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CIRCUIT BREAKER

- (57) A circuit breaker includes an L-pole circuit breaker (3, 6), an N-pole circuit breaker (4, 7) and a remote opening controller (5,8). An L-pole lock catch (31) and an N-pole lock catch (41) are connected through a lock catch shaft (32, 61). The N-pole lock catch (41) is provided with a socket (411) for realizing delayed tripping. One end of the lock catch shaft (32, 61) passing through the socket (411) on the N-pole lock catch (41), is connected and fitted with the remote opening controller (5,8), and another end of the lock catch shaft (32, 61) is connected and fitted with the L-pole lock catch (31). The shape of the socket (411) is configured to be capable of accommodating the lock catch shaft (32, 61) to abut against the socket (411) after the lock catch shaft (32, 61) conducts a certain movement stroke.

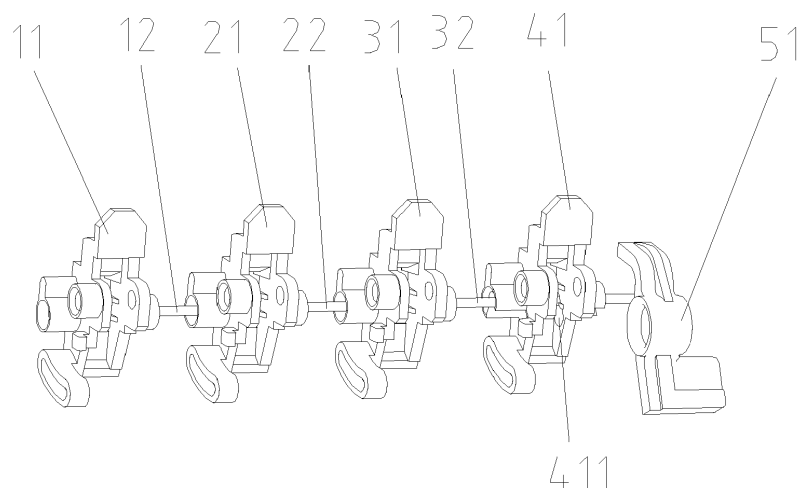


FIG.5

Description

TECHNICAL FIELD

[0001] The invention relates to the field of switchgear, in particular to a circuit breaker, and in particular to the improvement of a remote tripping and opening mechanism.

BACKGROUND

[0002] In a circuit breaker with N-pole, there are often design requirements for N-pole to close first and open post. On the one hand, the N-pole being closed first and opened post can ensure that the arc generated by the N-pole circuit breaker is small (or even no arc), the impact on the device is low, and the safety is high. At the same time, the N-pole circuit breaker can also be equipped with no arc extinguishing chamber, which has more abundant installation space. On the other hand, since the N pole is closed first and opened post, if the circuit breaker is virtually closed or open (that is, the circuit breaker is not fully closed or opened), at this time it can only be that the N-pole is in the closed state or the N-pole is not completely disconnected. Therefore, although the circuit breaker is not completely opened and closed, it ensures that only the N-line is connected to the load, avoiding the danger of electric shock during overhaul for the operator.

SUMMARY

[0003] The present invention proposes a circuit breaker with an optimized structure to solve the design requirement of the N-pole being post-opened in a delayed manner under the remote opening link.

[0004] The present invention adopts the following technical schemes to be implemented:

[0005] The present invention provides a circuit breaker, which includes a remote opening controller, an N-pole circuit breaker and an L-pole circuit breaker. The L-pole circuit breaker includes an L-pole lock catch for realizing its tripping and opening, and the N-pole circuit breaker includes an N-pole lock catch for realizing its tripping and opening. The circuit breaker further includes a lock catch shaft, the N-pole lock catch is provided with a socket for realizing delayed tripping. One end of the lock catch shaft is connected and fitted with the remote opening controller, the lock catch shaft passes through the socket on the N-pole lock catch, and another end of the lock catch shaft is connected and fitted with the L-pole lock catch. The shape of the socket is configured to be capable of accommodating the lock catch shaft to abut against the socket after the lock catch shaft conducts a certain movement stroke. The remote opening controller receives a remote signal and drives the lock catch shaft to generate a tripping stroke. The L-pole lock catch connected and fitted with another end of the lock catch shaft, is driven to trip and open synchronously, but, since the lock catch

shaft only abuts against the socket after moving for a certain stroke, the N-pole lock catch is driven to trip and open in a delayed manner.

