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(54) CIRCUIT BREAKER

(57) The present invention relates to the field of low-voltage electrical appliances, in particular to a circuit breaker. The circuit breaker includes a circuit breaker housing, and an operating mechanism, a contact system, a wire-incoming terminal, a wire-outgoing terminal, an arc-extinguishing chamber and a thermomagnetic tripping mechanism arranged in the circuit breaker housing. The contact system includes a first contact structure and a second contact structure which are arranged in synchronous rotation. In a height direction of the circuit breaker, an operating member of the operating mechanism, the contact system and the arc-extinguishing chamber are arranged sequentially; and in a length direction of the circuit breaker, the wire-incoming terminal and the wire-outgoing terminal are located at both ends of the circuit breaker, the contact system and the arc-extinguishing chamber are located between the wire-incoming terminal and the wire-outgoing terminal, the contact system and the arc-extinguishing chamber are located on one side of the thermomagnetic tripping mechanism, the wire-incoming terminal or the wire-outgoing terminal is located on the other side of the thermomagnetic tripping mechanism, and the first contact structure and the second contact structure are arranged side by side. The circuit breaker is more reasonable in internal layout, and provides a larger assembly space for the arc-extinguishing chamber.

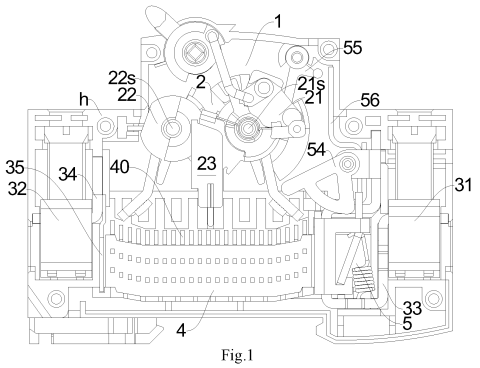

Fig.1

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Description

TECHNICAL FIELD

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

BACKGROUND

[0002] The internal layout of the existing circuit breaker leads to a limited mounting space of an arc-extinguishing chamber and fails to accommodate an arc-extinguishing chamber of a larger specification, thereby affecting an arc-extinguishing capacity and breaking capacity of the circuit breaker. Moreover, in respect of a contact system of the existing circuit breaker, due to a limited internal space of the circuit breaker, an opening distance cannot be greatly improved, limiting the improvement of the breaking capacity of a circuit breaker.

SUMMARY

[0003] An object of the present invention is to overcome at least one defect of the prior art, and provide a circuit breaker, which has more reasonable internal layout and provides a larger assembly space for an arc-extinguishing chamber.

[0004] In order to achieve the above object, the present invention adopts the following technical solutions:

a circuit breaker, comprising a circuit breaker housing, and an operating mechanism, a contact system, a wire-incoming terminal, a wire-outgoing terminal, an arc-extinguishing chamber and a thermomagnetic tripping mechanism which are separately arranged in the circuit breaker housing, wherein the contact system comprises a first contact structure and a second contact structure that are arranged in synchronous rotation;

in a height direction of the circuit breaker, an operating member of the operating mechanism, the contact system and the arc-extinguishing chamber are arranged in sequence; and

in a length direction of the circuit breaker, the wire-incoming terminal and the wire-outgoing terminal are located at both ends of the circuit breaker; the contact system and the arc-extinguishing chamber are located between the wire-incoming terminal and the wire-outgoing terminal; the contact system and the arc-extinguishing chamber are located on one side of the thermomagnetic tripping mechanism; the wire-incoming terminal or the wire-outgoing terminal is located on another side of the thermomagnetic tripping mechanism; and the first contact structure and the second contact structure are arranged side by side.

[0005] Further, the wire-incoming terminal, the first contact structure, the second contact structure and the wire-outgoing terminal are sequentially arranged side by side in the length direction of the circuit breaker; an arc inlet of the arc-extinguishing chamber is positioned opposite to a breaking interval formed by a disconnection of the first contact structure and the second contact structure and is oriented towards the operating member.

[0006] Further, the operating mechanism further comprises a main link rod, a jump catch and a lock catch; the first contact structure comprises a first support and a first contact; the first support is arranged pivotally in the circuit breaker housing; the first contact is arranged on the first support and rotates synchronously with the first support under the driving of the first support; the jump catch and the lock catch are arranged pivotally on the first support respectively and snap fit with each other; and two ends of the main link rod are hinged with the operating member and the jump catch, respectively.

[0007] Further, the operating mechanism further comprises a linkage rocker; the linkage rocker and the lock catch are arranged coaxially and in synchronous rotation; in a thickness direction of the circuit breaker, the linkage rocker and the lock catch are separately located on both sides of the first support; the thermomagnetic tripping mechanism comprises a thermal tripping structure and a magnetic tripping structure; the thermal tripping structure is used for driving the lock catch to rotate through the linkage rocker and disengage from the jump catch when an overload fault occurs in a circuit where the circuit breaker is installed the magnetic tripping structure is used for directly driving the lock catch to rotate and disengage from the jump catch when a short-circuit fault occurs in the circuit where the circuit breaker is installed; and when a plurality of circuit breakers are arranged side by side and in linkage, in any two circuit breaker adjacent to each other, the lock catch of one circuit breaker is in driving connection with the linkage rocker of another circuit breaker.

[0008] Further, the thermomagnetic tripping mechanism comprises a thermal tripping structure which is used for driving the operating mechanism to trip when an overload fault occurs in the circuit where the circuit breaker is installed and a magnetic tripping structure which is used for driving the operating mechanism to trip when a short-circuit fault occurs in a circuit where the circuit breaker is installed, and the thermal tripping structure and the magnetic tripping structure are arranged side by side in the height direction of the circuit breaker.

[0009] Further, in the length direction of the circuit breaker, the thermal tripping structure is located between the contact system and the wire-incoming terminal or the wire-outgoing terminal, and the magnetic tripping structure is located between the arc-extinguishing chamber and the wire-incoming terminal or the wire-outgoing terminal.

[0010] Further, the circuit breaker further comprises an arc-striking plate, which is electrically connected to the

wire-outgoing terminal and located between the wire-outgoing terminal and the arc-extinguishing chamber in the length direction of the circuit breaker.

[0011] Further, the thermomagnetic tripping mechanism further comprises a thermal tripping transmission member which is arranged pivotally; the thermal tripping structure comprises a bimetallic assembly; the thermal tripping transmission member is located between the operating mechanism and the bimetallic assembly.

[0012] Further, the thermomagnetic tripping mechanism further comprises a magnetic tripping transmission member which is arranged pivotally; the magnetic tripping structure is a clapper-type electromagnetic trip, and comprises an armature which is arranged pivotally; the magnetic tripping transmission member is located between the operating mechanism and the armature; rotation centers of the lock catch of the operating mechanism, magnetic tripping transmission member and thermal tripping transmission member are respectively located at three vertices of a triangle.

[0013] Further, the thermomagnetic tripping mechanism further comprises a magnetic tripping transmission member which is arranged pivotally; the magnetic tripping structure is a direct-acting electromagnetic trip; the magnetic tripping transmission member is located between the operating mechanism and the magnetic tripping structure; one end of the magnetic tripping transmission member is in transmission fit with the operating mechanism; and another end of the magnetic tripping transmission member is in transmission fit with an ejector rod of the direct-acting electromagnetic trip.

[0014] Further, the contact system further comprises a separator; the separator is located between the first contact structure and the second contact structure in the length direction of the circuit breaker; the separator comprises a separation portion; when the first contact structure and the second contact structure are closed, the separator is driven to make the separation portion move out of a position between a first contact point of the first contact structure and a second contact point of the second contact structure; and when the first contact structure and the second contact structure are diconnected, the separator is driven to make the separation portion move to the position between the first contact point and the second contact point.

[0015] Further, the arc-extinguishing chamber comprises a plurality of arc-extinguishing grids, which is sequentially arranged at intervals side by side in the length direction of the circuit breaker; rotation centers of the operating member, first contact structure and second contact structure are separately located at three vertices of an acute triangle.

[0016] Further, the circuit breaker housing is a convex structure, the operating member of the operating mechanism is arranged at an upper part of the convex structure, the arc-extinguishing chamber is arranged at a lower part of the convex structure; the wire-incoming terminal and the wire-outgoing terminal are located at both ends of the lower part of the convex structure, and the contact system is located at a junction between the upper and lower parts of the convex structure.

[0017] Further, the thermomagnetic tripping mechanism comprises a thermal tripping structure, a thermal tripping transmission member, a magnetic tripping structure and a magnetic tripping transmission member; the thermal tripping transmission member is located at the upper part of the convex structure; the thermal tripping structure extends from the lower part to the upper part of the convex structure; the operating member, the thermal tripping transmission member and an upper end of the thermal tripping structure are arranged side by side in the length direction of the circuit breaker; the magnetic tripping transmission member and the magnetic tripping structure are located at the lower part of the convex structure; the magnetic tripping transmission member and the magnetic tripping structure are arranged side by side in the height direction of the circuit breaker; in the length direction of the circuit breaker, the magnetic tripping transmission member is located between the contact system and the wire-incoming terminal, the magnetic tripping structure is located between the arc-extinguishing chamber and the wire-incoming terminal.

[0018] Further, the first contact structure and the second contact structure are arranged in symmetrical and synchronous rotation.

[0019] The circuit breaker of the present invention has a reasonable and compact layout, and provides a larger assembly space for an arc-extinguishing chamber of a larger specification to be mounted, thereby being conducive to improving the arc-extinguishing performance and breaking performance of the circuit breaker. Moreover, the first contact structure and the second contact structure are arranged to rotate synchronously, which not only can double a breaking speed of a contact system but also double an opening distance, and is thus conducive to improving the breaking performance and current-carrying capacity of a short circuit.

[0020] In addition, the lock catch and the linkage rocker are respectively matched with the thermal tripping structure and the magnetic tripping structure of the thermomagnetic tripping mechanism, which provides more choice space for matching sites between the operating mechanism and the thermomagnetic tripping mechanism, facilitating layout and structural design.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021]

FIG. 1 is a schematic structural diagram of a circuit breaker of the present invention, of which a contact system is in a broken state, and which is provided with a thermomagnetic tripping mechanism of a first embodiment;

FIG. 2 is a schematic structural diagram of the circuit breaker of the present invention, of which the contact

system is in a closed state, and which is provided with the thermomagnetic tripping mechanism of the first embodiment;

FIG. 3 is a schematic structural diagram of a housing base of a circuit breaker housing in the present invention;

FIG. 4 is a schematic structural diagram of a jump catch and a lock catch of an operating mechanism, and a first contact structure and a thermomagnetic tripping mechanism, in the present invention, in which the jump catch, the lock catch and the first contact structure are in an assembled state;

FIG. 5a is a schematic structural diagram of the jump catch, the lock catch and a linkage rocker of the operating mechanism, and the first contact structure and the thermomagnetic tripping mechanism, in the present invention, in which the jump catch, the lock catch and the first contact structure are in an assembled state, and the linkage rocker and the first contact structure are in an exploded state;

FIG. 5b is an enlarged schematic structural diagram of part A in FIG. 5a of the present invention;

FIG. 6 is a schematic diagram of a three-dimensional structure of the contact system of the first embodiment in the present invention;

FIG. 7 is a schematic diagram of a projection of the contact system of the first embodiment of the present invention, showing a matching relationship between a separator and a first support;

FIG. 8 is a schematic diagram of a three-dimensional structure of the separator of the first embodiment in the present invention;

FIG. 9a is a schematic structural diagram of the first contact structure and a second contact structure of the first embodiment of the present invention;

FIG. 9b is a schematic structural diagram of the first contact structure and the second contact structure of the first embodiment of the present invention, and also showing an assembly relationship between a second reset spring and a second support;

FIG. 10 is a schematic structural diagram of the second contact structure of the first embodiment of the present invention;

FIG. 11 is a schematic structural diagram of the first contact structure of the first embodiment in the present invention;

FIG. 12 is a schematic diagram of a cross-sectional structure of the first contact structure of the first embodiment in the present invention;

FIG. 13 is a schematic structural diagram of the linkage rocker in the present invention;

FIG. 14 is a schematic structural diagram of a thermal tripping transmission member in the present invention;

FIG. 15 is a schematic structural diagram of the thermomagnetic tripping mechanism of the first embodiment in the present invention;

FIG. 16 is a schematic diagram of an assembly structure of a yoke and an armature of a magnetic tripping structure of the thermomagnetic tripping mechanism of the first embodiment in the present invention;

FIG. 17 is a schematic structural diagram of a current-carrying conductive plate in the present invention;

FIG. 18 is a schematic structural diagram of a contact system of a second embodiment in the present invention;

FIG. 19 is a schematic structural diagram of the circuit breaker of the present invention, of which the contact system is in a broken state, and which is provided with a thermomagnetic tripping mechanism of a second embodiment;

FIG. 20 is a schematic structural diagram of the thermomagnetic tripping mechanism of the second embodiment in the present invention;

FIG. 21 is another structural schematic diagram of the contact system of the second embodiment in the present invention;

FIG. 22 shows a first connection mode between the operating mechanism and the contact system of the second embodiment in the present invention;

FIG. 23 shows a second connection mode between the operating mechanism and the contact system of the second embodiment in the present invention;

FIG. 24 shows a third connection mode between the operating mechanism and the contact system of the second embodiment in the present invention;

FIG. 25 is a schematic diagram of the connection between the operating mechanism and a contact system of a third embodiment in the present invention; and

FIG. 26 is a diagram of a connection principle between the operating mechanism and the contact system of the third embodiment in the present invention.

Reference symbol represents the following component:

[0022]

h-switch housing; h21-first contact shaft slot; h22-second contact shaft hole; h23-first guide chute; h55-thermal tripping lever shaft;

1-operating mechanism; 11-operating member; 11s-fifth center; 12-main link rod; 13-jump catch; 14-lock catch; 140-lock catch main body; 141-lock catch first arm; 142-lock catch second arm; 1420-lock catch second arm connecting portion; 1421-lock catch second arm driven portion; 14-15-linkage shaft; 15-linkage rocker; 150-rocker mounting portion; 1500-rocker mounting hole; 151-rocker first arm; 1510-rocker first arm matching groove; 152-rocker second arm; 16-slider; 17s-third center; 17-21-first sub-link; 17-22-second sub-link; 17-23-supporting

member link; 17-1s-first sub-center; 17-2s-second sub-center; 17-3s-third sub-center; 17-4s-fourth sub-center; 18-supporting member; 18s-supporting member link center; 19s-fifth center;
2-contact system; 2s-contact mechanism center;
21-first contact structure; 211-first contact; 2110-first contact point; 21 11-first contact arm; 212-first support; 2120-first support main body; 21200-first support cavity; 21201-first contact insertion hole; 2121-master gear; 2122-separator driving gear; 2123-jump catch shaft; 2124-first support shaft; 2125-first support bearing portion; 2126-first contact limiting block; 2127-first contact spring shaft; 2128-jump catch limiting block; 213-first contact spring; 21s-first center;
22-second contact structure; 221-second contact; 2210-second contact point; 2211-second contact arm; 222-second support; 2220-second support main body; 2221-slave gear; 2222-second support shaft; 2223-separator limiting table; 2224-second contact limiting block; 22s-second center; 23-separator; 230-separator backplate; 231-separator rack; 232-separation portion; 2320-separation plate; 2321-reinforced connecting portion; 2333-separator first sliding rib; 234-separator second sliding rib;
31-wire-incoming terminal; 32-wire-outgoing terminal; 33-current-carrying conductive plate; 330-conductive plate wiring section; 331-conductive plate first intermediate section; 332-conductive plate second intermediate section; 333-conductive plate matching section; 334-conductive plate third intermediate section; 335-conductive plate bimetallic adjusting section; 336-conductive plate supporting arm; 34-wire-outgoing conductive plate; 35-arc-striking plate; 36-wire-incoming conductive plate;
4-arc-extinguishing chamber; 40-arc-extinguishing grid;
5-thermomagnetic tripping mechanism; 51-yoke; 510-yoke main body; 5100-yoke main body bottom plate; 5101-yoke main body side plate; 511-yoke supporting arm; 5110-yoke supporting groove; 512-yoke limiting arm; 52-armature; 520-armature main plate; 521-armature driving plate; 5210-armature limiting plate; 5211-armature driving finger; 522-armature foot; 523-armature hanging spring hole; 53-armature spring; 54-magnetic tripping transmission member; 540-magnetic tripping transmission member mounting portion; 541- magnetic tripping transmission member first arm; 542-magnetic tripping transmission member second arm; 543-magnetic tripping transmission member reinforcing rib; 54s-third center; 55-thermal tripping transmission member; 550-thermal tripping transmission member mounting portion; 5500-thermal tripping transmission member mounting hole; 551-thermal tripping transmission member driven arm; 5510-transmission member driven arm connecting portion; 5511-transmission member driven arm driven portion; 552-thermal tripping transmission member driving arm; 55s-fourth center; 56-bimetallic sheet; 57-adjusting screw; 58-bimetallic bracket; 590-coil winding; 591-coil skeleton; 592-yoke; and 593-ejector rod.

DETAILED DESCRIPTION OF THE INVENTION

[0023] The specific implementations of a switching device of the present invention will be further described below in conjunction with the embodiments given in the accompanying drawings of the specification. The switching device of the present invention is not limited to the description of the following embodiments.

[0024] The present invention discloses a switching device, preferably a circuit breaker, which includes a switch housing h (preferably a circuit breaker housing) and an operating device arranged in the switch housing h. The operating device includes an operating mechanism 1 and a contact system 2. The operating mechanism 1 is in driving connection with the contact system 2 so as to drive the contact system 2 to be closed or disconnected. Further, the switching device further includes a wire-incoming terminal 31 and a wire-outgoing terminal 32. The contact system 2 is connected in series between the wire-incoming terminal 31 and the wire-outgoing terminal 32. The switching device is electrically connected to an external circuit (i.e., a circuit where the switching device is located) through the wire-incoming terminal 31 and the wire-outgoing terminal 32.

[0025] As shown in FIGs. 1-2 and 6-7, the contact system 2 includes a contact mechanism. The contact mechanism includes a first contact structure 21 and a second contact structure 22 which are oppositely arranged side by side. A rotation direction of the first contact structure 21 keeps opposite to a rotation direction of the second contact structure 22. The first contact structure 21 and the second contact structure 22 rotate synchronously toward each other to be closed and rotate synchronously away from each other to be broken. That is, a contact point of the first contact structure 21 and a contact point of the second contact structure 22 (a first contact point 2110 of the first contact structure 21 and a second contact point 2210 of the second contact structure 22) move toward each other to be closed (the first contact point 2110 and the second contact point 2210 move close to each other to be closed) or move away from each other to be broken (the first contact point 2110 and the second contact point 2210 move away from each other to be broken). Further, the first contact structure 21 includes a first support 212 arranged pivotally around a first center 21s and a first contact 211 arranged on the first support 212. The first contact 211 may also be referred to as a first moving contact. The first contact 211 rotates around the first center 21s under the driving of the first support 212. That is, the first support 212 bears the first contact 211 (the first moving contact) and drives the first contact 211 to rotate. The second contact structure 22 includes a

second support 222 arranged pivotally around a second center 22s and a second contact 221 arranged on the second support 222. The second contact 221 may also be referred to as a second moving contact. The second contact 221 rotates around the second center 22s under the driving of the second support 222. That is, the second support 222 bears the second contact 221 (the second moving contact) and drives the second contact 221 to rotate. Further, the first contact 211 is inserted on the first support 212, and the first contact point 2110 is arranged at the other end of the first contact 211; and one end of the second contact 221 is inserted on the second support 222, and the second contact point 2210 is arranged at the other end of the second contact 221.

