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(54) **OPERATING MECHANISM OF 2P2 MODULUS ELECTROMAGNETIC RESIDUAL CURRENT CIRCUIT BREAKER WITH OVERCURRENT PROTECTION**

(57) The present invention relates to an operation mechanism of a 2P2M electromagnetic residual current circuit breaker with overcurrent protection (RCBO), including a handle, a connection rod, and a contact lever. A first hinging and linking shaft is disposed in the middle part of the contact lever. The contact lever is linked to a first latch and a second latch. A relative linkage structure is disposed between the first latch and the second latch. The other end of the contact lever opposite to one end linked to the connection rod is provided with a second hinging and linking shaft. The contact lever is linked to a first movable contact and a second reset movable contact. A first reset spring and a second reset spring are sleeved on the second hinging and linking shaft. The present invention has the following advantages. In the operation mechanism of a 2P2M electromagnetic RCBO, a single handle may control multiple circuit breakers. This simplifies a structure and reduces the overall structural complexity of the circuit breaker and a quantity of components, so that costs are reduced and processing and assembly are convenient.

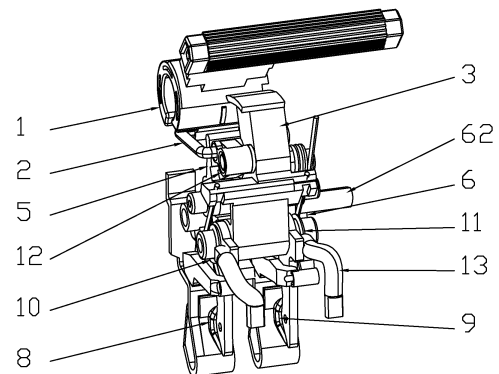


FIG. 1

Description

TECHNICAL FIELD

[0001] The present invention relates to the technical field of circuit breakers, and more particularly, to an operation mechanism of a 2P2M electromagnetic residual current circuit breaker with overcurrent protection (RCBO).

BACKGROUND

[0002] RCBO, also called earth leakage circuit breaker or ground fault circuit interrupter, is mainly used to protect a person in danger when current leakage occurs in a device, and may be used to protect a line or a motor to avoid overload or short circuit, or may be used in normal cases when a line is infrequently converted and started. The RCBO usually includes a housing. A circuit breaker apparatus and a current leakage protection apparatus are distributed in the housing. The circuit breaker apparatus is used to control connection or disconnection of a movable contact and a fixed contact when short circuit or overload occurs or a line is infrequently started. The current leakage protection apparatus is used to control the connection or disconnection of the movable contact and the fixed contact when current leakage occurs.

[0003] The circuit breaker apparatus usually includes an operation mechanism, a thermal tripping mechanism, an electromagnetic tripping mechanism, and an arc extinguishing system. The operation mechanism includes a handle, a contact lever, and a latch. The connection or disconnection of the movable contact and the fixed contact may be controlled through a linkage structure among the handle, the contact lever, and the latch. The latch is used to link the current leakage protection apparatus to the operation mechanism, to control the connection or disconnection of the movable contact and the fixed contact when current leakage occurs.

[0004] The circuit breaker in the prior art has a large quantity of components. When two or more existing circuit breakers are disposed, each circuit breaker is connected to one handle linkage mechanism for operation. As a result, there are lots of handle linkage mechanisms.

SUMMARY

[0005] In order to overcome the deficiencies of the prior art, the present invention provides an operation mechanism of a 2P2M electromagnetic RCBO in which a single handle may control multiple circuit breakers. This simplifies a structure and reduces the overall structural complicity of the circuit breaker and a quantity of components so that costs are reduced and processing and assembly are convenient.

