(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 506 979 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
12.02.2025 Bulletin 2025/07

(21) Application number: **23819148.0**

(22) Date of filing: **07.06.2023**

(51) International Patent Classification (IPC):
H01H 71/02 *(2006.01)* ***H01H 71/08*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
H01H 71/02; H01H 71/08

(86) International application number:
PCT/CN2023/098829

(87) International publication number:
WO 2023/236983 (14.12.2023 Gazette 2023/50)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **10.06.2022 CN 202210653854**

(71) Applicant: **Zhejiang Chint Electrics Co., Ltd.**
Yueqing, Zhejiang 325603 (CN)

(72) Inventors:
- **ZHU, Jun**
  Wenzhou, Zhejiang 325603 (CN)
- **SHAO, Jianghua**
  Wenzhou, Zhejiang 325603 (CN)

(74) Representative: **Petraz, Gilberto Luigi et al**
GLP S.r.l.
Viale Europa Unita, 171
33100 Udine (IT)

(54) CIRCUIT BREAKER

(57) A circuit breaker includes at least one first housing and a second housing spliced on one side of the first housing. At least one circuit breaker pole is assembled in the first housing. Each circuit breaker pole comprises at least one single-phase main line. A leakage protection module is assembled in the second housing. The leakage protection module includes a wiring terminal and a zero-sequence current transformer. An outgoing conductive member is connected to the at least one single-phase main line. A wiring lug is connected to the wiring terminal. A wiring port is formed in a side wall on one side of the first housing immediately adjacent to the second housing. The outgoing conductive member and/or the wiring lug form a plug-and-unplug connection structure connected to a main loop through the wiring port. The outgoing conductive member and/or the wiring lug pass through the threading hole of the zero-sequence current transformer. In the present invention, the outgoing conductive member of the circuit breaker pole and the wiring lug of the leakage protection module are matched to form a plug-and-unplug connection structure connected to the main loop, so that the modular circuit breaker pole and the leakage protection module can simultaneously meet the requirements for the main loop to pass through the zero-sequence current transformer during the assembly process, thereby making the wiring process straightforward and more convenient.

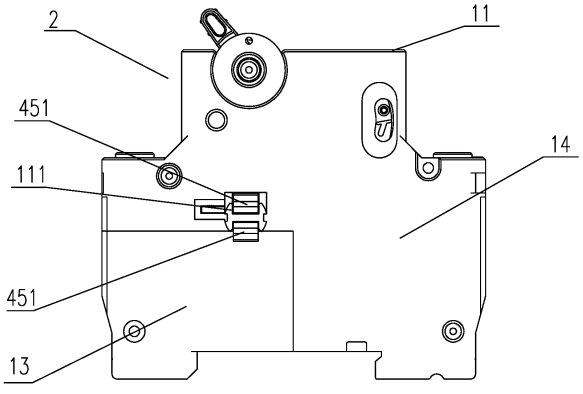

Fig.2

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Description

TECHNICAL FIELD

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

BACKGROUND

[0002] A low-voltage circuit breaker may be used to distribute electrical energy and protect overload and short circuit of a line and power supply equipment, and may also be used for infrequent conversion of the line and infrequent start of a motor. With the continuous development of Internet of Things technology and artificial intelligence technology, small size and modularization have become the trend of low-voltage circuit breakers. The existing low-voltage circuit breaker usually has a leakage protection function, but the circuit breaker with a leakage protection function usually adopts an integrated structure. That is, a circuit breaker pole and a leakage protection module are integrated in the same mounting cavity of a shell, so that the assembly in the production process is relatively complex, and is not conducive to automatic production.

SUMMARY

[0003] An object of the present invention is to overcome the defects of the prior art and provide a modular circuit breaker that is convenient for wiring.

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

A circuit breaker, comprising at least one first housing and a second housing spliced on one side of one first housing, wherein at least one circuit breaker pole is assembled in the first housing; each circuit breaker pole comprises at least one single-phase main line; a leakage protection module is assembled in the second housing; the leakage protection module comprises a wiring terminal and a zero-sequence current transformer; an outgoing conductive member is connected to at least one single-phase main line; a wiring lug is connected to the wiring terminal; a wiring port is formed in a side wall on one side of the first housing immediately adjacent to the second housing; the outgoing conductive member and/or the wiring lug are plugged through the wiring port to form a plug-and-unplug connection structure connected to a main loop; and the outgoing conductive member and/or the wiring lug pass through a threading hole of the zero-sequence current transformer.

[0005] Further, all circuit breaker poles comprise at least one L-phase main line and an N-phase main line; the leakage protection module comprises two wiring terminals and two wiring lugs; two outgoing conductive members are connected to the N-phase main line and one of the L-phase main lines, respectively; the two wiring lugs are connected with the two wiring terminals, respectively; and the two wiring lugs are in plug-and-unplug connection with the two outgoing conductive members, respectively.

[0006] Further, the wiring port is disposed opposite the threading hole of the zero-sequence current transformer; the wiring port comprises a first wiring port and a second wiring port; the first wiring port is located in the middle of a side wall of the first housing; the second wiring port is located in the middle of a side wall of the second housing; and the first wiring port is disposed opposite the second wiring port.

[0007] Further, at least one circuit breaker pole comprises a short-circuit protection mechanism, and an outgoing conductive member is connected to the short-circuit protection mechanism.

[0008] Further, the short-circuit protection mechanism comprises a coil assembly, the first wiring terminal of the coil of the coil assembly is used as the outgoing conductive member, or a connecting plate as the outgoing conductive member is connected to the first wiring terminal of the coil.

[0009] Further, the first wiring terminal of the coil of the coil assembly is provided with a conductive zone; the conductive zone of the first wiring terminal is used as a plug-in portion; and the conductive zone sequentially passes through the wiring ports of the first housing and the second housing and extends into the second housing.

[0010] Further, the wiring lug comprises a first wiring lug; the first wiring plug does not pass through the threading hole of the zero-sequence current transformer; the first wiring lug is provided with a first abutting groove; and the first abutting groove abuts against the conductive zone of the first wiring terminal.

[0011] Further, the connecting plate as the outgoing conductive member is connected to the first wiring terminal of the coil; a plug-in portion is arranged at one end of the connecting plate away from the first wiring terminal; and the plug-in portion is provided with a slot.

[0012] Further, the wiring lug comprises a first wiring lug, and the first wiring lug passes through the threading hole of the zero-sequence current transformer and is plugged with the plug-in portion.

[0013] Further, the circuit breaker pole comprises an N-pole static contact, one outgoing conductive member is connected to a static contact plate of the N-pole static contact, and the plug-in portion is arranged at one end of the outgoing conductive member away from the N-pole static contact.

[0014] Further, the wiring lug comprises a second wiring lug, and the second wiring lug passes through the threading hole of the zero-sequence current transformer and is plugged with the plug-in portion.

[0015] Further, the wiring lug is provided with the plug-in portion, the plug-in portion is provided with a slot, and the outgoing conductive member is in plug-in fit with the slot of the plug-in portion in the wiring lug.

[0016] Further, the plug-in portion comprises a first contact plate and a second contact plate; one end of the second contact plate is bent and connected with the first contact plate; the other end of the second contact plate is spaced apart from the first contact plate, so that a slot is formed between the first contact plate and the second contact plate; and the wiring lug and the slot of the outgoing conductive member form a plug-and-unplug connection structure, or the outgoing conductive member and the slot of the wiring lug form a plug-and-unplug connection structure.

[0017] Further, the first contact plate of the plug-in portion of the outgoing conductive member is the static contact plate of the N-pole static contact or the connecting plate.

[0018] Further, an electrical isolation plate is arranged in the threading hole; the electrical isolation plate separates the threading hole into a first threading hole and a second threading hole; and the two wiring lugs correspondingly pass through the first threading hole and the second threading hole, respectively; or

one outgoing conductive member and one wiring lug correspondingly pass through the first threading hole and the second threading hole, respectively; or
the two outgoing conductive members correspondingly pass through the first threading hole and the second threading hole, respectively.

[0019] Further, two circuit breaker poles are arranged in one of the first housings; the two circuit breaker poles are an L pole and an N pole, respectively; the L pole comprises an L-pole outgoing terminal; the N pole comprises an N-pole incoming terminal; the L-pole incoming terminal and the N-pole incoming terminal are arranged at one end of the first housing side by side; and
the leakage protection module comprises two wiring terminals arranged at the same end of the second housing; the two wiring terminals are an L-pole outgoing terminal and an N-pole outgoing terminal, respectively; an L-phase main line of an L pole is connected between the L-pole incoming terminal and the L-pole outgoing terminal; and an N-phase main line of an N pole is connected between the N-pole incoming terminal and the N-pole outgoing terminal.

[0020] According to the circuit breaker of the present invention, an outgoing conductive member of a circuit breaker pole and a wiring lug of a leakage protection module are matched to form a plug-and-unplug connection structure connected to a main loop. The circuit breaker pole and the leakage protection module are respectively two independent modules, so that the modular circuit breaker pole and the leakage protection module can simultaneously meet the requirements for the main loop to pass through a zero-sequence current transformer during the assembly process, thereby satisfying the modularization needs of existing circuit breakers and making the wiring process more straightforward and convenient.

[0021] In addition, the outgoing conductive member and/or the wiring lug correspondingly pass through the zero-sequence current transformer. In particular, a wiring port for the outgoing conductive member and the wiring lug to pass through is disposed opposite a threading hole of the zero-sequence current transformer, which can shorten the lengths of the wiring lug and the outgoing conductive member and is conducive to reducing the number of internal wires and reducing the volume of the circuit breaker.

[0022] In addition, the outgoing conductive member is connected to a coil opposite to the zero-sequence current transformer, which further shortens the length of the outgoing conductive member and is conducive to reducing the volume of the circuit breaker.

[0023] In addition, the outgoing conductive member is provided with a plug-in connection portion, so that the outgoing conductive member and the wiring lug are connected in a plugging and unplugging manner, which is conducive to enhancing the wiring stability.

[0024] In addition, an electrical isolation plate is provided in the threading hole to electrically isolate a two-phase main line that passes through the zero-sequence current transformer.