[0026] The first support 212 and the second support 222 are arranged pivotally on the first supporting structure, respectively. The first supporting structure is realized by the switch housing h. Further, as shown in FIG. 3, the switch housing h includes a housing base and a housing cover (not shown) that are oppositely buckled together. The housing base includes a first support shaft column and a second support shaft column which are arranged on a bottom plate of the housing base. A first base shaft hole h21 and a second base shaft hole h22 which are matched with rotating shafts (i.e., the first support shaft 2124 and the second support shaft 2222) of the first support 212 and the second support 222 are respectively formed in the middle of the first support shaft column and the second support shaft column.

[0027] Further, as shown in FIGs. 1-2, the first contact structure 21 and the second contact structure 22 are arranged in a symmetrical pivoting manner, and the symmetrical pivoting refers to symmetry of the first contact structure 21 and the second contact structure 22 in both rotation center and rotation angle, so that the first contact structure 21 and the second contact structure 22 rotate within a limited space and have a larger opening distance, thereby saving an internal space of the switching device, improving the breaking performance, facilitating the design and layout and also improving the aesthetic property. Of course, as other embodiments, the first contact structure 21 and the second contact structure 22 may also be asymmetrically arranged.

[0028] The operating mechanism 1 is in driving connection with the first contact structure 21 and/or the second contact structure 22 to drive the first contact structure 21 and the second contact structure 22 to rotate synchronously toward each other or to rotate synchronously away from each other. Specifically:

as shown in FIGs. 1-2, a first implementation mode in which the operating mechanism 1 is in driving connection with the contact system 2 is as follows: the first contact structure 21 and the second contact structure 22 are in transmission fit and rotatably arranged in linkage (that is, one of the first contact structure 21 and the second contact structure 22 rotates, and the other one is directly driven by the former and rotates synchronously); the operating mechanism 1 is in driving connection with the first contact structure 21; the operating mechanism 1 drives the first contact structure 21 to rotate, and the first contact structure 21 drives the second contact structure 22 to rotate simultaneously, so as to realize the synchronous rotation toward each other or away from each other of the first contact structure 21 and the second contact structure 22. The first contact structure 21 and the second contact structure 22 are in transmission fit with each other. The symmetrical and synchronous pivoting of the first contact structure 21 and the second contact structure 22 is conducive to the design of a transmission structure between the first contact structure 21 and the second contact structure 22, achieves higher and more reliable transmission efficiency, and ensures the closing and breaking reliability of the first contact structure 21 and the second contact structure 22. Of course, the operating mechanism 1 may also be in driving connection with the second contact structure 22. The operating mechanism 1 drives the second contact structure 22 to rotate; the second contact structure 22 drives the first contact structure 21 to rotate simultaneously, so as to realize the synchronous rotation toward each other or away from each other of the first contact structure 21 and the second contact structure 22. Further, one end of the first contact structure 21 and one end of the second contact structure 21 are arranged pivotally around the first center 21s and the second center 22s respectively, and the other ends thereof are closed or broken to close or break the contact system 2.

[0029] As shown in FIGs. 9a-11, a first embodiment of the contact system 2 is shown, wherein the operating mechanism 1 is in linkage with the first support 212 of the first contact structure 21, and the first support 212 is in linkage with the second support 222; the operating mechanism 1 drives the first support 212 to rotate, so as to drive the first contact 211 to rotate; and the first support 212 drives the second support 222 to rotate, so as to drive the second contact to rotate, so that the first contact 211 and the second contact 221 synchronously rotate toward each other or away from each other. Specifically, the first support 212 includes a master gear 2121. The second support 222 includes a slave gear 2221. The master gear 2121 is meshed with the slave gear 2221 to realize the driving fit between the first contact structure 21 and the second contact structure 22. The first support and the second support realize synchronous rotation through gear meshing, and work more reliably and stably.

[0030] Further, an axis of the master gear 2121 coincides with the first center 21s, and an axis of the slave gear 2221 coincides with the second center 22s. Of course, the axis of the master gear 2121 may also not coincide with the first center 21s, and the axis of the slave gear 2221 may also not coincide with the second center 22s.

[0031] Further, the master gear 2121 and the slave gear 2221 are both sector-shaped gears.

[0032] As shown in FIGs. 9a-11, the first support 212 includes a first support main body 2120 arranged pivo-

tally around the first center 21s. Gear teeth of the master gear 2121 are sequentially arranged on a circumferential side wall of the first support main body 2120 in a circumferential direction of the first support main body 2120. That is, the first support main body 2120 and the gear teeth arranged on the circumferential side wall of the first support main body 2120 form the master gear 2121. The second support 222 includes a second support main body 2220 arranged pivotally around the second center 22s. Gear teeth of the slave gear 2221 are sequentially arranged on a circumferential side wall of the second support main body 2220 in a circumferential direction of the second support main body 2220. That is, the second support main body 2220 and the gear teeth arranged on the circumferential side wall of the second support main body 2220 form the slave gear 2221. The gear teeth of the master gear 2121 and the gear teeth of the slave gear 2221 are located between the first support main body 2120 and the second support main body 2220 and mesh with each other.

[0033] As other embodiments, the first contact structure 21 and the second contact structure 22 may alternatively be in transmission connection indirectly. That is, the first contact structure 21 and the second contact structure 22 are in transmission connection through an intermediate transmission structure independent from two of them therebetween, so as to realize the linkage between the first contact structure 21 and the second contact structure 22.

[0034] The contact system 2 further includes a contact reset spring. The contact reset spring exerts an acting force to the first contact structure 21 or the second contact structure 22, so that the first contact structure 21 and the second contact structure 22 rotate away from each other to be broken. Further, the contact reset spring exerts an acting force to the first support 212 of the first contact structure 21 and/or exerts an acting force to the second support 222 of the second contact structure 22, so that the first contact structure 21 and the second contact structure 22 rotate synchronously away from each other to be broken.

[0035] Specifically, as shown in FIG. 9b, the second contact structure 22 includes a second reset spring 223. The second reset spring 223 is used as a contact reset spring to exert an acting force to the second contact structure 22, such that the second contact structure 22 rotate to its breaking position, the second contact structure 22 drives the first contact structure 21 to rotate to its breaking position simultaneously. That is, the second reset spring 223 drives the second contact structure 22 and the first contact structure 21 to rotate synchronously away from each other to be broken. Further, the second reset spring 223 is a torsion spring. The second support 222 further includes a second support spring limiting table 2225. The second reset spring 223 and the second support 222 are arranged coaxially. One end of the second reset spring 223 is matched with the second support spring limiting table 2225, and the other end of the second reset spring 223 is matched with the switch housing.

[0036] As other embodiments, the first contact structure 21 is provided with a first reset spring. The second contact structure 22 cancels the second reset spring. The first reset spring exerts an acting force to the first contact structure 21, such that the first contact structure 21 rotates to its breaking position, the first contact structure 21 drives the second contact structure 22 to rotate to its breaking position simultaneously. That is, the first reset spring drives the first contact structure 21 and the second contact structure 22 to rotate synchronously away from each other to be broken. Further, the first reset spring is a torsion spring, and is arranged in a manner similar to that of the second reset spring 223.

[0037] In the contact system in the present embodiment, since the first contact structure 21 and the second contact structure 22 are arranged in a symmetrical and synchronous pivoting manner and are in transmission fit with each other, only one contact reset spring (i.e., the second reset spring 223 or the first reset spring) needs to be arranged, such that the first contact structure 21 may be quickly broken from the second contact structure 22, achieving a simple structure and reliable action.

[0038] As shown in FIGs. 1-2, the operating mechanism 1 includes an operating member 11, a main link rod 12 and a snap-fastening transmission structure. The operating member 11 and the snap-fastening transmission structure are arranged pivotally, respectively. The main link rod 12 is hinged with the operating member 11 and the snap-fastening transmission structure, respectively. The snap-fastening transmission structure includes a jump catch 13 and a lock catch structure that are arranged pivotally, respectively, and are in snap fit with each other. The lock catch structure includes a lock catch 14 which is arranged pivotally and is in snap fit with the jump catch 13. The snap-fastening transmission structure is in transmission connection with the first contact structure 21 or the second contact structure 22. Further, the snap-fastening transmission structure further includes a rotating plate that is arranged pivotally. The jump catch 13 and the lock catch 14 are arranged pivotally on the rotating plate, respectively. Further, the operating member 11 is arranged pivotally on the first supporting structure, and the first supporting structure is realized by the switch housing h.

[0039] As shown in FIGs. 1-2, a specific connection mode of the operating mechanism 1 and the contact system 2 is as follows: the jump catch 13 and the lock catch 14 are arranged pivotally on the first support 212 respectively and are in snap fit with each other. The first support 212 is used as the rotating plate. Two ends of the main link rod 12 are hinged with the operating member 11 and the jump catch 13, respectively. The operating member 11 is driven by an external force to rotate and drives the jump catch 13, the lock catch 14 and the first support 212 to rotate as a whole around the first center 21s through the main link rod 12, such that the contact system

2 is closed or broken. The lock catch structure is driven by an external force (for example, an acting force exerted by the thermomagnetic tripping mechanism 5 to the lock catch structure, wherein a matching relationship between the thermomagnetic tripping mechanism 5 and the lock catch structure will be described in detail later) to rotate and release the snap fit between the lock catch structure and the jump catch 13 (that is, the snap fit between the lock catch 14 and the jump catch 13). A working principle and an action process of the operating mechanism 1 are of the prior art, and will not be described in detail herein. Further, as shown in FIGs. 6-7, 9a and 11, the first support 212 further includes a jump catch shaft 2123 for pivotal mounting of the jump catch 13, a lock catch shaft for pivotal mounting of the lock catch 14, and a first support shaft 2124 for pivotal mounting of the first support main body 2120 of the first support 212, wherein the lock catch shaft is arranged coaxially with the first support shaft 2124, and the jump catch shaft 2123 and the lock catch shaft are arranged at an axial end of the first support main body 2120. Specifically, the jump catch 13 is rotatably sleeved onto the jump catch shaft 2123, and the lock catch 14 is rotatably sleeved onto the lock catch shaft.

[0040] As shown in FIGs. 4, 9a and 11, the first support 212 further includes a lock latch rotating limiting table. The lock catch rotating limiting table is arranged on a radial side of the lock catch shaft and is arranged coaxially with the lock catch shaft. As shown in FIG. 4, the lock catch 14 includes a lock catch mounting hole and a lock catch stop boss arranged on an inner side wall of the lock catch mounting hole. The lock catch 14 is sleeved onto the lock catch shaft and the lock catch rotating limiting table through the lock catch mounting hole. The lock catch rotating limiting table and the lock catch stop boss are matched with each other and located on two radial sides of the lock catch shaft to limit a rotation angle of the lock catch 14 with respect to the first support 212.

[0041] As shown in FIGs. 1-2, 4-5a, 9a and 11, the first support 212 further includes a jump catch limiting block 2128 arranged on one side of the jump catch shaft 2123. The jump catch limiting block 2128 is in limiting fit with the jump catch 13 to limit a range of the jump catch 13 to swing with respect to the first support main body 2120 of the first support 212.

[0042] As shown in FIGs. 9 and 11, the first support 212 further includes a first support bearing portion 2125 arranged on a radial side of the first support main body 2120. The first support bearing portion 2125 is impacted (e.g., by a magnetic tripping transmission member 54 or a magnetic tripping structure), such that the first support 212 rotates in a breaking direction, thereby accelerating a speed at which the first support 212 rotates in the breaking direction, and improving the breaking efficiency of the contact system 2.

[0043] As other embodiments, the jump catch 13 and the lock catch 14 may alternatively be arranged pivotally on the second support 222 respectively and are in snap fit with each other. The jump catch 13, the lock catch 14 and the second support 222 are driven by the operating member 11 to rotate around the second center 22s, such that the contact system 2 is closed or broken.

[0044] As shown in FIGs. 1-2 and 5a, the lock catch structure of the operating mechanism 1 further includes a linkage rocker 15. The linkage rocker 15 and the lock catch 14 are arranged coaxially and rotate synchronously. The linkage rocker 15 and the lock catch 14 are stacked along the direction of the rotating shaft of the lock catch 14. The linkage rocker 15 is driven by the thermal tripping structure of the thermomagnetic tripping mechanism to rotate, and the linkage rocker 15 drives the lock catch 14 to rotate, thereby releasing the snap fit between the lock catch 14 and the jump catch 13. The lock catch 14 is driven by the magnetic tripping structure of the thermomagnetic tripping mechanism to rotate, thereby releasing the snap fit between the lock catch 14 and the jump catch 13. Further, the thermal tripping structure directly drives the linkage rocker 15 to rotate through a thermal tripping transmission member 55 that is arranged pivotally, and the linkage rocker 15 drives the lock catch 14 to rotate, thereby releasing the snap fit between the lock catch 14 and the jump catch 13. The magnetic tripping structure directly drives the lock catch 14 to rotate through the magnetic tripping transmission member 54, thereby releasing the snap fit between the lock catch 14 and the jump catch 13.

[0045] As shown in FIGs. 1-2 and 19, the lock catch structure, the thermal tripping transmission member 55 and the magnetic tripping transmission member 54 are distributed at three vertices of a triangle. Further, the lock catch 14 and the linkage rocker 15 are both arranged pivotally around the first center 21s. The magnetic tripping transmission member 54 is arranged pivotally around a third center for 54s. The thermal tripping transmission member 55 is arranged pivotally around a fourth center 55s. The first center 21s, the third center 54s and the fourth center 55s are distributed at three vertices of a triangle.

[0046] As shown in FIG. 5a, the lock catch 14, the first support 212 and the linkage rocker 15 are sequentially stacked along the rotating shaft of the lock catch 14, and the lock catch 14 and the linkage rocker 15 are respectively located on both sides of the first support 212.

[0047] As shown in FIGs. 4 and 5a, the lock catch 14 includes a lock catch main body 140 and a lock catch second arm 142 arranged on the lock catch main body 140, and the lock catch 14 is arranged pivotally through the lock catch main body 140. The linkage rocker 15 includes a rocker mounting portion 150 and a rocker first arm 151 arranged on the rocker mounting portion 150. The linkage rocker 15 is arranged pivotally through the rocker mounting portion 150, and the lock catch second arm 142 is in driving connection with the rocker first arm 151. Further, the lock catch second arm 142 includes a lock catch second arm connecting portion 1420 and a lock catch second arm driven portion 1421. One end of the lock catch second arm connecting portion 1420 is

connected to the lock catch main body 140, and the other end of the lock catch second arm connecting portion 1420 is connected to the lock catch second arm driven portion 1421. The rocker first arm 151 is provided with a rocker first arm matching groove 1510, and the lock catch second arm driven portion 1421 is inserted in the rocker first arm matching groove 1510, so as to realize the synchronous rotation of the lock catch 14 and the linkage rocker 15. Further, an extension direction of the lock catch second arm driven portion 1421 is parallel to the direction of the rotating shaft of the lock catch 14.

[0048] As shown in FIGs. 4 and 5a, the linkage rocker 15 further includes a rocker second arm 152 connected to the rocker main body 150. The lock catch 14 also includes a lock catch first arm 141 connected to the lock catch main body 14. When a plurality of operating mechanisms 1 is arranged in linkage and side by side, the rocker second arms 152 and the lock catch first arm 141 of every two adjacent operating mechanisms 1 are connected through a linkage shaft 14-15, thereby achieving linkage tripping of various operating mechanisms.

[0049] As shown in FIG. 13, the rocker main body 150 of the linkage rocker 15 includes a rocker main body shaft hole 1500 formed in the middle, and the rocker main body 150 is rotatably sleeved onto a first support shaft column of the housing base through the rocker main body shaft hole 1500.

[0050] As shown in FIGs. 2-5a, an included angle between the lock catch first arm 141 and the lock catch second arm 142 is an obtuse angle, and an included angle between the rocker first arm 151 and the rocker second arm 152 is an obtuse angle. Further, the lock catch first arm 141 and the rocker second arm 152, as well as the lock catch second arm 142 and the rocker first arm 151 are correspondingly arranged in the direction of the rotating shaft of the lock catch 14.

[0051] As shown in FIG. 12, the first contact structure 21 further includes a first contact spring 213. The first contact 211 is arranged rotatably with respect to the first support 212. The first contact spring 213 is arranged between the first contact 211 and the first support 212. The first contact spring 213 exerts a first acting force to the first contact 211. After the first contact 211 is separated from the second contact 222, that is, after the first contact point 2110 of the first contact 211 is disengaged from the second contact point 2210 of the second contact 211, the first acting force causes the first contact 211 to be in limiting fit with the first support 212 and remain relatively stationary. When the first contact 211 and the second contact 221 are closed, the first contact 211 rotates with respect to the first support 212 so that the first contact spring 213 stores energy, and the first acting force makes the first contact 211 press against the second contact 221, that is, the first contact spring 213 provides an overtravel force to the first contact 211 to ensure that the first contact 211 and the second contact 221 are reliably closed.

[0052] As shown in FIG. 12, the first contact 211, the first support 212 and the first contact spring 213 are assembled in the following manner: the first support 212 includes a first support main body 2120 and a first contact limiting block 2126; a first support cavity 21200 is formed in the middle of the first support main body 2120; a first contact insertion hole 21201 is formed in a side wall of the first support cavity 21200; one end of the first contact 211 is inserted into the first support cavity 21200 via the first contact insertion hole 21201; the first contact limiting block 2126 is arranged on an outer side wall of the first support main body 2120 and is located on one side of the first contact insertion hole 21201; the first contact spring 213 is a torsion spring arranged in the first support cavity 21200; one end of the torsion spring is in limiting fit with the inner side wall of the first support cavity 21200, and the other end of the torsion spring is in limiting fit with one end of the first contact 211 inserted in the first support cavity 21200, such that the first contact 211 props against the first contact limiting block 216; and the first contact 211 is arranged rotatably with respect to the first support 212 by taking the first contact limiting block 2126 as a support. The above assembly manner is simple in structure and reliable in assembly, and guarantees the reliable action of the first contact structure 21. The first contact limiting block 2126 is also used for shielding a part of the first contact 211 which protrudes out of the first support 212 and is close to the first support 212, which is conducive to increasing an electrical clearance and creepage distance between the first contact structure 21 and the second contact structure 22 after breaking. Further, the first support 212 further includes a first contact spring shaft 2127 arranged in the first support cavity 21200, and the first contact spring 213 is sleeved onto the first contact spring shaft 2127.

[0053] As other embodiments, the first contact spring 213 may alternatively be provided as a tension spring, and two ends of the tension spring are respectively hung to one end of the first contact 211 inserted into the first support cavity 21200 and to the first contact spring shaft 2127. Of course, an arrangement position of the first contact spring shaft 2127 needs to be adjusted accordingly.

[0054] In conjunction with FIGs. 1-2, 4, 6, 9a and 11-12, the lock catch shaft 2123, one first support shaft 2124 and the jump catch limiting block 2128 are arranged at an axial end of the first support main body 2120. The first support cavity 21200 is formed in an axial middle part of the first support main body 2120, and the other first support shaft 2124 is arranged at the other axial end of the first support main body 2120. Further, one side of the first support cavity 21200 facing the linkage rocker 15 is open.