[0006] To achieve the foregoing objectives, the present invention provides the following technical solutions. An operation mechanism of a 2P2M electromag-

netic RCBO is provided, including a handle and a connection rod with one end linked to the handle, where the other end of the connection rod opposite to the end linked to the handle is linked to a contact lever; a first hinging and linking shaft with one end hinged to a housing of the circuit breaker is disposed in the middle part of the contact lever; a first latch hinged to one end of the first hinging and linking shaft is linked to one side of the contact lever; an end of the first latch intermittently abuts against and is linked to the contact lever, and a second latch hinged to the other end of the first hinging and linking shaft is linked to the other side of the contact lever opposite to the side linked to the first latch; the other end of the contact lever opposite to the end linked to the connection rod is provided with a second hinging and linking shaft; the side of the contact lever towards the first latch is linked to a first movable contact, where the first movable contact is hinged to an end of the second hinging and linking shaft and may be intermittently linked to the first latch; a first reset spring linked to the first movable contact is sleeved on a position where the second hinging and linking shaft is hinged to the first movable contact; the side of the contact lever towards the second latch is linked to a second movable contact, where the second movable contact is hinged to the end of the second hinging and linking shaft and may be intermittently linked to the second latch; and a second reset spring linked to the second movable contact is sleeved on a position where the second hinging and linking shaft is hinged to the second movable contact.

[0007] In the foregoing technical solutions, the structure of the operation mechanism is improved. The first latch and the second latch are respectively linked to the two sides of the contact lever through the two ends of the first hinging and linking shaft, and further the first movable contact and the second movable contact are respectively linked to the two sides of the contact lever through the two ends of the second hinging and linking shaft. In this way, one handle may drive two movable contacts, and further, a single handle may control multiple circuit breakers. This simplifies a structure of the operation mechanism and reduces the overall structural complicity of the circuit breaker and a quantity of components, so that costs are reduced and processing and assembly are convenient.

[0008] The foregoing operation mechanism of a 2P2M electromagnetic RCBO may further be set as follows. A relative linkage structure is disposed between the first latch and the second latch.

[0009] The foregoing operation mechanism of a 2P2M electromagnetic RCBO may further be set as follows. The relative linkage structure includes an insertion pin disposed on a side of the middle part of the second latch towards the first latch; the first latch is provided with a linkage shaft hole that fits with the insertion pin; and the contact lever may be driven by the connection rod to push the first latch to rotate around the first hinging and linking shaft, and the second latch follows the first latch through

the insertion pin to rotate around the first hinging and linking shaft.

[0010] In the foregoing technical solutions, by disposing the relative linkage structure, the first latch drives the second latch to work with the handle, so that a single handle may control multiple circuit breakers. In addition, because the two circuit breakers work highly simultaneously, security of the circuit breakers is enhanced.

[0011] The foregoing operation mechanism of a 2P2M electromagnetic RCBO may further be set as follows. A side of the middle part of the second latch far away from the first latch is provided with a first push pin linked to a current leakage protection apparatus.

[0012] In the foregoing technical solutions, the first push pin is disposed, so that the current leakage protection apparatus is linked to the circuit breaker apparatus. Therefore, when current leakage occurs, the current leakage protection apparatus may control multiple circuit breakers by using the first push pin, to ensure that the current leakage protection apparatus works normally.

[0013] The foregoing operation mechanism of a 2P2M electromagnetic RCBO may further be set as follows. A flexible connection mechanism is disposed between the connection rod and the contact lever.

[0014] The foregoing operation mechanism of a 2P2M electromagnetic RCBO may further be set as follows. The flexible connection mechanism includes a flexible linkage block with one end hinged to an end of the connection rod, and the other end of the flexible linkage block opposite to the end linked to the connection rod is hinged to the contact lever.

[0015] In the foregoing technical solutions, the connection manner of the handle and the connection rod makes the connection rod move curvedly, and the flexible connection mechanism disposed between the connection rod and the contact lever makes the connection rod and the contact lever move more smoothly and free from getting stuck. The two ends of the flexible linkage block may perform adaptive motion under action of the connection rod and the contact lever, so that the two ends of the flexible linkage block may not get stuck.

[0016] The foregoing operation mechanism of a 2P2M electromagnetic RCBO may further be set as follows. An end of the first movable contact adjacent to the second hinging and linking shaft and an end of the second movable contact adjacent to the second hinging and linking shaft are separately fixed to a second push pin intermittently linked to a thermal tripping mechanism in the circuit breaker.