[0025] In addition, outgoing conductive members at an L-pole and an N-pole are arranged in parallel to reduce a space occupied by the outgoing conductive members inside the circuit breaker pole.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026]

FIG. 1 is a top view of a circuit breaker pole in the present invention;
FIG. 2 is a schematic structural diagram of a side wall on one side of a first housing in the present invention;
FIG. 3 is a schematic diagram of an internal structure of the circuit breaker pole in the present invention;
FIG. 4 is a schematic diagram of an internal structure of the circuit breaker pole in the present invention (on the other side);
FIG. 5 is a schematic structural diagram of a short-circuit protection mechanism and an outgoing conductive member in the present invention;
FIG. 6 is a schematic structural diagram of an N-pole static contact in the present invention;
FIG. 7 is a schematic structural diagram of a leakage protection module in the present invention;
FIG. 8 is a schematic structural diagram of a second housing in the present invention;
FIG. 9 is a schematic diagram of an internal structure of the leakage protection module in the present invention (a first embodiment);
FIG. 10 is a schematic structural diagram of a zero-sequence current transformer as well as a first wiring lug and a second wiring lug in the present invention

(the first embodiment);

FIG. 11 is a schematic diagram of an internal structure of the leakage protection module in the present invention (a second embodiment);

FIG. 12 is a schematic structural diagram of the zero-sequence current transformer as well as the first wiring lug and the second wiring lug in the present invention (the second embodiment); and

FIG. 13 is a schematic structural diagram of a coil in the present invention (the second embodiment).

DETAILED DESCRIPTION OF THE INVENTION

[0027] The following implementation of a circuit breaker of the present invention is further described below in conjunction with the embodiments given in conjunction with FIGS. 1-13. The circuit breaker of the present invention is not limited to the description of the following embodiments.

[0028] A circuit breaker includes at least one first housing 11 and a second housing 12 spliced on one side of the first housing 11. At least one circuit breaker pole 2 is assembled in the first housing 11. Each circuit breaker pole 2 includes at least one single-phase main line. A leakage protection module 3 is assembled in the second housing 12. The leakage protection module 3 includes a wiring terminal and a zero-sequence current transformer 34. An outgoing conductive member 45 is connected to the at least one single-phase main line. A wiring lug is connected to the wiring terminal. A wiring port is formed in a side wall on one side of the first housing 11 immediately adjacent to the second housing 12. The outgoing conductive member 45 and/or the wiring lug form a plug-and-unplug connection structure connected to a main loop through the wiring port. The outgoing conductive member 45 and/or the wiring lug pass through a threading hole of the zero-sequence current transformer 34.

[0029] According to the circuit breaker of the present invention, the outgoing conductive member 45 of the circuit breaker pole 2 and the wiring lug of the leakage protection module 3 are matched to form the plug-and-unplug connection structure connected to the main loop. The circuit breaker pole 2 and the leakage protection module 3 are respectively two independent modules, so that the modular circuit breaker pole 2 and the leakage protection module 3 can simultaneously meet the requirements for the main loop to pass through a zero-sequence current transformer 34 during the assembly process, thereby satisfying the modularization needs of existing circuit breakers and making the wiring process more straightforward and convenient.

[0030] As shown in FIGS. 1-13, the circuit breaker includes a shell. At least one circuit breaker pole 2 is arranged in the shell. The shell includes at least one mounting cavity for assembling the circuit breaker pole 2. When the shell has a plurality of mounting cavities inside, the shell may include a plurality of partition plates fixedly arranged inside the shell. Every two adjacent partition plates are spaced apart to form the mounting cavity. Alternatively, the shell includes an upper cover, a base and a partition plate assembled between the upper cover and the base. The upper cover and the partition plate cover each other to form one mounting cavity. The base and the other partition plate form another mounting cavity. The remaining partition plates are respectively opposite each other in pairs to form a plurality of independent mounting cavities. This independent mounting cavity may be used as a first housing 11, and two adjacent first housings 11 may be assembled together, so that the shell of the circuit breaker includes a plurality of assembled first housings 11.

[0031] A single-phase main line is arranged in each circuit breaker pole 2, that is, an N-phase main line or a L-phase main line is arranged in each circuit breaker pole 2. For example, four circuit breaker poles 2 are arranged in the circuit breaker, wherein three circuit breaker poles 2 are all L poles and are respectively provided with a L-phase main line and an operating mechanism, and one circuit breaker pole 2 is provided with an N-phase main line and an operating mechanism. Alternatively, two circuit breaker poles 2 are arranged in the circuit breaker, and the two circuit breaker poles 2 are both L poles, or an L pole and an N pole, respectively. Of course, it is also possible to arrange a two-phase main line in the same circuit breaker pole 2 at the same time. For example, the L-phase main line and the N-phase main line are arranged in one circuit breaker pole 2 at the same time. Alternatively, a two-phase L-phase main line may also be arranged in one circuit breaker pole 2 at the same time. It is preferred to arrange one operating mechanism only in the same circuit breaker pole.

[0032] The present application takes two circuit breaker poles 2 as an example. Only one single-phase main line is arranged in each circuit breaker pole 2. That is, one of the circuit breaker poles 2 is provided with an L-phase main line as the L pole, and the other circuit breaker pole 2 is provided with an N-phase main line as the N pole. The main loop of the circuit breaker is jointly formed by the L-phase main line and the N-phase main line. The L pole and the N pole are jointly assembled in the same mounting cavity. That is, the L pole and the N pole are jointly arranged in the same first housing 11.

[0033] Each circuit breaker pole 2 includes a pair of wiring terminals connected to the single-phase main line, and a handle mechanism 21, an operating mechanism 22 and a contact mechanism that are sequentially connected in linkage. The pair of wiring terminals includes an incoming terminal and an outgoing terminal. The contact mechanism is connected between the pair of wiring terminals and used for controlling the single-phase main line to be powered on and off. The contact mechanism includes a moving contact and a static contact that cooperate with each other. The moving contact is connected in linkage with the operating mechanism 22. The static contact is fixedly assembled on one side opposite to the moving contact. The operating mechanism 22 is

driven by manually operating the handle mechanism 21, so that the moving contact is in contact with or separated from the static contact, thereby realizing the on-off control of the main line in the circuit breaker pole 2. In addition, each circuit breaker pole 2 may also be provided with an arc-extinguishing system, and a short-circuit protection mechanism and/or an overload protection mechanism 26 that cooperate with the operating mechanism 22. The arc-extinguishing system is cooperatively arranged on one side of the contact mechanism to extinguish an arc generated by a moving contact and a static contact in the opening and closing processes. The short-circuit protection mechanism or the overload protection mechanism 26 triggers the operating mechanism 22 to trip when the main loop has a short-circuit or an overload fault.

[0034] As shown in FIGS. 1-4, a wiring terminal of the circuit breaker pole 2 is arranged at least one end of the shell. Incoming terminals (outgoing terminals) of two adjacent circuit breaker poles 2 are located at the same end of the shell. The handle mechanism 21 is rotatably assembled at the upper part of the shell (a first housing 11). The operating mechanism 22 is arranged on one side of the handle mechanism 21. The handle mechanism 21 is connected in linkage with the operating mechanism 22 through a link. The moving contact is connected to the lower part of the operating mechanism 22. The operating mechanisms 22 of the adjacent two circuit breaker poles 2 are connected in linkage with the handle mechanism 21, respectively. An arc-extinguishing chamber 24 of the arc-extinguishing system and the static contact are fixed in the middle of the shell (the first housing 11), wherein the static contact is disposed opposite the moving contact.

[0035] The operating mechanism 22 of each circuit breaker pole 2 includes a lever that is rotatably assembled in the shell. The lever may be rotatably connected to a side wall on one side of the shell or the partition plate in the shell or a side wall of the first housing 11. The lever is rotatably equipped with a jump catch and a lock catch. The moving contact is rotatably mounted through a contact support and is in linkage with the lever. The jump catch is in snap fit with one end of the lock catch, and the other end of the jump catch is in linkage with a link. The lock catch is provided with a linkage portion which is of a rod-shaped structure as a whole. A side wall on one side of the shell corresponding to the linkage portion or the partition plate in the shell or the side wall of the first housing 11 is provided with an avoidance hole. One end of the linkage portion may pass through the avoidance hole. Of course, other action mechanisms of the circuit breaker may also be connected in linkage with the linkage portion through the avoidance hole. An energy storage spring is assembled between the lever and the contact support. Two elastic arms of the energy storage spring abut against the contact support and the lever, respectively. Preferably, the energy storage spring is a torsion spring which is coaxially and rotatably assembled in the contact support.

[0036] As shown in FIGS. 3 and 4, a short-circuit protection mechanism and an overload protection mechanism 26 are arranged in the L pole. The short-circuit protection mechanism is arranged between the handle mechanism 21 and the arc-extinguishing chamber 24 of the arc-extinguishing system. One end of the short-circuit protection mechanism is disposed opposite the operating mechanism 22 of the L pole. The overload protection mechanism 26 and the short-circuit protection mechanism are respectively arranged on both sides of the operating mechanism 22 of the L pole. One end of the overload protection mechanism 26 is matched with the operating mechanism 22. A short-circuit protection mechanism, an arc-extinguishing system and an overload protection mechanism 26 may not be arranged in the N pole. Of course, it is also possible to arrange a short-circuit protection mechanism, an arc-extinguishing system and an overload protection mechanism 26 in the N pole, that is, the structure similar to the L pole is adopted as the N pole. In addition, the operating mechanisms 22 of the adjacent circuit breaker poles 2 may share some parts, such as the lever, the contact support and the jump catch, and the handle mechanism 21 is in linkage with the lock catch.

[0037] An accessory module is also arranged on one side of one of the circuit breaker poles 2, that is, an accessory module is arranged on one side of the first housing. The accessory module in the present embodiment takes the leakage protection module 3 as an example. As shown in FIGS. 7-13, the leakage protection module 3 preferably includes a second housing 12. The second housing 12 is spliced with one of the first housings 11 to form a circuit breaker with a leakage protection function. The shell includes a second housing 12 and at least one first housing 11 at this time. A leakage detection circuit and a leakage tripping mechanism are assembled in the second housing 12, wherein the leakage tripping mechanism includes a tripping unit 37 driven by a leakage detection circuit. The leakage detection circuit includes a circuit board 35 and a zero-sequence current transformer 34 connected to the circuit board 35. A controller for driving the leakage tripping mechanism is arranged on the circuit board 35. The zero-sequence current transformer 34 is connected with an L-phase main line and an N-phase main line for detecting a leakage signal. When the leakage detection circuit detects a leakage fault, an ejector rod of the tripping unit 37 may be driven to make an action. After the ejector rod completes the action, a push plate 39 and an indicator 38 are correspondingly arranged on one side of the ejector rod of the tripping unit 37. An avoidance hole is formed in a side wall of the second housing 12 corresponding to the push plate 39. The linkage portions of the adjacent circuit breaker poles 2 pass through the avoidance hole and are matched with the push plate 39. In the case of a leakage fault, the tripping unit 37 triggers the push plate 39 to rotate, such that the linkage portion drives the lock catch to rotate and the operating mechanism trips, and the indicator 38 acts to indicate leakage. The leakage trip-

ping mechanism in the present embodiment may adopt the prior art.