[0055] As shown in FIG. 10, the second contact structure 22 further includes a second contact spring (not shown), the second contact 221 is rotatably arranged with respect to the second support 222, and the second contact spring is arranged between the second contact 221 and the second support 222; and the second contact

spring exerts a second acting force to the second contact 221. After the second contact 221 is separated from the first contact 211, that is, after the second contact point 2210 of the second contact 221 is disengaged from the first contact point 2110 of the first contact 211, the second acting force causes the second contact 221 to be in limiting fit with the second support 222 and remain relatively stationary. When the second contact 221 and the first contact 211 are closed, the second contact 221 rotates with respect to the second support 222 so that the second contact spring may release energy. The second acting force causes the second contact 221 to press against the first contact 211, that is, the second contact spring provides an overtravel force to the second contact 221 to ensure that the second contact 221 and the first contact 211 are reliably closed. The second contact limiting block 2224 is also used for shielding a portion of the second contact 221 which protrudes out of the second support 222 and is close to the second support 222, which is conducive to increasing an electrical clearance and creepage distance between the first contact structure 21 and the second contact structure 22 after breaking.

[0056] Referring to FIG. 12, the second contact 221, the second support 222 and the second contact spring are assembled in the following manner: the second support 222 includes a second support main body 2220 and a second contact limiting block 2224; a second support cavity is formed in the middle of the second support main body 2220; a side wall of the second support cavity is provided with a second contact insertion hole; one end of the second contact 221 is inserted into the second support cavity via the second contact insertion hole; the second contact limiting block 2224 is arranged on an outer side wall of the second support main body 2220 and is located on one side of the second contact insertion hole; the second contact spring is a torsion spring arranged in the second support cavity; one end of the torsion spring is in limiting fit with an inner side wall of the second support cavity, and the other end of the torsion spring is in limiting fit with one end of the second contact 221 inserted in the second support cavity such that the second contact props against the second contact limiting block 2224; and the second contact 221 is arranged rotatably with respect to the second support 222 with the second contact limiting block 2224 as a support. Further, the second support 222 further includes a second contact spring shaft arranged in the second support cavity, and the second contact spring is sleeved onto the second contact spring shaft.

[0057] Further, as shown in FIGs. 9a and 10, the second support 222 further includes second support shafts 222, and the two second support shafts 222 are respectively arranged at two axial ends of the second support main body 2220.

[0058] As other embodiments, the second contact spring may alternatively be provided as a tension spring, and two ends of the tension spring are respectively hung to one end of the second contact 221 inserted into the second support cavity and to the second contact spring shaft. Of course, an arrangement position of the second contact spring shaft needs to be adjusted accordingly.

[0059] As shown in FIGs. 9a and 11-12, the first contact 211 includes a first contact point 2110 and a first contact arm 2111. The first contact arm 2111 is of a V-shaped structure, and includes a first contact arm outer section and a first contact arm inner section. The first contact point 2110 is arranged at one end of the first contact arm outer section, and the other end of the first contact arm outer section is connected with one end of the first contact arm inner section in a bending manner. The other end of the first contact arm inner section is inserted into the first support 212. The first contact arm outer section is bent with respect to the first contact arm inner section in a direction away from the second contact 221. Further, an included angle between the first contact arm outer section and the first contact arm inner section is an obtuse angle.

[0060] As shown in FIGs. 6-7 and 9a-12, the first contact 211 and the second contact 212 are structures symmetrical with each other, and the structure of the second contact 212 is not described herein.

[0061] As shown in FIGs. 1-2 and 6-7, the contact system 2 further includes a separator 23. The separator 23 includes a separation portion 232. As shown in FIG. 2, when the first contact structure 21 and the second contact structure 22 are closed, the separator 23 is driven by the operating mechanism 1 or the contact system 2, such that the separation portion 232 moves out of a position between the first contact point 2110 of the first contact structure 21 and the second contact point 2210 of the second contact structure 22. As shown in FIG. 1, when the first contact structure 21 and the second contact structure 22 are broken, the separator 23 is driven, such that the separation portion 232 moves to the position between the first contact point 2110 and the second contact point 2210. The separator 23 can elongate and shield an electric arc generated between the first contact structure 21 and the second contact structure 22 in the breaking process, and is conducive to improving the breaking performance and the current-carrying capacity of the contact system 2. Further, the separator 23 moves as a whole, and is driven to move in a first direction or a second direction, and the first direction and the second direction are opposite directions to each other, so that the separation portion 232 moves to or out of the position between the first contact point 2110 and the second contact point 2210. It should be pointed out that the first contact point 2110 and the second contact point 2210, i.e., mutual contact areas of the first contact structure 21 and the second contact structure 22, can not only refer to a contact point structure independently arranged in a narrow sense, but also may be parts of the first contact structure 21 and the second contact structure 22 which are used for contacting each other. Specifically, as shown in the directions of FIGs. 1, 2, 19, 21 and 23-25, when the

first contact structure 21 and the second contact structure 22 are closed, a baffle plate 23 is driven to move upward and move out of the position between the first contact point 2110 and the second contact point 2210. When the first contact structure 21 is broken from the second contact structure 22, the baffle plate 23 is driven to move downward and move to the position between the first contact point 2110 and the second contact point 2210.

[0062] As shown in FIG. 1, after the first contact structure 21 is broken from the second contact structure 22, the separator 23 completely separates the first contact 211 (in particular, a part of the first contact 211 which protrudes out of the first support 212) of the first contact structure 21 from the second contact 221 (in particular, a part of the second contact structure 221 which protrudes out of the second support 222) of the second contact structure 22. That is, the first contact 211 and the second contact 221 are, one with respect to the other, completely shielded by the separator 23 in a direction perpendicular to a moving direction of the separator 23.

[0063] As other embodiments, the separator 23 may also be rotatably arranged. When the first contact structure 21 and the second contact structure 22 are closed, the separator 23 is driven to swing, such that the separation 232 moves out of the position between the first contact point 2110 and the second contact point 2210; and when the first contact structure 21 is broken from the second contact structure 22, the separator 23 is driven to swing, such that the separation portion 232 moves to the position between the first contact point 2110 and the second contact point 2210. It should be noted that the separator 23 in the present embodiment is used for separating the first contact structure 21 and the second contact structure 22 which are arranged in a symmetrical and synchronous pivoting manner. As other embodiments, the separator may also be used to separate the first contact structure 21 and the second contact structure 22 which are arranged synchronously but asymmetrically and are both in moving fit with each other.

[0064] As shown in FIGs. 1-2 and 6-7, in the switching device of the present invention, the separator 23 is driven by the first contact structure 21 to act, so that the separation portion 232 moves to or out of the position between the first contact point 2110 and the second contact point 2210.

[0065] As shown in FIGs. 6-7, the first support 212 includes a separator driving gear 2122, and an axis of the separator driving gear 2122 coincides with the first center 21s. The separator 23 includes a separator rack 231 connected to the separation portion 232. The separator driving gear 2122 is meshed with the separator rack 231. The first support 212 is driven by the operating mechanism 1 to rotate. The first support 212 drives the separator driving gear 2122 to rotate. The separator driving gear 2122 drives the separator 23 to move in a straight line through the separator rack 231, so that the separation portion 232 of the separator 23 moves to or out of the position between the first contact point 2110 and the second contact point 2210. Further, gear teeth of the separator driving gear 2122 are sequentially arranged on a circumferential side wall of the first support main body 2120 along a circumferential direction of the first support main body 2120 of the first support 2120. That is, the first support main body 2120 and the gear teeth of the separator driving gear 2122 arranged on the circumferential side wall of the first support main body 2120 form the separator driving gear 2122.

[0066] As shown in FIGs. 9a-9b and 11, the gear teeth of the separator driving gear 2122 and the gear teeth of the master gear 2121 are arranged side by side along an axial direction of the first support 212.

[0067] As shown in FIGs. 6-7, the second support 222 includes a separator limiting table 2223. The separator limiting table 2223 and the separator driving gear 2122 are respectively located on both sides of the separator rack 231. The separator limiting table 2223 is in limiting fit with the separator rack 231, such that the separator rack 231 and the separator driving gear 2122 remain meshed. Further, the separator rack 231 includes teeth arranged on its front and a rack limiting side surface arranged on its back. The separator limiting table 2223 abuts against and limits the rack limiting side surface, so that the separator rack 231 and the separator driving gear 2122 remain meshed.

[0068] As shown in FIGs. 6-7, 9a and 10, the separator limiting table 2223 is a sector-shaped table a circle center of which coincides with the second center 22s and includes a limiting arc surface, wherein the limiting arc surface is in line contact with the separator rack 231, thereby reducing a frictional force therebetween while ensuring a limiting effect.

[0069] As shown in FIGs. 1-2, 6 and 8, the separator 23 further includes a separator backplate 230. The separator backplate 230 is located on and connected to one side of the separator rack 231 in a width direction of the separator rack 231 (a direction in which the teeth of the separator rack 231 are arranged side by side, is a length direction of the separator rack 231; an extension direction of a single tooth of the separator rack 231 is a width direction of the separator 231, and the length direction and the width direction are perpendicular to each other). One ends of the separator rack 231 and the separator backplate 230 in the length direction of the separator rack 231 (a direction in which the teeth of the separator rack 231 are arranged side by side, is the length direction of the separator rack 231) are respectively connected to the separation portion 232. The separator backplate 230 is conducive to enhance the strength of the separator rack 231. Further, the separator 23 is formed into an L-shaped structure as a whole. The separation portion 231 is used as one edge of the L-shaped structure, and the separator rack 231 and the separator backplate 230 are used as another edge of the L-shaped structure.

[0070] As shown in FIGs. 6-8, the separation portion 232 includes a separation plate 2320 and a reinforced

connecting portion 2321. One ends of the separator rack 231 and the separator backplate 230 in the length direction of the separator rack 231 are respectively connected to the reinforced connecting portion 2321. The separator backplate 230 and the separator rack 231 are located on one side of the reinforced connecting portion 2321, and the separation plate 2320 is located on the other side of the reinforced connecting portion 2321. The thickness of the reinforced connecting portion 2321 is greater than the thickness of the separation plate 2320, thereby enhancing the connection strength of the separator rack 231, the separator backplate 230 and the separation portion 232. Further, two ends of the reinforced connecting portion 2320 in a thickness direction protrude out from both sides of the separation plate 2320, respectively.

[0071] As shown in FIGs. 1-3, 6 and 8, the separator 23 further includes a separator first sliding rib 233 and a separator second sliding rib 234 which are respectively arranged at both ends of the separation portion 232. The separator first sliding rib 233 and the separator second sliding rib 234 are respectively used for sliding fit with a first guide groove h23 and a second guide groove (not shown) which are fixedly arranged, so as to confine a moving path of the separator 23 and ensure the reliable fit among the separator, the first contact structure 21 and the second contact structure 23. Further, the first guide groove h23 and the second guide groove are respectively formed in the housing base and the housing cover of the switch housing h.

[0072] As shown in FIGs. 1-2, 4 and 5a, the switching device of the present invention further includes a thermomagnetic tripping device. The thermomagnetic tripping device is used for driving the operating mechanism 1 to trip when an overload or short-circuit fault occurs in a circuit where the switching device is installed, so that the circuit where the switching device is located is broken by the contact system 2.

[0073] The thermomagnetic tripping device includes a thermomagnetic tripping mechanism 5. The thermomagnetic tripping mechanism 5 includes a thermal tripping structure and a magnetic tripping structure. The thermal tripping structure is used for driving the operating mechanism 1 to trip and open when an overload fault occurs in the circuit where the circuit breaker is installed. The magnetic tripping structure is used for driving the operating mechanism 1 to trip and open when a short-circuit fault occurs in the circuit where the switching device is installed. Further, the thermal tripping structure includes a bimetallic sheet 56, wherein one end of the bimetallic sheet 56 in a length direction is fixedly connected to the magnetic tripping structure. In the length direction of the bimetallic sheet 56, the magnetic tripping structure and the thermal tripping structure are arranged side by side. This layout mode is conducive to reducing a mounting space required by the thermomagnetic tripping mechanism 5, so that the thermomagnetic tripping mechanism 5 can be mounted within a narrow space. The thermal tripping structure and the magnetic tripping structure are of an integrated modular structure, facilitating transportation, installation and disassembly, and improves the positioning accuracy of various components of the thermomagnetic tripping mechanism, such that the thermomagnetic tripping mechanism will not change by the deformation of a housing used for mounting the thermomagnetic tripping mechanism, thereby ensuring the action performance of the thermomagnetic tripping mechanism. Moreover, the thermal tripping structure and the magnetic tripping structure can also be matched with the operating mechanism from different directions, facilitating structure and layout design, and can also save the amount of a material used for the bimetallic sheet. Further, one end of the bimetallic sheet 56 is a bimetallic sheet fixing end that is fixedly connected to the magnetic tripping structure, and the other end of the bimetallic sheet 56 is a bimetallic sheet driving end for outputting a first tripping driving force outward. The magnetic tripping structure includes a magnetic tripping driving member, wherein one end of the magnetic tripping driving member is a driving member driving end which is used for outputting a second tripping driving force outward, and the other end of the magnetic tripping driving member is a driving member mounting end. In the length direction of the bimetallic sheet 56, the bimetallic sheet driving end, the bimetallic sheet fixing end, the driving member driving end and the driving member mounting end are sequentially arranged, which is conducive to reducing a mounting space required by the thermomagnetic tripping mechanism 5. Specifically, in the directions shown in FIGs. 4, 5a and 20, the bimetallic sheet driving end, the bimetallic sheet fixing end, the driving member driving end and the driving member mounting end are arranged sequentially from top to bottom.

[0074] As shown in FIGs. 1-2 and 19, the thermal tripping device further includes a thermal tripping transmission member 55 and a magnetic tripping transmission member 54 which are arranged pivotally, respectively. The magnetic tripping transmission member 54, the thermal tripping transmission member 55 and the lock catch structure of the operating mechanism 1 are distributed at three vertices of a triangle. When an overload fault occurs in the circuit where the thermomagnetic tripping mechanism 5 is located, the thermal tripping structure drives the lock catch structure to rotate through the thermal tripping transmission member 55 and releases the snap fit with the jump catch 13, so that the operating mechanism 1 trips. When a short-circuit fault occurs in the circuit where the thermomagnetic tripping mechanism 5 is located, the magnetic tripping structure drives the lock catch structure to rotate through the magnetic tripping transmission member 55 and releases the snap fit with the jump catch 13, so that the operating mechanism 1 trips. The thermal tripping structure is in driving fit with the lock catch structure through the thermal tripping transmission member, and the magnetic tripping structure is in driving fit with the lock catch structure through the magnetic tripping transmission member,

which ensures the reliability and stability of a transmission path of the thermomagnetic tripping mechanism and the operating mechanism, and is conducive to saving the space due to a small action space and mounting space required because the thermal tripping transmission member and the magnetic tripping transmission member are arranged pivotally.

[0075] As shown in FIGs. 1-2, 4-5b and 15-17, a first embodiment of the thermomagnetic tripping mechanism 5 is shown.

[0076] According to the thermomagnetic tripping mechanism 5 in the first embodiment, the magnetic tripping structure is a clapper-type electromagnetic trip, which includes a current-carrying conductive plate 33, and a yoke 51 and an armature 52 which are used cooperatively. The current-carrying conductive plate 33 is used for connecting in series with a circuit to be protected (i.e., a circuit to which the switching device of the present invention is connected). Specifically to the present embodiment, the current-carrying conductive plate 33 and the contact system 2 are connected in series and are both connected in series into the circuit where the switching device is located. The armature 52 is used as a magnetic tripping driving member, wherein one end of the armature is rotatably arranged and is an armature pivoting end (the armature pivoting end is used as the driving member mounting end), and the other end of the armature swings and is an armature driving end (the armature driving end is used as the driving member driving end). The armature 52 swings so as to be attracted with or separated from the yoke 51. A conductive plate matching section 333 of the current-carrying conductive plate 33 passes through the middle of the yoke 51 and is located between the yoke 51 and the armature 52. A plane where the conductive plate matching section 333 is located is parallel to a rotation axis of the armature 52, an direction in which the conductive plate matching section 333 inserts between the yoke 51 and the armature 52 is perpendicular to the rotation axis of the armature 52, and an extension direction of the conductive plate matching section 333 is the same as the direction in which the conductive plate matching section 333 inserts between the yoke 51 and the armature 52. The bimetallic sheet fixing end of the bimetallic sheet 56 is fixedly and electrically connected to the current-carrying conductive plate 33. When an overload or short-circuit fault occurs in the circuit where the switching device is installed, an overload or short-circuit current flows through the current-carrying conductive plate 33, so that the bimetallic sheet 56 is heated and bent or the yoke 51 is made to attract the armature 52, thereby driving the operating mechanism 1 to trip and open. In the thermomagnetic tripping mechanism 5, the bimetallic sheet fixing end is fixedly connected to the current-carrying conductive plate 33, the armature 52 is rotatably arranged on the yoke 51, and the yoke 51 is fixedly connected to the current-carrying conductive plate 33, so that the thermomagnetic tripping mechanism 5 becomes an integrated structure, and the thermomagnetic tripping mechanism 5 is regarded as an integral module, facilitating assembly and disassembly.

[0077] As shown in FIGs. 1-2, the current-carrying conductive plate 33 is also used as a conductive plate for serial connection of the contact system 2 and the wire-incoming terminal 31.

[0078] The above-mentioned layout of the thermal tripping structure and the magnetic tripping structure of the first embodiment, compared with the traditional mode in which the bimetallic assembly is placed between the yoke and the armature of the magnetic tripping structure, is conducive to reducing the size and specification of the yoke 51 and reducing the overall thickness (i.e., the thickness in a direction from the armature 52 to the yoke 51) of the thermomagnetic tripping mechanism 5.

[0079] As shown in FIGs. 1-2, 4-5b and 15, the magnetic tripping structure further includes an armature spring 53. The armature spring 53 is connected to the armature 52, and exerts an acting force to the armature 52, so that the armature 52 has a rotational tendency to be separated from the yoke 51. When the armature 52 is attracted by the yoke 51, the acting force exerted on the armature 52 by the armature spring 53 needs to be overcome. Further, the current-carrying conductive plate 33 further includes a conductive plate second intermediate section 332, wherein one end of the conductive plate second intermediate section 332 is connected to one end of the conductive plate matching section 333 away from a bimetallic assembly in a bending manner, one end of the armature spring 53 is connected to the armature driving end of the armature 52, and the other end of the armature spring 53 is connected to the conductive plate second intermediate section 332.

[0080] As shown in FIGs. 5a and 15, the thermal tripping structure further includes a bimetallic bracket 58. The bimetallic bracket 58 includes a vertical bracket portion 580 and a horizontal bracket portion 581, wherein one end of the vertical bracket portion 580 is connected to the bimetallic sheet 56, and the other end of the vertical bracket portion 580 is connected to the horizontal bracket portion 581 in a bending manner. The current-carrying conductive plate 33 further includes a conductive plate third intermediate section 334 which is connected to the conductive plate matching section 333 in a bending manner. The conductive plate third intermediate section 334 is located between the magnetic tripping structure and the bimetallic bracket 58. The horizontal bracket portion 581 and the conductive plate third intermediate section 334 are laminated in parallel and connected fixedly, that is, the bimetallic sheet 56 is fixedly connected to the magnetic tripping structure through the bimetallic bracket 58. Further, the bimetallic bracket 58 is of an L-shaped structure, and the vertical bracket portion 580 and the horizontal bracket portion 581 are respectively used as two side edges of the L-shaped structure.