[0017] In the foregoing technical solutions, the second push pin is disposed, so that the thermal tripping mechanism in the circuit breaker may be linked to the operation mechanism. When overall temperature in the circuit breaker is excessively high, the thermal tripping mechanism may successively drive the two movable contacts to be separated from a fixed contact, to ensure that the thermal tripping mechanism works normally, thereby enhancing security of the circuit breaker.

[0018] The present invention is further described in detail below with reference to the accompanying drawings and embodiments.

5 BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

FIG. 1 is a schematic structural diagram (partial) according to an embodiment of the present invention; FIG. 2 is a schematic diagram of a left view of FIG. 1; FIG. 3 is a schematic diagram of a right view of FIG. 1; FIG. 4 is a schematic diagram of a first latch according to an embodiment of the present invention;

FIG. 5 is a schematic diagram of a second latch according to an embodiment of the present invention; FIG. 6 is a schematic diagram of a contact lever according to an embodiment of the present invention; and

FIG. 7 is a schematic diagram of an assembly state according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0020] The technical solutions in embodiments of the present invention will be described below clearly and completely with reference to the accompanying drawings in the embodiments of the present invention. Apparently, the described embodiments are merely a part rather than all of the embodiments of the present invention. All other embodiments derived from the embodiments in the present invention by a person of ordinary skill in the art without creative work shall fall within the protection scope of the present invention.

[0021] An operation mechanism of a 2P2M electromagnetic RCBO shown in FIG. 1 to FIG. 7 includes a handle 1 and a connection rod 2 with one end linked to the handle 1. The other end of the connection rod 2 opposite to the end linked to the handle 1 is linked to a contact lever 3. A first hinging and linking shaft 4 with one end hinged to a housing of the circuit breaker is disposed in the middle part of the contact lever 3. A first latch 5 hinged to one end of the first hinging and linking shaft 4 is linked to one side of the contact lever 3. An end of the first latch 5 intermittently abuts against and is linked to the contact lever 3. A second latch 6 hinged to the other end of the first hinging and linking shaft 4 is linked to the other side of the contact lever 3 opposite to the side linked to the first latch 5. A relative linkage structure is disposed between the first latch 5 and the second latch 6. The other end of the contact lever 3 opposite to the end linked to the connection rod 2 is provided with a second hinging and linking shaft 7. The side of the contact lever 3 towards the first latch 5 is linked to a first movable contact 8, where the first movable contact 8 is hinged to an end of the second hinging and linking shaft 7 and may be intermittently linked to the first latch 5. A first reset

spring 10 linked to the first movable contact 8 is sleeved on a position where the second hinging and linking shaft 7 is hinged to the first movable contact 8. The side of the contact lever 3 towards the second latch 6 is linked to a second movable contact 9, where the second movable contact 9 is hinged to the end of the second hinging and linking shaft 7 and may be intermittently linked to the second latch 6. A second reset spring 11 linked to the second movable contact 9 is sleeved on a position where the second hinging and linking shaft 7 is hinged to the second movable contact 9. The relative linkage structure includes an insertion pin 61 disposed on a side of the middle part of the second latch 6 towards the first latch 5. The first latch 5 is provided with a linkage shaft hole 51 that fits with the insertion pin 61. The contact lever 3 is driven by the connection rod 2 to push the first latch 5 to rotate around the first hinging and linking shaft 4. The second latch 6 follows the first latch 5 through the insertion pin 61 to rotate around the first hinging and linking shaft 4. One side of the middle part of the second latch 6 far away from the first latch 5 is provided with a first push pin 62 linked to a current leakage protection apparatus. A flexible connection mechanism is disposed between the connection rod 2 and the contact lever 3, and the flexible connection mechanism includes a flexible linkage block 12 with one end hinged to an end of the connection rod 2. The other end of the flexible linkage block 12 opposite to the end linked to the connection rod 2 is hinged to the contact lever 3. An end of the first movable contact adjacent to the second hinging and linking shaft 7 and an end of the second movable contact adjacent to the second hinging and linking shaft 7 are separately fixed to a second push pin 13 intermittently linked to a thermal tripping mechanism of the circuit breaker.

