leakage circuit breaker.

[0004] In order to achieve the above object, the technical scheme adopted in the present invention is as follows:

A residual current operated circuit breaker, comprising an L-pole circuit breaker module, an electric leakage tripping pole module and an N-pole circuit breaker module, wherein the L-pole circuit breaker module and the N-pole circuit breaker module are disposed on both sides of the electric leakage tripping pole module respectively; the L-pole circuit breaker module comprises an L-pole moving contact mechanism; the N-pole circuit breaker module comprises an N-pole moving contact mechanism; the electric leakage tripping pole module comprises an electric leakage jump buckle, an electric leakage lock buckle, a resetting member, a rocker arm, an assembling shaft and a tripping device; the electric leakage jump buckle can be lapped with the electric leakage lock buckle; the rocker arm abuts against the resetting member;

the assembling shaft is in linkage with the L-pole moving contact mechanism and the N-pole moving contact mechanism;

the rocker arm is connected to one side of the electric leakage lock buckle; at least one of the rocker arm and the electric leakage lock buckle can abut against the assembling shaft; and

in the event of an overload current or a leakage current in an electric circuit, the tripping device can push the electric leakage lock buckle, so when the electric leakage jump buckle is separated from the electric leakage lock buckle, the electric leakage lock buckle rotates in a direction close to the assembling shaft, and the resetting member drives the rocker arm to rotate, so that at least one of the rocker arm and the electric leakage lock buckle pushes the assembling shaft.

[0005] In some possible embodiments, the electric leakage lock buckle and the rocker arm are capable of abutting against the assembling shaft at the same time, so that the rocker arm and the electric leakage lock buckle simultaneously push the assembling shaft; or

the electric leakage lock buckle is capable of abutting against the assembling shaft ahead of the rocker arm, so that the electric leakage lock buckle pushes the assembling shaft; or

the electric leakage lock buckle is capable of abutting against the assembling shaft ahead of the rocker arm, and the rocker arm is capable of abutting against the assembling shaft, so that the rocker arm and the electric leakage lock buckle simultaneously push the assembling shaft; or

the rocker arm is capable of abutting against the assembling shaft ahead of the electric leakage lock buckle, so that the rocker arm pushes the assembling shaft.

[0006] In some possible embodiments, the L-pole moving contact mechanism comprises an L-pole lock buckle, and the N-pole moving contact mechanism comprises an N-pole lock buckle;

the assembling shaft is fixedly connected to the L-pole lock buckle and is in clearance fit with the N-pole lock buckle; or

the assembling shaft is in clearance fit with the L-pole lock buckle and is fixedly connected to the N-pole lock buckle; or

the assembling shaft is fixedly connected to the L-pole lock buckle and is fixedly connected to the N-pole lock buckle.

[0007] In some possible embodiments, the assembling shaft is fixedly connected to the L-pole lock buckle and is in clearance fit with the N-pole lock buckle; and when the tripping device pushes the electric leakage lock buck-

le, the electric leakage lock buckle pushes the N-pole lock buckle.

[0008] In some possible embodiments, the electric leakage lock buckle comprises an electric leakage lock buckle body, and a protrusion portion connected to the electric leakage lock buckle body; the protrusion portion is provided at an angle to the electric leakage lock buckle body; the protrusion portion is disposed on one side of the electric leakage lock buckle body facing the N-pole circuit breaker module; and the protrusion portion is capable of pushing the N-pole lock buckle.

[0009] In some possible embodiments, the assembling shaft is in clearance fit with the L-pole lock buckle and is fixedly connected to the N-pole lock buckle; and when the tripping device pushes the electric leakage lock buckle, the electric leakage lock buckle pushes the L-pole lock buckle.

[0010] In some possible embodiments, the electric leakage lock buckle comprises an electric leakage lock buckle body, and a protrusion portion connected to the electric leakage lock buckle body; the protrusion portion is provided at an angle to the electric leakage lock buckle body; the protrusion portion is disposed on one side of the electric leakage lock buckle body facing the L-pole circuit breaker module; and the protrusion portion is capable of pushing the L-pole lock buckle.

[0011] In some possible embodiments, the rocker arm is disposed on one side of the electric leakage lock buckle body away from the protrusion portion.

[0012] In some possible embodiments, the rocker arm comprises a rocker arm body and a first connecting shaft disposed on the rocker arm body, the electric leakage lock buckle is connected to the first connecting shaft, and the electric leakage lock buckle is capable of rotating around the first connecting shaft.

[0013] In some possible embodiments, the rocker arm comprises a rocker arm body and a mounting hole formed in the rocker arm body, the rocker arm body is connected to a fixed shaft of a shell through the mounting hole, and the resetting member is capable of driving the rocker arm body to rotate around the fixed shaft.

[0014] In some possible embodiments, the rocker arm comprises a rocker arm body and a second connecting shaft disposed on the rocker arm body, the electric leakage jump buckle is connected to the second connecting shaft, and the electric leakage jump buckle is capable of rotating around the second connecting shaft.

[0015] In some possible embodiments, the rocker arm comprises a rocker arm body and a bent structure connected to one end of the rocker arm body, and the bent structure is disposed around the assembling shaft.

[0016] In some possible embodiments, the electric leakage tripping pole module further comprises a circuit board and a state indication module; the tripping device and the state indication module are electrically connected to the circuit board, respectively; the circuit board is capable of detecting a current signal; and when the current signal reaches an action current threshold, the tripping

device pushes the electric leakage lock buckle, and the state indication module has a plurality of states and is capable of presenting one of the plurality of states.

[0017] In some possible embodiments, the state indication module comprises an indicator light; the electric leakage tripping pole module further comprises a test button; the test button comprises a button body and a connecting end; the button body has a transparent structure; the connecting end is connected to the circuit board; and the button body covers the indicator light.

[0018] In some possible embodiments, the electric leakage tripping pole module further comprises a zero-sequence transformer, and the N-pole circuit breaker module further comprises a current transformer.

[0019] The present invention has the following beneficial effects.

[0020] According to the residual current operated circuit breaker provided by the present invention, the electric leakage tripping pole module, the L-pole circuit breaker module and the N-pole circuit breaker module all have independent structures and opened respectively; when the tripping device is operated and a top rod of the tripping device pushes the electric leakage lock buckle to rotate counterclockwise around the fixed shaft, the electric leakage jump buckle of the electric leakage tripping pole module is unlocked from a buckle of the electric leakage lock buckle; and when a buckle surface is separated, the resetting member drives the rocker arm to rotate, at least one of the rocker arm and the electric leakage lock buckle pushes the assembling shaft, and meanwhile the assembling shaft drives the L-pole moving contact mechanism and the N-pole moving contact mechanism to trip. The L-pole circuit breaker module and the N-pole circuit breaker module are opened at the same time, which ensures the synchronization of the actions and improves the action speed to prolong the service life; the L-pole circuit breaker module and the N-pole circuit breaker module are simultaneously subjected to at least one action force from the electric leakage lock buckle and the rocker arm through the assembling shaft, thereby improving the breaking capability; and leakage protection and overload protection share one tripping device to simplify the structure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021]

FIG. 1 is a schematic diagram of the appearance of a residual current operated circuit breaker provided in Embodiment 1 of the present invention;

FIG. 2 is a schematic structural diagram of an L-pole circuit breaker module provided in Embodiment 1 of the present invention;

FIG. 3 is a schematic structural diagram of an electric leakage tripping pole module provided in Embodiment 1 of the present invention in an opened state;

FIG. 4 is a schematic structural diagram of the elec-

tric leakage tripping pole module provided in Embodiment 1 of the present invention in a closed state; FIG. 5 is a schematic structural diagram of an N-pole circuit breaker module in Embodiment 1 of the present invention in a closed state;

FIG. 6 is a schematic structural diagram of a part of the residual current operated circuit breaker provided in Embodiment 1 of the present invention in a opened state;

FIG. 7 is a schematic diagram of a part of the residual current operated circuit breaker provided in Embodiment 1 of the present invention in a closed state;

FIG. 8 is a schematic structural diagram of the residual current operated circuit breaker provided in Embodiment 1 of the present invention in a closed state, in which a shell is removed;

FIG. 9 is a schematic structural diagram of the residual current operated circuit breaker provided in Embodiment 1 of the present invention in a opened state, in which a shell is removed;

FIG. 10 is a schematic structural diagram of a rocker arm provided in Embodiment 1 of the present invention, wherein the rocker arm has no bent structure; FIG. 11 is a schematic structural diagram of the electric leakage lock buckle provided in Embodiment 1 of the present invention;

FIG. 12 is a schematic diagram of an assembled structure of the rocker arm, the electric leakage lock buckle and a resetting member provided in Embodiment 1 of the present invention;

FIG. 13 is a schematic structural diagram of the residual current operated circuit breaker provided in Embodiment 1 of the present invention from another prospective, in which the shell is removed;

FIG. 14 is an exploded view of the residual current operated circuit breaker provided in Embodiment 1 of the present invention from a prospective, in which the shell is removed;

FIG. 15 is an exploded view of the residual current operated circuit breaker provided in Embodiment 1 of the present invention from another prospective, in which the shell is removed; and

FIG. 16 is a schematic structural diagram of the electric leakage tripping pole module provided in Embodiment 4 of the present invention in a opened state.

[0022] In drawings, reference symbols represent the following components:

1. L-pole circuit breaker module; 11. bimetallic elements; 12. L-pole moving contact mechanism; 121. L-pole lock buckle; 13. L-pole handle; 14. instantaneous action coil; 15. L-pole arc extinguishing chamber;

2. electric leakage tripping pole module; 20. zero-sequence transformer; 21. test button; 211. button body; 212. connecting end; 22. tripping pole handle; 23. lever; 24. electric leakage jump buckle; 25. re-

setting member; 26. rocker arm; 261. rocker arm body; 262. first connecting shaft; 263. second connecting shaft; 264. mounting hole; 265. bent structure; 27. electric leakage lock buckle; 271. protrusion portion; 272. electric leakage lock buckle body; 2721. connecting hole; 28. assembling shaft; 29. circuit board; 291. jack; 292. indicator light; 201. tripping device;

3. N-pole circuit breaker module; 30. N-pole arc extinguishing chamber; 32. N-pole handle; 33. N-pole moving contact mechanism; 331. N-pole lock buckle; 3311. first limiting member; 34. current transformer.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0023] The technical solutions in the embodiments of the present invention will be clearly and completely described as follows in combination with the drawings in the examples of the present invention, but obviously, the described examples are only a part of the embodiments of the present invention, rather than all the embodiments. Based on the examples of the present invention, all other examples obtained by a person skilled in the art without creative efforts shall fall within the protection scope of the present invention.

[0024] In the present invention, the terms "connected", "connection", "fixing", and the like shall be understood in a broad sense unless otherwise specified and defined. For example, they may be fixed connection, removable connection or integrated connection; may be mechanical connection or electrical connection; and may be direct connection, or indirect connection through an intermediate medium, and connection inside two elements. The specific meanings of the above terms in the present invention may be understood in a specific case by those of ordinary skills in the art.

[0025] In the present invention, unless otherwise specified and limited, the first feature "on" or "under" the second feature may include direct contact between the first feature and the second feature, and may also include the contact between the first feature and the second feature through another feature therebetween instead of the direct contact. Furthermore, the first feature "on", "above" and "over" the second feature includes that the first feature is directly above and obliquely above the second feature, or only indicates that the first feature is higher than the second feature in a horizontal height. The first feature "under", "below" and "underneath" the second feature includes that the first feature is directly below and obliquely below the second feature, or only indicates that the first feature is lower than the second feature in a horizontal height.