[0081] As shown in FIGs. 5a and 15, the current-carrying conductive plate 33 further includes a conductive plate bimetallic adjusting section 335 opposite to the

vertical bracket portion 580. The conductive plate bimetallic adjusting section 335 is connected to the conductive plate third intermediate section 334 in a bending manner. The conductive plate bimetallic adjusting section 335 and the conductive plate matching section 333 are respectively bent toward both sides of the conductive plate third intermediate section 334. The conductive plate bimetallic adjusting section 335 is provided with an adjusting section screw hole. The thermal tripping structure further includes a bimetallic adjusting screw 57. The bimetallic adjusting screw 57 is in threaded fit with the adjusting section screw hole. One end of the bimetallic adjusting screw 57 is used for pressing against the vertical bracket portion 58 and adjusting the bimetallic sheet 56. Further, the conductive plate matching section 333, the conductive plate third intermediate section 334 and the conductive plate bimetallic adjusting section 335 are sequentially connected with one another in a right-angle bending manner.

[0082] As shown in FIGs. 1-2 and 5a, the bimetallic sheet 56 directly drives the linkage rocker 15 of the operating mechanism 1 to rotate through the thermal tripping transmission member 55, and the linkage rocker 15 drives the lock catch 14 to rotate and release the snap fit between the lock catch 14 and the jump catch 13.

[0083] As other embodiments, the thermal tripping transmission member 55 directly drives the lock catch 14 to rotate and release the snap fit with the jump catch 13. Further, a thermal tripping transmission member driving arm 552 of the thermal tripping transmission member 55 directly drives the lock catch second arm 142 of the lock latch 14.

[0084] As shown in FIGs. 1-2 and 5a, the thermal tripping transmission member 55 includes a thermal tripping transmission member mounting portion 550, a thermal tripping transmission member driven arm 551 and a thermal tripping transmission member driving arm 552. The thermal tripping transmission member 55 is arranged pivotally through the thermal tripping transmission member mounting portion 550. One end of the thermal tripping transmission member driven arm 551 is connected to the thermal tripping transmission member mounting portion 550, and the other end of the thermal tripping transmission member driven arm 551 is in driving fit with the bimetallic sheet 56. One end of the thermal tripping transmission member driving arm 552 is connected to the thermal tripping transmission member mounting portion 550, and the other end of the thermal tripping transmission member driving arm 552 is in driving fit with the operating mechanism 1 to drive the lock catch 14 of the operating mechanism 1 to rotate and release the snap fit with the jump catch 13. The thermal tripping transmission member driven arm 551 and the thermal tripping transmission member driving arm 552 are distributed in an circumferential direction of the thermal tripping transmission member mounting portion 550. Further, a free end of the thermal tripping transmission member driving arm 552 is in driving fit with the linkage rocker 15 of the operating mechanism 1 to drive the linkage rocker 15 to rotate, and the linkage rocker 15 drives the lock catch 14 to rotate and release the snap fit with the jump catch 13. Further, an included angle between the thermal tripping transmission member driven arm 551 and the thermal tripping transmission member driving arm 552 is less than or equal to 90°.

[0085] As shown in FIG. 14, the thermal tripping transmission member mounting portion 550 includes a thermal tripping transmission member mounting hole 5500 formed in the middle thereof. The housing base is provided with a thermal tripping lever shaft h55. The thermal tripping transmission member mounting portion 550 is rotatably sleeved onto the thermal tripping lever shaft h55 through the thermal tripping transmission member mounting hole 5500.

[0086] As shown in FIG. 14, the thermal tripping transmission member driven arm 551 includes a transmission member driven arm connecting portion 5510 and a transmission member driven arm driven portion 5511. One end of the transmission member driven arm connecting portion 5510 is connected to the thermal tripping transmission member mounting portion 550, and the other end of the transmission member driven arm connecting portion 5510 is connected to the transmission member driven arm driven portion 5511. An extension direction of the transmission member driven arm driven portion 5511 is parallel to the direction of the rotating shaft of the thermal tripping transmission member 55 and is perpendicular to an extension direction of the bimetallic sheet 56 of the thermomagnetic tripping mechanism 5.

[0087] As shown in FIGs. 1-2, 4-5b and 15-16, the yoke 51 includes a yoke main body 510, and a yoke supporting arm 511 and a yoke limiting arm 512 respectively arranged at both ends of the yoke main body 510. Two ends of the armature 52 are respectively the armature pivoting end and the armature driving end. The armature pivoting end is rotatably supported on the yoke supporting arm 511 and is in limiting fit with the yoke supporting arm 511 to limit the movement of the armature 52 along its rotation axis. The armature driving end is in limiting fit with the yoke limiting arm 512 to limit the movement of the armature 52 along its rotation axis. The assembly mode of the yoke 51 and the armature 52 is simple and reliable. The yoke 51 forms reliable limit to the armature 52 while supporting the rotation of the armature 52, so as to ensure that the armature 52 reliably and stably rotates at a predetermined position, so that a short-circuit protection function is reliably achieved.

[0088] As shown in FIGs. 1-2, 4-5b and 15-16, the yoke main body 510 is of a U-shaped structure, and includes a yoke main body bottom plate 5100 and yoke main body side plates 5101. Two ends of the yoke main body bottom plate 5100 and the two yoke main body side plates 5101 are oppositely arranged at intervals, respectively. The conductive plate matching section 333 passes between the two yoke main body side plates 5101 and is opposite to and fixedly connected to the yoke main body bottom

plate 5100. An edge of each yoke main body side plate 5101 facing the armature 52 is attracted with or separated from the armature 52. Each of the yoke main body side plates 5101 is provided with a yoke supporting arm 511 and a yoke limiting arm 512. The yoke supporting arms 511 on the two yoke main body side plates 5101 are arranged at intervals to face each other, and the yoke limiting arms 512 on the two yoke main body side plates 5101 are arranged at intervals to face each other. The armature driving end is rotatably supported on the two yoke limiting arms 512, and swings between the two yoke limiting arms 512. Further, both ends of the edge of each yoke main body side plate 5101 facing the armature 52 are provided with the yoke supporting arm 511 and the yoke limiting arm 512 separately.

[0089] As other embodiments, the yoke main body 510 may further include more than two yoke main body side plates 5101, which are sequentially arranged side by side at intervals. Of course, the structure of the conductive plate matching section 333 also needs to be adjusted accordingly, e.g., an opening for the yoke main body side plate 5101 located in the middle to pass through is provided. Each of the yoke main body side plates 5101 may be provided with the yoke supporting arm 511 and the yoke limiting arm 512, or the outermost two yoke main body side plates 5101 may each be provided with the yoke supporting arm 511 and the yoke limiting arm 512.

[0090] As shown in FIGs. 1-2, 4-5b and 15-16, the yoke supporting arm 511 is provided with a yoke supporting groove 5110. The armature 52 further includes two armature feet 522 arranged on the armature pivoting end at intervals to face each other. Two sides of the two armature feet 522 form supporting shoulders, i.e., two step-shaped structures formed on both sides of the two armature bases 522. The two supporting shoulders are rotatably arranged in the two yoke supporting grooves 5110, respectively. The two armature feet 522 are located between the two yoke supporting arms 511 and are respectively in limiting fit with the two yoke supporting arms 511 to limit the movement of the armature 52 along its axis direction. Furthermore, an edge of the yoke main body side plate 5101 facing the armature 52 forms a side wall of the yoke supporting groove 5110, so that when the yoke 51 and the armature 52 attract each other, the armature 52 is closely attached to the yoke main body side plate 5101.

[0091] As shown in FIGs. 5a-5b and 16, a free end of each yoke limiting arm 512 is provided with a magnetic yoke stop, and the two yoke stops protrude between the two yoke limiting arms 512. The two yoke stops are in limiting fit with the armature driving end, preventing the armature driving end from swinging out of a position between the two yoke limiting arms 512, so as to ensure that the armature 52 swings within a predetermined swing angle range with respect to the yoke 52. Further, the armature driving end includes an armature limiting plate 5210 and an armature driving finger 5211, wherein the armature limiting plate 5210 is located between the two yoke limiting arms 512 and is in limiting fit with the two yoke stops, and the armature driving finger 5211 is used for being in driving fit with the operating mechanism 1.

[0092] As shown in FIGs. 1-2, 4-5b and 15-16, the armature 52 further includes an armature main plate 520. The armature main plate 520 is located between the armature supporting arm 511 and the armature limiting arm 512 and is matched with the yoke main body side plate 5101. One end of the armature main plate 520 is connected to the armature bottom feet 522, and the other end of the armature main plate 520 is connected to the armature limiting plate 5210.

[0093] As shown in FIGs. 1-2 and 4, the armature 52 directly drives the lock catch 14 to rotate through the magnetic tripping transmission member 54, so that the lock catch 14 releases the snap fit with the jump catch 13, and the operating mechanism 1 trips.

[0094] As shown in FIGs. 1-2 and 5a, the rotation centerlines of the magnetic tripping transmission member 54, the thermal tripping transmission member 55 and the armature 52 are arranged in parallel.

[0095] As shown in FIGs. 1-2, 15 and 17, the current-carrying conductive plate 33 further includes a conductive plate supporting arm 336. The conductive plate supporting arm 336 is connected to the conductive plate bimetallic adjusting section 335 in a bending manner. The magnetic tripping transmission member 54 is arranged pivotally on the conductive plate supporting arm 336. Further, a plane where the conductive plate supporting arm 336 is located is perpendicular to a plane where the conductive plate bimetallic adjusting section 335 is located. Further, a rotation axis of the magnetic tripping transmission member 54 is parallel to a rotation axis of the armature 52.

[0096] As shown in FIGs. 1-2 and 4, the magnetic tripping transmission member 54 includes a magnetic tripping transmission member first arm 541 and a magnetic tripping transmission member second arm 542. One end of the magnetic tripping transmission member first arm 541 is in transmission fit with the armature 52, and the other end of the magnetic tripping transmission member first arm 541 is connected to the magnetic tripping transmission member second arm 542 in a bending manner. The other end of the magnetic tripping transmission member second arm 542 is in transmission fit with the lock catch first arm 141 of the lock catch 14. The magnetic tripping transmission member 54 is arranged pivotally through a junction between the magnetic tripping transmission member first arm 541 and the magnetic tripping transmission member second arm 542. Further, the magnetic tripping transmission member 54 further includes a magnetic tripping transmission member reinforcing rib 543. Two ends of the magnetic tripping transmission member reinforcing rib 543 are respectively connected to the magnetic tripping transmission member first arm 541 and the magnetic tripping transmission member second arm 542. The magnetic tripping transmission member reinforcing rib 543 improves the struc-

tural strength of the magnetic tripping transmission member 54 so that it can withstand the impact from the armature 52. An included angle between the magnetic tripping transmission member first arm 541 and the magnetic tripping transmission member second arm 542 is less than or equal to 90°. Further, the magnetic tripping transmission member reinforcing rib 543 is an arc-shaped rib, a circle center of which coincides with the rotation center of the magnetic tripping transmission member 54.

[0097] The thermomagnetic tripping mechanism of the present invention also achieves the following technical effects: the thermal tripping structure and the magnetic tripping structure are respectively in driving fit with the linkage rocker 15 and the lock catch 14 through the thermal tripping transmission member 55 and the magnetic tripping transmission member 54, which increases a clearance between transmission paths of the linkage rocker and the lock catch, avoids the linkage rocker and the lock catch from interfering with each other, and facilitates the layout and structural design.

[0098] As shown in FIGs. 19-20, a second embodiment of the thermomagnetic tripping mechanism 5 is shown: in the thermomagnetic tripping mechanism 5 of the second embodiment, the magnetic tripping structure is a direct-acting electromagnetic trip and includes a coil winding 590, a coil skeleton 591, a yoke 592, an ejector rod 593, a fixed iron core and a moving iron core, wherein the coil winding 590 is sleeved onto the coil skeleton 591; the yoke 592 is connected to the coil skeleton 590 and arranged around the coil winding 590; the ejector rod 593 is used as a magnetic tripping driving member, and an axial direction of the ejector rod 593 is the same as a length direction of the bimetallic sheet 56; one end of the ejector rod 593 protrudes out of the coil skeleton 590 as the driving member driving end, and the other end of the ejector rod 593 is slidably inserted in the middle of the coil skeleton 590 as the driving member mounting end; the fixed iron core and the moving iron core are respectively arranged in the middle of the coil skeleton 590, and the ejector rod 593 is fixedly connected to the moving iron core; the bimetallic sheet mounting end of the bimetallic sheet 56 is fixedly connected to the yoke 592; and the bimetallic sheet 56 is electrically connected to the coil winding 590. Further, a moving direction of the ejector rod 593 is perpendicular to the direction of the rotating shaft of the magnetic tripping transmission member 54, and is the same as an axial direction of the ejector rod 593.

[0099] One end of the coil winding 590 is electrically connected to the wire-incoming conductive plate 36, and the other end of the coil winding 590 is electrically connected to the bimetallic bracket 58; and the wire-incoming conductive plate 36 is also matched with the wire-incoming terminal 31.

[0100] The yoke 592 is of a U-shaped structure, which includes a yoke bottom plate and yoke side plates, wherein the two yoke side plates are respectively connected to both ends of the yoke bottom plate in a bending manner and are fixedly connected to both ends of the coil skeleton 591 respectively. Further, the yoke bottom plate and two terminals of the coil winding 590 are respectively located on two radial sides of the coil skeleton 590. Further, the two terminals of the coil winding 590 extend to both sides of two axial ends of the coil skeleton 590, respectively.

[0101] The bimetallic bracket 58 is fixedly connected to the yoke 592, wherein one end of the bimetallic sheet 56 is fixedly and electrically connected to the bimetallic bracket 58, and the other end of the bimetallic sheet 56 is in transmission fit with the thermal tripping transmission member 55. Further, the bimetallic bracket 58 is of an L-shaped structure as a whole, and includes a horizontal bracket portion 580 and a vertical bracket portion 581, wherein one end of the horizontal bracket portion 580 is fixedly connected to one end of the yoke 592, the other end of the horizontal bracket portion 580 is connected to one end of the vertical bracket portion 581 in a bending manner, and the other end of the vertical bracket portion 581 is fixedly and electrically connected to one end of the bimetallic sheet 56. Further, the horizontal bracket portion 580 is fixedly connected to the yoke side plate of the yoke 592 close to the thermal tripping structure.

[0102] In order to be suitable for the direct-acting electromagnetic trip, as shown in FIGs. 19-20, the magnetic tripping transmission member 54 needs to be improved as follows: the magnetic tripping transmission member 54 includes a magnetic tripping transmission member first arm 541 and a magnetic tripping transmission member second arm 542, wherein one end of the magnetic tripping transmission member first arm 541 is in transmission connection with the ejector rod 593 of the magnetic tripping structure, and the other end of the magnetic tripping transmission member first arm 541 is connected to one end of the magnetic tripping transmission member second arm 542 in a bending manner; and the other end of the magnetic tripping transmission member second arm 542 is in transmission fit with the lock catch 14 of the operating mechanism 1, so as to drive the lock catch 14 to rotate and release the snap fit with the jump catch 13. Further, the magnetic tripping transmission member first arm 541 and the magnetic tripping transmission member second arm 542 are of a V-shaped structure as a whole.

[0103] Further, an included angle between the magnetic tripping transmission member first arm 541 and the magnetic tripping transmission member second arm 542 is an obtuse angle.

[0104] Further, the magnetic tripping transmission member 54 further includes a magnetic tripping transmission member mounting portion 540. The magnetic tripping transmission member 54 is arranged pivotally through the magnetic tripping transmission member mounting portion 540. Further, the magnetic trip transmission member mounting portion 540 is arranged at one end of the magnetic tripping transmission member first arm 541 which is connected to the magnetic tripping transmission member second arm 542.

[0105] Further, the magnetic tripping transmission member 54 is of an integral structure, preferably formed by cutting and bending a metal plate.

[0106] As shown in FIGs. 4 and 9a, a matching process of the first support bearing portion 2125 of the first support 212 and the magnetic tripping transmission member 54 is as follows: as the magnetic tripping structure acts, the lock catch 14 is first driven to rotate and release the snap fit with the jump catch 13, and then drives the first support 212 through the first support bearing portion 2125 to rotate, so that the first support 212 rotates in a breaking direction. Further, as the magnetic tripping structure acts, the armature 52 drives the magnetic tripping transmission member 541 to rotate through the magnetic tripping transmission member first arm 541, and the magnetic tripping transmission member 54 hits the lock catch second arm 142 of the lock catch 14 through the magnetic tripping transmission member second arm 542 such that the lock catch 14 rotates and disengage from the jump catch 13; and then the magnetic tripping transmission member second arm 542 hits the first support bearing portion 2125, so that the first support 212 rotates in the breaking direction to accelerate a breaking speed of the contact system 2.

[0107] As other embodiments, the lock catch 14 is hit by the magnetic tripping transmission member 54 to rotate, such that the lock catch 14 release the snap fit with the jump catch 13, and the lock catch 14 further rotates and hits the first support bearing portion 2125 of the first support 212, such that the first support bearing portion 2125 rotates in the breaking direction.

[0108] As shown in FIGs. 15 and 17, the current-carrying conductive plate 33 further includes a conductive plate first intermediate section 331 and a conductive plate wiring section 330. The conductive plate wiring section 330, the conductive plate first intermediate section 331, the conductive plate second intermediate section 332, the conductive plate matching section 333, the conductive plate third intermediate section 334 and the conductive plate bimetallic adjusting section 335 are connected end to end in sequence. The conductive plate first intermediate section 331, the conductive plate second intermediate section 332, the conductive plate matching section 333 and the conductive plate third intermediate section 334 define a box-shaped structure. The conductive plate wiring section 330 is bent to one side away from the conductive plate matching section 333 with respect to the conductive plate first intermediate section 331. The conductive plate bimetallic adjusting section 335 is bent to one side away from the conductive plate second intermediate section 332 with respect to the conductive plate third intermediate section 334. Further, the conductive plate supporting arm 336 is connected to the conductive plate bimetallic adjusting section 335 in a bending manner and is located on the same side of the conductive plate bimetallic adjusting section 335 together with the conductive plate second intermediate section 334.

[0109] As shown in FIGs. 1-2 and 19, the switching device further includes a wire-outgoing conductive plate 34, which is used for connecting the wire-outgoing terminal 32 in series with the contact system 2.

[0110] As shown in FIGs. 1-2 and 19, the switching device further includes an arc-striking plate 35, wherein one end of the arc-striking plate 35 is electrically connected to the wire-outgoing conductive plate 34, and the other end of the arc-striking plate 35 extends to one side of the arc-extinguishing chamber 4.

[0111] As shown in FIGs. 1-2 and 19, the switching device of the present invention is a circuit breaker, and adopts the following layout mode:

the operating mechanism 1, the contact system 2, the wire-incoming terminal 31, the wire-outgoing terminal 32 and the arc-extinguishing chamber 4 are all arranged in a circuit breaker housing (i.e., the switch housing h); the operating member 11 of the operating mechanism 1, the contact system 2 and the arc-extinguishing chamber 4 are sequentially arranged in a height direction of the circuit breaker; the wire-incoming terminal 31 and the wire-outgoing terminal 32 are located at both ends of the circuit breaker in the length direction of the circuit breaker; the contact system 2 and the arc-extinguishing chamber 4 are located between the wire-incoming terminal 31 and the wire-outgoing terminal 32 in the length direction of circuit breaker, and the first contact structure 21 and the second contact structure 22 of the contact system 2 are arranged in symmetrical and synchronous rotation in the length direction of the circuit breaker; and the arc inlet of the arc-extinguishing chamber 4 is positioned opposite to the breaking interval formed by the separation of the first contact structure 21 from the second contact structure 22 and is oriented towards the operating member 11. The above-mentioned layout mode of the circuit breaker is reasonable and compact in layout and provides a larger assembly space for the arc-extinguishing chamber 4 of larger specification to be mounted, thereby being conducive to improving the arc-extinguishing performance and breaking performance of the circuit breaker. Moreover, the first contact structure 21 and the second contact structure 22 are arranged in symmetrical and synchronous rotation, which not only can double the breaking speed of the contact system 2 but also doubles an opening distance, and thus is conducive to improving the breaking performance and current-carrying capacity of the short circuit. Specifically, as shown in FIGs. 1-2 and 19, a left-right direction in FIGs. 1-2 and 19 (i.e., a direction from the wire-incoming terminal 31 to the wire-outgoing terminal 32) is the length direction of the circuit breaker, an up-down direction in FIGs. 1-2 (i.e., the direction from the operating member 11 to the arc-extinguishing chamber 4) is the height direction of the circuit breaker, and an inside and outside direction of a paper surface in FIGs. 1-2 is the thickness direction of the circuit breaker.