[0022] Working principles are as follows. When power is on, the handle 1 is pushed, and an end of the connection rod 2, driven by the handle 1 and by using the flexible linkage block 12, pushes the contact lever 3 to rotate (where the first latch is pushed, and the first latch pushes the contact lever, so that the contact lever drives the movable contact to contact with the fixed contact). The contact lever 3 pushes the first latch 5 to rotate around the first hinging and linking shaft 4. Meanwhile, the first latch 5 drives, by using the insertion pin 61, the second latch 6 to rotate around the first hinging and linking shaft 4. The first movable contact 8 and the second movable contact 9 are respectively driven by the first latch 5 and the second latch 6, to contact with the fixed contact, so that power is on. The whole operation procedure is easy, in which one handle may drive two movable contacts, and further, a single handle may control multiple circuit breakers. This simplifies a structure of the operation mechanism and reduces the overall structural complicity of the circuit breaker and a quantity of components, so that costs are reduced and processing and assembly are convenient.

Claims

1. An operation mechanism of a 2P2M electromagnetic residual current circuit breaker with overcurrent protection (RCBO), comprising a handle and a connection rod with one end linked to the handle, wherein the other end of the connection rod opposite to the end linked to the handle is linked to a contact lever; a first hinging and linking shaft with one end hinged to a housing of the circuit breaker is disposed in a middle part of the contact lever; a first latch hinged to one end of the first hinging and linking shaft is linked to one side of the contact lever; an end of the first latch intermittently abuts against and is linked to the contact lever, and a second latch hinged to the other end of the first hinging and linking shaft is linked to the other side of the contact lever opposite to the side linked to the first latch; the other end of the contact lever opposite to the end linked to the connection rod is provided with a second hinging and linking shaft; the side of the contact lever towards the first latch is linked to a first movable contact, wherein the first movable contact is hinged to an end of the second hinging and linking shaft and is intermittently linked to the first latch; a first reset spring linked to the first movable contact is sleeved on a position where the second hinging and linking shaft is hinged to the first movable contact; the side of the contact lever towards the second latch is linked to a second movable contact, wherein the second movable contact is hinged to the end of the second hinging and linking shaft and is intermittently linked to the second latch; and a second reset spring linked to the second movable contact is sleeved on a position where the second hinging and linking shaft is hinged to the second movable contact.
2. The operation mechanism of the 2P2M electromagnetic RCBO according to claim 1, wherein a relative linkage structure is disposed between the first latch and the second latch.
3. The operation mechanism of the 2P2M electromagnetic RCBO according to claim 2, wherein the relative linkage structure comprises an insertion pin disposed on a side of a middle part of the second latch towards the first latch; the first latch is provided with a linkage shaft hole that fits with the insertion pin; and the contact lever is driven by the connection rod to push the first latch to rotate around the first hinging and linking shaft, and the second latch follows the first latch through the insertion pin to rotate around the first hinging and linking shaft.
4. The operation mechanism of the 2P2M electromagnetic RCBO according to claim 3, wherein a side of the middle part of the second latch far away from the first latch is provided with a first push pin linked to a

current leakage protection apparatus.