[0038] The leakage protection module 3 is also provided with a leakage test mechanism. The leakage test mechanism includes a leakage test loop that draws electricity from the main loop. The leakage test loop includes a test button 36, a first elastic member 31 and a second elastic member 32. The test button 36 is slidably assembled on the second housing 12. The first elastic member 31 and the second elastic member 32 are matched to form a breakpoint of the leakage test loop. The first elastic member 31 is elastically deformed by pressing the test button 36 to connect the breakpoint of the leakage test loop. Preferably, the leakage test loop is also connected in series with a leakage test loop winding of the zero-sequence current transformer 34, and the leakage current detection winding of the zero-sequence current transformer 34 is connected to the circuit board 35.

[0039] An improvement point of the present application is as follows: the accessory module and the circuit breaker pole 2 are of a modular structure, respectively; and the accessory module and the circuit breaker pole 2 are also assembled together by splicing two module structures. That is, the leakage protection module 3 in the present embodiment adopts a modular structure. The second housing 12 of the leakage protection module 3 and the first housing 11 of the circuit breaker pole 2 are spliced. The shell of the circuit breaker is spliced by the first housing 11 and the second housing 12. Meanwhile, the leakage protection module 3 is assembled on one side of the circuit breaker pole 2 and can simultaneously draw electricity from the main loop connected to the circuit breaker pole 2. Preferably, the leakage protection module 3 is preferably connected to the main loop of the circuit breaker in a plugging and unplugging manner. That is, the leakage protection module 3 is connected to the L-phase main line and the N-phase main line of the circuit breaker pole 2 in a plugging and unplugging manner. It should be noted that, as other embodiments, the electricity can be drawn in the leakage protection module 3 as well as the L-phase main line and the N-phase main line of the circuit breaker pole 2 in a contact electricity-drawing manner. However, the contact electricity-drawing mode is not as stable as the plug-and-unplug connection.

[0040] Specifically, a wiring port is arranged on a side wall of the first housing adjacent to the second housing 12. At least one outgoing conductive member 45 is connected to the L-phase main line or the N-phase main line of the circuit breaker pole. A wiring lug is connected to a wiring terminal of the leakage protection module 3. The outgoing conductive member 45 and/or the wiring lug form a plug-and-unplug connection structure through the wiring port, and the plug-and-unplug connection structure is connected to the main loop. The outgoing conductive member 45 and/or the wiring lug of the plug-and-unplug connection structure pass through the threading hole of the zero-sequence current transformer 34. Preferably, at least one outgoing conductive member 45 is provided with a plug-in portion 451. The plug-in portion 451 corresponds to a first wiring port 111 on the side wall of the first housing 11. A plug-in lug 44 is formed at one end of the wiring lug. The plug-in lug 44 may pass through the threading hole of the zero-sequence current transformer 34. The plug-in lug 44 corresponds to a second wiring port 121 on the side wall of the second housing 12. Preferably, the plug-in lug 44 is formed into a sheet-like structure. The plug-in portion 451 is a slot that extends into the first wiring port 111. The plug-in lug 44 extends out of the second housing 12, is inserted into the plug-in portion 451, and is in plug-in fit with the plug-in portion 451. Of course, as other embodiments, the plug-in portion 451 may also extend out of the first housing 11 and extend into the second housing 12 for plug-in fit. As other embodiments, the plug-in portion 451 may also be arranged on the wiring lug. The plug-in lug 44 is formed at one end of the outgoing conductive member 45. The plug-in lug 44 is in plug-in fit with the plug-in portion 451. The plug-and-unplug connection structure formed cooperatively by the wiring lug and the outgoing conductive member 45 allows the main loop to pass through the threading hole of the zero-sequence current transformer 34 while realizing that the leakage protection module 3 and the circuit breaker pole 2 are connected to draw electricity, so a wire is omitted, which is conducive to reducing the volume of the circuit breaker. The leakage protection module 3 and the circuit breaker pole 2 are two independent modules, so the modular development of the circuit breaker is satisfied.

[0041] Preferably, the outgoing conductive member 45 is connected to the main loop of the circuit breaker. That is, the outgoing conductive member 45 is connected to the N-phase main line and one of the L-phase main lines of the circuit breaker pole 2, respectively. The side walls on one sides of the first housing 11 and the second housing 12, which intermediately adjacent to each other, are respectively provided with a wiring port corresponding to the outgoing conductive member 45. That is, the wiring port is formed in a side wall of the shell of the circuit breaker pole 2 in a thickness direction. This wiring port is disposed opposite the wiring port of the zero-sequence current transformer 34. Specifically, the wiring port includes a first wiring port 111 arranged in the middle of the side wall of the first housing 11 and a second wiring port 121 arranged in the middle of the side wall of the second housing 12. The number of the first wiring ports 111 may correspond to the number of the outgoing conductive members 45. The number of the second wiring ports 121 is in one-to-one correspondence to the number of the wiring lugs, or one first wiring port 111 and one second wiring port 121 may be arranged only on one side of the first housing 11 and one side of the second housing 12, such that the two outgoing conductive members 45 correspond to the same first wiring port 111. The two wiring lugs correspond to the same second wiring port of the second housing 12. In addition, the two outgoing con-

ductive members 45 may extend into the second housing 12 and are plugged with the two wiring lugs, respectively. Alternatively, the two wiring lugs may extend out of the second housing 12 and are plugged with the two outgoing conductive members 45, respectively. Alternatively, one outgoing conductive member 45 extends into the second housing 12 and is plugged with one wiring lug, and the other wiring lug extends out of the second housing 12 and is plugged with the other outgoing conductive member 45. In this way, when the leakage protection module 3 is plugged with the circuit breaker pole 2, the two wiring lugs may be plugged with the L-phase main line and the N-phase main line respectively to draw the electricity. Of course, other accessory modules of the circuit breaker may also be connected to the main loop of the circuit breaker pole 2 in this wiring way to draw the electricity.

[0042] Preferably, each circuit breaker pole 2 includes an incoming terminal and an outgoing terminal which are respectively arranged at both ends of the first housing 11. A single-phase main line is connected between the incoming terminal and the outgoing terminal. Two wiring terminals of the leakage protection module 3 are an L-pole outgoing terminal 41-1b and an N-pole outgoing terminal 41-2b, respectively. This structure can not only affect the leakage protection module 3 to draw the electricity from the main loop of the circuit breaker pole 2, and but also ensure that the normal wiring of the circuit breaker pole 2 will not be affected when the leakage protection module 3 is not spliced. After the leakage protection module 3 is spliced, the outgoing terminal of the circuit breaker pole 2 may not be used, and the outgoing terminal can be shielded by a shield plate.

[0043] Of course, an incoming terminal or an outgoing terminal may also be arranged only in the circuit breaker pole 2. In this embodiment, the incoming terminal is arranged in the circuit breaker pole 2. The corresponding outgoing terminal is arranged in the leakage protection module 3. That is, the L-pole incoming terminal 41-1a and the N-pole incoming terminal 41-2a are arranged in parallel at one end of the first housing 11. The leakage protection module 3 includes two wiring terminals arranged at the same end of the second housing 12. The two wiring terminals are an L-pole outgoing terminal 41-1b and an N-pole outgoing terminal 41-2b, respectively. The L-phase main line of the L pole is connected between the L-pole incoming terminal 41-1a and the L-pole outgoing terminal 41-1b. The N-phase main line of the N pole is connected between the N-pole incoming terminal 41-2a and the N-pole outgoing terminal 41-2b. Therefore, after the leakage protection module 3 and the circuit breaker pole 2 are spliced, the circuit breaker can be wired normally. This structure can save the internal space of the circuit breaker.

[0044] Further, the outgoing conductive member 45 is provided with an elastic plug-in portion 451. At least one end of the first housing 11 is provided with a wiring terminal. Two first wiring ports 111 are formed in a side wall on one side of the first housing 11. Each plug-in portion 451 is provided with a slot. Each plug-in portion 451 corresponds to one first wiring port 111. That is, each plug-in portion 451 is located in the first housing 11 and is disposed opposite the first wiring port 111. Preferably, the slot of each plug-in portion 451 correspondingly extends into one first wiring port 111. Two second wiring ports are formed in a side wall on one side of the second housing 12. The two wiring lugs correspondingly pass through the second wiring ports 121 respectively to form a plug-in lug 44 and are correspondingly in plug-and-unplug connection with the two plug-in portions 451. Preferably, the slot may sequentially pass through the first wiring port 111 and the second wiring port 121 and is plugged with the plug-in lug 44 of the wiring lug. Of course, the wiring lug may also sequentially pass through the second wiring port 121 and the first wiring port 111 and is plugged with the slot.

[0045] Further, the wiring lug and/or the outgoing conductive member 45 correspondingly pass through the threading hole of the zero-sequence current transformer 34. Preferably, the first wiring port 111 and the second wiring port 121 correspond to the threading hole of the zero-sequence current transformer 34. At this time, the first wiring port 111 and the second wiring port 121 are respectively located in the middle parts of the side walls of the first housing 11 and the second housing 12. In this way, the lengths of the wiring lug and the outgoing conductive member 45 can be shortened and the occupied space is reduced. In this way, the outgoing conductive member 45 is preferably connected in the vicinity of the components in the middle of the L pole and the middle of the N pole, such as a static contact of the contact mechanism and the short-circuit protection mechanism. In the present embodiment, the short-circuit protection mechanism is located in the middle of the first housing 11. The zero-sequence current transformer 34 is located in the middle of the second housing 12. The short-circuit protection mechanism corresponds to the zero-sequence current transformer 34. Preferably, the outgoing conductive member 45 of the L pole is connected to the short-circuit protection mechanism, and the outgoing conductive member 45 of the N pole is connected to the contact mechanism of the N pole. That is, the first wiring port 111 is located at a position on the side wall of the shell corresponding to the short-circuit protection mechanism, or a position corresponding to the static contact. The second wiring port 121 is located at a position on the side wall of the second housing 12 opposite to the threading hole of the zero-sequence current transformer 34. Meanwhile, the first wiring port 111 corresponds to the second wiring port 121, and the first wiring port 111 also corresponds to the zero-sequence current transformer 34. In this way, the lengths of the outgoing conductive member 45 and the wiring lug can be shortened, which is conducive to plug-in fit.