[0112] As shown in FIGs. 1-2 and 19, the rotation centers of the operating member 11, the first contact

structure 21 and the second contact structure 22 are located at three vertices of a triangle.

[0113] Further, as shown in FIGs. 1-2 and 19, the above triangle is an acute triangle.

[0114] As shown in FIGs. 1-2 and 19, the wire-incoming terminal 31, the first contact structure 21, the second contact structure 22 and the wire-outgoing terminal 32 are sequentially arranged side by side in the length direction of the circuit breaker.

[0115] As shown in FIGs. 1-2 and 19, the lock catch 14 of the operating mechanism 1, the first support 212 of the contact system 2 and the linkage rocker 15 of the operating mechanism 1 are sequentially stacked in the thickness direction of the circuit breaker. That is, the lock catch 14 and the linkage rocker 15 are located on both sides of the first support 212 in the thickness direction of the circuit breaker. The lock catch 14 and the linkage rocker 15 cooperate to provide more selection space for matching sites between the operating mechanism 1 and the thermomagnetic tripping mechanism 5, facilitating layout and structural design.

[0116] As shown in FIGs. 1-2 and 19, in the length direction of the circuit breaker, the contact system 2 and the arc-extinguishing chamber 4 are located on one side of the thermomagnetic tripping mechanism 5, and the wire-incoming terminal 31 is located on the other side of the thermomagnetic tripping mechanism 5.

[0117] As shown in FIGs. 1-2 and 19, the thermal tripping structure and the magnetic tripping structure of the thermomagnetic tripping mechanism 5 are arranged side by side in the height direction of the circuit breaker. Further, in the length direction of the circuit breaker, the thermal tripping structure and the contact system 2 are arranged side by side, and the magnetic tripping structure and the arc-extinguishing chamber 4 are arranged side by side.

[0118] As other embodiments, in the length direction of the circuit breaker, the contact system 2 and the arc-extinguishing chamber 4 are located on one side of the thermomagnetic tripping mechanism 5, and the wire-outgoing terminal 32 is located on the other side of the thermomagnetic tripping mechanism 5.

[0119] As other embodiments, the thermomagnetic tripping mechanism 5 is located between the contact system 2 and the wire-incoming terminal 31 or between the contact system 2 and the wire-outgoing terminal 32 in the length direction of the circuit breaker.

[0120] As other embodiments, the thermomagnetic tripping mechanism 5 is located between the arc-extinguishing chamber 4 and the wire-incoming terminal 31 or between the arc-extinguishing chamber 4 and the wire-outgoing terminal 32 in the length direction of the circuit breaker.

[0121] As other embodiments, the thermal tripping structure and the magnetic tripping structure of the thermomagnetic tripping mechanism 5 are separately located on both sides of the contact system 2 or on both sides of the arc-extinguishing chamber 4 in the length direction of the circuit breaker.

[0122] As shown in FIGs. 1-2 and 19, the thermal tripping transmission member 55 of the thermomagnetic tripping mechanism 5 is located between the operating mechanism 1 and the bimetallic assembly. Further, the thermal tripping transmission member 55 is located between the linkage rocker 15 of the operating mechanism 1 and the bimetallic sheet 56 of the bimetallic assembly in the length direction of the circuit breaker.

[0123] As shown in FIGs. 1-2, the magnetic tripping structure is a clapper-type electromagnetic trip, wherein the magnetic tripping transmission member 54 of the thermomagnetic tripping mechanism 5 is located between the operating mechanism 1 and the armature 52. Further, the magnetic tripping transmission member 54 is located between the lock catch **14** of the operating mechanism 1 and the armature 52 in the length direction of the circuit breaker. Further, the magnetic tripping transmission member 54 is located below the thermal tripping transmission member 55 in the height direction of the circuit breaker.

[0124] As other embodiments, the magnetic tripping structure is a direct-acting electromagnetic trip, wherein the magnetic tripping transmission member 54 is located between the operating mechanism 1 and the ejector rod 593 of the direct-acting electromagnetic trip.

[0125] As shown in FIGs. 1-2 and 19, the rotation centers of the lock catch 14, the magnetic tripping transmission member 54 and the thermal tripping transmission member 55 are located at three vertices of a triangle.

[0126] Further, as shown in FIGs. 1-2, when the magnetic tripping structure is a clapper-type electromagnetic trip, the triangle is an acute triangle.

[0127] Further, as shown in FIG. 19, when the magnetic tripping structure is a direct-acting electromagnetic trip, the triangle is an obtuse triangle, and a vertex angle corresponding to the lock catch **14** is an obtuse angle.

[0128] As shown in FIGs. 1-2 and 19, the separator 23 of the contact system 2 is located between the first contact structure 21 and the second contact structure 22 in the length direction of the circuit breaker.

[0129] As shown in FIGs. 1-2 and 19, the arc-extinguishing chamber 40 includes a plurality of arc-extinguishing grids 40 which are sequentially arranged side by side at intervals in the length direction of the circuit breaker.

[0130] As shown in FIGs. 1-2 and 19, the arc-striking plate 35 and the yoke 51/592 of the magnetic tripping structure (as shown in FIGs. 1-2, the magnetic tripping structure is a clapper-type electromagnetic trip, which includes a yoke 51; as shown in FIG. 19, the magnetic tripping structure is a direct-acting electromagnetic trip, which includes a yoke 592) are respectively located on both sides of the arc-extinguishing chamber 4 in the length direction of the circuit breaker, which is conducive to improving a speed at which the arc enters the arc-extinguishing chamber 4, and improving the arc-extinguishing efficiency. Moreover, the yoke 51/592 is used as

the arc-striking structure on one side of the arc-extinguishing chamber 40, which is conducive to simplifying an internal structure of the circuit breaker and reducing the number of parts.

[0131] As shown in FIGs. 1-2 and 19, the circuit breaker is a small circuit breaker. A circuit breaker housing of this small circuit breaker is a convex structure. The operating member 11 of the operating mechanism 1 is arranged at the upper part of the convex structure. The arc-extinguishing chamber 4 is arranged at the lower part of the convex structure, so the arc-extinguishing chamber 4 obtains a larger mounting space, and the circuit breaker can apply an arc-extinguishing chamber 4 of larger specification to improve the arc-extinguishing capacity. The wire-incoming terminal 31 and the wire-outgoing terminal 32 are located at both ends of the lower part of the convex structure, and the contact system 2 is located at a junction between the upper and lower parts of the convex structure. Further, the thermal tripping transmission member 55 of the thermomagnetic tripping mechanism 5 is located at the upper part of the convex structure. The thermal tripping structure of the thermomagnetic tripping mechanism 5 extends from the lower part to the upper part of the convex structure. The operating member 11, the thermal tripping transmission member 55 and the upper end of the thermal tripping structure are arranged side by side in the length direction of the circuit breaker. The magnetic tripping transmission member 54 and the magnetic tripping structure are located at the lower part of the convex structure. The magnetic tripping transmission member 54 is located between the contact system 2 and the wire-incoming terminal 31 in the length direction of the circuit breaker. The magnetic tripping structure is located between the arc-extinguishing chamber 4 and the wire-incoming terminal 31 in the length direction of the circuit breaker. Further, the upper and lower parts of the convex structure refer to an upper square space and a lower square space of the convex structure.

[0132] The present invention further discloses a circuit breaker device, which includes two or more circuit breakers used side by side, wherein lock catch structures of every two adjacent circuit breakers are in transmission connection with each other and arranged in linkage. Further, in the adjacent circuit breakers, the lock catch 14 of one lock catch structure and the linkage rocker 15 of the other lock catch structure are in transmission connection with each other and arranged in linkage. For example, the lock catch first arm 141 of the lock catch 14 is in transmission connection with the rocker second arm 152 of the corresponding linkage rocker 15 through a linkage shaft 14-15.

[0133] As shown in FIGs. 18, 21 and 22, a second implementation mode in which the operating mechanism 1 is in driving connection with the contact system 2 is shown. The operating mechanism 1 is in driving connection with the contact system 2 in the second embodiment. Compared with the first embodiment, the second embodiment of the contact system 2 further includes a slider 16 which is arranged slidably, a first sub-link 17-21 and a second sub-link 17-22, wherein two ends of the first sub-link 17-21 are hinged with the slider 16 and the first contact structure 21 respectively, and two ends of the second sub-link 17-22 are hinged with the slider 16 and the second contact structure 22 respectively; the operating mechanism 1 drives the slider 16 to slide; and the slider 16 drives the first contact structure 21 and the second contact structure 22 to rotate synchronously toward each other or rotate synchronously away from each other through the first sub-link 17-21 and the second sub-link 17-22 respectively. Further, the slider 16 is arranged in a linear sliding manner. Of course, the operating mechanism 1 may also be not connected to the slider 16, but is connected to any one of the first contact structure 21 and the second contact structure 22. The operating mechanism 1 drives the first contact structure 21 or the second contact structure 22 to rotate, and meanwhile the first contact structure 21 or the second contact structure 22 drives the second contact structure 22 or the first contact structure 21 to rotate through the cooperation of the first sub-link 17-21, the slider 16 and the second sub-link 17-22, so as to realize the synchronous rotation toward each other or away from each other of the first contact structure 21 and the second contact structure 22. At this moment, the slider 16, the first sub-link 17-21 and the second sub-link 17-22 become an intermediate transmission structure that realizes the linkage of the first contact structure 21 and the second contact structure 22. That is, the first contact structure 21 and the second contact structure 22 are in transmission connection indirectly via the intermediate transmission structure formed by the slider 16, the first sub-link 17-21 and the second sub-link 17-22. The slider 16 drives the first contact structure 21 and the second contact structure 22 respectively through the first sub-link 17-21 and the second sub-link 17-22, so that the first contact structure 21 and the second contact structure 22 rotate synchronously toward each other or away from each other, achieving stable and reliable transmission. However, compared with the existing double-contact structure that adopts one moving contact and one static contact, an opening distance has been doubled, and the breaking performance of the circuit breaker has been significantly improved. Further, the first reset spring exerts an acting force to the first support 212, such that the first contact structure 21 rotates to its breaking position, and meanwhile the first contact structure 21 drives the second contact structure 22 to rotate to its breaking position through the first sub-link 17-21, the slider 16 and the second sub-link 17-22; and/or, the second reset spring 223 exerts an acting force to the second support 222, such that the second contact structure 22 rotate to its breaking position, and meanwhile the second contact structure 22 drives the first contact structure 21 to rotate to its breaking position through the second sub-link 17-22, the slider 16 and the first sub-link 17-21.

[0134] As shown in FIGs. 18, 21 and 22, the slider 16, the first sub-link 17-21 and the second sub-link 17-22 are all located between the first contact structure 21 and the second contact structure 22, and the first sub-link 17-21 and the second sub-link 17-22 are arranged in a V-shape. One end of the first contact structure 21 and one end of the second contact structure 22 are respectively arranged pivotally around the first center 21s and the second center 22s, and the other end of the first contact structure 21 and the other end of the second contact structure 22 are closed or broken (that is, the first contact point 2110 of the first contact structure 21 and the second contact point 2210 of the second contact structure 22 cooperate with each other to be closed or broken). One end of the first sub-link 17-21 is hinged with the slider 16, and the other end of the first sub-link 17-21 is hinged with the first contact structure 21. One end of the second sub-link 17-22 is hinged with the slider 16, and the other end of the second sub-link 17-22 is hinged with the second contact structure 22. Further, one end of the first sub-link 17-21 is hinged with the slider 16, and the other end of the first sub-link 17-21 is hinged with the middle part of the first contact structure 21, wherein the middle part of the first contact structure 21 preferably refers to a part of the first contact structure 21 that is located between the first center 21s and the first contact point 2110 of the second contact structure 21. One end of the second sub-link 17-22 is hinged with the slider 16, and the other end of the second sub-link 17-22 is hinged with the middle part of the second contact structure 22, wherein the middle part of the second contact structure 22 preferably refers to a part of the second contact structure 22 that is located between the second center 22s and the second contact point 2210 of the second contact structure 22. Further, the first sub-link 17-21 and the second sub-link 17-22 are symmetrically arranged, and are of structures symmetrical with each other.

[0135] As shown in FIGs. 18, 21 and 22, the first sub-link 17-21 and the second sub-link 17-22 are hinged with the slider 16 around a third center 17s, that is, one end of the first sub-link 17-21 and one end of the second sub-link 17-22 are coaxially and rotatably arranged on the slider 16. The first sub-link 17-21 is hinged with the first contact structure 21 around a third sub-center 17-3s. The second sub-link 17-22 is hinged with the second contact structure 22 around a fourth sub-center 17-4s. Further, the third center 17s, the first center 21s and the second center 22s are respectively located at three vertices of an isosceles triangle. The first center 21s and the second center 22s are respectively located at vertices corresponding to two base angles of the isosceles triangle.

[0136] As other embodiments, the middle part of the first contact structure 21 and the middle part of the second contact structure 22 are respectively arranged pivotally around the first center 21s and the second center 22s, one end of the first contact structure 21 is hinged with the first sub-link 17-21, one end of the second contact structure 22 is hinged with the second sub-link 17-22, and the other end of the first contact structure 21 and the other end of the second contact structure 22 are closed or broken.

[0137] Further, as shown in FIGs. 18, 21 and 22, the first sub-link 17-21 and the second sub-link 17-22 are hinged with the first support 212 and the second support 222, respectively. That is, one end of the first sub-link 17-21 is hinged with the slider 16, and the other end of the first sub-link 17-21 is hinged with the first support 212; and one end of the second sub-link 17-22 is hinged with the slider 16, and the other end of the second sub-link 17-22 is hinged with the second support 222, which is conducive to improving the insulativity.

[0138] As shown in FIG. 22, a first connection mode between the operating mechanism 1 and the contact system 2 in the second embodiment is as follows: the operating mechanism 1 includes an operating member 11, a main link rod 12, a jump catch 13 and a lock catch 14, wherein the jump catch 13 and the lock catch 14 are respectively arranged pivotally on the first contact structure 21 or the second contact structure 22 and snap fit with each other, and two ends of the main link rod 12 are hinged with the operating member 11 and the jump catch 13 respectively. Further, the jump catch 13 and the lock catch 14 are arranged pivotally on the first support 212, respectively. A working principle of the operating mechanism 1 is the same as the prior art, and will not be described herein.

[0139] As other embodiments, the jump catch 13 and the lock catch 14 are arranged pivotally on the second support 222, respectively.

[0140] As shown in FIG. 22, the slider 16 and the separator 23 are connected and move synchronously. Further, the slider 16 and the separator 23 are of an integrated structure, which is conducive to reducing the number of parts of the circuit breaker and improving the mounting efficiency and working stability.

[0141] As shown in FIG. 22, the slider 16 is slidably arranged on the circuit breaker housing. The first contact structure 21 and the second contact structure 22 are arranged pivotally on the circuit breaker housing (specifically, the first support 212 is arranged pivotally on the circuit breaker housing through its first support shaft 2124, and the second support 222 is arranged pivotally on the circuit breaker housing through its second support shaft 2222), respectively.

[0142] As shown in FIG. 23, a second connection mode of the operating mechanism 1 and the contact system 2 in the second embodiment is as follows: the operating mechanism 1 includes an operating member 11, a main link rod 12, a jump catch 13, a lock catch 14, a supporting member 18 and a supporting member link 17-23, wherein the operating member 11 and the supporting member 18 are arranged pivotally, respectively; the jump catch 13 and the lock catch 14 are arranged pivotally on the supporting member 18, respectively; two ends of the main link rod 12 are hinged with the operating member 11 and the jump catch 13, respectively; and two ends of

the supporting member link 17-23 are hinged with the supporting member 18 and the slider 16, respectively. Further, the supporting member link 17-23 is hinged with the slider 16 around a link-slider center.

[0143] Further, the first sub-link 17-21 is hinged with the slider 16 around a first sub-center 17-1s, the second sub-link 17-22 is hinged with the slider 16 around a second sub-center 17-2s, and the first sub-center 17-1s and the second sub-center 17-2s are arranged at intervals in parallel. Further, the link-slider center, the first sub-center 17-1s and the second sub-center 17-2s are located at three vertices of a triangle. Further, the above triangle is an isosceles triangle, and the first sub-center 17-1s and the second sub-center 17-2s are located at vertices corresponding to two base angles of the isosceles triangle, respectively. Of course, according to actual needs, the first sub-link 17-21 and the second sub-link 17-22 are hinged with the slider 16 around the same center.

[0144] As shown in FIG. 24, a third connection mode between the operating mechanism 1 and the contact system 2 in the second embodiment is as follows: the third connection mode is different from the second connection mode in a connection structure of the operating mechanism 1 and the contact system 2, specifically: one end of the supporting member link 17-23 is hinged with the supporting member 18, and the other end of the supporting member link 17-23 is hinged with the first contact structure 21 or the second contact structure 22.

[0145] Further, the supporting member link 17-23 is hinged with the first support 212 of the first contact structure 21. Of course, according to actual needs, the supporting member link 17-23 can be changed to be hinged with the second support 222 of the second contact structure 22.

[0146] As shown in FIGs. 25-26, a third embodiment of the contact system 2 is shown.

[0147] The middle part of the first contact structure 21 and the middle part of the second contact structure 22 are both arranged pivotally around a contact mechanism center 2s, that is, arranged coaxially and rotatably. One end of the first sub-link 17-21 is hinged with the slider 16, and the other end of the first sub-link 17-21 is hinged with one end of the first contact structure 21 around a third sub-center 17-3s. One end of the second sub-link 17-22 is hinged with the slider 16, and the other end of the second sub-link 17-22 is hinged with one end of the second contact structure 22 around a fourth sub-center 17-4s. The slider 16, the third sub-center 17-3s, the contact mechanism center 2s and the fourth sub-center 17-4s are located at four vertices of a quadrilateral, respectively.

[0148] Further, the operating mechanism 1 includes an operating member 11, a main link rod 12, a jump catch 13, a lock catch 14, a supporting member 18 and a supporting member link 17-23, wherein the operating member 11 and the supporting member 18 are arranged pivotally, respectively; the jump catch 13 and the lock catch 14 are arranged pivotally on the supporting member 18, respectively; two ends of the main link rod 12 are hinged with the operating member 11 and the jump catch 13, respectively; and the supporting member 18 is in transmission connection with the slider 16. Further, the first sub-link 17-21 and the second sub-link 17-22 are hinged with the supporting member 18 around a fifth center 19s through a link hinging shaft. That is, the first sub-link 17-21 and the second sub-link 17-22 are both hinged with the supporting member 18 through the link hinging shaft, and an axis of the link hinging shaft coincides with the fifth center 19s; and the link hinging shaft is used as the slider 16.