5. The operation mechanism of the 2P2M electromagnetic RCBO according to claim 1, wherein a flexible connection mechanism is disposed between the connection rod and the contact lever. 5
6. The operation mechanism of the 2P2M electromagnetic RCBO according to claim 5, wherein the flexible connection mechanism comprises a flexible linkage block with one end hinged to an end of the connection rod, and the other end of the flexible linkage block opposite to the end linked to the connection rod is hinged to the contact lever. 10
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7. The operation mechanism of the 2P2M electromagnetic RCBO according to claim 1, wherein an end of the first movable contact adjacent to the second hinging and linking shaft and an end of the second movable contact adjacent to the second hinging and linking shaft are separately fixed to a second push pin intermittently linked to a thermal tripping mechanism in the circuit breaker. 20
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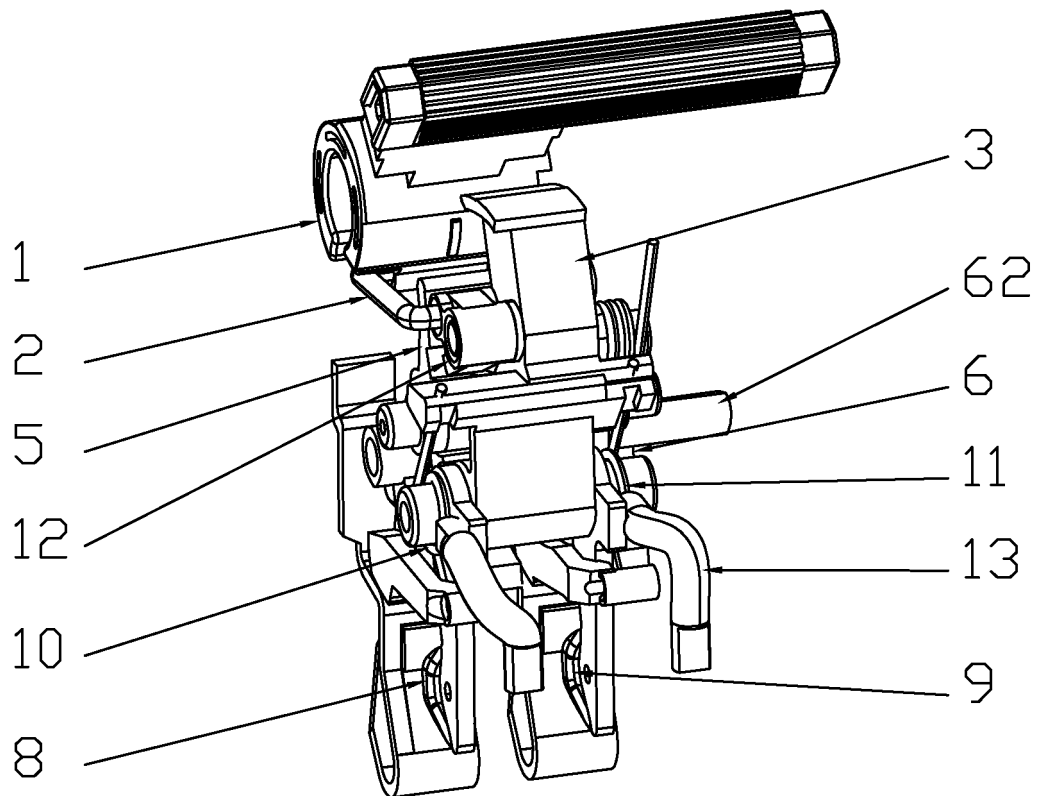