Embodiment 1

[0026] The present embodiment provides a residual current operated circuit breaker. As shown in FIGs. 1 to

15, the residual current operated circuit breaker includes an electric leakage tripping pole module 2, and an L-pole circuit breaker module 1 and an N-pole circuit breaker module 3 disposed on both sides of the electric leakage tripping pole module 2, wherein the L-pole circuit breaker module 1 includes an L-pole moving contact mechanism 12; the N-pole circuit breaker module 3 includes an N-pole moving contact mechanism 33; the electric leakage tripping pole module 2 includes an electric leakage jump buckle 24, an electric leakage lock buckle 27, a resetting member 25, a rocker arm 26, an assembling shaft 28 and a tripping device 201; the electric leakage jump buckle 24 and the electric leakage lock buckle 27 can be lapped with each other; the rocker arm 26 abuts against the resetting member 25; the assembling shaft 28 is in linkage with the L-pole moving contact mechanism 12 and the N-pole moving contact mechanism 33; the rocker arm 26 is connected to one side of the electric leakage lock buckle 27; at least one of the rocker arm 26 and the electric leakage lock buckle 27 can abut against the assembling shaft 28; in the event of an overload current or a leakage current in an electric circuit, the tripping device 201 can push the electric leakage lock buckle 27; when the electric leakage jump buckle 24 is separated from the electric leakage lock buckle 27, the electric leakage lock buckle 27 rotates in a direction close to the assembling shaft 28; the resetting member 25 drives the rocker arm 26 to rotate; and at least one of the rocker arm 26 and the electric leakage lock buckle 27 pushes the assembling shaft 28.

[0027] Optionally, when the electric leakage jump buckle 24 is separated from the electric leakage lock buckle 27, the resetting member 25 drives the rocker arm 26 to rotate around a fixed shaft of a shell.

[0028] A working principle of the residual current operated circuit breaker is as follows:

in a closed state: FIG. 4, FIG. 5, FIG. 7 and FIG. 8 are schematic structural diagrams of the electric leakage tripping pole module 2, the N-pole circuit breaker module 3, a part of the residual current operated circuit breaker and the residual current operated circuit breaker in a closed state, respectively, in which the shell is removed, wherein the tripping device 201 is opposite to the electric leakage lock buckle 27, the electric leakage jump buckle 24 can be lapped with the electric leakage lock buckle 27, and the electric leakage tripping pole module 2, the L-pole circuit breaker module 1 and the N-pole circuit breaker module 3 all have independent structures and closed respectively.

[0029] In an opened state: as shown in FIG. 3, FIG. 6 and FIG. 9, in the event of an overload current or a leakage current in an electric circuit, the tripping device 201 can be driven to act; a top rod of the tripping device 201 pushes the electric leakage lock buckle 27 to rotate counterclockwise around the fixed shaft, the electric leakage jump buckle 24 of the electric leakage tripping pole module 2 is unlocked from a buckle of the electric leakage lock buckle 27; and when a buckle surface is separated, the resetting member 25 drives the rocker arm 26 to rotate,

at least one of the rocker arm 26 and the electric leakage lock buckle 27 pushes the assembling shaft 28, and meanwhile the assembling shaft 28 drives the L-pole moving contact mechanism 12 and the N-pole moving contact mechanism 33 to trip. The L-pole circuit breaker module 1 and the N-pole circuit breaker module 3 are opened at the same time, which ensures the synchronization of the actions and improves the action speed to prolong the service life; the L-pole circuit breaker module 1 and the N-pole circuit breaker module 3 are subjected to an action force from the electric leakage lock buckle 27 or the rocker arm 26 through the assembling shaft 28, or two action forces from the electric leakage lock buckle 27 and the rocker arm 26 at the same time, thereby improving the breaking capability; and leakage protection and overload protection share one tripping device 201 to simplify the structure.

[0030] Due to different action speeds of the electric leakage lock buckle 27 and the rocker arm 26, or the strokes of the electric leakage lock buckle 27 and the rocker arm 26 from the assembling shaft 28, or the integrated reasons of the above speeds and strokes, when the electric leakage lock buckle 27 and the rocker arm 26 push the assembling shaft 28, the action sequence includes the following four cases.

[0031] In the first case, the electric leakage lock buckle 27 and the rocker arm 26 are capable of abutting against the assembling shaft 28 at the same time, so that the rocker arm 26 and the electric leakage lock buckle 27 simultaneously push the assembling shaft 28.

[0032] In the second case, the electric leakage lock buckle 27 is pushed to the assembling shaft 28. For example, the electric leakage lock buckle 27 pushes the assembling shaft 28 ahead of the rocker arm 26 at an enough pushing force and a fast enough speed, so that the L-pole circuit breaker module 1 is directly unlocked from the N-pole circuit breaker module 3, and the rocker arm 26 cannot push the assembling shaft.

[0033] In the third case, the electric leakage lock buckle 27 pushes the assembling shaft 28 ahead of the rocker arm 26, and the rocker arm 26 is capable of abutting against the assembling shaft 28, such that the rocker arm 26 and the electric leakage lock buckle 27 push the assembling shaft 28 at the same time. For example, the electric leakage lock buckle 27 pushes the assembling shaft 28 first. However, because there is no energy storage spring and the force is not sufficient due to the loss in force transmission during the pushing process, the L-pole circuit breaker module 1 cannot be unlocked from the N-pole circuit breaker module 3, and the rocker arm 26 is then pushed to the assembling shaft 28 for unlocking.

[0034] In the fourth case, the rocker arm 26 can abut against the assembling shaft 28 ahead of the electric leakage lock buckle 27, such that the rocker arm 26 pushes the assembling shaft 28; and the rocker arm 26 is pushed first to the assembling shaft 28. In the presence of an energy storage spring and a sufficient force, the L-

pole circuit breaker module 1 is directly unlocked from the N-pole circuit breaker module 3, and the electric leakage lock buckle 27 cannot push the assembling shaft 28.

[0035] Specifically, as shown in FIG. 2 and FIG. 5, the L-pole moving contact mechanism 12 includes an L-pole lock buckle 121, the N-pole moving contact mechanism 33 includes an N-pole lock buckle 331, and the L-pole lock buckle 121 and the N-pole lock buckle 331 are connected to both ends of the assembling shaft 28 respectively.

[0036] In the present embodiment, the assembling shaft 28 is fixedly connected to the L-pole lock buckle 121, and is in clearance fit with the N-pole lock buckle 331. Specifically, the clearance fit refers that the N-pole lock buckle 331 is provided with a first limiting member 3311 with a hole, and one end of the assembling shaft 28 is located in the hole of the first limiting member 3311, without any fixed connection. When the electric leakage lock buckle 27 and the rocker arm 26 push the assembling shaft 28, the action sequence is as follows: the assembling shaft 28 first drives the L-pole lock buckle 121, and then drives the N-pole lock buckle 331 to move. Therefore, the assembling shaft 28 is in linkage with the L-pole moving contact mechanism 12 and the N-pole moving contact mechanism 33.

[0037] Further, as shown in FIG. 6 and FIG. 7, when the tripping device 201 pushes the electric leakage lock buckle 27, the electric leakage lock buckle 27 pushes the N-pole lock buckle 331, and then the assembling shaft 28 pushes the N-pole lock buckle 331 to move. Before the assembling shaft 28 drives the N-pole lock buckle 331 to move, the electric leakage lock buckle 27 gives the N-pole lock buckle 331 a force in advance, so that the assembling shaft 28 drives the N-pole lock buckle 331 to move faster, thereby improving the synchronization and further the breaking capability.

[0038] In the preset embodiment, due to the clearance fit between the first limiting member 3311 and the assembling shaft 28, the loss in force transmission will be caused when the assembling shaft 28 pushes the N-pole lock buckle 331, so the N-pole lock buckle 331 acts slowly. Alternatively, due to a long stroke in the clearance fit between the N-pole lock buckle 331 and the assembling shaft 28, etc., the N-pole lock buckle 331 cannot abut against the assembling shaft 28 ahead of the electric leakage lock buckle 27 and the rocker arm 26 although the electric leakage lock buckle 27 first pushes the N-pole lock buckle 331. Even if the N-pole lock buckle 331 abuts against the assembling shaft 28 ahead of the electric leakage lock buckle 27 and the rocker arm 26, there is also no sufficient force to push the assembling shaft 28, so that the electric leakage lock buckle 27 and/or the rocker arm 26 can push the assembling shaft 28. At this time, the action sequence by which the electric leakage lock buckle 27 and the rocker arm 26 push the assembling shaft 28 is the same as the above four cases.

[0039] Optionally, as shown in FIG. 6, FIG. 7 and FIG. 11, the electric leakage lock buckle 27 is disposed be-

tween the L-pole circuit breaker module 1 and the N-pole circuit breaker module 3, the electric leakage lock buckle 27 includes an electric leakage lock buckle body 272, the upper end of the electric leakage lock buckle body is lapped with the electric leakage jump buckle 24, and the lower end of the electric leakage lock buckle body can push the N-pole lock buckle 331. Specifically, the bottom of the electric leakage jump buckle 14 is arc-shaped, and the top of the electric leakage lock buckle body 272 is in an arc shape adaptive with the electric leakage jump buckle 14. Specifically, the electric leakage lock buckle 27 further includes a protrusion portion 271 connected to the lower end of the electric leakage lock buckle body 272; the protrusion portion 271 is provided at an angle to the electric leakage lock buckle body; the protrusion portion 271 is disposed on one side of the electric leakage lock buckle body facing the N-pole circuit breaker module 3; the protrusion portion 271 can push the N-pole lock buckle 331; and the protrusion portion 271 can extend into the N-pole circuit breaker module to push the N-pole lock buckle 331, thereby further improving the breaking capability.

[0040] In the present embodiment, the protrusion portion 271 is perpendicular to the electric leakage lock buckle. Preferably, the protrusion portion 271 is perpendicular to the electric leakage lock buckle body 272.

[0041] As shown in FIG. 12, the rocker arm 26 is disposed on one side of the electric leakage lock buckle body 272 away from the protrusion portion 271, so that the protrusion portion 271 can abut against the N-pole lock buckle 331, making the structure more compact.

[0042] As shown in FIGs. 10 to 15, in the present embodiment, the rocker arm 26 includes a rocker arm body 261 and a first connecting shaft 262 disposed on the rocker arm body 261, wherein the electric leakage lock buckle 27 is connected to a first connecting shaft 262, and the electric leakage lock buckle 27 is capable of rotating around the first connecting shaft 262. Specifically, when the tripping device 201 pushes the electric leakage lock buckle 27, the electric leakage lock buckle 27 rotates around the first connecting shaft 262, so that the electric leakage jump buckle 24 is separated from the electric leakage lock buckle 27. Specifically, the rocker arm body 261 and the first connecting shaft 262 may be of an integrated structure or a split structure. In the present embodiment, the electric leakage lock buckle body 272 is connected to the first connecting shaft 262 via a connecting hole 2721.

[0043] In the present embodiment, the rocker arm 26 includes a mounting hole 264 formed in the rocker arm body 261, the rocker arm body 261 is connected to a fixed shaft of a shell through the mounting hole 264, and the resetting member 25 is capable of driving the rocker arm body 261 to rotate around the fixed shaft. Specifically, when the resetting member 25 drives the rocker arm 26 to rotate, the rocker arm body 261 rotates around the fixed shaft, and the electric leakage lock buckle 27 rotates at the same time with the rocker arm body 261.