[0149] It should be explained that, in the description of the present invention, the terms such as "up", "down", "left", "right", "inner" and "outer" indicating the directional or positional relations on the basis of the directional or positional relations shown in the drawings are only used for conveniently describing the present invention and simplifying the description, not indicate or imply that the referred devices or elements must have a specific orientation and be configured and operated in a specific direction; therefore, they cannot be construed as a limitation on the present invention.

[0150] We have made further detailed description of the present invention mentioned above in combination with specific preferred embodiments, but it is not deemed that the specific embodiments of the present invention is only limited to these descriptions. A person skilled in the art can also, without departing from the concept of the present invention, make several simple deductions or substitutions, which all be deemed to fall within the protection scope of the present invention.

Claims

1. A circuit breaker, comprising a circuit breaker housing, and an operating mechanism (1), a contact system (2), a wire-incoming terminal (31), a wire-outgoing terminal (32), an arc-extinguishing chamber (4) and a thermomagnetic tripping mechanism (5) which are separately arranged in the circuit breaker housing; wherein the contact system (2) comprises a first contact structure (21) and a second contact structure (22) that are arranged in synchronous rotation;

   in a height direction of the circuit breaker, an operating member (11) of the operating mechanism (1), the contact system (2) and the arc-extinguishing chamber (4) are arranged in sequence; and

   in a length direction of the circuit breaker, the wire-incoming terminal (31) and the wire-outgoing terminal (32) are located at both ends of the circuit breaker, the contact system (2) and the arc-extinguishing chamber (4) are located between the wire-incoming terminal (31) and the

wire-outgoing terminal (32), the contact system (2) and the arc-extinguishing chamber (4) are located on one side of the thermomagnetic tripping mechanism (5), the wire-incoming terminal (31) or the wire-outgoing terminal (32) is located on another side of the thermomagnetic tripping mechanism (5), and the first contact structure (21) and the second contact structure (22) are arranged side by side.

2. The circuit breaker according to claim 1, wherein the wire-incoming terminal (31), the first contact structure (21), the second contact structure (22) and the wire-outgoing terminal (32) are sequentially arranged side by side in the length direction of the circuit breaker; an arc inlet of the arc-extinguishing chamber (4) is positioned opposite to a breaking interval formed by a disconnection of the first contact structure (21) and the second contact structure (22) and is oriented towards the operating member (11); and

the arc-extinguishing chamber (4) comprises a plurality of arc-extinguishing grids (40), which are sequentially arranged at intervals side by side in the length direction of the circuit breaker; and rotation centers of the operating member (11), first contact structure (21) and second contact structure (22) are separately located at three vertices of an acute triangle.

3. The circuit breaker according to claim 1, wherein the operating mechanism (1) further comprises a main link rod (12), a jump catch (13) and a lock catch (14); the first contact structure (21) comprises a first support (212) and a first contact (211); the first support (212) is arranged pivotally in the circuit breaker housing; the first contact (211) is arranged on the first support (212) and rotates synchronously with the first support (212) under the driving of the first support (212); the jump catch (13) and the lock catch (14) are arranged pivotally on the first support (212) respectively and in snap fit with each other; and two ends of the main link rod (12) are hinged with the operating member (11) and the jump catch (13), respectively.

4. The circuit breaker according to claim 3, wherein the operating mechanism (1) further comprises a linkage rocker (15); the linkage rocker (15) and the lock catch (14) are arranged coaxially and in synchronous rotation; in a thickness direction of the circuit breaker, the linkage rocker (15) and the lock catch (14) are separately located on both sides of the first support (212); the thermomagnetic tripping mechanism (5) comprises a thermal tripping structure and a magnetic tripping structure; the thermal tripping structure is used for driving the lock catch (14) to rotate through the linkage rocker (15) and disengage from the jump catch (13) when an overload fault occurs in a circuit where the circuit breaker is installed; the magnetic tripping structure is used for directly driving the lock catch (14) to rotate and disengage from the jump catch (13) when a short-circuit fault occurs in the circuit where the circuit breaker is installed; and when a plurality of circuit breakers are arranged side by side and in linkage, in two circuit breaker adjacent to each other, the lock catch (14) of one circuit breaker is in driving connection with the linkage rocker (15) of another circuit breaker.

5. The circuit breaker according to claim 1, wherein the thermomagnetic tripping mechanism (5) comprises a thermal tripping structure which is used for driving the operating mechanism (1) to trip when an overload fault occurs in a circuit where the circuit breaker is installed and a magnetic tripping structure which is used for driving the operating mechanism (1) to trip when a short-circuit fault occurs in the circuit where the circuit breaker is installed, and the thermal tripping structure and the magnetic tripping structure are arranged side by side in the height direction of the circuit breaker;

in the length direction of the circuit breaker, the thermal tripping structure is located between the contact system (2) and the wire-incoming terminal (31) or the wire-outgoing terminal (32), and the magnetic tripping structure is located between the arc-extinguishing chamber (4) and the wire-incoming terminal (31) or the wire-outgoing terminal (32).

6. The circuit breaker according to claim 5, wherein the thermomagnetic tripping mechanism (5) further comprises a thermal tripping transmission member (55) which is arranged pivotally; the thermal tripping structure comprises a bimetallic assembly; the thermal tripping transmission member (55) is located between the operating mechanism (1) and the bimetallic assembly;

the thermomagnetic tripping mechanism (5) further comprises a magnetic tripping transmission member (54) which is arranged pivotally; the magnetic tripping structure is a clapper-type electromagnetic trip, and comprises an armature (52) which is arranged pivotally; the magnetic tripping transmission member (54) is located between the operating mechanism (1) and the armature (52); rotation centers of the lock catch (14) of the operating mechanism (1), magnetic tripping transmission member (54) and thermal tripping transmission member (55) are respectively located at three vertices of a triangle; or

the thermomagnetic tripping mechanism (5) further comprises a magnetic tripping transmission member (54) which is arranged pivotally;

the magnetic tripping structure is a direct-acting electromagnetic trip; the magnetic tripping transmission member (54) is located between the operating mechanism (1) and the magnetic tripping structure; one end of the magnetic tripping transmission member (54) is in transmission fit with the operating mechanism (1), and another end of the magnetic tripping transmission member (54) is in transmission fit with an ejector rod of the direct-acting electromagnetic trip.

7. The circuit breaker according to claim 1, wherein the contact system (2) further comprises a separator (23); the separator (23) is located between the first contact structure (21) and the second contact structure (22) in the length direction of the circuit breaker; the separator (23) comprises a separation portion (232); when the first contact structure (21) and the second contact structure (22) are closed, the separator (23) is driven to make the separation portion (232) move out of a position between a first contact point (210) of the first contact structure (21) and a second contact point (2210) of the second contact structure (22); and when the first contact structure (21) and the second contact structure (22) are disconnected, the separator (23) is driven to make the separation portion (232) move to the position between the first contact point (2110) and the second contact point (2210).

8. The circuit breaker according to claim 1, wherein the first contact structure (21) and the second contact structure (22) are arranged in symmetrical and synchronous rotation, and the first contact structure (21) and the second contact structure (22) synchronously rotate toward each other to be closed and synchronously rotate away from each other to be broken.

9. The circuit breaker according to claim 8, wherein the first contact structure (21) and the second contact structure (22) are in transmission fit with each other;

the first contact structure (21) comprises a first support (212) arranged pivotally around a first center (21s) and a first contact (211) arranged on the first support (212), wherein the first support (212) comprises a master gear (2121); and
the second contact structure (22) comprises a second support (222) arranged pivotally around a second center (22s) and a second contact (221) arranged on the second support (222), wherein the second support (222) comprises a slave gear (2221), and the slave gear (2221) is in meshing fit with the master gear (2121).

10. The circuit breaker according to claim 7, wherein the separator (23) is arranged to integrally move between the first contact structure (21) and the second contact structure (22), and is driven to move to a first direction or a second direction which are opposite to each other, so that the separation portion (232) moves to or out of the position between the first contact point (2110) and the second contact point (2210).

11. The circuit breaker according to claim 10, wherein the separator (23) is driven by the first contact structure (21) to make the separation portion (232) move to or out of the position between the first contact point (2110) and the second contact point (2210);

the first contact structure (21) comprises a first support (212) arranged pivotally around the first center (21s) and a first contact (211) arranged on the first support (212); the first support (212) comprises a separator driving gear (2122), an axis of which coincides with the first center (21s); the separator (23) comprises a separator rack (231) connected to the separation portion (232); and the separator driving gear (2122) is in meshing fit with the separator rack (231); and
the second contact structure (22) comprises a second support (222) arranged pivotally around the second center (22s); the second support (222) comprises a separator limiting table (2223); the separator limiting table (2223) and the separator driving gear (2122) are respectively located on both sides of the separator rack (231); and the separator limiting platform (2223) is in limiting fit with the separator rack (231), such that the separator rack (231) keeps meshed with the separator driving gear (2122).

12. The circuit breaker according to claim 8, wherein the contact system (2) further comprises a first sub-link (17-21), a second sub-link (17-22) and a slider (16) which is arranged slidably; two ends of the first sub-link (17-21) are hinged with the slider (16) and the first contact structure (21), respectively; two ends of the second sub-link (17-22) are hinged with the slider (16) and the second contact structure (22), respectively; and the slider (16) drives the first contact structure (21) and the second contact structure (22) to rotate synchronously toward each other to be closed and rotate synchronously away from each other to be broken through the first sub-link (17-21) and the second sub-link (17-22), respectively.

13. The circuit breaker according to claim 12, wherein the slider (16), the first sub-link (17-21) and the second sub-link (17-22) are located between the first contact structure (21) and the second contact structure (22), respectively; the first sub-link (17-21) and the second sub-link (17-22) are arranged in a V-shape;

one end of the first contact structure (21) is arranged pivotally around the first center (21s); one end of the second contact structure (22) is arranged pivotally around the second center (22s); another end of the first contact structure (21) and another end of the second contact structure (22) cooperate with each other to be closed or broken; and

one end of the first sub-link (17-21) is hinged with the slider (16), and another end of the first sub-link (17-21) is hinged with the first contact structure (21); and one end of the second sub-link (17-22) is hinged with the slider (16), and another end of the second sub-link (17-22) is hinged with the second contact structure (22).

14. The circuit breaker according to claim 13, further comprising the operating mechanism (1), wherein the operating mechanism (1) is in transmission connection with the contact system (2) to drive the contact system (2) to be closed and broken; the operating mechanism (1) comprises the operating member (11) which is arranged pivotally, a main link rod (12), a jump catch (13) and a lock catch (14), wherein the jump catch (13) and the lock catch (14) are arranged pivotally on the first contact structure (21) or the second contact structure (22) respectively and in snap fit with each other; and two ends of the main link rod (12) are hinged with the operating member (11) and the jump catch (13), respectively.

15. The circuit breaker according to claim 13, further comprising the operating mechanism (1), wherein the operating mechanism (1) is in transmission connection with the contact system (2) to drive the contact system (2) to be closed and broken; the operating mechanism (1) comprises the operating member (11), a main link rod (12), a jump catch (13), a lock catch (14), a supporting member (18) and a supporting member link (17-23); the operating member (11) and the supporting member (18) are arranged pivotally, respectively; the jump catch (13) and the lock catch (14) are arranged pivotally on the supporting member (18), respectively; and two ends of the main link rod (12) are hinged with the operating member (11) and the jump catch (13), respectively;

two ends of the supporting member link (17-23) are hinged with the supporting member (18) and the slider (16), respectively; or

one end of the supporting member link (17-23) is hinged with the supporting member (18), and another end of the supporting member link (17-23) is hinged with the first contact structure (21) or the second contact structure (22).

16. The circuit breaker according to claim 8, wherein a middle part of the first contact structure (21) and a middle part of the second contact structure (22) are both arranged pivotally around a contact mechanism enter (2s); one end of the first sub-link (17-21) is hinged with the slider (16), and another end of the first sub-link (17-21) is hinged with one end of the first contact structure (21) around a third sub-center (17-3s); one end of the second sub-link (17-22) is hinged with the slider (16), and another end of the second sub-link (17-22) is hinged with one end of the second contact structure (22) around a fourth sub-center (17-4s); and the slider (16), the third sub-center (17-3s), the contact mechanism center (2s) and the fourth sub-center (17-4s) are respectively located at four vertices of a quadrilateral.

17. The circuit breaker according to claim 16, further comprising the operating mechanism (1), wherein the operating mechanism (1) is in transmission connection with the contact system (2) to drive the contact system (2) to be closed and broken; the operating mechanism (1) comprises the operating member (11), a main link rod (12), a jump catch (13), a lock catch (14) and a supporting member (18); the operating member (11) and the supporting member (18) are arranged pivotally, respectively; the jump catch (13) and the lock catch (14) are arranged pivotally on the supporting member (18), respectively; two ends of the main link rod (12) are hinged with the operating member (11) and the jump catch (13), respectively; and the supporting member (18) is in transmission connection with the slider (16).

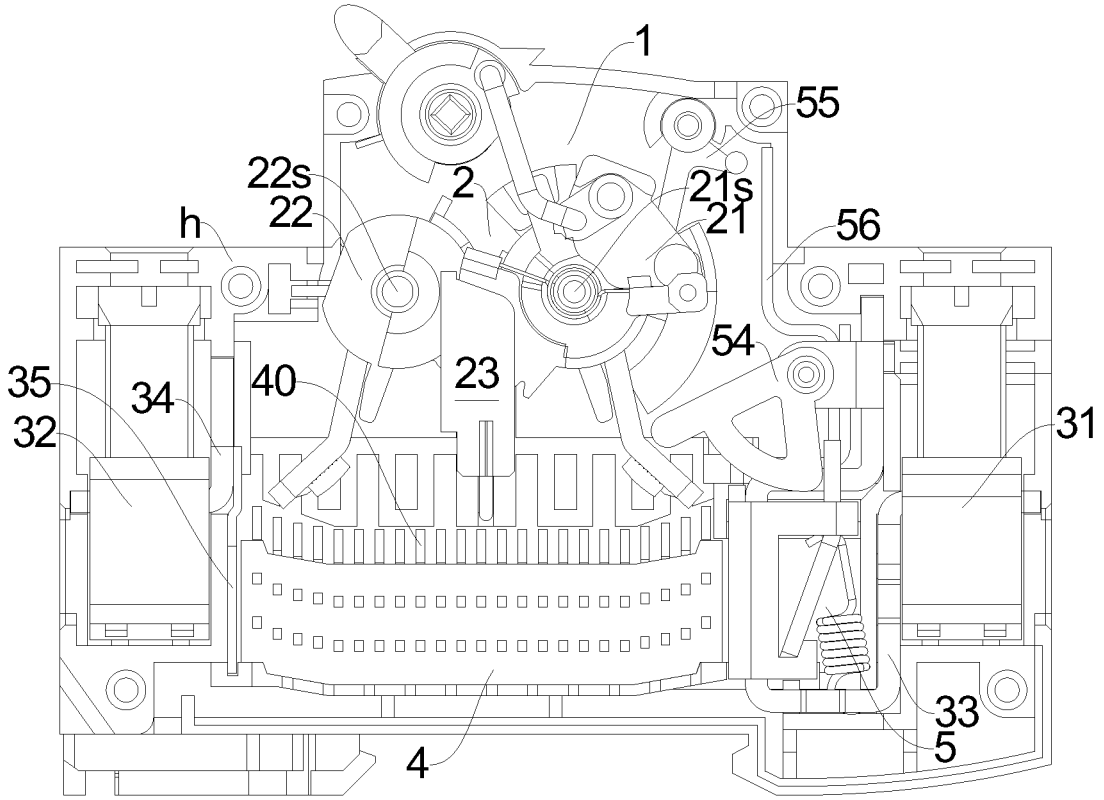
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Fig.1

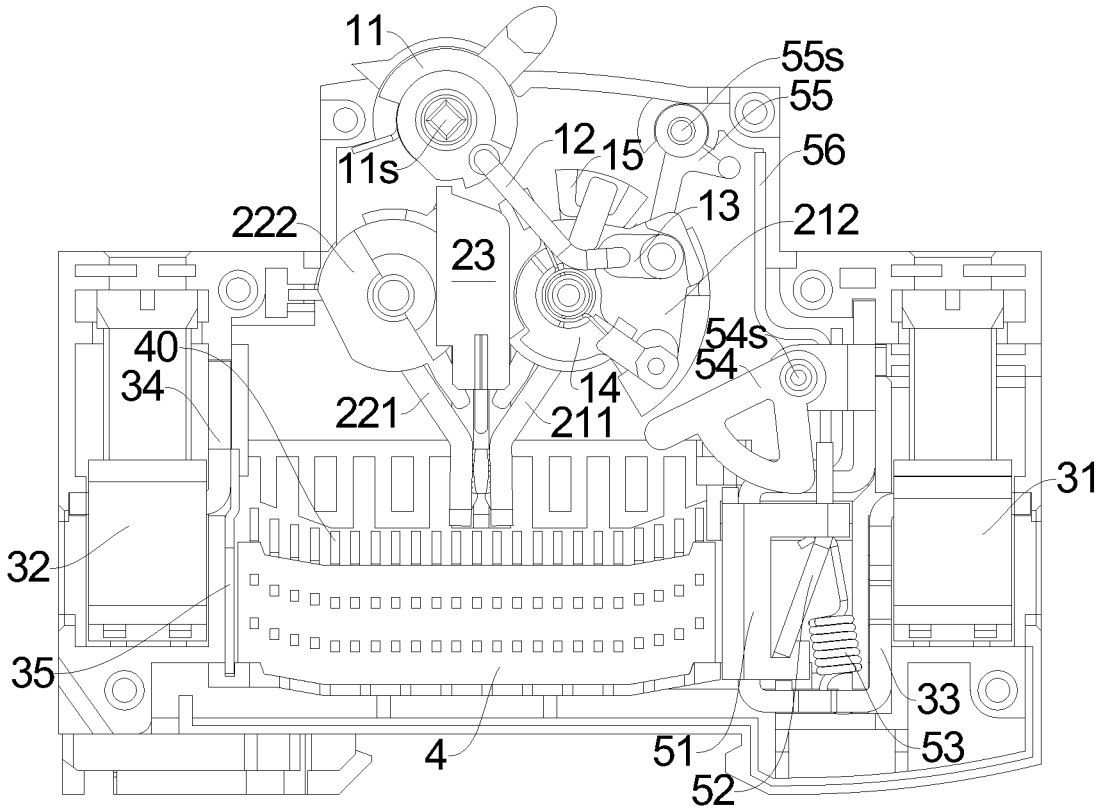
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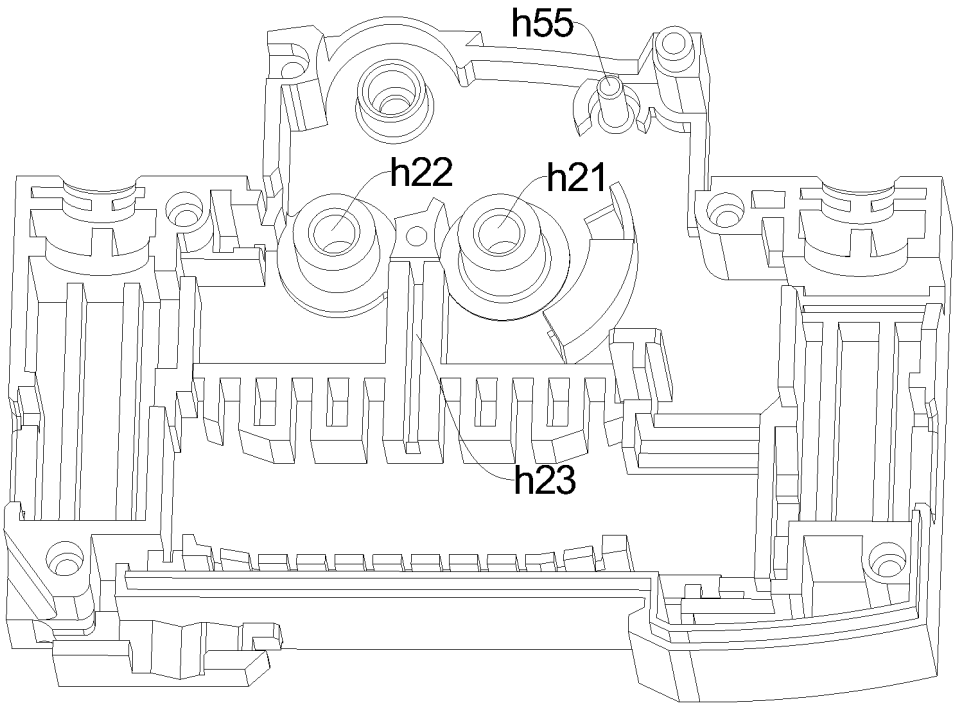
Fig.2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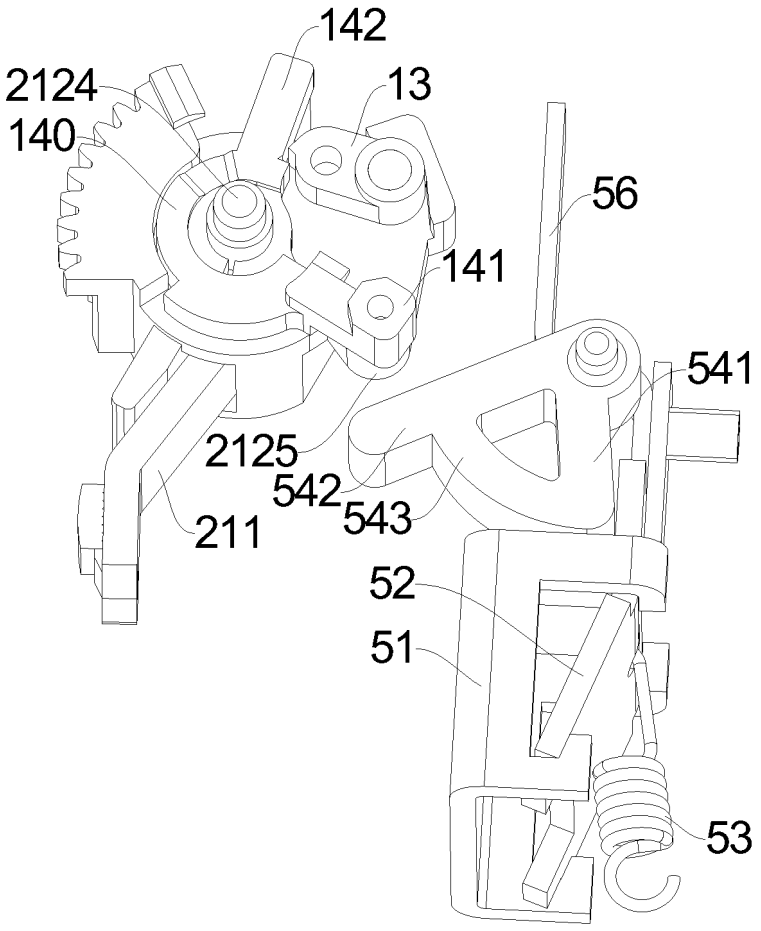
h22
h21
h23