FIG. 1

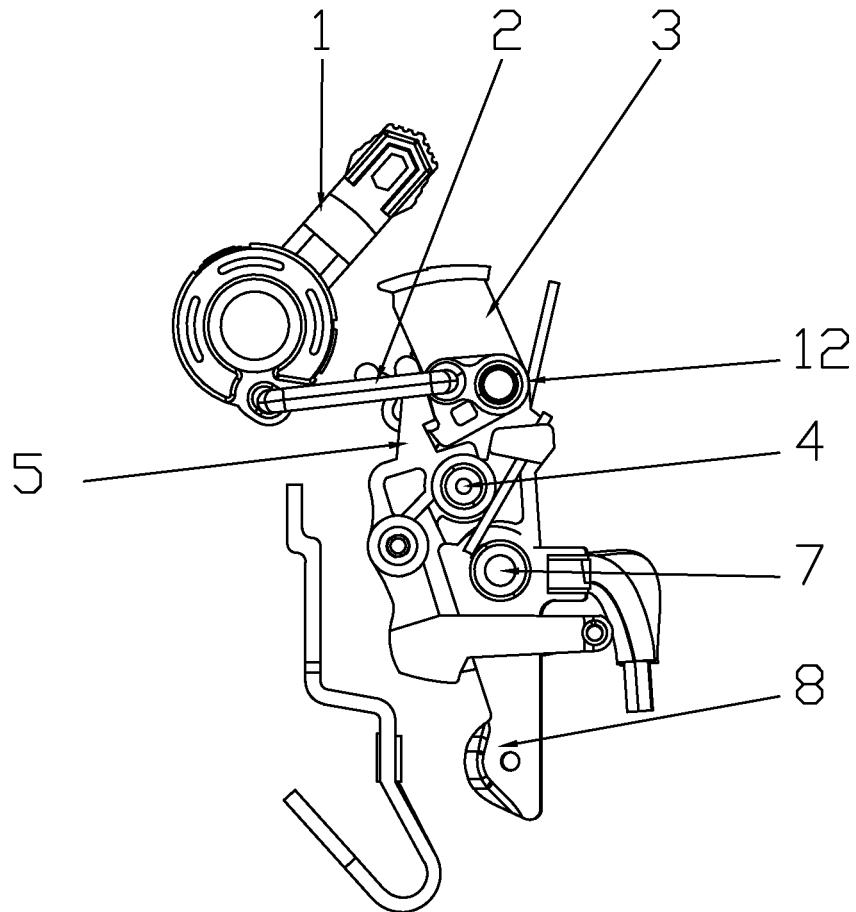


FIG. 2

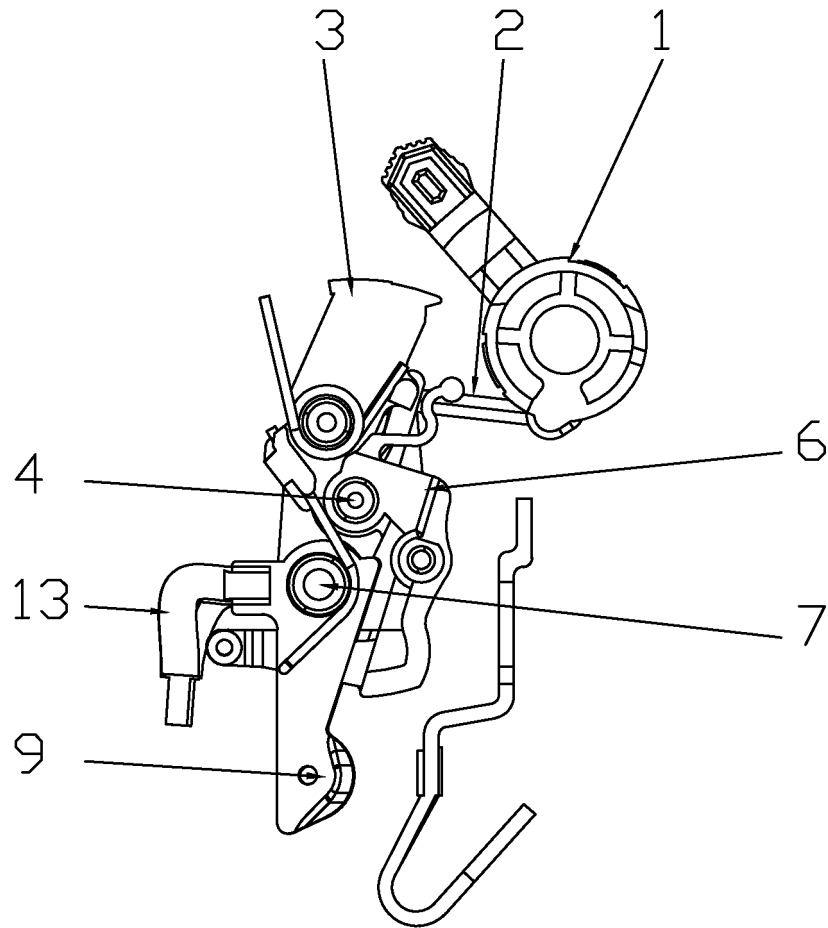


FIG. 3

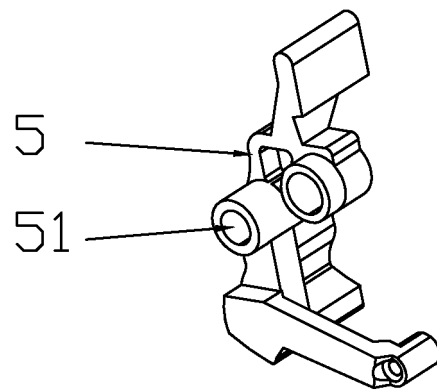


FIG. 4

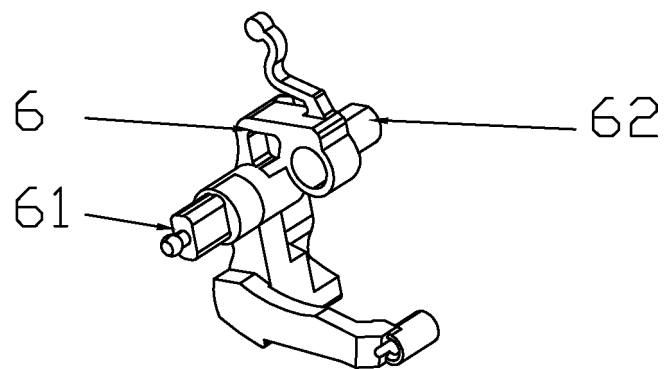


FIG. 5

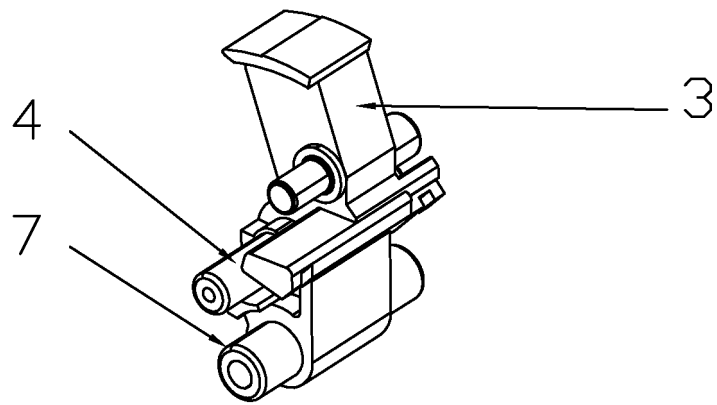


FIG. 6

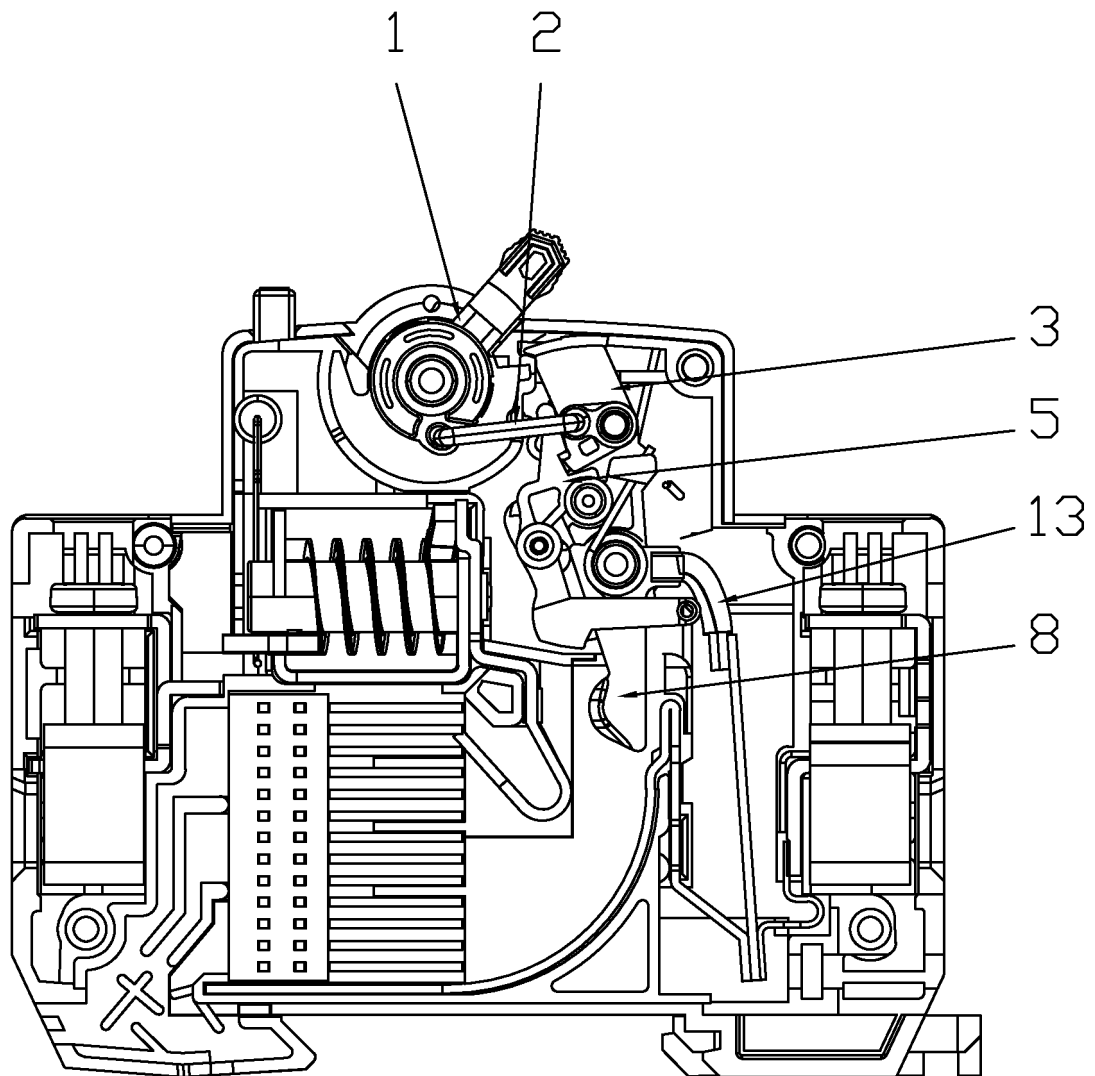


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2021/114977

A. CLASSIFICATION OF SUBJECT MATTER

H01H 71/10(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H01H71/-

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; WPABSC; USTXT; EPTXT; WOTXT; ENTXTC; CNKI: 断路器, 手柄, 联动, 脱扣, breaker, handle, linkage, trip

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 112967912 A (ETMAN ELECTRIC (CHANGZHOU) CO., LTD.) 15 June 2021 (2021-06-15) description, paragraphs 1-22, and figures 1-7	1-7