[0044] Optionally, the electric leakage tripping pole module 2 further includes a tripping pole handle 22 and a lever 23, wherein the lever 23 is connected to the tripping pole handle 22 and the electric leakage jump buckle 24. The specific connection relationship and working principle and the like may refer to the prior art, which will not be repeated.

[0045] In the present embodiment, the rocker arm 26 also includes a second connecting shaft 263 disposed on the rocker arm body 261, the electric leakage jump buckle 24 is connected to the second connecting shaft 263, and the electric leakage jump buckle 24 can rotate around the second connecting shaft 263. Specifically, when the tripping device 201 pushes the electric leakage lock buckle 27 to rotate the electric leakage lock buckle 27 around the first connecting shaft 262, the electric leakage jump buckle 24 is unlocked from a buckle of the electric leakage lock buckle 27. On the one hand, because the handle is connected to the electric leakage jump buckle 24 through the lever 23 in the previous closed process such that the electric leakage jump buckle 24 stores energy, the electric leakage jump buckle 24 releases energy for rotation when the buckle surface is separated. On the other hand, the electric leakage jump buckle 24 is in contact with the rocker arm 26 in the closed process, the rocker arm 26 abuts against the resetting member 25, the resetting member 25 stores energy, and meanwhile, the electric leakage jump buckle 24 stores energy accordingly. When the buckle surface is separated, the electric leakage jump buckle 24 can release energy for rotation, and the electric leakage jump buckle 24 rotates around the second connecting shaft 263 under the combined action of the above two parts, so that the electric leakage jump buckle 24 is separated from the electric leakage lock buckle 27.

[0046] Further, as shown in FIG. 8 and FIG. 9, the rocker arm 26 further includes a bent structure 265 connected to one end of the rocker arm body 261, and the assembling shaft 28 may be located in the bent structure 265, thereby increasing a contact area between the bent structure 265 and the assembling shaft 28 and improving the reliability of pushing the assembling shaft 28.

[0047] Specifically, as shown in FIG. 9 and FIG. 10, the second connecting shaft 263 is located at the upper part of the rocker arm body 261, and the resetting member 25 abuts against the upper part of the rocker arm body 261. The bent structure 265 is located at the lower part of the rocker arm body 261, and the mounting hole 264 and the first connecting shaft 262 are located in the middle of the rocker arm body 261. The resetting member 25 acts on one end of the rocker arm body 261, and when the rocker arm body 261 rotates around the fixed shaft, the action force of the bent structure 265 located at the other end of the rocker arm body 261 on the assembling shaft 28 is enhanced. Specifically, the resetting member 25 is a torsion spring which is fixed to the shell.

[0048] As shown in FIG. 1, generally, the L-pole circuit breaker module 1 is disposed on the left side of the elec-

tric leakage tripping pole module 2, and the N-pole circuit breaker module 3 is disposed on the right side of the electric leakage tripping pole module 2.

[0049] As shown in FIG. 2, optionally, the L-pole circuit breaker module 1 further includes an L-pole instantaneous action coil 14, and the L-pole instantaneous action coil 14 can push the L-pole lock buckle 121 to trip. When a main circuit generates a short-circuit current, the L-pole lock buckle of the L-pole moving contact mechanism 12 is driven by a top rod of the L-pole instantaneous action coil 14 to trip, and the N-pole lock buckle 331 of the N-pole moving contact mechanism 33 is driven by the assembling shaft 28 to trip as the L-pole moving contact mechanism moves. Optionally, the L-pole circuit breaker module 1 includes a bimetallic element 11. Generally, the bimetallic element 11 functions for overload backup protection; in general cases, electronic overload protection first acts, and the bimetallic element 11 then acts after the electronic protection fails. The specific connection relationship and working principle and the like of the bimetallic element 11 may refer to the prior art, which will not be repeated. Further, the L-pole circuit breaker module 1 includes an L pole handle 13 and an L-pole arc extinguishing chamber 15, and the specific connection relationship and working principle and the like may refer to the prior art, which will not be repeated.

[0050] Optionally, the electric leakage tripping pole module 2 further includes a circuit board 29, wherein the tripping device 201 is electrically connected to the circuit board 29; the circuit board 29 is capable of detecting a current signal; and when the current signal reaches an action current threshold, the tripping device 201 pushes the electric leakage lock buckle 27.

[0051] Optionally, as shown in FIG. 2, the electric leakage tripping pole module 2 includes a zero-sequence transformer 20 which is electrically connected to the circuit board 29. When a leakage current occurs in the circuit, the leakage current in the circuit is detected by the zero-sequence transformer 20; and as analyzed and determined by the circuit board 29, when the leakage current reaches an action threshold, the tripping device 201 is driven to act, and then trip.

[0052] As shown in FIG. 5, optionally, the N-pole circuit breaker module 3 also includes a current transformer 34 which is electrically connected to the circuit board 29. The current transformer 34 detects an overcurrent in the electric circuit, and the current transformer 34 is electrically connected to the circuit board 29. As analyzed and determined by the circuit board 29, the circuit board 29 is electrically connected to the tripping device 201. When the overcurrent reaches an action current threshold, a top rod of the tripping device 201 is driven to act and drive the L-pole circuit breaker module 1 and the N-pole circuit breaker module 3 to trip.

[0053] Optionally, as shown in FIG. 5, the N-pole circuit breaker module 3 is provided with an N-pole arc extinguishing chamber 30, which improves the breaking capability of the N-pole circuit breaker module 3.

[0054] Optionally, as shown in FIG. 5, the N-pole circuit breaker module 3 includes an N-pole handle 32, and the specific connection relationship and working principle and the like may refer to the prior art, which will not be repeated.

[0055] Specifically, in the event of short-circuit protection in the electric leakage circuit breaker and the overload protection in the bimetallic element 11, the L-pole handle 13 and the N-pole handle 32 both trip, but the tripping pole handle 22 does not trip; and in the event of tripping under leakage current protection and electronic overload protection, the L-pole handle 13, the N-pole handle 32 and the tripping pole handle 22 all trip.

Embodiment 2

[0056] The present embodiment provides a residual current operated circuit breaker, which is basically the same structure as Embodiment 1, and the same portion will not be repeated. The present embodiment is different from Embodiment 1 in that: the assembling shaft 28 is in clearance fit with the L-pole lock buckle 121 and is fixedly connected to the N-pole lock buckle 331. That is, the N-pole lock buckle 331 is not provided with a first limiting member 3311, a second limiting member with a hole (not shown) is disposed on the L-pole lock buckle 121, and one end of the assembling shaft 28 is located in the hole of the second limiting member, without any fixed connection. When the electric leakage lock buckle 27 and the rocker arm 26 push the assembling shaft, an action sequence is as follows: the assembling shaft 28 first drives the N-pole lock buckle 331, and then drives the L-pole lock buckle 121 to move, thereby realizing the linkage of the assembling shaft 28 with the L-pole moving contact mechanism 12 and the N-pole moving contact mechanism 33.

[0057] Further, when the tripping device 201 pushes the electric leakage lock buckle 27, the electric leakage lock buckle 27 pushes the L-pole lock buckle 121, and then the assembling shaft 28 pushes the L-pole lock buckle 121 to move. Before the assembling shaft 28 drives the L-pole lock buckle 121 to move, the electric leakage lock buckle 27 gives the L-pole lock buckle 121 a force in advance, so that the assembling shaft 28 drives the L-pole lock buckle 121 to move faster, thereby improving the synchronization and further the breaking capability.

[0058] In the preset embodiment, due to the clearance fit between the second limiting member and the assembling shaft 28, the loss in force transmission will be caused when the assembling shaft 28 pushes the L-pole lock buckle 121, so the L-pole lock buckle 121 acts slowly. Alternatively, due to a long stroke in the clearance fit between the L-pole lock buckle 121 and the assembling shaft 28, etc., the L-pole lock buckle 121 cannot abut against the assembling shaft 28 ahead of the electric leakage lock buckle 27 and the rocker arm 26 although the electric leakage lock buckle 27 first pushes the L-pole

lock buckle 121. Even if the L-pole lock buckle 121 abuts against the assembling shaft 28 ahead of the electric leakage lock buckle 27 and the rocker arm 26, there is also no sufficient force to push the assembling shaft 28, so that the electric leakage lock buckle 27 and/or the rocker arm 26 can push the assembling shaft 28. At this time, the action sequence by which the electric leakage lock buckle 27 and the rocker arm 26 push the assembling shaft 28 is the same as the above four cases in Embodiment 1.

[0059] Specifically, the electric leakage lock buckle 27 includes an electric leakage lock buckle body 272, and a protrusion portion 271 connected to the electric leakage lock buckle body 272; the protrusion portion 271 is provided at an angle to the electric leakage lock buckle body 272; the protrusion portion 271 is disposed on one side of the electric leakage lock buckle body 272 facing the L-pole circuit breaker module 1; and the protrusion portion 271 is capable of pushing the L-pole lock buckle 121, thereby further improving the breaking capability.

Embodiment 3

[0060] The present embodiment provides a residual current operated circuit breaker, which has basically the same structure as Embodiment 1, and the same portion will not be repeated. The present embodiment is different from Embodiment 1 in that: the assembling shaft 28 is fixedly connected to the L-pole lock buckle 121 and the N-pole lock buckle 331; the assembling shaft 28 can drive the L-pole lock buckle 121 and the N-pole lock buckle 331 at the same time; and the assembling shaft 28 directly pushes the L-pole lock buckle 121 and the N-pole lock buckle 331 respectively, thereby greatly reducing the loss in force transmission. When the electric leakage lock buckle 27 and/or the rocker arm 26 pushes the assembling shaft 28, the electric leakage lock buckle 27 does not push the L-pole lock buckle 121 or the N-pole lock buckle 331. At this time, the four cases are consistent with those in Embodiment 1.

[0061] In addition, since in this embodiment, the assembling shaft 28 may drive the L-pole lock buckle 121 and the N-pole lock buckle 331 to move at the same time, the synchronization is high. Therefore, there is no need to provide a protrusion portion 271 on the electric leakage lock buckle 27 to push the N-pole lock buckle 331 or the L-pole lock buckle 121.

Embodiment 4

[0062] The present embodiment provides a residual current operated circuit breaker, which has basically the same structure as Embodiment 1, Embodiment 2 and Embodiment 3, and the same portion will not be repeated. The present embodiment is different from Embodiment 1, Embodiment 2 and Embodiment 3 in that: as shown in FIG. 16, a state indication module is electrically connected to the circuit board; the state indication module

has a plurality of states from which one state can be selected alternatively; and the state indication module is able to present different states according to different currents for easy identification.

[0063] Optionally, the state indication module includes an indicator light 292 and a test button 21. The test button 21 includes a button body 211 and a connecting end 212. The button body 211 has a transparent structure. The connecting end 212 is connected to the circuit board 29. The button body 211 covers the indicator light 292. A fault state of the circuit breaker is displayed through the indicator light 292 and is intuitively displayed to a user through the button body 211.

[0064] Optionally, the state of the indicator light 292 is one of a plurality of colors, one of a plurality of flashing frequencies, or a combination of one of a plurality of colors and one of a plurality of flashing frequencies.

[0065] Specifically, the state be indicated by a combination of a blue color and a flashing frequency. The indicator light 292 is disposed on the circuit board 29 to distinguish two protection states. For example, the test button 21 displays the blue color during normal operation. In the event of leakage protection, the test button 21 continues to display blue, and the tripping pole handle 22 is in the tripped state. In the event of electronic overload protection, the test button 21 displays blue flashing, and the tripping pole handle 22 is not in a tripped state, which can further distinguish the electronic overload protection from the leakage protection. Of course, it is also possible to display other states through the test button 21, e.g., display two different state by displaying different colors or different flashing frequencies.