[0046] Correspondingly, the leakage test loop of the leakage protection module 3 draws electricity from the main loop. Preferably, the second elastic member 32 as

an electricity-drawing end of the leakage test loop is electrically connected with the L-pole outgoing terminal 41-lb, so that the leakage test loop can draw the electricity from the L-phase main line. The other electricity-drawing end of the leakage test loop is electrically connected with the N-pole outgoing terminal 41-2b directly and indirectly for drawing the electricity. A first end of the first elastic member 31 is connected with the zero-sequence current transformer 34, and a second end of the first elastic member 31 and a second end of the second elastic member 32 are matched to form a breakpoint. In this way, the second elastic member 32 may form the breakpoint of the leakage test loop, or may also be used for drawing the electricity for the leakage test loop, which is conducive to reducing the number of wires used. In addition, the circuit board 35 in the leakage current detection circuit also draws the electricity through the second elastic member 32. A third elastic member 33 is also connected to the circuit board 35, wherein a second end of the third elastic member 33 as an electricity-drawing end of the circuit board 35 is connected with the second wiring lug 43. In this way, the circuit board 35 can also reduce the number of electricity-drawing wires while drawing the electricity from the main loop, thereby increasing a space utilization rate, and being conducive to reducing the volume.

[0047] Further, a plug pin is adopted at the wiring terminal of the zero-sequence current transformer 34 in the leakage protection module 3. In this way, the wiring of the zero-sequence current transformer 34 can be realized by means of plug-and-unplug connection, and compared with the existing mode of drawing the electricity with a wire, has the advantages of convenient wiring and a small number of wires.

[0048] A first embodiment is provided in conjunction with FIGS. 1-10. In the present embodiment, the circuit breaker pole 2 is in plug-in fit with the leakage protection module 3. The two wiring lugs are located in the second housing 12. As shown in FIGS. 1, 3 and 4, in the L pole, an L-pole incoming terminal 41-1a is arranged at one end of the L pole. That is, an L-pole incoming terminal 41-1a is arranged at one end of the first housing 11. The contact mechanism of the L pole includes an L-pole moving contact and an L-pole static contact 231. The L-pole moving contact is electrically connected with the L-pole incoming terminal 41-1a. The L-pole static contact 231 is fixed on one side of the arc-extinguishing chamber 24. The short-circuit protection mechanism is arranged between the arc-extinguishing chamber 24 and the handle mechanism 21. The short-circuit protection mechanism includes a coil assembly. The coil assembly includes a coil skeleton and a coil 25 wound on the outer side of the coil skeleton. A second wiring terminal of the coil 25 is connected with the L-pole static contact 231, and a first wiring terminal 251 of the coil 25 is connected with a connecting plate. The outgoing conductive member 45 as the L pole extends outward from the connecting plate along a direction perpendicular to a plane where the arc-extinguishing chamber 24 is located, that is, extends outward along a thickness direction of the circuit breaker pole 2. In the drawings, the connecting plate is arranged along a gap between the short-circuit protection mechanism and the arc-extinguishing chamber 24, and a plug-in portion 451 is arranged at one end of the connecting plate away from the first wiring terminal 251, that is, the plug-in portion 451 is arranged at one end of the first wiring terminal 251 close to the L-pole static contact 231.

[0049] The N pole and the L pole are arranged in parallel in the same first housing 11, and an N-pole incoming terminal 41-2a is arranged at one end of the N pole. That is, the L-pole incoming terminal 41-1a and the N-pole incoming terminal 41-2a are arranged in parallel at one end of the first housing 11. The contact mechanism of the N pole includes an N-pole moving contact and an N-pole static contact 232, wherein the N-pole static contact 232 and the L-pole static contact 231 are arranged in parallel. A conductive plate of the N-pole static contact 232 is arranged along a horizontal direction in FIG. 3 and FIG. 4. In the drawings, the conductive plate of the N-pole static contact 232 corresponds to a gap between the coil assembly of the L pole and the arc-extinguishing chamber 24. The conductive member 45 is formed by extending outward from the middle side of the conductive plate of the N-pole static contact 232. The outgoing conductive members 45 of the N pole and the L pole extend side by side to one side of the first housing 11. That is, the outgoing conductive member 45 of the N pole extends to one side close to the second housing 12 perpendicular to a plane where the arc extinguishing chamber 24 is located, that is, extends to one side of the second housing 12 along the thickness direction of the circuit breaker pole 2. Each outgoing conductive member 45 correspondingly extends into one of the first wiring ports 111, respectively. The plug-in portion 451 is provided with a slot that extends out of the first wiring port 111. Of course, the slot may be located in the first housing 11 or may also be located in the first wiring port 111. Preferably, a side wall of the shell provided with the first wiring port 111, that is, a side wall on one side of the first housing 11 includes a first cover 13 and a second cover 14 that are spliced with each other. One of the first wiring ports 111 is located at the splicing place of the first cover 13 and the second cover 14. This splicing structure is conducive to ensuring the electrical clearance and insulation between the two first wiring ports 111. Further, the lower edge of each first wiring port 111 is protrudingly provided with an insulating portion 112. The insulating portion 112 plays an insulating role, prevents the adjacent outgoing conductive members 45 from being short-circuited, and may also cooperate with the second wiring port 121 to play the role of plug-in guidance. The insulating portion 112 is arranged corresponding to the first wiring port 111 and protrudes from the side wall of the shell. The insulating portion 112 may only be arranged on the lower edge of the first wiring port 111, or may be arranged around the first wiring port 111.

[0050] In the present embodiment, the plug-in portion 451 is shown in FIG. 5 and FIG. 6, and includes a first contact plate and a second contact plate. One end of the second contact plate is bent and connected with the first contact plate, and the other end of the second contact plate is spaced from the first contact plate, so that a gap between the first contact plate and the second contact plate forms a slot. In the drawings, the first contact plate is of a straight plate-shaped structure. The first contact plate in FIG. 6 is formed by a conductive plate of the N-pole static contact 232. In addition, the first contact plate may also be a connecting plate connected to the first wiring terminal 251 of the coil 25. In this way, the space occupied by the slot can be saved, and the cost is reduced. The middle part of the second contact plate is bent and is close to the first contact plate, such that a plug-in gap in the slot is the narrowest in the middle. The plug-in portion 451 is similar to a hairpin shape as a whole, which facilitates elastic plug-in fit between the first wiring lug 42 and the second wiring plate 43, and is conducive to keeping the wiring stable.

[0051] In the leakage protection module 3, a button groove is formed at the upper part of the second housing 12. Two wiring terminals are arranged in parallel at one end of the second housing 12. A wiring lug is connected to each wiring terminal, wherein one of the wiring terminals is used as an L-pole outgoing terminal 41-lb, and the wiring lug connected to the L-pole outgoing terminal 41-1b is used as a first wiring lug 42; and the other wiring terminal is used as an N-pole outgoing terminal 41-2b, and the wiring lug connected to the N-pole outgoing terminal 41-2b is used as a second wiring lug 43. The first wiring lug 42 is connected with the outgoing conductive member 45 of the L pole, and the second wiring lug 43 is connected with the outgoing conductive member 45 of the N pole. At this time, an L-pole incoming terminal 41-1a and an N-pole incoming terminal 41-2a are arranged at one end of the shell of the whole circuit breaker, and an L-pole outgoing terminal 41-1b and an N-pole outgoing terminal 41-2b are arranged at the other end of the shell.

[0052] A side wall on one side of the second housing 12 facing the first housing 11 is provided with two second wiring ports 121. A zero-sequence current transformer 34 is assembled at a position corresponding to the second wiring port 121. A circuit board 35 is arranged on one side of the zero-sequence current transformer 34 away from the wiring terminal. Preferably, an edge on one side of the circuit board 35 is provided with an arc-shaped recess. The zero-sequence current transformer 34 is correspondingly assembled in this arc-shaped recess. A portion of the circuit board 35 adjacent to the arc-shaped recess is provided with a jack. The test button 36 is slidably assembled in a button groove. The first elastic member 31 is located between the test button 36 and the zero-sequence current transformer 34. The second elastic member 32 is cooperatively arranged on one side of the first elastic member 31 and located above the zero-sequence current transformer 34. A second end of the first elastic member 31 is oppositely spaced from a second end of the second elastic member 32 to form a breakpoint. The test button 36 abuts against the middle part of the first elastic member 31. A first end of the second elastic member 32 is plugged with the circuit board 35. In FIG. 9, a second end of the second elastic member 32 is connected with the first wiring lug 42 for drawing the electricity. The middle part of the second elastic member 32 is oppositely spaced from a second end of the first elastic member 31 to form a breakpoint. A first end of the first elastic member 31 is connected with the zero-sequence current transformer 34. Specifically, the first end of the first elastic member 31 is connected with a fourth pin of the zero-sequence current transformer 34. Preferably, a position of the fourth pin is close to the first elastic member 31. A third elastic member 33 is connected to the circuit board 35. The third elastic member 33 is used for electrically connecting the circuit board 35 with the N-pole outgoing terminal 41-2b.

[0053] The zero-sequence current transformer 34 includes an iron core, and a leakage test loop winding and a leakage current detection winding wound on the outer side of the iron core. A threading hole is formed in the middle of the iron core. An electrical isolation plate 345 is arranged in the threading hole. The electrical isolation plate 345 separates the threading hole into a first threading hole and a second threading hole which are parallel to each other. Preferably, the first threading hole and the second threading hole are in one-to-one correspondence with two second wiring ports 121, respectively. The first wiring lug 42 and the second wiring lug 43 correspondingly pass through the two second wiring ports 121 to form two plug-in lugs 44 which are arranged side by side. The two plug-in lugs 44 are plugged with the plug-in portions 451 of the two outgoing conductive members 45. The electrical isolation between the first wiring lug 42 and the second wiring lug 43 is realized by the electrical isolation plate 345.

[0054] The leakage test loop winding includes a third pin and a fourth pin. The fourth pin abuts against the first elastic member 31. The third pin is plugged with the circuit board 35. The leakage current detection winding includes a first pin and a second pin. The first pin and the second pin are connected with the circuit board 35, respectively. The first pin, the second pin and the third pin are located on the same side of the iron core. The fourth pin is located on the other side of the iron core. That is, the first pin, the second pin and the third pin all extend side by side along a radial direction of the iron core. The fourth pin extends outward along a tangential direction of the iron core, so that the fourth pin is located on one side close to the first elastic member 31. An edge of the arc-shaped recess of the circuit board 35 is provided with jacks (i.e., a first jack, a second jack and a third jack) for the first pin, the second pin and the third pin to be plugged. The first pin, the second pin and the third pin of the zero-sequence current transformer 34 may be connected with the circuit board

35 by means of tin soldering.