PX	CN 112951665 A (ETMAN ELECTRIC (CHANGZHOU) CO., LTD.) 11 June 2021 (2021-06-11) description, paragraphs 1-42, and figures 1-15	1-7
E	CN 214542094 U (ETMAN ELECTRIC (CHANGZHOU) CO., LTD.) 29 October 2021 (2021-10-29) description, paragraphs 1-28, and figures 1-7	1-7
X	CN 202434448 U (ZHEJIANG DINGWEI TECHNOLOGY CO., LTD.) 12 September 2012 (2012-09-12) description, paragraphs 36-46, and figures 1-6	1-7
X	CN 111293009 A (BEIJING MINGRI ELECTRICAL EQUIPMENT CO., LTD.) 16 June 2020 (2020-06-16) description, paragraphs 1-37, and figures 1-9	1-7
A	US 6614334 B1 (EATON CORP.) 02 September 2003 (2003-09-02) entire document	1-7

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

* Special categories of cited documents:

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Date of the actual completion of the international search

01 December 2021

Date of mailing of the international search report

27 December 2021

Name and mailing address of the ISA/CN

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2021/114977

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Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	112967912	A	15 June 2021	CN	214542094	U	29 October 2021
CN	112951665	A	11 June 2021	None			
CN	214542094	U	29 October 2021	CN	112967912	A	15 June 2021
CN	202434448	U	12 September 2012	None			
CN	111293009	A	16 June 2020	CN	211578679	U	25 September 2020
US	6614334	B1	02 September 2003	None			

Form PCT/ISA/210 (patent family annex) (January 2015)