Fig.3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2125
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211
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51
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Fig.4

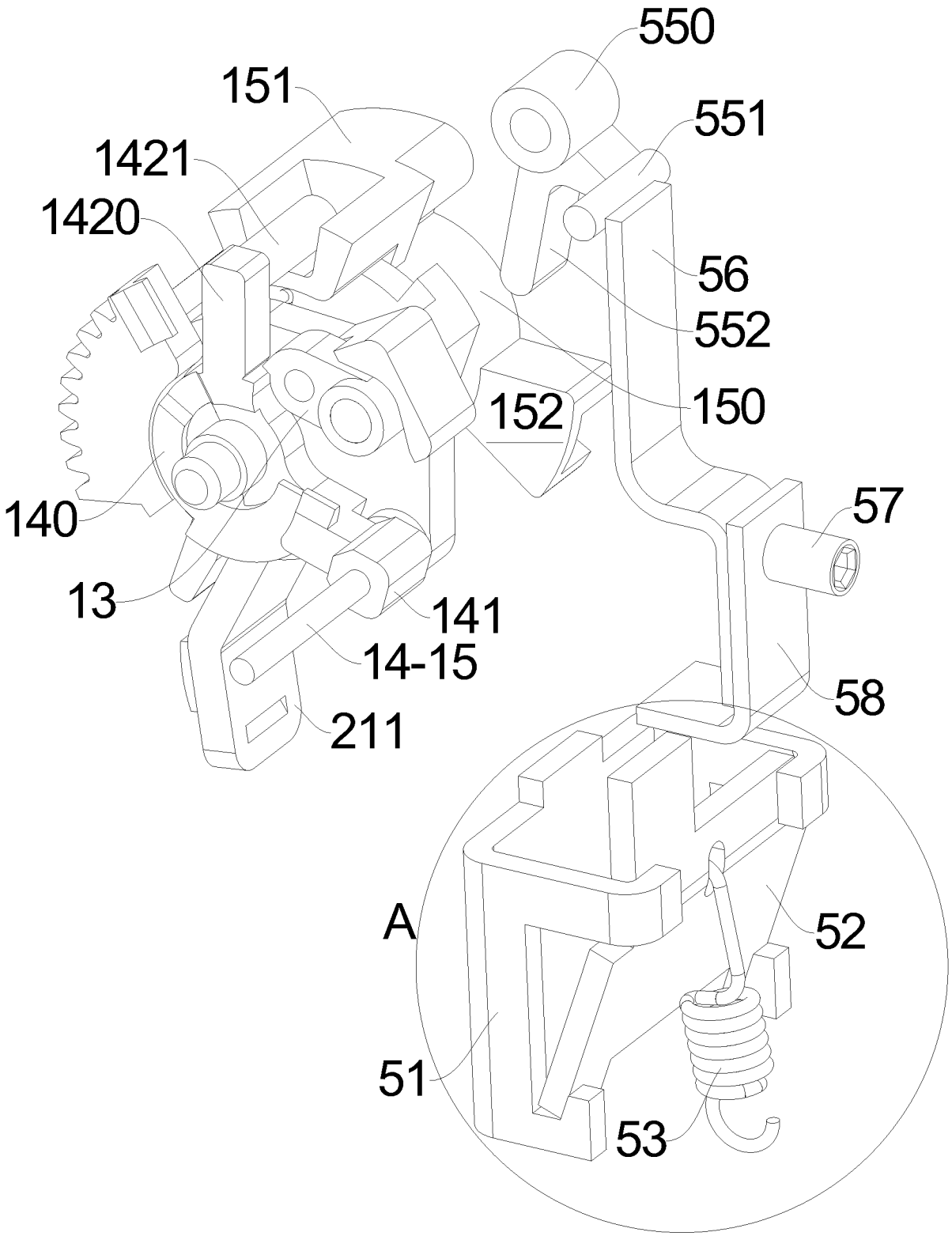
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Fig.5a