[0055] As shown in FIGS. 9 and 10, the first wiring lug 42 includes a first conductive plate, an extension plate and a second conductive plate which are integrally formed. One end of the first conductive plate as a first end of the first wiring lug 42 is connected with one N-pole outgoing terminal 41-2b or the L-pole outgoing terminal 41-1b. In the drawings, a first end of the first wiring lug 42 is connected with the L-pole outgoing terminal 41-1b, and the other end of the first conductive plate is bent to one side away from the L-pole outgoing terminal 41-1b, so that the first conductive plate is L-shaped as a whole. One end of the extension plate is connected with an edge of the other end of the first conductive plate, and the other end of the extension plate is bent in a direction away from the first conductive plate. In the drawings, the other end of the extension plate is bent upwards, such that the extension plate is of an L-shaped plate-like structure as a whole. A plate surface of the expansion plate is perpendicular to a plate surface of the first conductive plate. A first abutting groove 421 is formed in a side of the extension plate. A first end of the second elastic member 32 elastically abuts against the first abutting groove 421, and the second elastic member 32 elastically abuts against the first abutting groove 421, thereby achieving the advantages of convenient wiring, wire omitting and small occupied space. The second conductive plate is used as the second end of the first wiring lug 42, one end of the second conductive plate is connected with the middle side of the extension plate, and the other end of the second conductive plate passes through the threading hole of the transformer 34. A plate surface at one end of the extension plate and a plate surface at one end of the second conductive plate are close to one side of the zero-sequence current transformer 34 away from the second wiring port 121. At this time, the first wiring lug 42 and the second wiring lug 43 pass through the threading hole of the zero-sequence current transformer 34 side by side, which facilitates the stable plugging with the outgoing conductive member 45.

[0056] As shown in FIGS. 9 and 10, the second wiring lug 43 is of an L-shaped plate-like structure as a whole. The second wiring lug 43 is arranged between the wiring terminal and the circuit board 35 along a vertical direction in the drawings, and is arranged close to one side of the zero-sequence current transformer 34 away from the second wiring port 121. A second abutting groove 431 is formed in a side at the first end of the second wiring lug 43. The second end of the third elastic member 33 abuts against the second abutting groove 431. In the drawings, the third elastic member 33 is preferably a torsion spring. In addition, the first end of the second wiring lug 43 is connected with the N-pole outgoing terminal 41-2b through a wire. Preferably, a conductive plate is also connected between the wire and the N-pole outgoing terminal 41-2b, and the second end of the second wiring lug 43 sequentially passes through the second threading hole of the zero-sequence current transformer 34 and one second wiring port 121 of the second housing 12 to form the plug-in lug 44.

[0057] A second embodiment is provided in conjunction with FIGS. 11-13. In the present embodiment, one wiring lug extends out of the second housing 12 and is plugged with one outgoing conductive member 45, and the other outgoing conductive member 45 extends to the second housing 12 and is plugged with the other wiring lug. That is, the plug-in portion 451 of one outgoing conductive member 45 extends out of the first housing 11 through the first wiring port 111 and is plugged into the other wiring lug in the second housing 12.

[0058] The L pole and the N pole are jointly assembled in the first housing 11 identical with the first embodiment, wherein the L pole and the N pole are arranged in parallel. The N pole includes an N-pole incoming terminal 41-2a identical with the above-mentioned N pole, an N-pole contact mechanism and an outgoing conductive member 45 connected to the N-pole static contact 232. The L pole includes an L-pole incoming terminal 41-1a identical with the above-mentioned L-pole, an arc-extinguishing chamber 24, an L-pole contact mechanism, a short-circuit protection mechanism and an overload protection mechanism 26, but is different from the above-mentioned L pole in that a first wiring terminal 251 of the coil 25 is used as an outgoing conductive member 45 of the L pole. Preferably, the first wiring terminal 251 of the coil 25 also extends outward along a direction perpendicular to a plane where the arc-extinguishing chamber 24 is located, that is, extends outward along a thickness direction of the circuit breaker pole 2. The first wiring terminal 251 of the coil 25 extends out of one first wiring port 111 of the first housing 11 correspondingly extends into the second housing 12, and forms a conductive zone at the end of the first wiring terminal 251 of the coil 25. The conductive zone may be in plug-in fit with the first wiring terminal 42 of the leakage protection module 3 as the plug-in portion 451. Preferably, a conductive zone is formed by stripping off an insulating layer of an enameled wire. At this time, the first wiring terminal 251 of the coil 25 passes through the first wiring port 111. The conductive zone may be used as the plug-in portion 451 after extending out of the shell through the first wiring port 111.

[0059] The leakage protection module 3 is assembled in the second housing 12 with the same structure as the first embodiment. The leakage protection module 3 includes an L-pole outgoing terminal 41-1b, an N-pole outgoing terminal 41-2b, a zero-sequence current transformer 34 and a circuit board 35 which are identical with those of the above-mentioned leakage protection module 3. The second wiring lug 43 connected to the N-pole outgoing terminal 41-2b has the same structure as the second wiring lug 43 of the first embodiment. A third elastic member 33 is connected between the circuit board 35 and the second wiring lug 43, The second end of the third elastic member 33 abuts against the second abutting groove 431 of the second wiring lug 43. This leakage protection module 3 is different from

the above-mentioned leakage protection module 3 in that the first wiring lug 42 connected to the L-pole outgoing terminal 41-1b no longer passes through the threading hole of the zero-sequence current transformer 34, the first wiring terminal 251 of the coil 25 passes through the first threading hole of the zero-sequence current transformer 34, and the first wiring lug 42 is plugged with the conductive zone of the first wiring terminal 251. In addition, a test button 36, a first elastic member 31 and a second elastic member 32 are also arranged above the zero-sequence current transformer 34, wherein the first elastic member 31 is connected to the zero-sequence current transformer 34, one end of the second elastic member 32 is connected to the circuit board 35, and the second elastic member 32 is connected to the conductive zone of the first wiring terminal 251 for drawing the electricity.

[0060] As shown in FIG. 12, the first wiring lug 42 includes an L-shaped conductive plate. One end of the L-shaped conductive plate as the first end of the first wiring lug 42 is connected with one wiring terminal (L-pole outgoing terminal 41-1b). A side of the other end of the L-shaped conductive plate extends outward along a direction away from the L-shaped conductive plate to form the extension plate. In FIG. 12, a plate surface of the extension plate is arranged along one side of the zero-sequence current transformer 34 away from the second wiring port 121 and is close to the zero-sequence current transformer 34. The extension plate is used as the second end of the first wiring lug 42. A certain included angle is formed between the plate surface of the extension plate and the plate surface of the conductive plate. Preferably, the plate surface of the extension plate is perpendicular to the plate surface of the conductive plate. The first abutting groove 421 is formed in a side of the extension plate. Preferably, the first abutting groove 421 is located at the lower edge of the extension plate. The first wiring terminal 251 of the coil 25 may be correspondingly plugged in the first abutting groove 421. The conductive zone of the first wiring terminal 251 is in abutting fit with the first abutting groove 421, so that the L-phase main line between the leakage protection module 3 and the L pole is powered on. The first wiring terminal 251 may be regarded as the plug-in portion 451 extending into the second housing 12. The second end of the second elastic member 32 abuts against the first abutting groove 421, and the conductive zone elastically abuts against the first abutting groove 421, thereby achieving the advantages of convenient wiring, wire omitting and small occupied space.

[0061] As a third embodiment, when the two wiring lugs both extend out of the second housing 12, the two wiring lugs sequentially pass through the second wiring port 121 and the first wiring port 111 and extend into the first housing 11. That is, the two wiring lugs correspondingly pass through the first threading hole and the second threading hole of the zero-sequence current transformer 34 respectively and are then in plug-in fit with the two outgoing conductive members 45. Preferably, in the present embodiment, the plug-in portions 451 are arranged at two wiring lugs. The plug-in lug 44 is arranged at one end of the outgoing conductive member 45. A slot identical with that of the above embodiment may be selected as the plug-in portion 451. The plug-in portion 451 includes a first contact plate and a second contact plate which are spaced from each other. Of course, the plug-in portion 451 and the plug-in plug 44 have concave-convex structures that match each other, and their specific structures are not limited to the above described structure.

[0062] In addition, when the circuit breaker has three L poles, one N pole and a leakage protection module 3, wherein one of the L pole and the N pole may be jointly assembled in one first housing 11 immediately adjacent to the leakage protection module 3. At this time, the leakage protection module 3 and the L pole as well as the N pole are connected in a mode identical with the above three embodiments. Alternatively, the three L poles and the N pole are respectively assembled in the four first housings 11, wherein one of the outgoing conductive members 45 may pass through the adjacent first housing 11, so that the two outgoing conductive members 45 finally extend side by side to the middle part of the same side wall of the same first housing 11. The leakage protection module 3 may adopt the structure of the above three embodiments.

[0063] 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.

[0064] 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 at least one first housing (11) and a second housing (12) spliced on one side of one first housing (11), wherein at least one circuit breaker pole (2) is assembled in the first housing (11); each circuit breaker pole (2) comprises at least one single-phase main line; a leakage protection module (3) is assembled in the second housing (12); the leakage protection module (3) com-

prises a wiring terminal and a zero-sequence current transformer (34); an outgoing conductive member (45) is connected to at least one single-phase main line; a wiring lug is connected to the wiring terminal; a wiring port is formed in a side wall on one side of the first housing (11) immediately adjacent to the second housing (12); the outgoing conductive member (45) and/or the wiring lug are plugged through the wiring port to form a plug-and-unplug connection structure connected to a main loop; and the outgoing conductive member (45) and/or the wiring lug pass through a threading hole of the zero-sequence current transformer (34).

2. The circuit breaker according to claim 1, wherein all circuit breaker poles (2) comprise at least one L-phase main line and an N-phase main line; the leakage protection module (3) comprises two wiring terminals and two wiring lugs; two outgoing conductive members (45) are connected to the N-phase main line and one of the L-phase main lines, respectively; the two wiring lugs are connected with the two wiring terminals, respectively; and the two wiring lugs are in plug-and-unplug connection with the two outgoing conductive members (45), respectively.

3. The circuit breaker according to claim 2, wherein the wiring port is disposed opposite the threading hole of the zero-sequence current transformer (34); the wiring port comprises a first wiring port (111) and a second wiring port (121); the first wiring port (111) is located in the middle of a side wall of the first housing (11); the second wiring port (121) is located in the middle of a side wall of the second housing (12); and the first wiring port (111) is disposed opposite the second wiring port (121).

4. The circuit breaker according to any one of claims 1 to 3, wherein at least one circuit breaker pole (2) comprises a short-circuit protection mechanism, and the outgoing conductive member (45) is connected to the short-circuit protection mechanism.

5. The circuit breaker according to claim 4, wherein the short-circuit protection mechanism comprises a coil assembly, the first wiring terminal (251) of the coil (25) of the coil assembly is used as the outgoing conductive member (45), or a connecting plate as the outgoing conductive member (45) is connected to the first wiring terminal (251) of the coil (25).