[0006] In some embodiments, in order to reduce the wear of the lock catch shaft, in one embodiment, preferably, the shape of the shape of the socket is a shape of an oblong hole matching with a tripping stroke route of the lock catch shaft.

[0007] In some embodiments, in order to reduce the wear of the lock catch shaft, in one embodiment, the width of the oblong hole is preferably slightly larger than the outer diameter of the lock catch shaft.

[0008] In some embodiments, based on considerations of installation and manufacturing considerations, in one embodiment, preferably, another end of the lock catch shaft is plug-fitted and fixed with the L-pole lock catch.

[0009] In some embodiments, as a preferred embodiment, the circuit breaker is a multi-pole circuit breaker including an L1-pole circuit breaker, an L2-pole circuit breaker and an L3-pole circuit breaker corresponding to three-phase current; the L1- pole circuit breaker, the L2-pole circuit breaker, the L3-pole circuit breaker, the N-pole circuit breaker and the remote opening controller are arranged and cascaded in sequence, and the L-pole lock catch is provided on the L3-pole circuit breaker adjacent to the N-pole circuit breaker. Or, as another preferred embodiment, the L-pole circuit breaker includes only one-pole L-pole circuit breaker.

[0010] In some embodiments, the L1-pole circuit breaker includes a first lock catch for realizing its tripping and opening; the L2-pole circuit breaker includes a second lock catch for realizing its tripping and opening; the L3-pole circuit breaker includes a third lock catch for realizing its tripping and opening and being used as the L-pole lock catch; and the first lock catch, the second lock catch and the third lock catch are connected in linkage.

[0011] In some embodiments, in order to save more effort, preferably, the L1-pole circuit breaker further includes a first lock catch shaft with one end plugged and fixed on the first lock catch; the L2-pole circuit breaker further includes a second lock catch shaft with one end plugged and fixed on the second lock catch; another end of the first lock catch shaft is plugged into the second lock catch, and another end of the second lock catch shaft is plugged into the third lock catch, so that when the third lock catch moves, the second lock catch is linked to move first, and then the first lock catch is linked to move by the second lock catch.

[0012] In some embodiments, the L3-pole circuit breaker further includes a third lock catch shaft with one end plugged and fixed on the third lock catch, being used as the lock catch shaft; the remote opening controller is a shunt trip, including a shunt push rod for driving opening; the third lock catch shaft passes through the socket on the N-pole lock catch and extends into the shunt trip, and acts under push of the shunt push rod.

[0013] In some embodiments, in order to ensure the

stability of the plug-fit and fixation, preferably, each the end of the first lock catch shaft, the second lock catch shaft and the third lock catch shaft for plug-fit is knurled.

[0014] In some embodiments, in order to realize that the N-pole circuit breaker is closed first and opened post during manual opening and closing, preferably, the N-pole circuit breaker and the L-pole circuit breaker coincides with each other in the arrangement direction of the circuit breaker, and the static contact of the N-pole circuit breaker is arranged more forward than the static contact of the L-pole circuit breaker, such that the spacing between the moving contact and static contact in the N-pole circuit breaker is smaller than the spacing between the moving contact and static contact in the L-pole circuit breaker.