[0066] Further, when the residual current operated circuit breaker has more functions, such as short-circuit protection, electronic overload protection, overload protection of the bimetallic element 11 as backup protection, electric leakage protection, current detection under over- and under-voltage protection current detection, jacks 291 formed in the circuit board 29 may be formed in a wire incoming end and a wire outgoing end as current calibration holes, or the jacks 291 may also be used as communication ports, and a short-circuit fault, an overload fault and an electric leakage fault state may be intuitively displayed through the test button 21 on the appearance of the residual current operated circuit breaker. A state indication of the indicator light 292, the action states of the L-pole handle 13, the tripping pole handle 22 and the N-pole handle 32 and the corresponding fault relationship are as follows:

the circuit breaker displays blue while operating normally; if a short-circuit fault is indicated, the L-pole handle 13 and the N-pole handle 32 trip, and the tripping pole handle 22 does not trip; if an overload fault is displayed, the L-pole handle 13 and the N-pole handle 32 trip, the tripping pole handle 22 trips, and the indicator light 292 displays red; if a leakage fault is indicated, the L-pole handle 13 and the N-pole handle 32 trip, the tripping pole handle 22 trips, and the indicator light 292 displays blue; if an

over-voltage fault in the electrical circuit is indicated, the L-pole handle 13 and the N-pole handle 32 trip, the tripping pole handle 22 trips, and the indicator light 292 displays yellow; and if an under-voltage fault in the electric circuit is indicated, the L-pole handle 13 and the N-pole handle 32 trip, the tripping pole handle 22 trips, and the indicator light 292 displays yellow flashing.

[0067] Of course, the colors of the indicator light 292 are not limited to the above several colors, but may also be indicated by changing the flashing frequency indication states of the indicator light 292, etc., which will not be repeated.

[0068] It is obvious that the above description only gives examples for clarity, which does not impose a limitation on their embodiments. A person skilled in the art can make various changes or modifications on the basis of the above description. There is no need and inability to give all exhaustive embodiments. However, any modification, equivalent replacement and improvement made within the essence and principle of the present invention shall be included in the protection scope of the present invention.

Claims

1. A residual current operated circuit breaker, comprising an L-pole circuit breaker module (1), an electric leakage tripping pole module (2) and an N-pole circuit breaker module (3), wherein the L-pole circuit breaker module (1) and the N-pole circuit breaker module (3) are disposed on both sides of the electric leakage tripping pole module (2) respectively; the L-pole circuit breaker module (1) comprises an L-pole moving contact mechanism (12); the N-pole circuit breaker module (3) comprises an N-pole moving contact mechanism (33); the electric leakage tripping pole module (2) comprises an electric leakage jump buckle (24), an electric leakage lock buckle (27), a resetting member (25), a rocker arm (26), an assembling shaft (28) and a tripping device (201); the electric leakage jump buckle (24) can be lapped with the electric leakage lock buckle (27); the rocker arm (26) abuts against the resetting member (25);

the assembling shaft (28) is in linkage with the L-pole moving contact mechanism (12) and the N-pole moving contact mechanism (33);

the rocker arm (26) is connected to one side of the electric leakage lock buckle (27); at least one of the rocker arm (26) and the electric leakage lock buckle (27) can abut against the assembling shaft (28); and

in the event of an overload current or a leakage current in an electric circuit, the tripping device (201) can push the electric leakage lock buckle (27), so when the electric leakage jump buckle (24) is separated from the electric leakage lock

- buckle (27), the electric leakage lock buckle (27) rotates in a direction close to the assembling shaft (28), and the resetting member (25) drives the rocker arm (26) to rotate, so that at least one of the rocker arm (26) and the electric leakage lock buckle (27) pushes the assembling shaft (28).
2. The residual current operated circuit breaker according to claim 1, wherein
- the electric leakage lock buckle (27) and the rocker arm (26) are capable of abutting against the assembling shaft (28) at the same time, so that the rocker arm (26) and the electric leakage lock buckle (27) simultaneously push the assembling shaft (28); or
- the electric leakage lock buckle (27) is capable of abutting against the assembling shaft (28) ahead of the rocker arm (26), so that the electric leakage lock buckle (27) pushes the assembling shaft (28); or
- the electric leakage lock buckle (27) is capable of abutting against the assembling shaft (28) ahead of the rocker arm (26), and the rocker arm (26) is capable of abutting against the assembling shaft (28), so that the rocker arm (26) and the electric leakage lock buckle (27) simultaneously push the assembling shaft (28); or
- the rocker arm (26) is capable of abutting against the assembling shaft (28) ahead of the electric leakage lock buckle (27), so that the rocker arm (26) pushes the assembling shaft (28).
3. The residual current operated circuit breaker according to claim 1, wherein the L-pole moving contact mechanism (12) comprises an L-pole lock buckle (121), and the N-pole moving contact mechanism (33) comprises an N-pole lock buckle (331);
- the assembling shaft (28) is fixedly connected to the L-pole lock buckle (121) and is in clearance fit with the N-pole lock buckle (331); or
- the assembling shaft (28) is in clearance fit with the L-pole lock buckle (121) and is fixedly connected to the N-pole lock buckle (331); or
- the assembling shaft (28) is fixedly connected to the L-pole lock buckle (121) and is fixedly connected to the N-pole lock buckle (331).
4. The residual current operated circuit breaker according to claim 3, wherein the assembling shaft (28) is fixedly connected to the L-pole lock buckle (121) and is in clearance fit with the N-pole lock buckle (331); and when the tripping device (201) pushes the electric leakage lock buckle (27), the electric leakage lock buckle (27) pushes the N-pole lock buckle (331).
5. The residual current operated circuit breaker according to claim 4, wherein the electric leakage lock buckle (27) comprises an electric leakage lock buckle body (272), and a protrusion portion (271) connected to the electric leakage lock buckle body (272); the protrusion portion (271) is provided at an angle to the electric leakage lock buckle body (272); the protrusion portion (271) is disposed on one side of the electric leakage lock buckle body (272) facing the N-pole circuit breaker module (3); and the protrusion portion (271) is capable of pushing the N-pole lock buckle (331).
6. The residual current operated circuit breaker according to claim 3, wherein the assembling shaft (28) is in clearance fit with the L-pole lock buckle (121) and is fixedly connected to the N-pole lock buckle (331); and when the tripping device (201) pushes the electric leakage lock buckle (27), the electric leakage lock buckle (27) pushes the L-pole lock buckle (121).
7. The residual current operated circuit breaker according to claim 6, wherein the electric leakage lock buckle (27) comprises an electric leakage lock buckle body (272), and a protrusion portion (271) connected to the electric leakage lock buckle body (272); the protrusion portion (271) is provided at an angle to the electric leakage lock buckle body (272); the protrusion portion (271) is disposed on one side of the electric leakage lock buckle body (272) facing the L-pole circuit breaker module (1); and the protrusion portion (271) is capable of pushing the L-pole lock buckle (121).
8. The residual current operated circuit breaker according to claim 5 or 7, wherein the rocker arm (26) is disposed on one side of the electric leakage lock buckle body (272) away from the protrusion portion (271).
9. The residual current operated circuit breaker according to any one of claims 1 to 7, wherein the rocker arm (26) comprises a rocker arm body (261) and a first connecting shaft (262) disposed on the rocker arm body (261), the electric leakage lock buckle (27) is connected to the first connecting shaft (262), and the electric leakage lock buckle (27) is capable of rotating around the first connecting shaft (262).
10. The residual current operated circuit breaker according to any one of claims 1 to 7, wherein the rocker arm (26) comprises a rocker arm body (261) and a mounting hole (264) formed in the rocker arm body (261), the rocker arm body (261) is connected to a fixed shaft of a shell through the mounting hole (264), and the resetting member (25) is capable of driving the rocker arm body (261) to rotate around the fixed shaft (261).

11. The residual current operated circuit breaker according to any one of claims 1 to 7, wherein the rocker arm (26) comprises a rocker arm body (261) and a second connecting shaft (263) disposed on the rocker arm body (261), the electric leakage jump buckle (24) is connected to the second connecting shaft (263), and the electric leakage jump buckle (24) is capable of rotating around the second connecting shaft (263). 5
12. The residual current operated circuit breaker according to any one of claims 1 to 7, wherein the rocker arm (26) comprises a rocker arm body (261) and a bent structure (265) connected to one end of the rocker arm body (261), and the bent structure (265) is disposed around the assembling shaft (28). 10 15
13. The residual current operated circuit breaker according to any one of claims 1 to 7, wherein the electric leakage tripping pole module (2) further comprises a circuit board (29) and a state indication module; the tripping device (201) and the state indication module are electrically connected to the circuit board (29), respectively; the circuit board (29) is capable of detecting a current signal; and when the current signal reaches an action current threshold, the tripping device (201) pushes the electric leakage lock buckle (27), and the state indication module has a plurality of states and is capable of presenting one of the plurality of states. 20 25 30
14. The residual current operated circuit breaker according to claim 13, wherein the state indication module comprises an indicator light (292); the electric leakage tripping pole module (2) further comprises a test button (21); the test button (21) comprises a button body (211) and a connecting end (212); the button body (211) has a transparent structure; the connecting end (212) is connected to the circuit board (29); and the button body (211) covers the indicator light (292). 35 40
15. The residual current operated circuit breaker according to any one of claims 1 to 7, wherein the electric leakage tripping pole module (2) further comprises a zero-sequence transformer (20), and the N-pole circuit breaker module (3) further comprises a current transformer (34). 45

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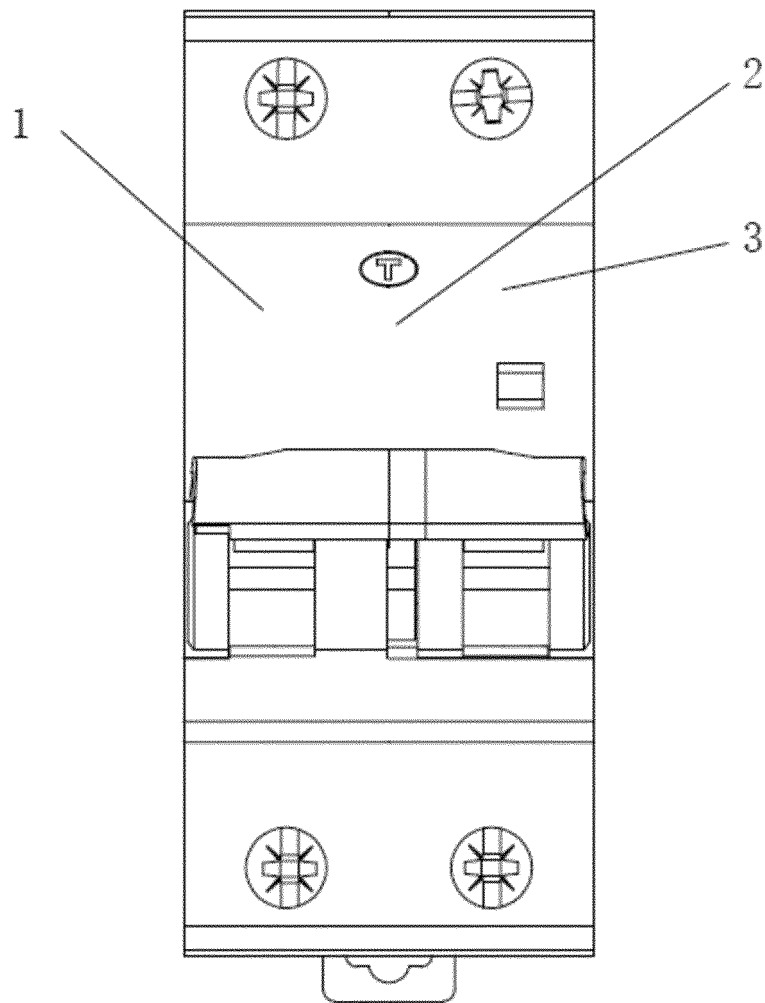