6. The circuit breaker according to claim 5, wherein the first wiring terminal (251) of the coil (25) of the coil assembly is provided with a conductive zone; the conductive zone of the first wiring terminal (251) is used as a plug-in portion (451); and the conductive zone sequentially passes through the wiring ports of the first housing (11) and the second housing (12) and extends into the second housing (12).

7. The circuit breaker according to claim 6, wherein the wiring lug comprises a first wiring lug (42); the first wiring plug (42) does not pass through the threading hole of the zero-sequence current transformer (34); the first wiring lug (42) is provided with a first abutting groove (421); and the first abutting groove (421) abuts against the conductive zone of the first wiring terminal (251).

8. The circuit breaker according to claim 5, wherein the connecting plate as the outgoing conductive member (45) is connected to the first wiring terminal (251) of the coil (25); a plug-in portion (451) is arranged at one end of the connecting plate away from the first wiring terminal (251); and the plug-in portion (451) is provided with a slot.

9. The circuit breaker according to claim 8, wherein the wiring lug comprises a first wiring lug (42), and the first wiring lug (42) passes through the threading hole of the zero-sequence current transformer (34) and is plugged with the plug-in portion (451).

10. The circuit breaker according to claim 1, wherein the circuit breaker pole (2) comprises an N-pole static contact (231), one outgoing conductive member (45) is connected to a static contact plate of the N-pole static contact (231), and the plug-in portion (451) is arranged at one end of the outgoing conductive member (45) away from the N-pole static contact (231).

11. The circuit breaker according to claim 10, wherein the wiring lug comprises a second wiring lug (43), and the second wiring lug (43) passes through the threading hole of the zero-sequence current transformer (34) and is plugged with the plug-in portion (451).

12. The circuit breaker according to claim 1, wherein the wiring lug is provided with the plug-in portion (451), the plug-in portion (451) is provided with a slot, and the outgoing conductive member (45) is in plug-in fit with the slot of the plug-in portion (451) in the wiring lug.

13. The circuit breaker according to claim 8, 10 or 12, wherein the plug-in portion (451) comprises a first contact plate and a second contact plate; one end of the second contact plate is bent and connected with the first contact plate; the other end of the second contact plate is spaced apart from the first contact plate, so that a slot is formed between the first contact plate and the second contact plate; and the wiring lug and the slot of the outgoing conductive

member (45) form a plug-and-unplug connection structure, or the outgoing conductive member (45) and the slot of the wiring lug form a plug-and-unplug connection structure.

14. The circuit breaker according to claim 2, wherein an electrical isolation plate (345) is arranged in the threading hole; the electrical isolation plate (345) separates the threading hole into a first threading hole and a second threading hole; and the two wiring lugs correspondingly pass through the first threading hole and the second threading hole, respectively; or

one outgoing conductive member (45) and one wiring lug correspondingly pass through the first threading hole and the second threading hole, respectively; or
the two outgoing conductive members (45) correspondingly pass through the first threading hole and the second threading hole, respectively.

15. The circuit breaker according to claim 1, wherein two circuit breaker poles (2) are arranged in one of the first housings (11); the two circuit breaker poles (2) are an L pole and an N pole, respectively; the L pole comprises an L-pole outgoing terminal (41-1a); the N pole comprises an N-pole incoming terminal (41-2a); the L-pole incoming terminal (41-1a) and the N-pole incoming terminal (41-2a) are arranged at one end of the first housing (11) side by side; and
the leakage protection module (3) comprises two wiring terminals arranged at the same end of the second housing (12); the two wiring terminals are an L-pole outgoing terminal (41-1b) and an N-pole outgoing terminal (41-2b), respectively; an L-phase main line of an L pole is connected between the L-pole incoming terminal (41-1a) and the L-pole outgoing terminal (41-1b); and an N-phase main line of an N pole is connected between the N-pole incoming terminal (41-2a) and the N-pole outgoing terminal (41-2b).