[0015] The invention has the following beneficial effects: the invention realizes that the N-pole is opened afterward when the circuit breaker is remotely opened, with a simple structure and good reliability.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

FIG. 1 is a bottom view of a multi-pole circuit breaker in Embodiment 1;

FIG.2 is the disassembly drawing of the multi-pole circuit breaker in Embodiment 1;

FIG.3 is a front view of a multi-pole circuit breaker in Embodiment 1;

FIG.4 is a sectional view at A-A in FIG.3;

FIG.5 is a schematic diagram of the first lock catch, the second lock catch, the third lock catch, the fourth lock catch, the first lock catch shaft, the second lock catch shaft, the third lock catch shaft and the shunt push rod in Embodiment 1;

FIG.6 is a schematic diagram of a fourth lock catch in Embodiment 1;

FIG.7 is an exploded view of the structure of the third lock catch shaft, the fourth lock catch and the shunt push rod in Embodiment 1;

FIG.8 is a schematic diagram of the electromagnetic drive mechanism of the S-pole shunt trip pushing the shunt push rod in Embodiment 1;

FIG.9 is a schematic diagram of the shunt push rod pushing the third lock catch shaft to move in the oblong hole in Embodiment 1;

FIG. 10 is a schematic diagram of the shunt push rod pushing the third lock catch shaft to abut against

the oblong hole in Embodiment 1;

FIG. 11 is a side view of a multi-pole circuit breaker in Embodiment 1;

FIG. 12 is a sectional view at B-B in Figure 11;

FIG. 13 is a schematic diagram of the circuit breaker in Embodiment 2.

DETAILED DESCRIPTION

[0017] To further illustrate the various embodiments, the present invention is provided with the accompanying drawings. These drawings are a part of the disclosure of the present invention, which are mainly used to illustrate the embodiments, and may be used in conjunction with the relevant description of the specification to explain the operation principles of the embodiments. With reference to these contents, those ordinary skilled in the art will understand other possible embodiments and benefits of the present invention. Components in the figures are not drawn to scale, and similar component symbols are often used to represent similar components.

[0018] The existing circuit breaker with design of N-pole being closed first and opened post is mostly applied in the manual opening and closing process of the circuit breaker, but it is difficult to realize in the application of remote automatic opening. For example, an existing multi-pole circuit breaker with a shunt trip consists of an L-pole circuit breaker, an N-pole circuit breaker and an S-pole shunt trip, which are cascaded in series in sequence. When a shunt signal is received, the shunt trip first acts on a lock catch of the N-pole circuit breaker, to trip and open the N-pole circuit breaker, and the lock catch of the N-pole circuit breaker is linked with the lock catches of other-pole circuit breaker to make the other-pole circuit breaker open, in which the design requirement of the N-pole being post-opened cannot be achieved.

[0019] The present invention will now be further described with reference to the accompanying drawings and specific embodiments.

Example 1:

[0020] Referring to FIG.1-FIG.2, as a preferred embodiment of the present invention, there is provided a multi-pole circuit breaker, which includes an L1-pole circuit breaker 1, an L2-pole circuit breaker 2, an L3-pole circuit breaker 3, a N-pole circuit breaker 4 and S-pole shunt trip 5 cascaded in series in sequence. L1-pole circuit breaker 1, L2-pole circuit breaker 2 and L3-pole circuit breaker 3 correspond to three-phase power supply respectively. N-pole circuit breaker 4 corresponds to neutral line, and S-pole shunt trip 5 is used to receive shunt signal and drive each pole circuit breaker to shunt trip remotely.

[0021] Referring to FIG.4-FIG.5, the L1-pole circuit

breaker 1 includes a first lock catch 11 for realizing its tripping and opening, and a first lock catch shaft 12 plug-fitted and fixed on the first lock catch 11; the L2-pole circuit breaker 2 includes a second lock catch 21 for realizing its tripping and opening, and a second lock catch shaft 22 plug-fitted and fixed on the second lock catch 21; the L3-pole circuit breaker 3 includes a third lock catch 31 (as the L-pole lock catch), and a third lock catch shaft 32 plug-fitted and fixed on the third lock catch 31; the N-pole circuit breaker 4 includes the fourth lock catch 41 (i.e. the N-pole lock catch); the S-pole shunt trip 5 includes a shunt push rod 51.