Fig.1

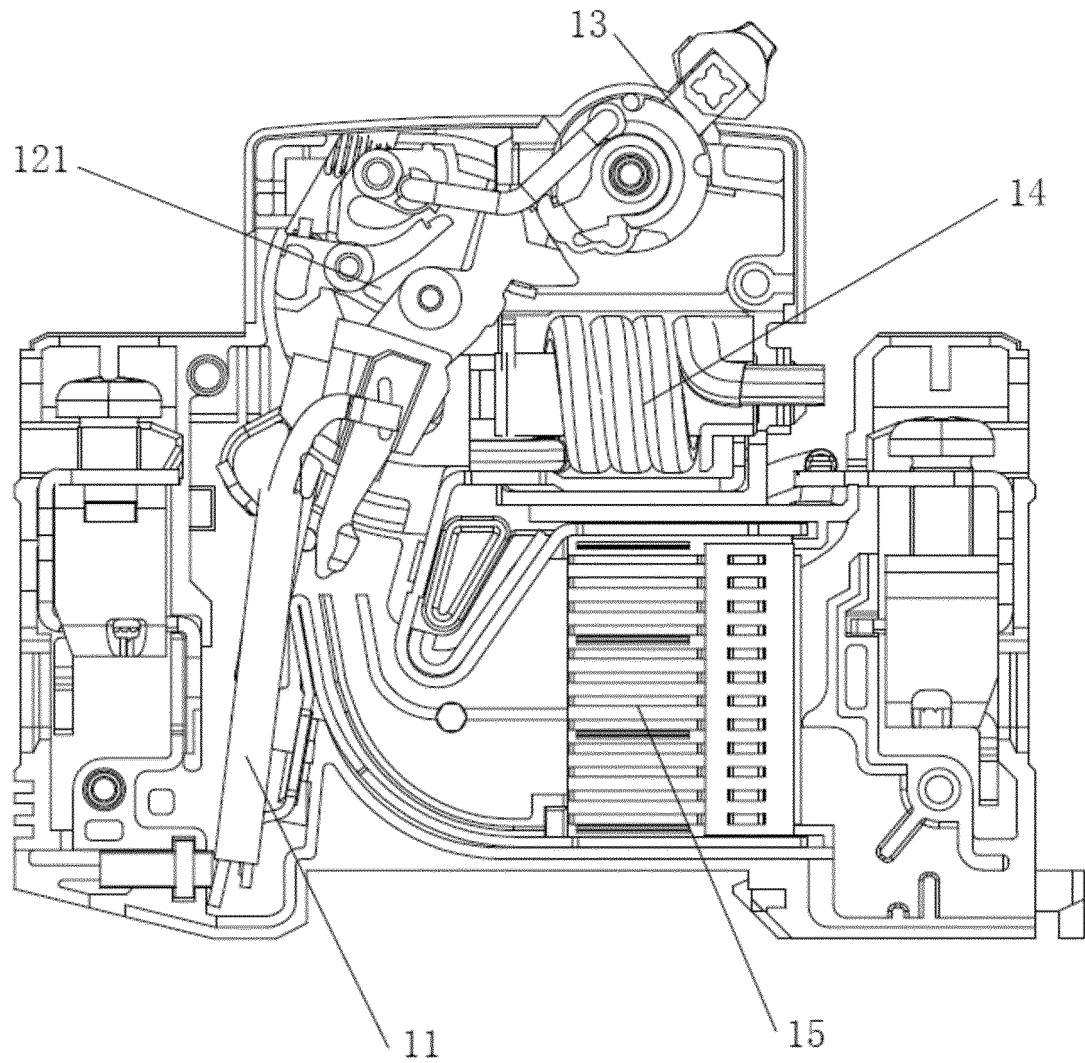


Fig.2

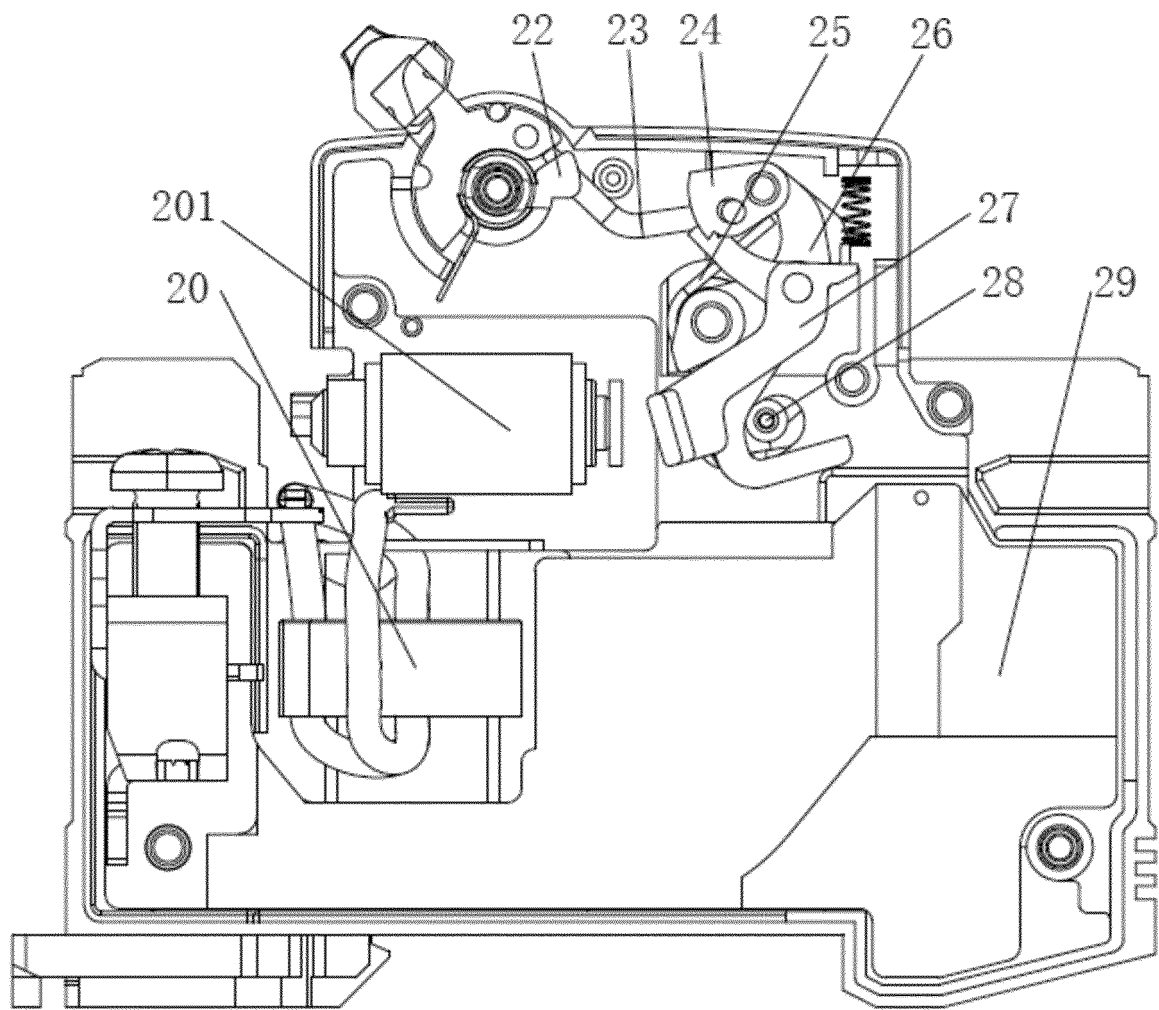


Fig.3

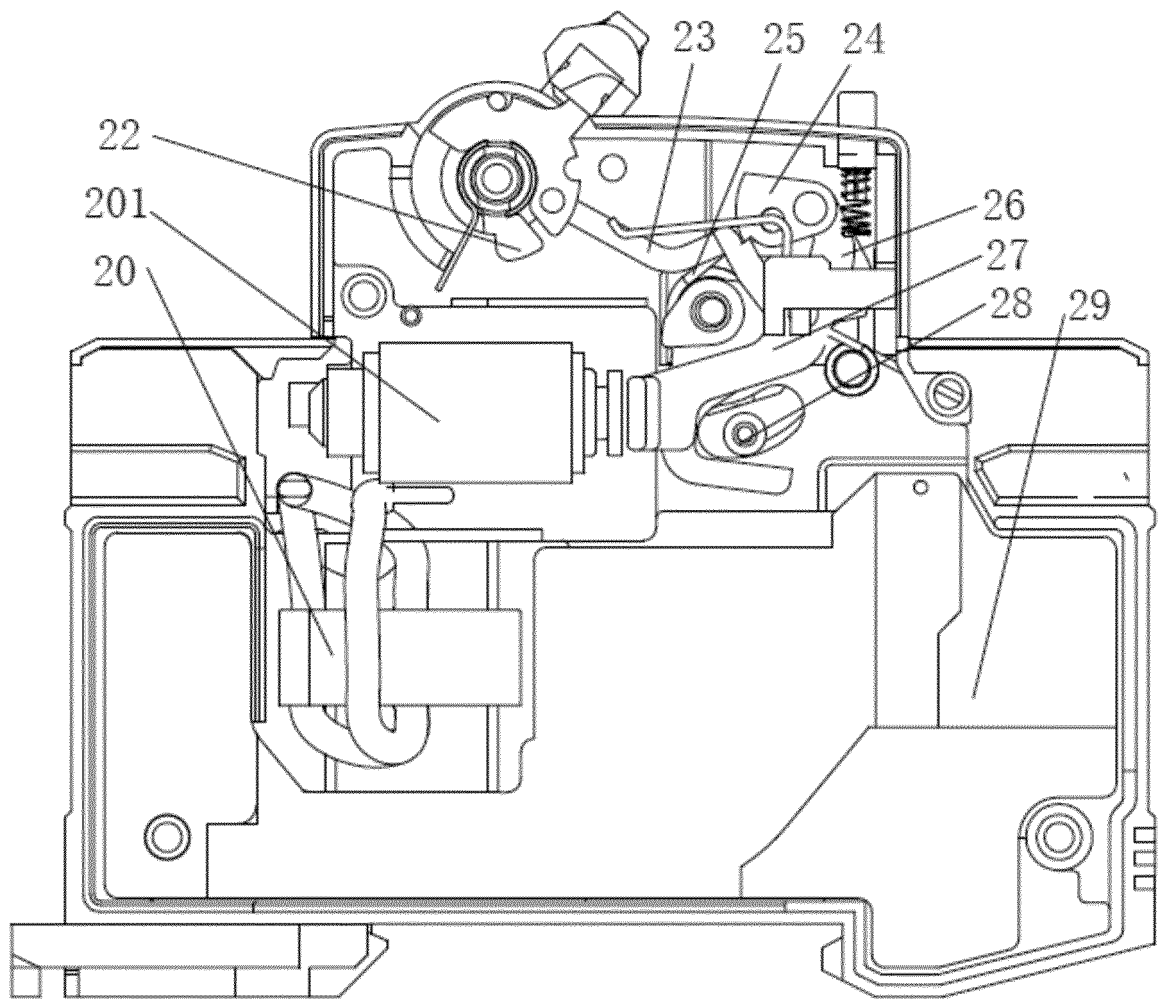


Fig.4

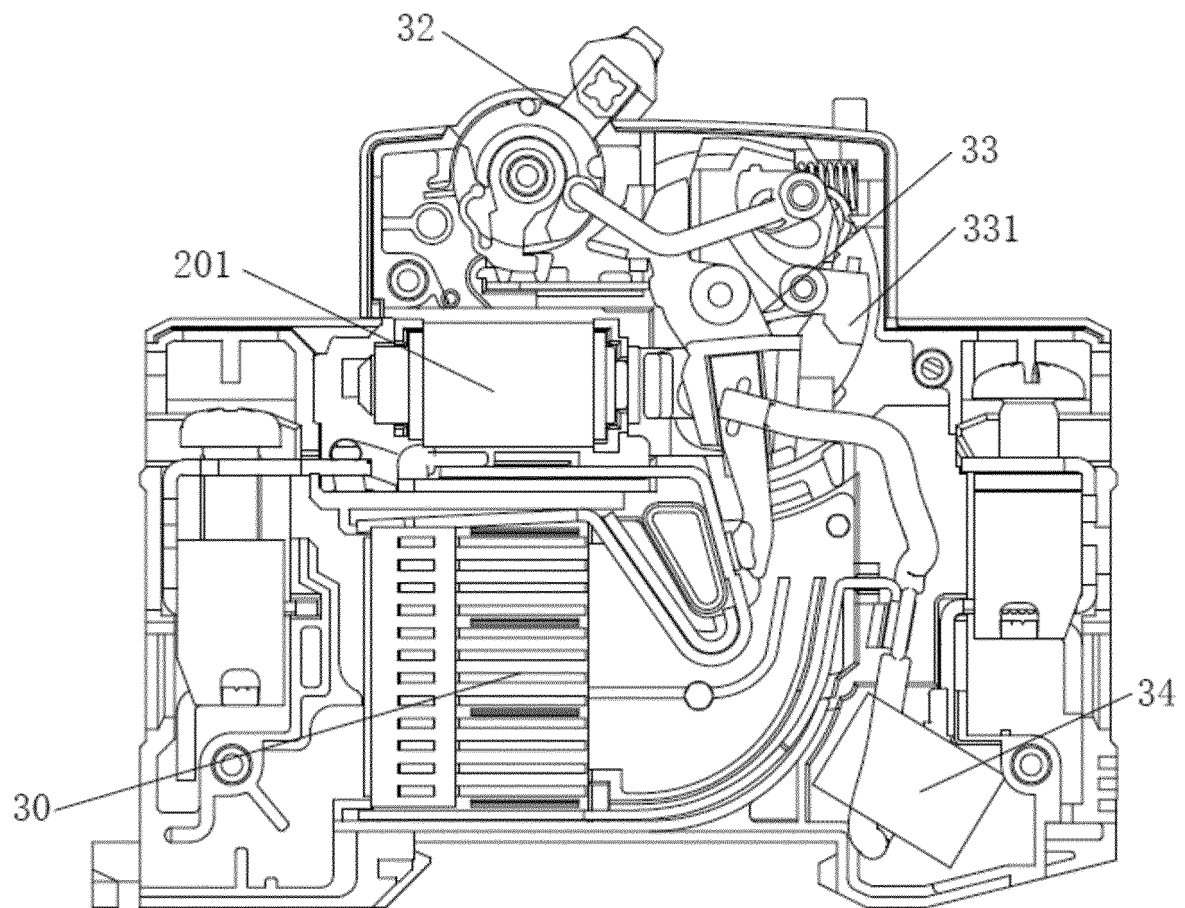


Fig.5

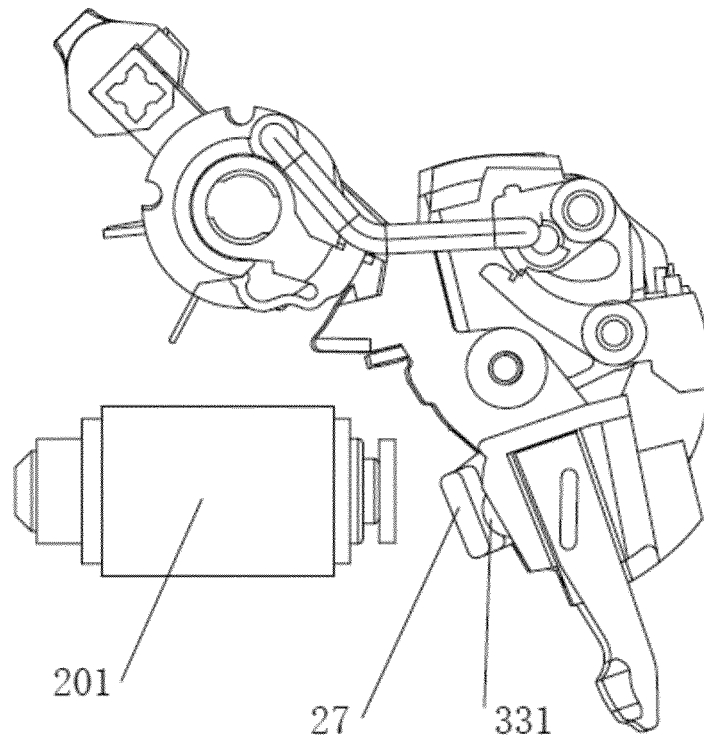


Fig.6

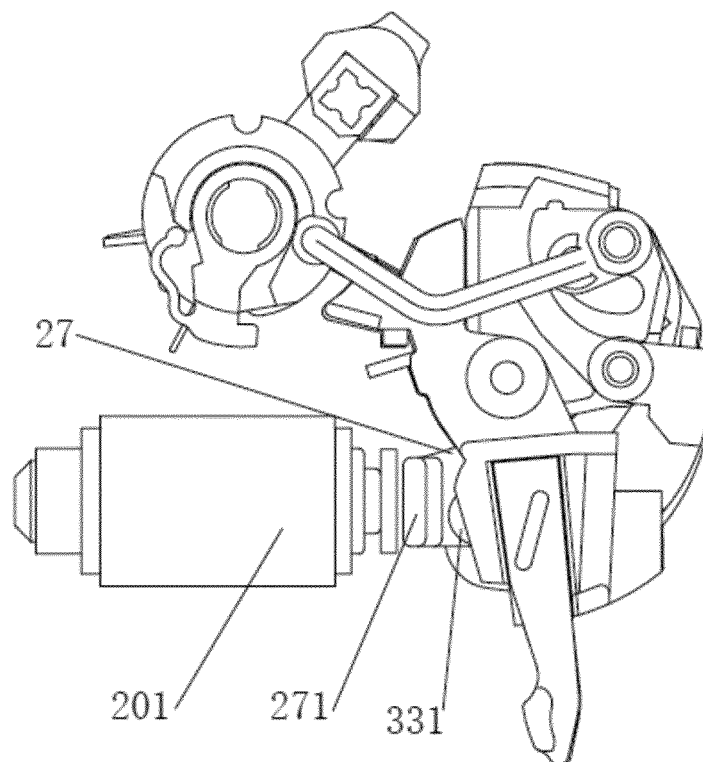


Fig.7

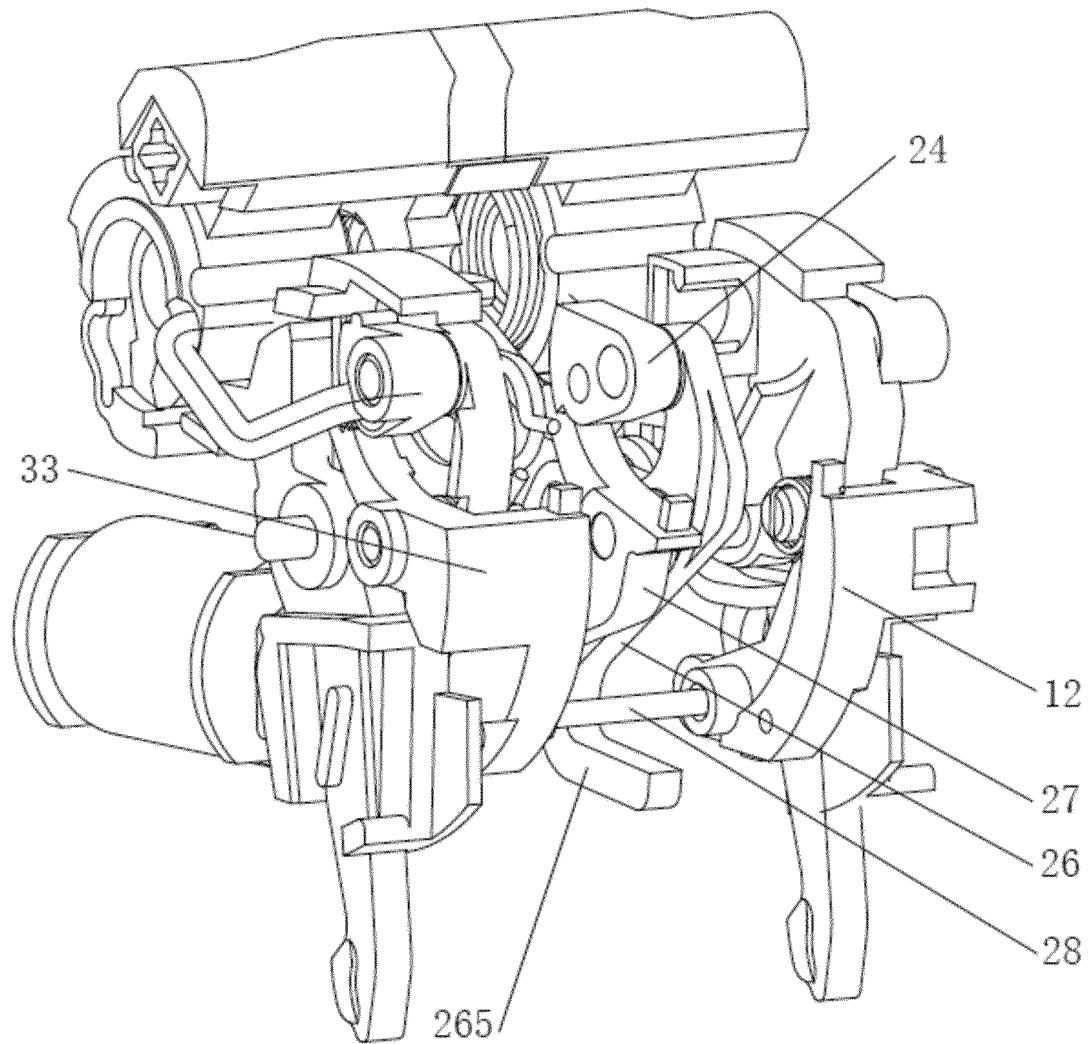


Fig. 8

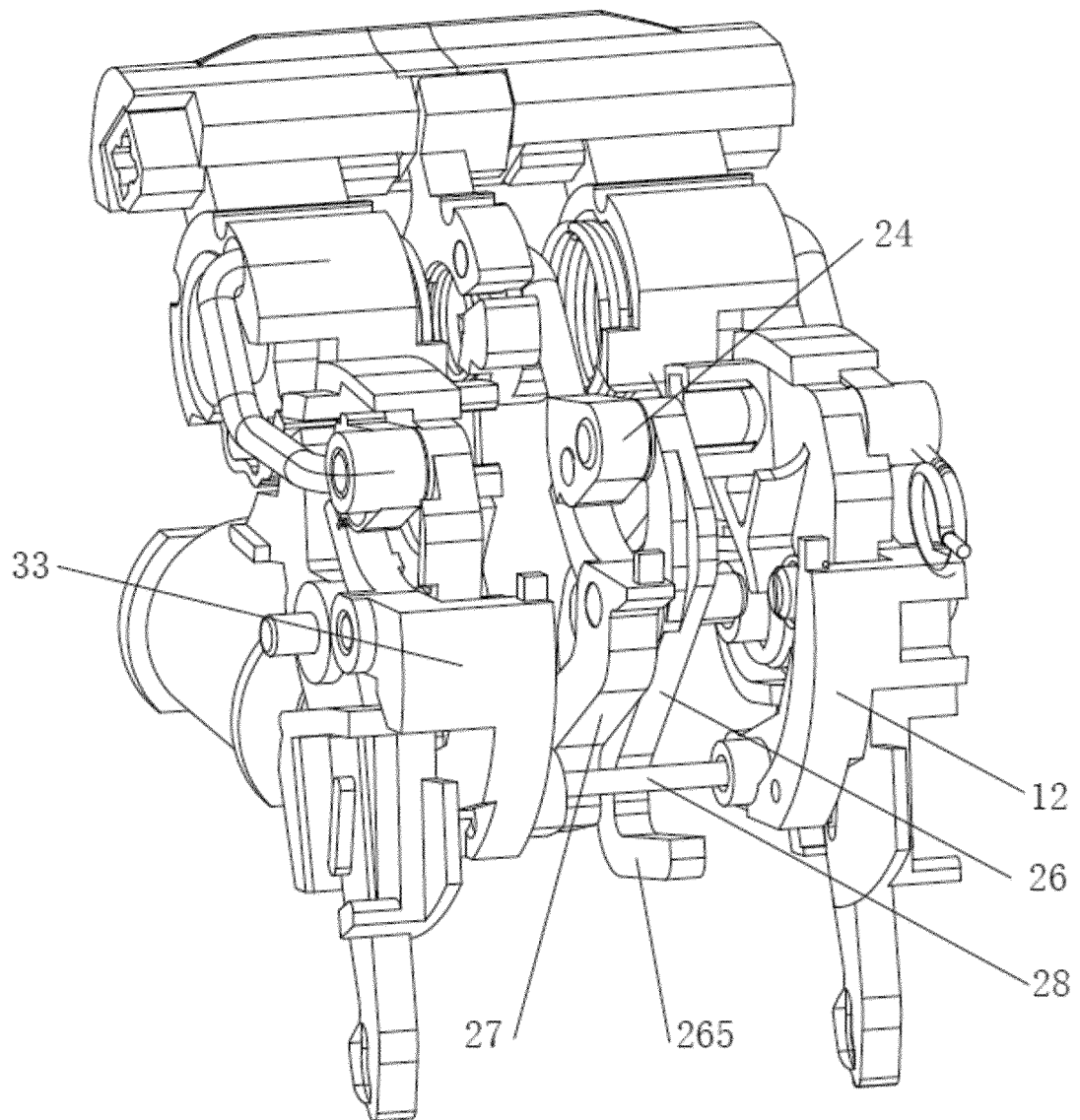


Fig.9

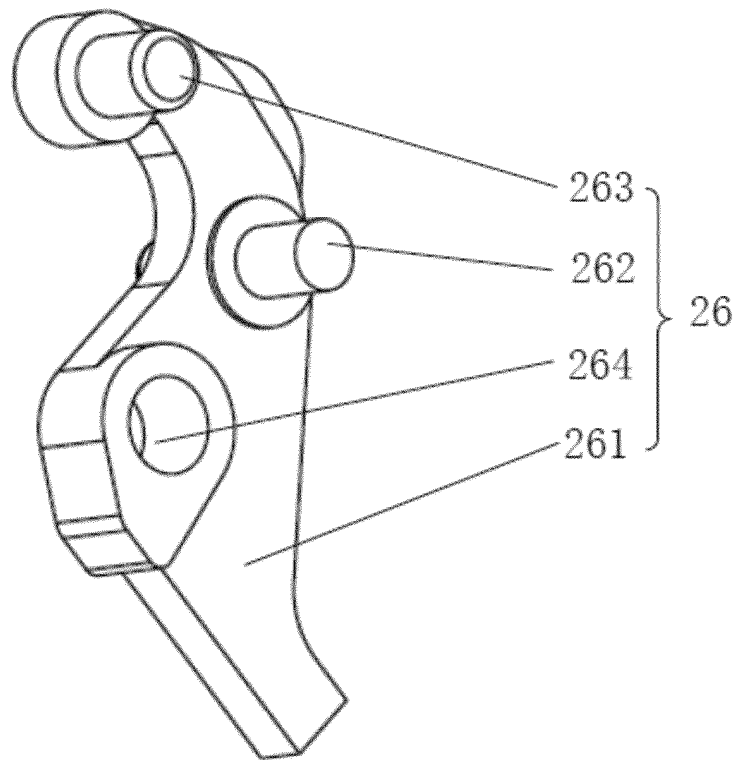


Fig. 10

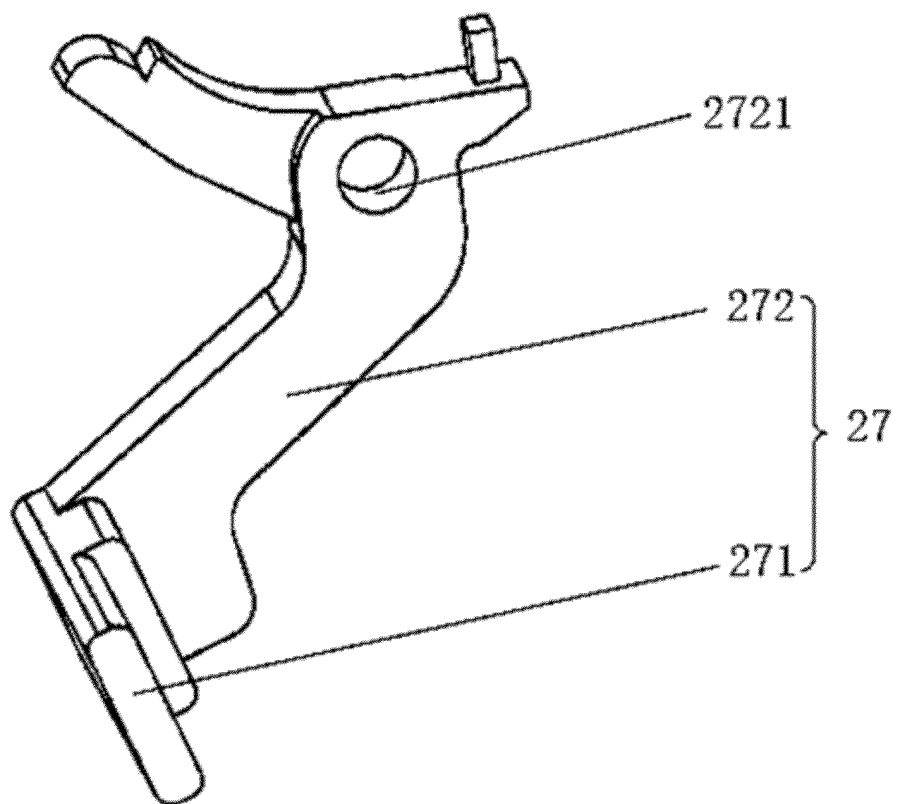


Fig. 11

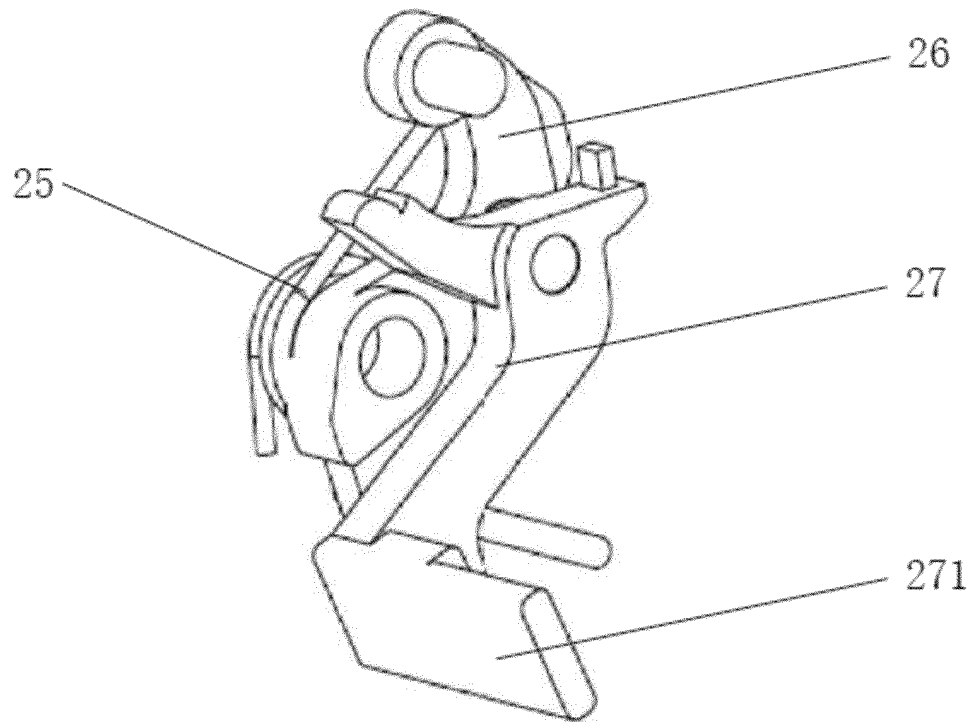


Fig. 12

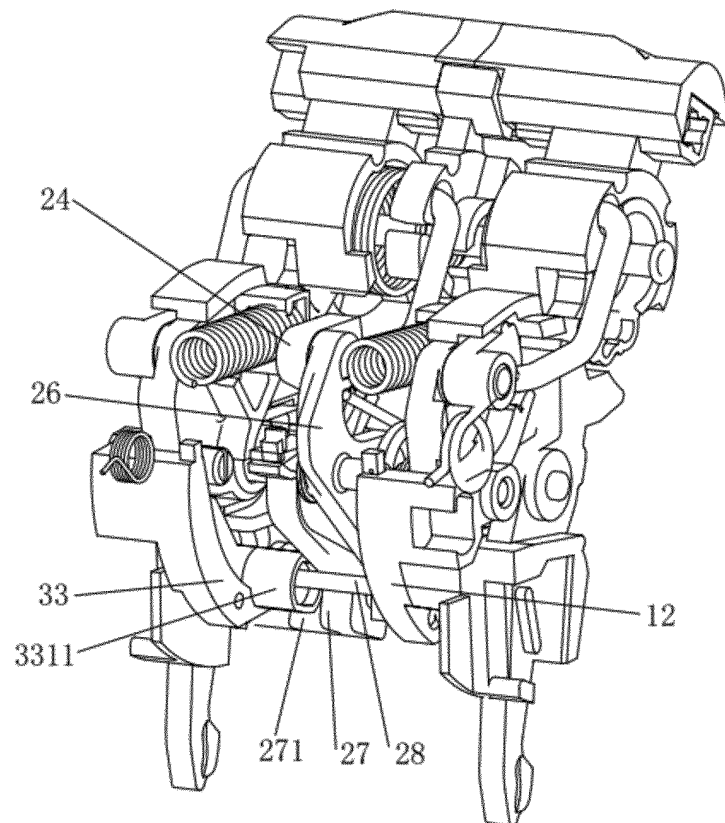


Fig. 13

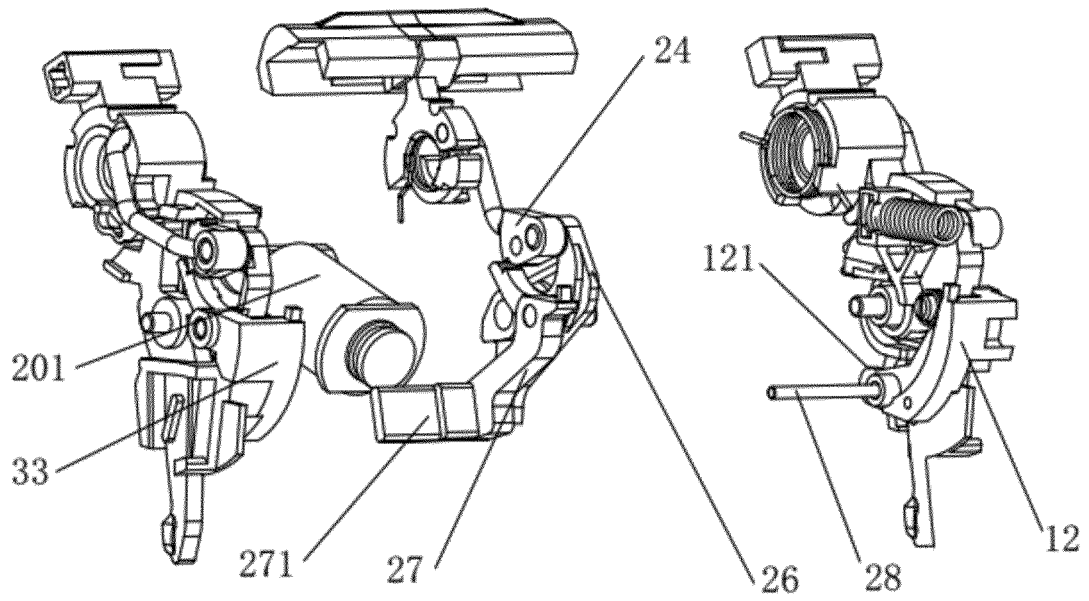


Fig. 14

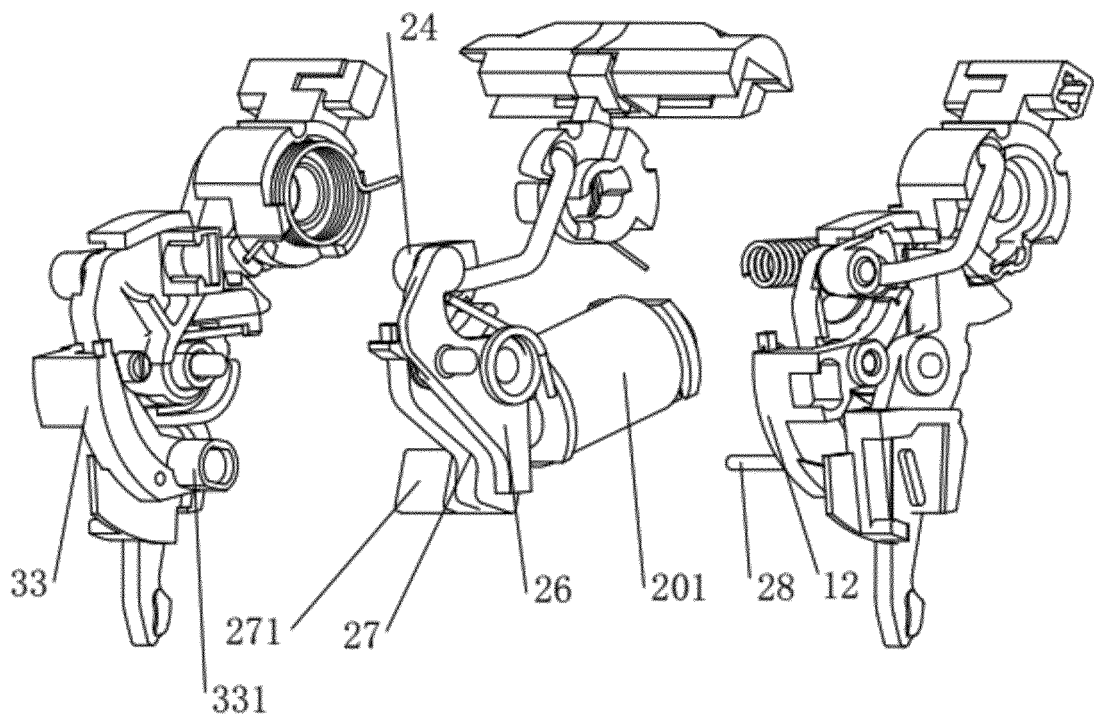


Fig. 15

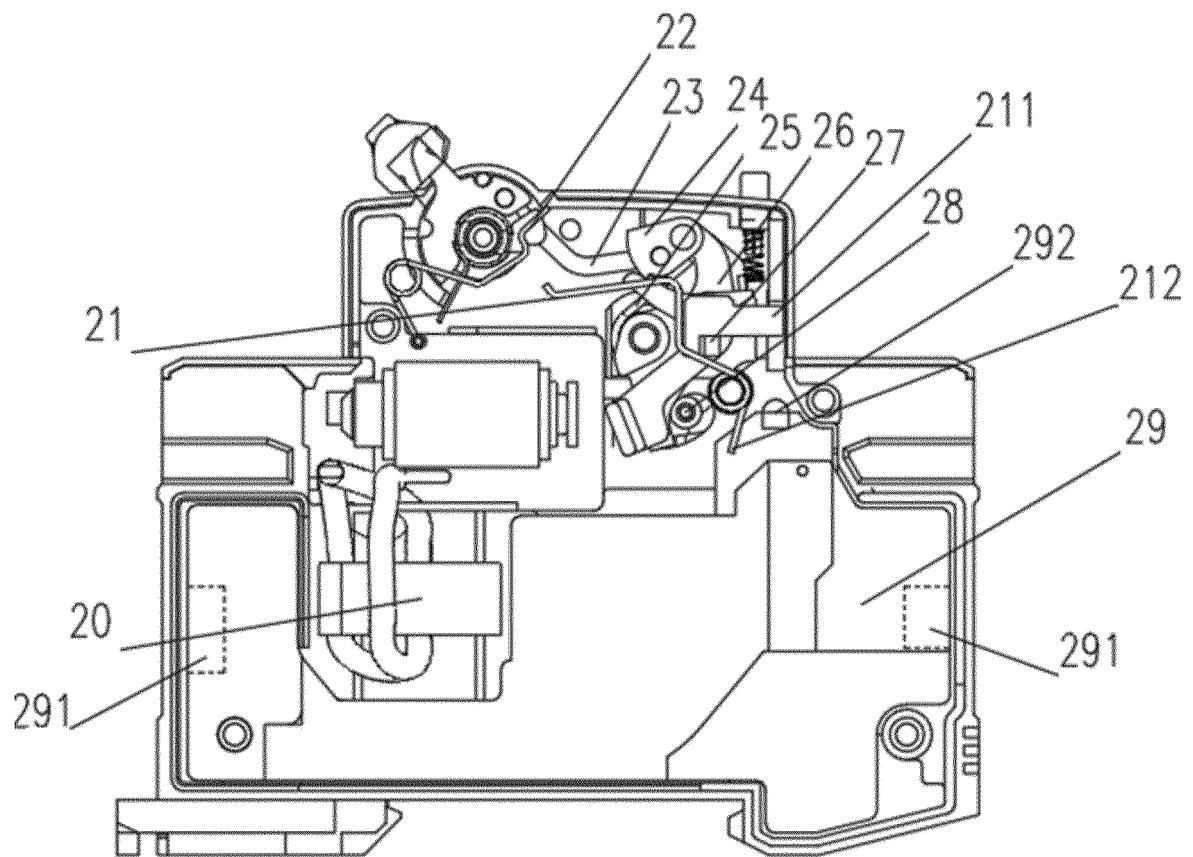


Fig.16

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2022/117552

A. CLASSIFICATION OF SUBJECT MATTER H01H71/10(2006.01)i According to International Patent Classification (IPC) or to both national classification and IPC																			