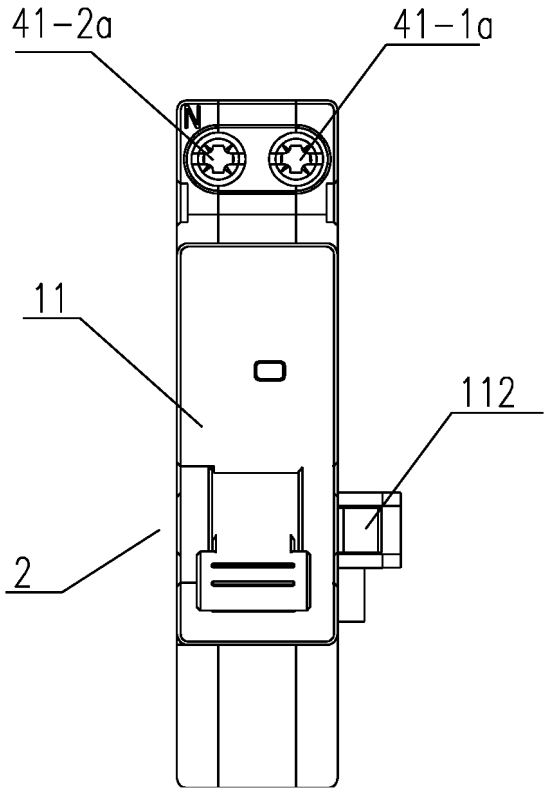

Fig.1

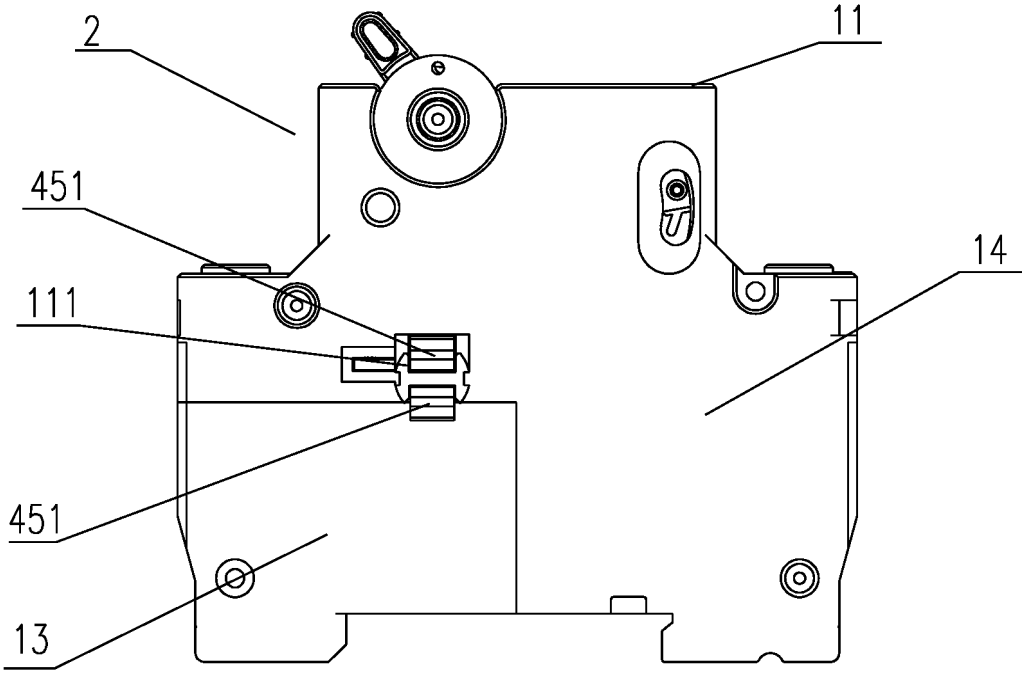

Fig.2

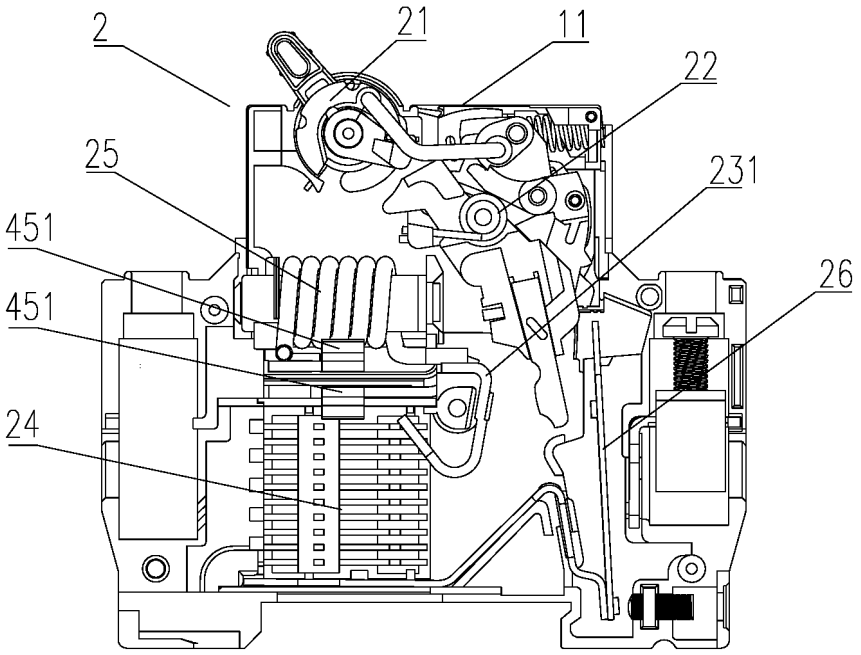

Fig.3

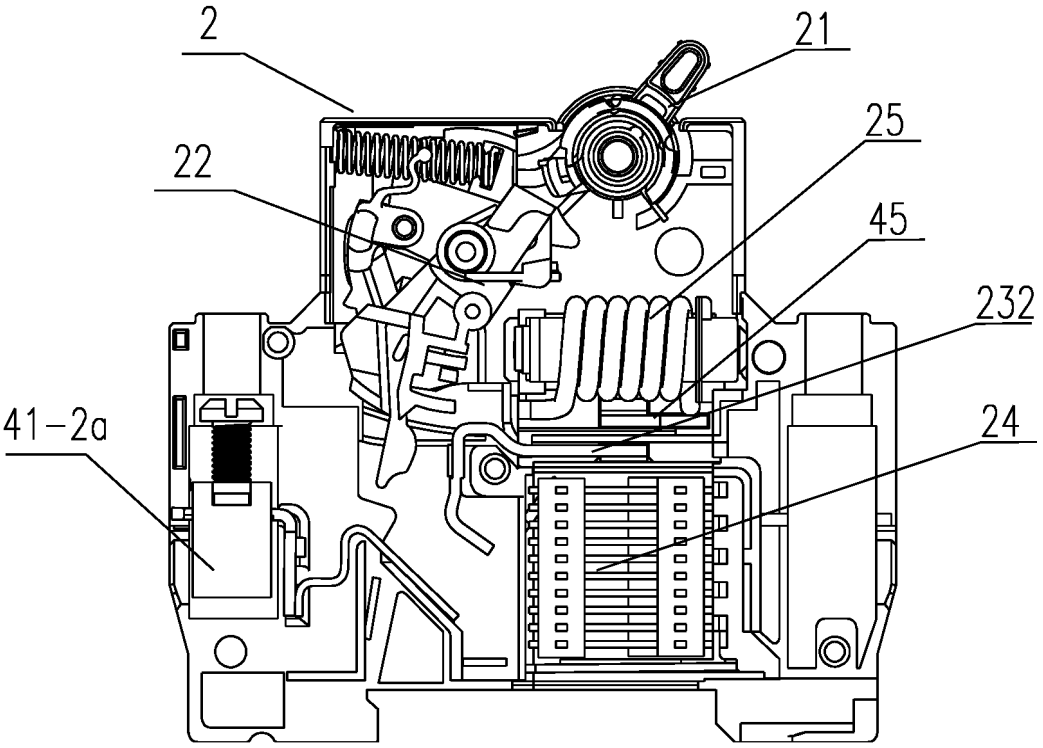

Fig.4

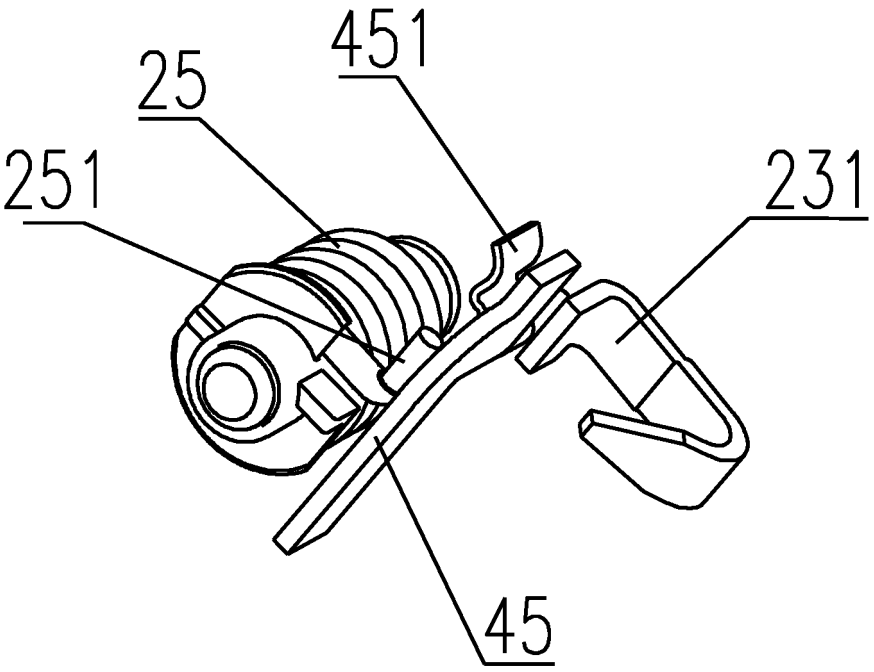

Fig.5

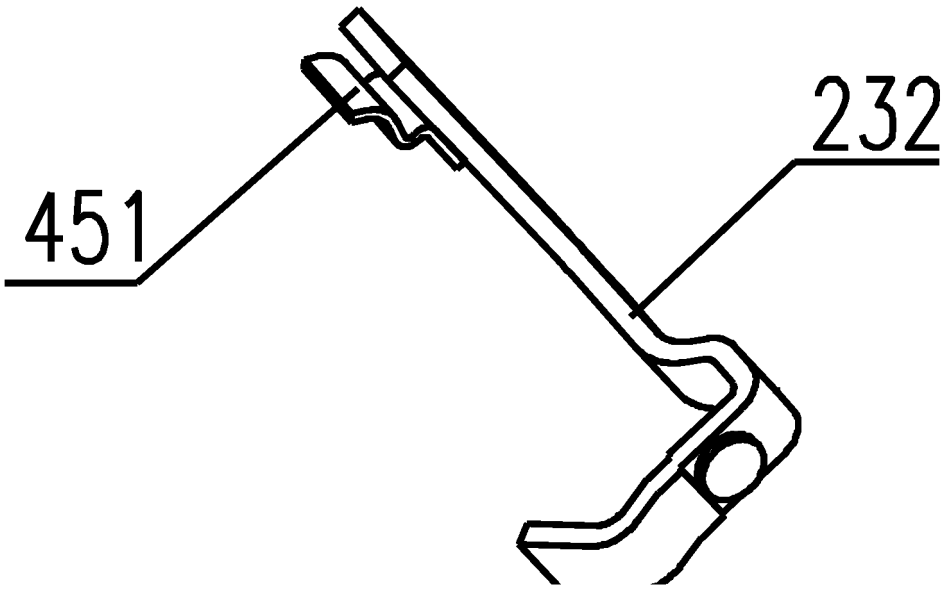

Fig.6

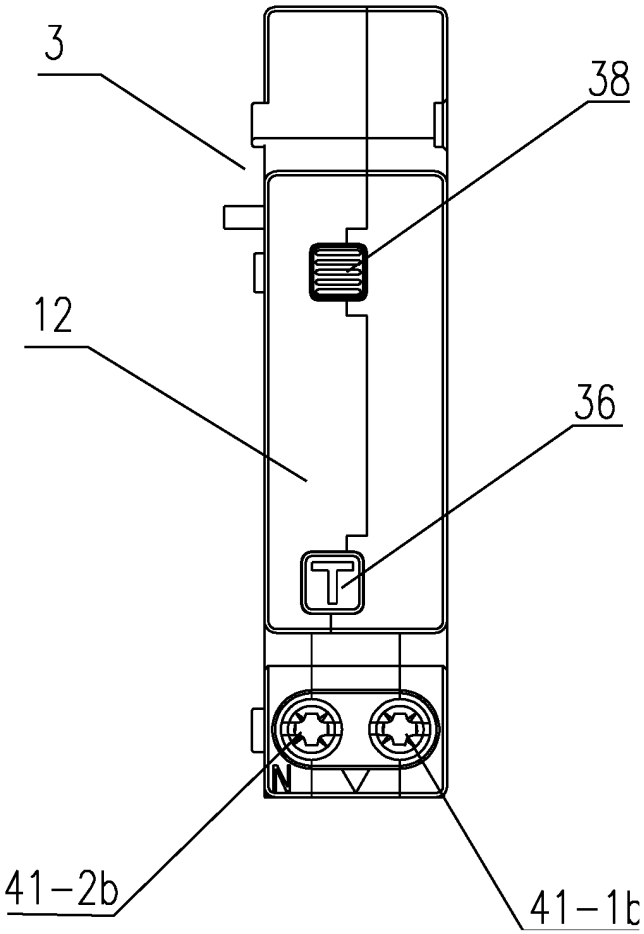

Fig.7

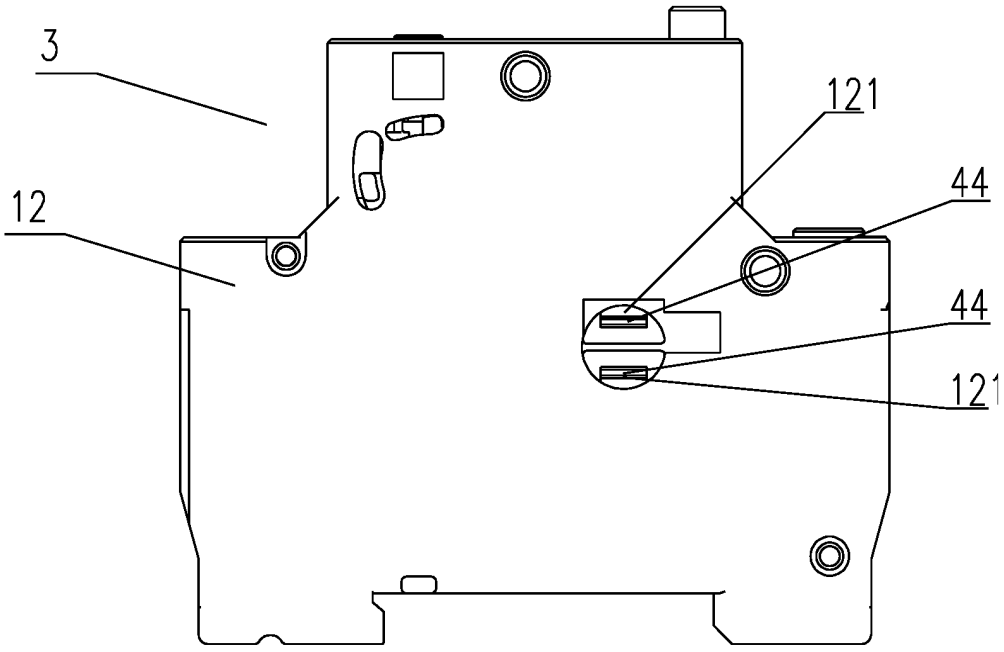

Fig.8

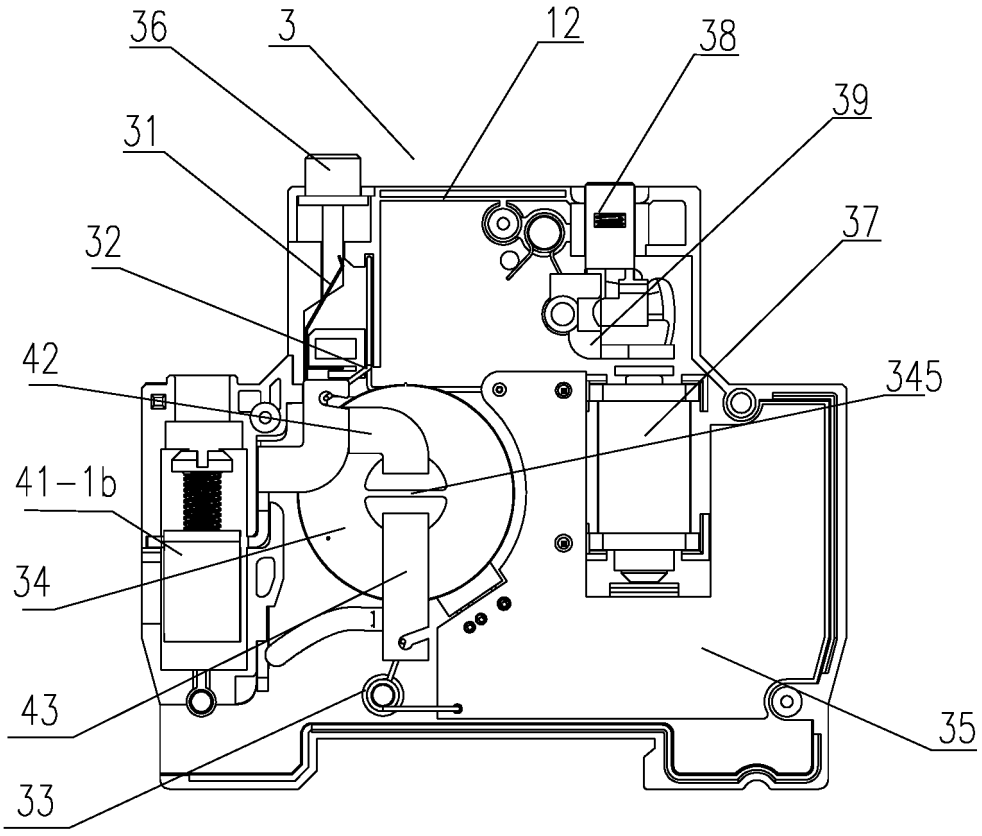
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Fig.9