[0022] The first lock catch 11, the second lock catch 21, the third lock catch 31 and the fourth lock catch 41 are side by side. The first lock catch shaft 12 is further plugged into a linkage hole of the second lock catch 21. The second lock catch shaft 22 is further plugged into a linkage hole of the third lock catch 31. The L1-pole circuit breaker 1, the L2-pole circuit breaker 2 and the L3-pole circuit breaker are linked integrally through the linkage of the first lock catch shaft 12 and the second lock catch shaft 22. The linkage between the L3-pole circuit breaker 3 and the N-pole circuit breaker 4 is realized by the third lock catch 31 (as the L-pole lock catch), the third lock catch shaft 32 and the fourth lock catch 41 (as the N-pole lock catch).

[0023] As shown in FIG.6, the fourth lock catch 41 is provided with an oblong hole 411 (as a socket) for realizing delayed tripping. Referring to FIG.5 and FIG.7, the third lock catch shaft 32 passes through the oblong hole 411 of the fourth lock catch 41 and extends into the S-pole shunt trip 5 to cooperate with the actuation of the shunt push rod 51. As shown in FIG.8, in the S-pole shunt trip 5, an electromagnetic drive mechanism 52 pushes the shunt push rod 51 to swing, and the shunt push rod 51 pushes the third lock catch shaft 32 during the swinging process. When pushed by the shunt push rod 51, the third lock catch shaft 32 has a tripping stroke for tripping and opening each pole circuit breaker. The oblong hole 411 is set along the tripping stroke route of the third lock catch shaft 32.

[0024] As shown in FIG.8- FIG.9, the working principle of this embodiment is: when the S-pole shunt trip 5 receives a shunt signal, the shunt push rod 51 swings and pushes the third lock catch shaft 32, so that the third lock catch shaft 32 has a tripping stroke; the third lock catch shaft 32 is linked with the third lock catch 31, the third lock catch 31 is further linked with the second lock catch 21, and then the second lock catch 21 is linked with the first lock catch 11, so that the L3-pole circuit breaker 3, the L2-pole circuit breaker 2 and the L1-pole circuit breaker 1 are tripped and opened; at the same time, since the socket on the fourth lock catch 41 is an oblong hole 411, during the movement and trip of the third lock catch 31, the second lock catch 21 and the first lock catch 11, the third lock catch shaft 32 further moves in the oblong hole 411, and finally abuts against the end of the oblong hole 411, so that the fourth lock catch 41 is triggered; the third

lock catch shaft 32 pushes against the end of the oblong hole 411 to make the fourth lock catch 41 move and trip, so as to achieve the purpose of N-pole being post-opened in a delayed manner.

[0025] In some embodiments, the socket on the fourth lock catch 41 is an oblong hole 411, but in other embodiments, it can also be replaced with sockets of other structures, such as a fan-shaped hole, a round hole with a larger diameter, a square hole, special-shaped holes, etc., as long as the shape of the socket is configured to be able to accommodate the third lock catch shaft 32 to abut against with it after a certain movement stroke. In this example, the oblong hole 411 is used, which can match the shunt swing routine of the third lock catch shaft 32 better and reduce the wear of the third lock catch shaft 32. On this basis, a more preferred solution is that the width of the oblong hole 411 is slightly larger than the outer diameter of the third lock catch shaft 32 to further reduce the wear of the third lock catch shaft 32.

[0026] The fit between the third lock catch shaft 32 and the third lock catch 31 may be any fit manner as long as synchronous linkage may be realized. That is, when the third lock catch shaft 32 swings for tripping and opening, it can drive the third lock catch 31 to move with it synchronously. For example, in addition to plug-fit and fixation adopted in some embodiments, the form of clip connection, screw connection and the like may also be used. In some embodiments, the third lock catch shaft 32 and the third lock catch 31 are connected and fitted by adopting plug-fit and fixation, which is more convenient for installation and manufacture. In order to ensure the stability of the fit, the plug end of the third lock catch shaft 32 and the third lock catch 31 are knurled. Similarly, the plug ends of the first lock catch shaft 12 and the second lock catch shaft 22 can also be knurled.

[0027] In some embodiments, the third lock catch shaft 32 is extended to pass through the oblong hole 411 provided on the fourth lock catch 41 and into the S-pole shunt trip 5 to fit with the shunt push rod 51. The manufacturing cost is low, the assembly process is simple, and more importantly, post-opening of the N-pole is very reliable, and the design requirement of the N-pole being post-opened in a delayed manner under the remote shunt trip link are realized.