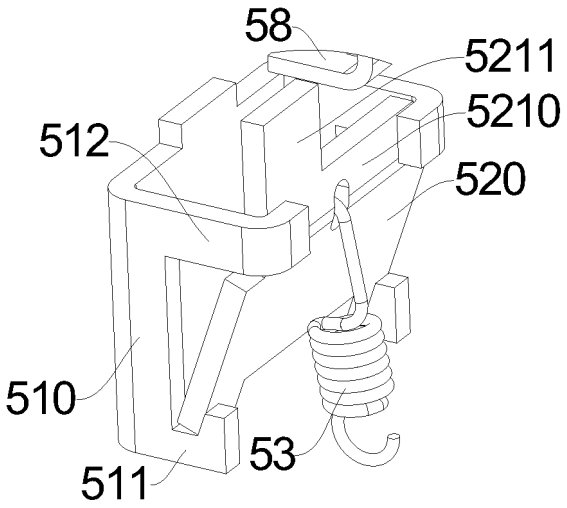


Fig.5b

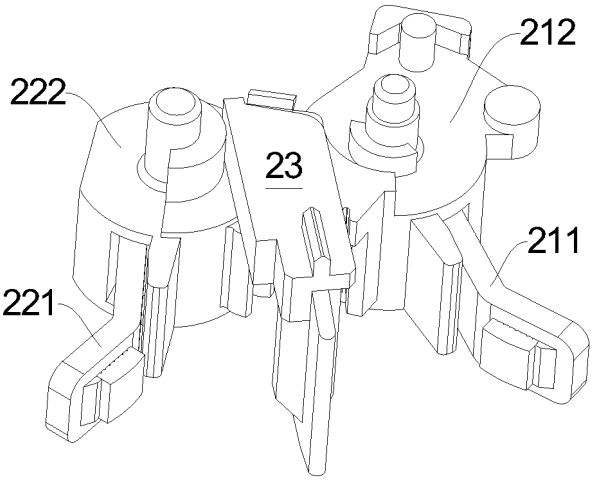


Fig.6

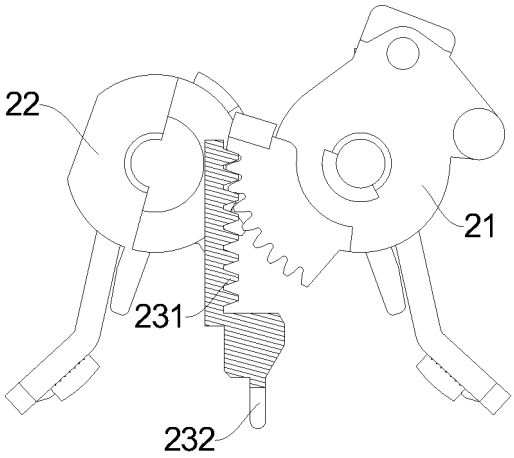


Fig.7

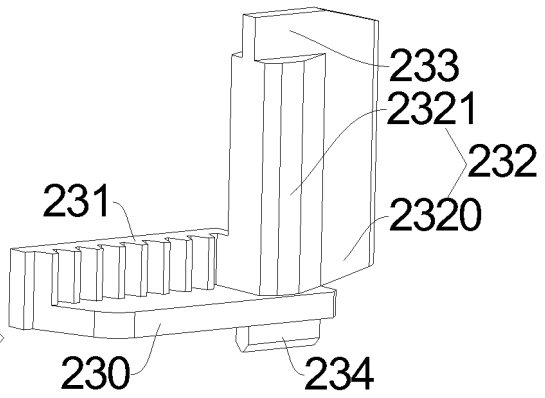


Fig.8

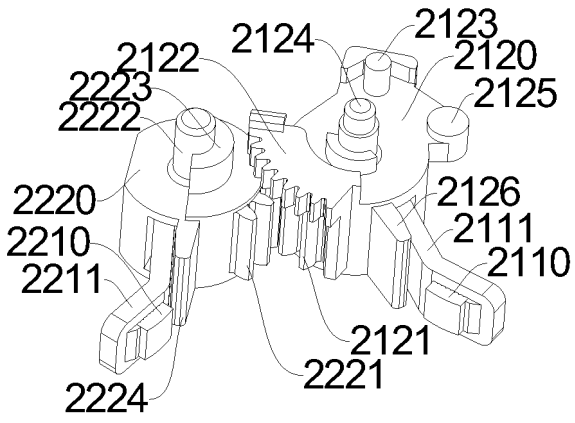


Fig.9a

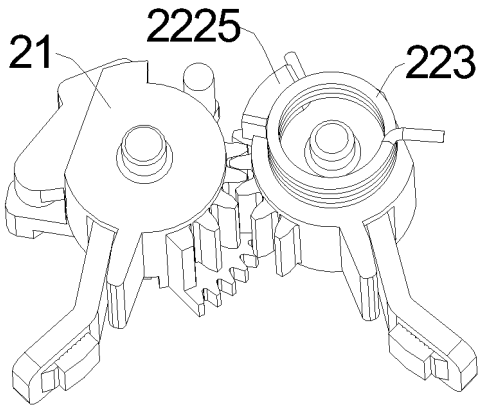


Fig.9b

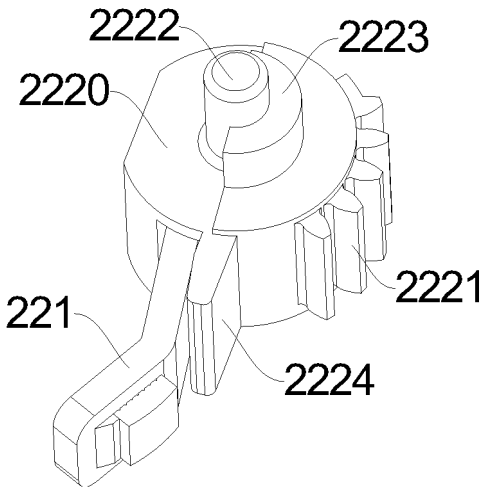


Fig.10

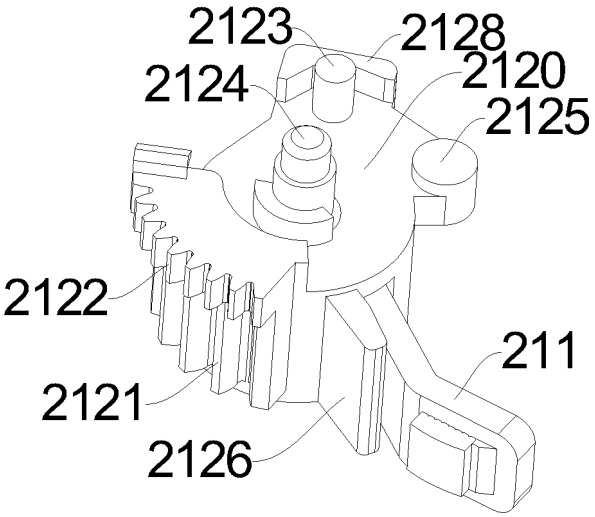


Fig.11

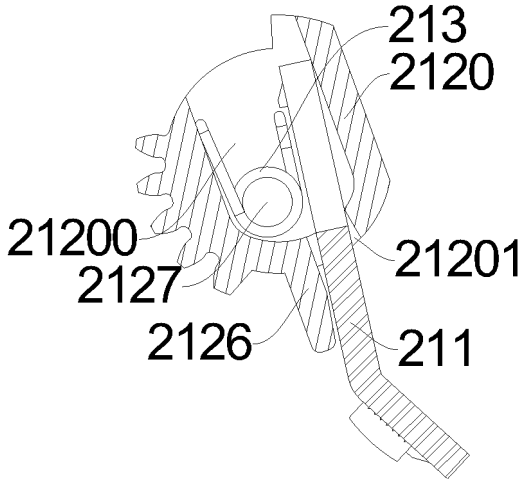


Fig.12

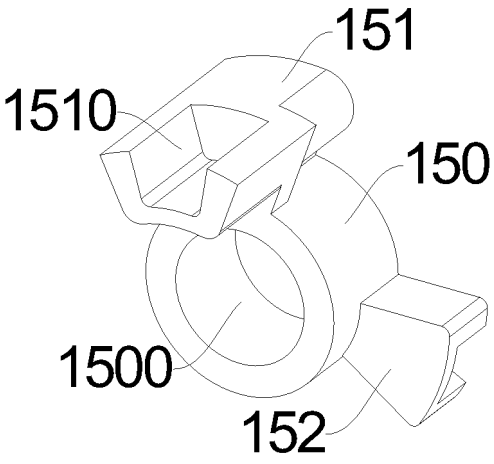


Fig.13

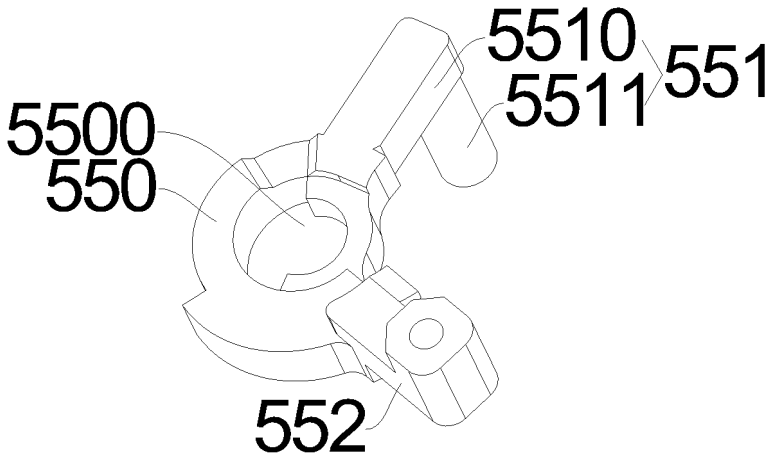


Fig.14

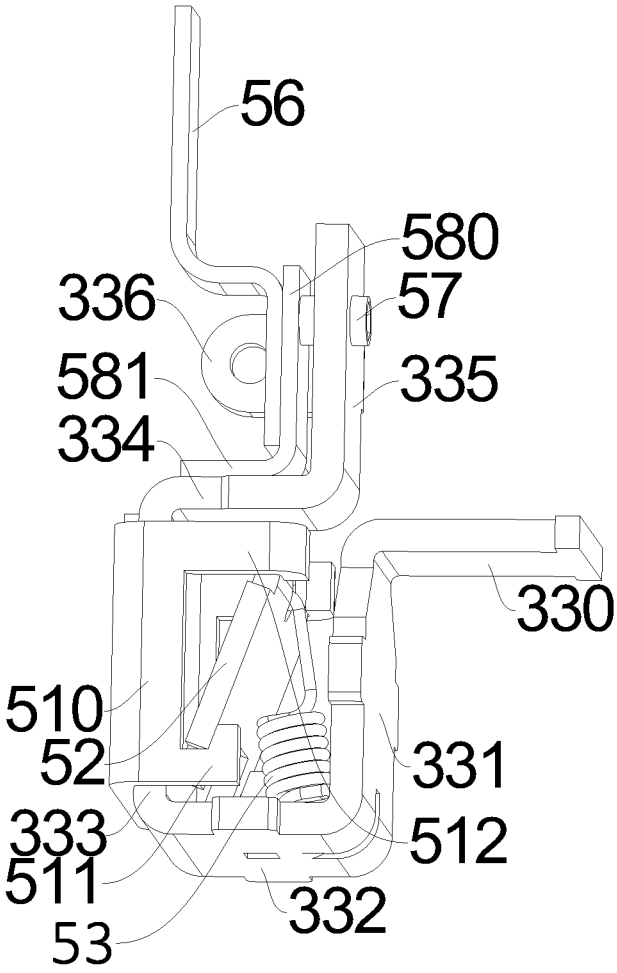


Fig.15

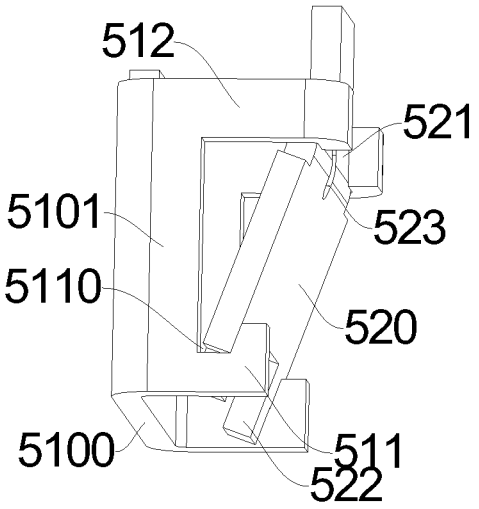


Fig.16

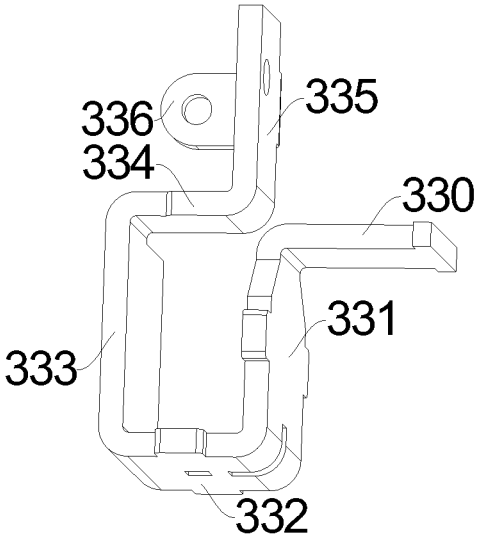


Fig.17

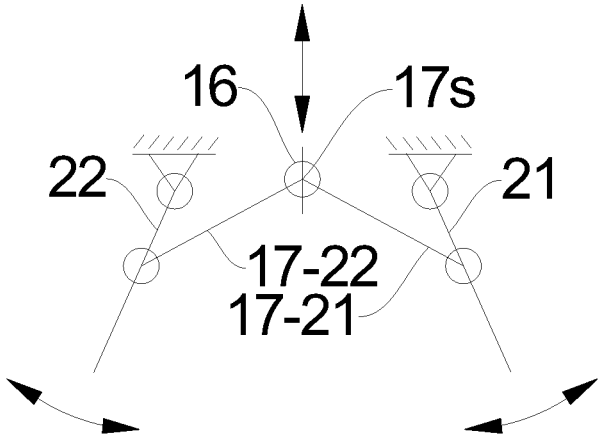


Fig.18

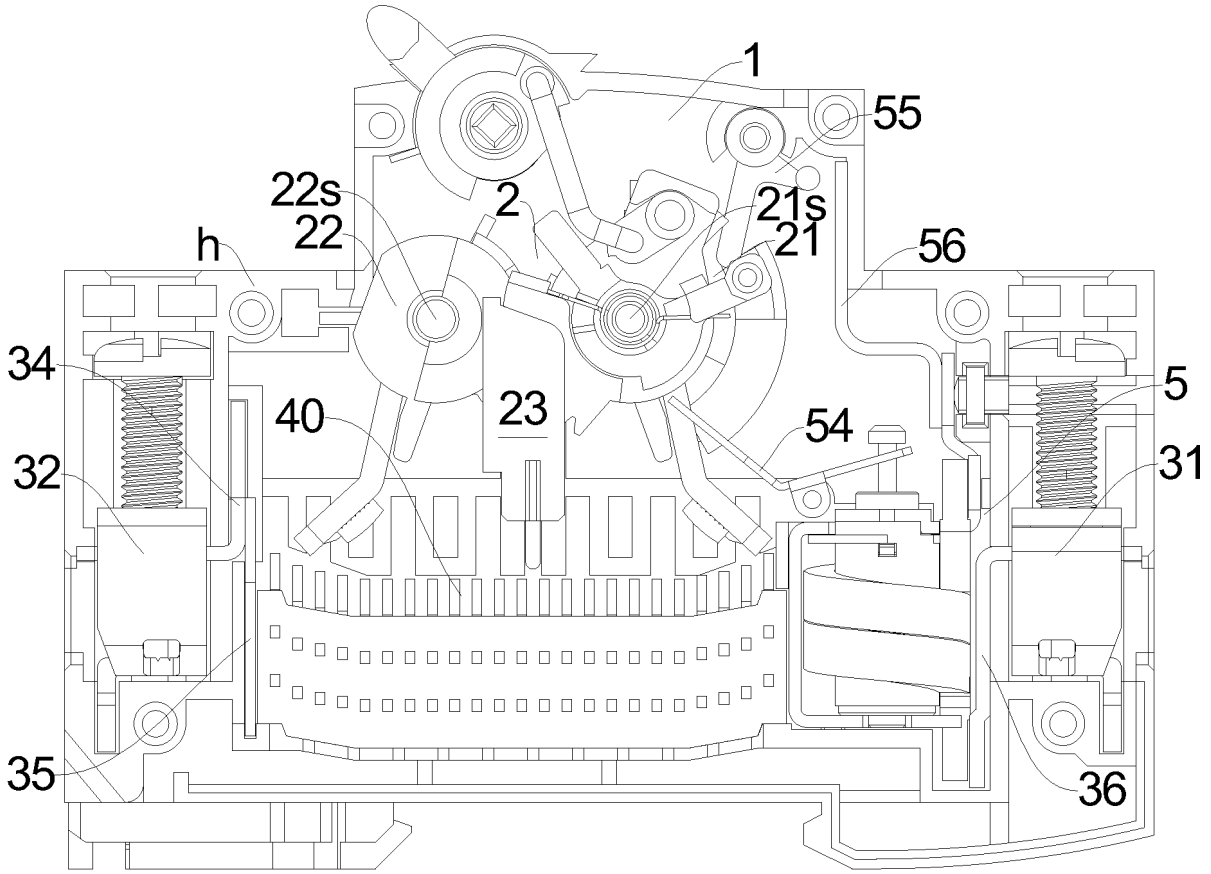


Fig.19

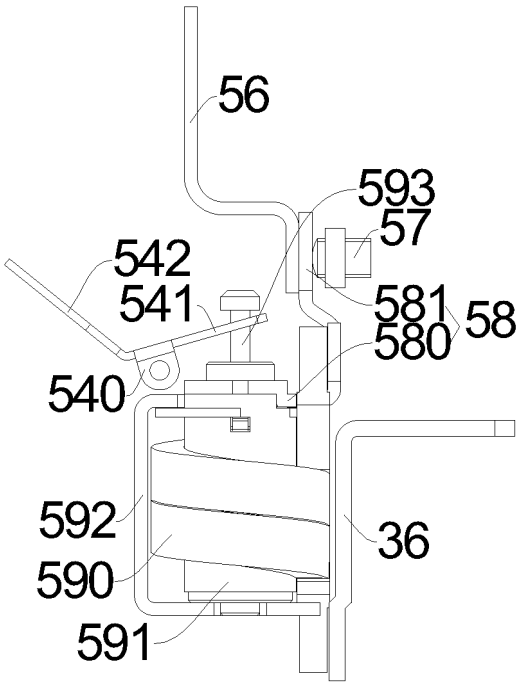
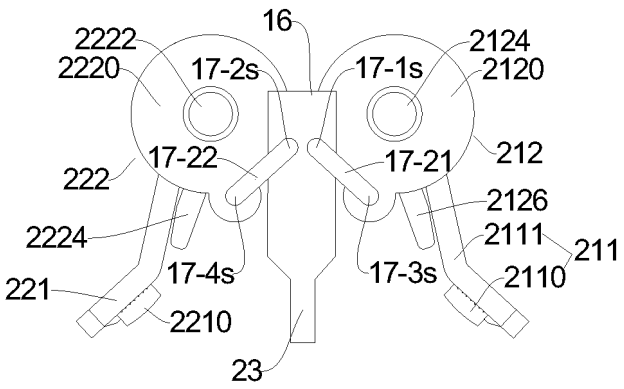


Fig.20



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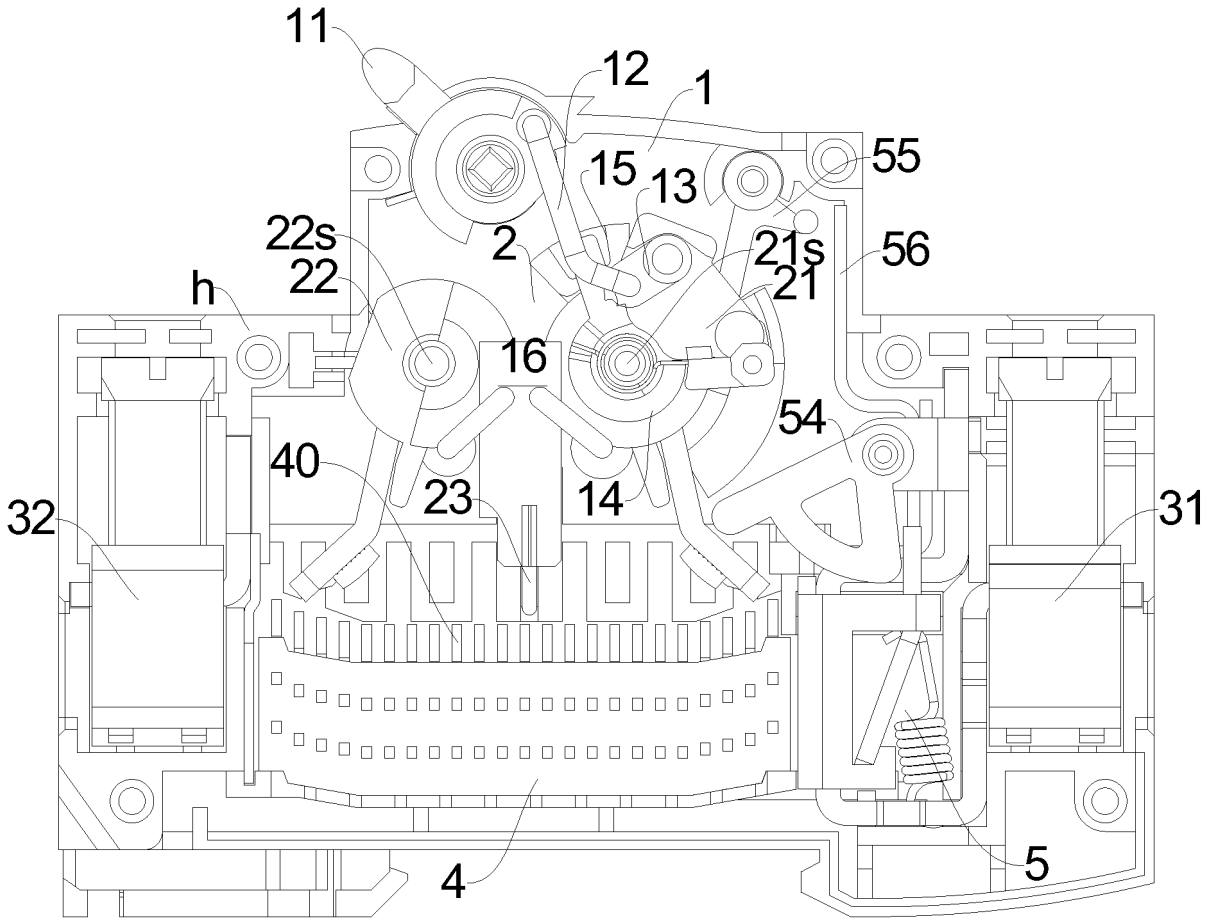
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Fig.22

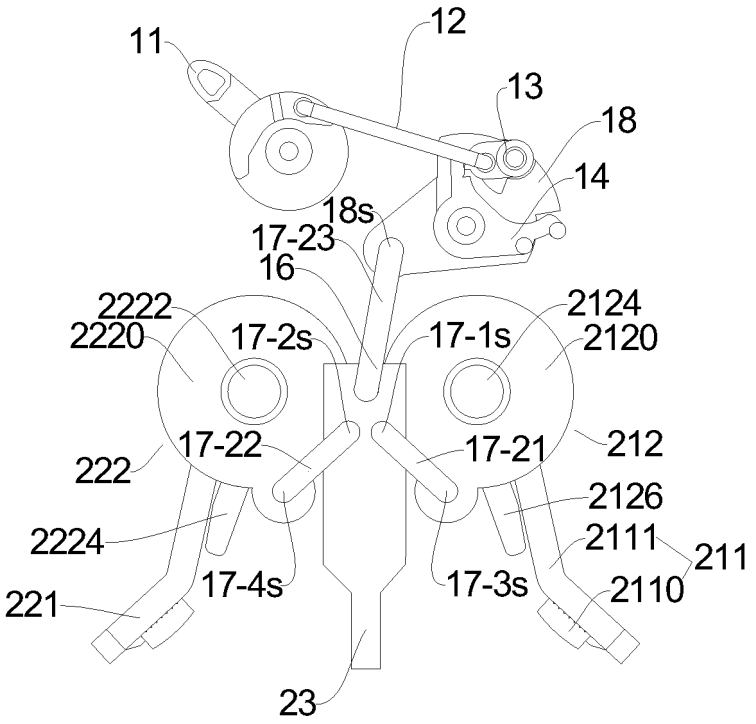
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Fig.23

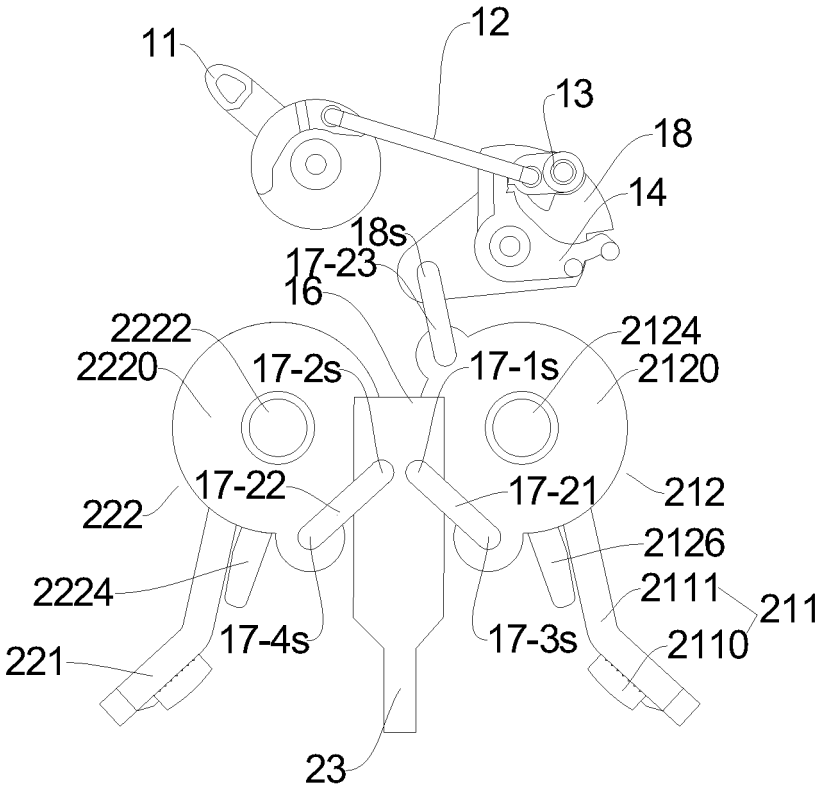

Fig.24

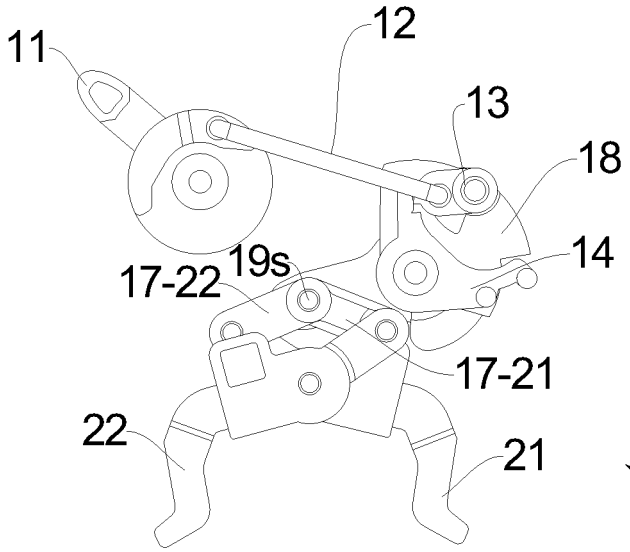

Fig.25

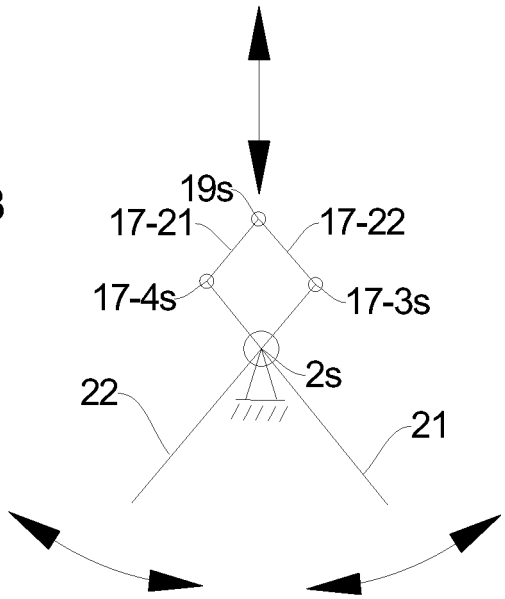

Fig.26

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/125270

A. CLASSIFICATION OF SUBJECT MATTER

H01H73/18(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: H01H71/-、H01H73/-

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; VEN; DWPI; WOTXT; EPTXT; USTXT; CNKI; IEEE: 断路器, 同步, 转动, 触头, 灭弧, 锁扣, 联动, 分隔, 齿轮, 滑块, 铰接, breaker, synchronous, rotate, contact, arc extinction, lock catch, linkage, separate, gear, slider, hinge joint

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 114914131 A (SHANGHAI ELECTRICAL APPARATUS RESEARCH INSTITUTE (GROUP) CO., LTD. et al.) 16 August 2022 (2022-08-16) description, paragraphs 40-74, and figures 1-8	1-6, 8-9
Y	CN 107863281 A (XIAMEN ANDAXING ELECTRIC GROUP CO., LTD.) 30 March 2018 (2018-03-30) description, paragraphs 27-34, and figures 1-4	1-6, 8-9
Y	CN 114068262 A (TIANJIN SHOURUI INTELLIGENT ELECTRIC CO., LTD.) 18 February 2022 (2022-02-18) description, paragraphs 33-75, and figures 6-13	1-6, 8-9
Y	CN 107146745 A (ZHEJIANG CHINT ELECTRIC APPLIANCE CO., LTD. et al.) 08 September 2017 (2017-09-08) description, paragraphs 25-43, and figures 1-8	3-4
Y	CN 112992620 A (ZHEJIANG CHINT ELECTRIC APPLIANCE CO., LTD.) 18 June 2021 (2021-06-18) description, paragraphs 44-79, and figures 1-14	4

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document cited by the applicant in the international application
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 December 2023	**03 January 2024**
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**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/125270

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2016042414 A (FUJI ELECTRIC CO., LTD. et al.) 31 March 2016 (2016-03-31) entire document	1-17
A	CN 110416035 A (XIAMEN ANDAXING ELECTRIC GROUP CO., LTD.) 05 November 2019 (2019-11-05) entire document	1-17

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/125270

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 114914131 A	16 August 2022	CN 218160202 U	27 December 2022
CN 107863281 A	30 March 2018	CN 207503898 U	15 June 2018
CN 114068262 A	18 February 2022	WO 2022028222 A1	10 February 2022
CN 107146745 A	08 September 2017	CN 107146745 B	18 February 2020
CN 112992620 A	18 June 2021	CN 211350533 U	25 August 2020
JP 2016042414 A	31 March 2016	JP 6474976 B2	27 February 2019
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