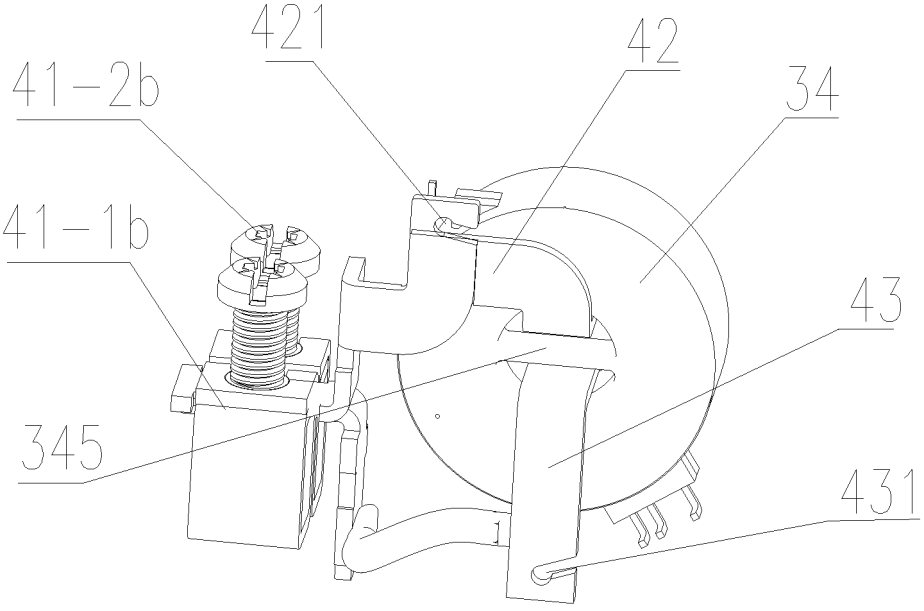
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Fig.10

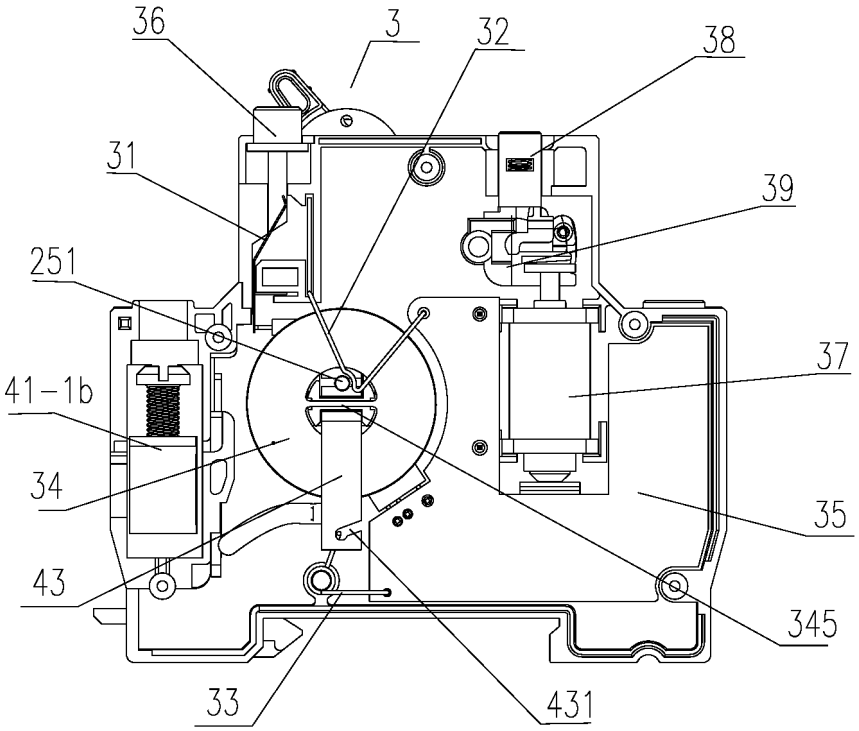
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Fig.11

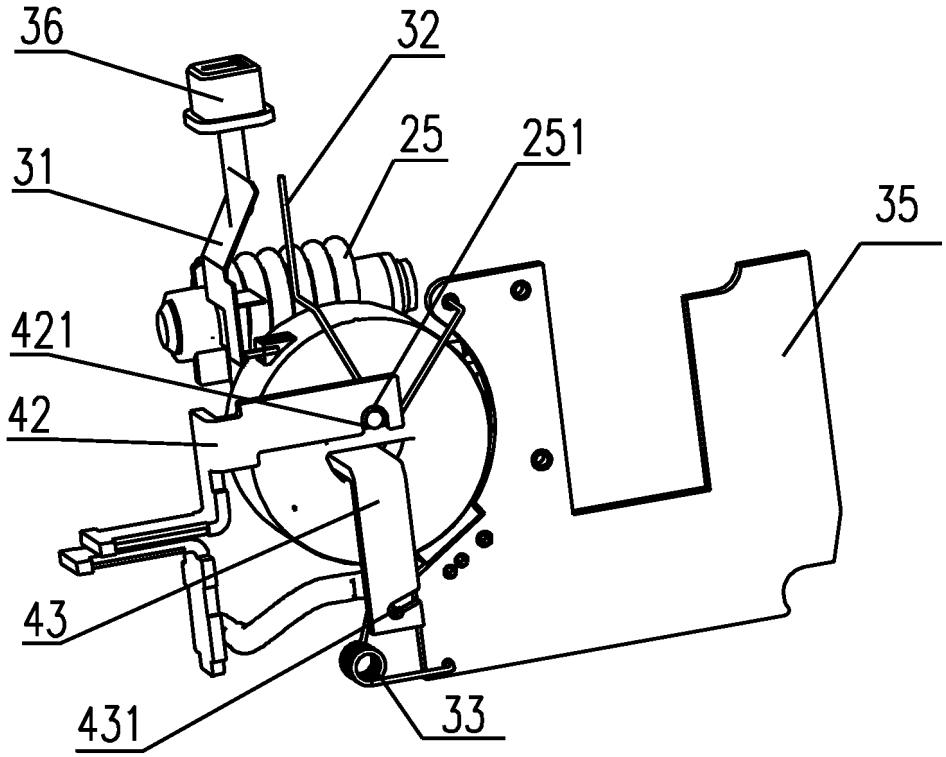
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Fig.12

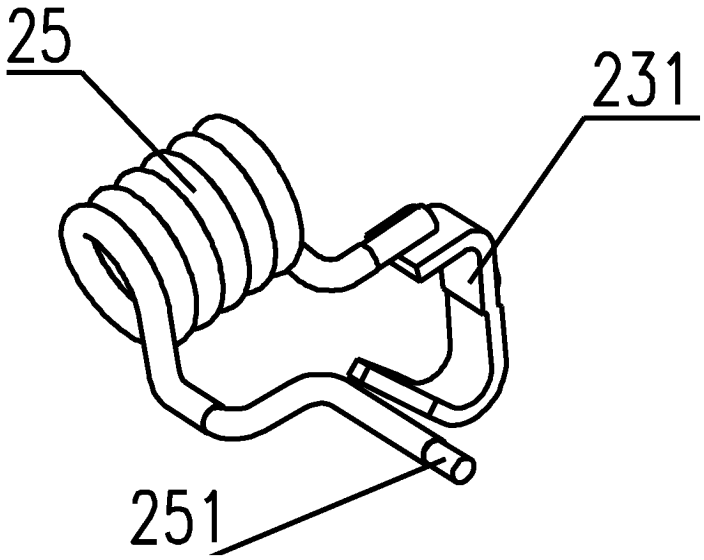

Fig.13

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/098829

A. CLASSIFICATION OF SUBJECT MATTER

H01H71/02(2006.01)i; H01H71/08(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: H01H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNTXT, ENTXTC, VEN, IEEE, CNKI: 侧壁, 插槽, 插接, 插口, 电连接, 互感器, 接口, 零序, 漏 电, 模块, 拼接, 拼装, 组合, 断路, 端子, side, wall, slot, groove, hole, connect, transformer, zero, sequence, leakage, module, stitch, combine, circuit, breaker, terminal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 201725756 U (HONGDA ELECTRIC APPLIANCE GROUP CO., LTD.) 26 January 2011 (2011-01-26) description, paragraphs [0018]-[0020], and figures 1-9	1-15
X	CN 111128614 A (BOPU ELECTRICAL CO., LTD.) 08 May 2020 (2020-05-08) description, specific embodiments, and figures	1-15
A	CN 109524277 A (BULL GROUP CO., LTD.) 26 March 2019 (2019-03-26) entire document	1-15
A	EP 1562212 A2 (SIEMENS AKTIENGESELLSCHAFT) 10 August 2005 (2005-08-10) entire document	1-15
A	EP 3035359 A2 (AG, A.S. et al.) 22 June 2016 (2016-06-22) entire document	1-15
A	JP 2001126607 A (FUJI ELECTRIC CO., LTD.) 11 May 2001 (2001-05-11) entire document	1-15

☐ 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
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"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
14 August 2023	**14 August 2023**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/098829

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EP	1562212	A2	10 August 2005	DE	502004009961	D1	08 October 2009
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				EP	1562212	B1	26 August 2009
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				CN	105655207	A	08 June 2016
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Form PCT/ISA/210 (patent family annex) (July 2022)