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC:H01H Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched																			
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) CNABS; CNTXT; CNKI; VEN; USTXT; WOTXT; EPTXT: 脱扣, 跳扣, 互感器, 锁扣, 漏电, 剩余, trip+, lock+, leakage, residual+, transformer, sensor																			
C. DOCUMENTS CONSIDERED TO BE RELEVANT																			
<table border="1"> <thead> <tr> <th>Category*</th><th>Citation of document, with indication, where appropriate, of the relevant passages</th><th>Relevant to claim No.</th></tr> </thead> <tbody> <tr> <td>PX</td><td>CN 114899055 A (ZHEJIANG CHINT ELECTRICS CO., LTD.) 12 August 2022 (2022-08-12) claims 1-15</td><td>1-15</td></tr> <tr> <td>X</td><td>CN 102683131 A (SEARI ELECTRICAL APPARATUS TECHNOLOGY CO., LTD. et al.) 19 September 2012 (2012-09-19) description, paragraphs [0039]-[0042], and figures 1-10</td><td>1, 3, 4, 6, 9-11, 13-15</td></tr> <tr> <td>A</td><td>CN 102683131 A (SEARI ELECTRICAL APPARATUS TECHNOLOGY CO., LTD. et al.) 19 September 2012 (2012-09-19) description, paragraphs [0039]-[0042], and figures 1-10</td><td>2, 5, 7, 8, 12</td></tr> <tr> <td>A</td><td>CN 113889377 A (ZHEJIANG CHINT ELECTRICS CO., LTD.) 04 January 2022 (2022-01-04) description, paragraphs [0034]-[0059], and figures 1-13</td><td>1-15</td></tr> <tr> <td>A</td><td>CN 212783272 U (ZHEJIANG CHINT ELECTRICS CO., LTD.) 23 March 2021 (2021-03-23) description, paragraphs [0031]-[0059], and figures 1-15</td><td>1-15</td></tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	PX	CN 114899055 A (ZHEJIANG CHINT ELECTRICS CO., LTD.) 12 August 2022 (2022-08-12) claims 1-15	1-15	X	CN 102683131 A (SEARI ELECTRICAL APPARATUS TECHNOLOGY CO., LTD. et al.) 19 September 2012 (2012-09-19) description, paragraphs [0039]-[0042], and figures 1-10	1, 3, 4, 6, 9-11, 13-15	A	CN 102683131 A (SEARI ELECTRICAL APPARATUS TECHNOLOGY CO., LTD. et al.) 19 September 2012 (2012-09-19) description, paragraphs [0039]-[0042], and figures 1-10	2, 5, 7, 8, 12	A	CN 113889377 A (ZHEJIANG CHINT ELECTRICS CO., LTD.) 04 January 2022 (2022-01-04) description, paragraphs [0034]-[0059], and figures 1-13	1-15	A	CN 212783272 U (ZHEJIANG CHINT ELECTRICS CO., LTD.) 23 March 2021 (2021-03-23) description, paragraphs [0031]-[0059], and figures 1-15	1-15	
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☒ Further documents are listed in the continuation of Box C.	☒ See patent family annex.																		
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Date of the actual completion of the international search 09 February 2023	Date of mailing of the international search report 01 March 2023																		
Name and mailing address of the ISA/CN China National Intellectual Property Administration (ISA/CN) China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088 Facsimile No. (86-10)62019451	Authorized officer Telephone No.																		

Form PCT/ISA/210 (second sheet) (July 2022)

INTERNATIONAL SEARCH REPORT

International application No. PCT/CN2022/117552

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
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