[0028] In some embodiments, the linkage connection of the L1-pole circuit breaker 1, the L2-pole circuit breaker 2 and the L3-pole circuit breaker 3 is realized by the second lock catch shaft 22 and the first lock catch shaft 12. In other embodiments, only one lock catch shaft may be used, that is, the one lock catch shaft is connected in series with the L1-pole circuit breaker 1, the L2-pole circuit breaker 2 and the L3-pole circuit breaker 3 to realize the linkage connection of the three, but in this structure the one lock catch shaft needs to push lock catches of the three circuit breaker at the same time, which is laborious and requires a large driving force. In some embodiments, the second lock catch shaft 22 and the first lock catch shaft 12 are used to form a segmented linkage.

The third lock catch 31 is linked to the second lock catch 21 first through the second lock catch shaft 22, and then the second lock catch 21 is linked to the first lock catch 11 through the first lock catch shaft 12, which requires less driving force and saves more effort.

[0029] The above-mentioned segments of the lock catch shafts (the first lock catch shaft 12, the second lock catch shaft 22 and the third lock catch shaft 32) may have different shapes (such as different cross-sectional shapes, different thicknesses, etc.), but based on consideration of modular production and the difficulty of manufacturing and assembly, it is preferable to choose each segment of the lock catch shaft with a same shape, then the shape of the sockets on the first lock catch 11, the second lock catch 21 and the third lock catch 31 may also be configured to be the same.

[0030] The S-pole shunt trip 5 in some embodiments is essentially a remote opening controller. In other embodiments, it can also be replaced with an overvoltage trip, an undervoltage trip, or an overvoltage and undervoltage trip.

[0031] This embodiment realizes the delayed post-opening of the N-pole circuit breaker when the multi-pole circuit breaker is remotely opened. On this basis, in some embodiments the N-pole circuit breaker is configured to close first and open post in the case of manual opening and closing. Specifically, as shown in FIG.12, the L1-pole circuit breaker 1 includes an L1-pole static contact 13 and an L1-pole moving contact 14, the L2-pole circuit breaker 2 includes an L2-pole static contact 23 and an L2-pole moving contact 24, the L3-pole circuit breaker 3 includes an L3-pole static contact 33 and an L3-pole moving contact 34, the N-pole circuit breaker 4 includes an N-pole static contact 43 and an N-pole moving contact 44, where the positions of the L1-pole moving contact 14, the L2-pole moving contact 24, the L3-pole moving contact 34 and the N-pole moving contact 44 coincide with each other in the arrangement direction (that is, the left and right directions in the figure) of the multi-pole circuit breaker, and the position of the N-pole static contact 43 is set more forward compared with the positions of static contacts of each L-pole circuit breaker (i.e., the L1-pole static contact 13, the L2-pole static contact 23 and L3 pole static contacts 33), so that the spacing between the moving and static contact in the N-pole circuit breaker 4 (indicated by S1 in FIG.12) is smaller than the spacing between the moving and static contact in each L-pole circuit breaker (indicated by S2 in FIG.12). Then, when manually closing, the N-pole circuit breaker 4 will close first due to the smaller spacing between the moving and static contact, and has a certain overtravel after the L-pole circuit breaker is closed. When manually opening, the N-pole circuit breaker 4 needs to return to overtravel first, so that the N-pole circuit breaker 4 will also be opened post. Moreover, in some embodiments, by the third lock catch shaft 32 passing through the oblong hole 411 of the N-pole, when shunt tripping, the shunt push rod pushes the third lock catch 31 to trip, then the third

lock catch shaft 32 continues to move and abut against with the oblong hole 411, driving the N-pole to trip. During this process, the N-pole static contact 43 has a larger overtravel than the L-pole static contact as it is set more forward. When shunt tripping, the disconnection of the N-pole contact will also play a certain delaying role.

Example 2:

[0032] The present embodiment provides a circuit breaker, including an L-pole circuit breaker 6, an N-pole circuit breaker 7 and an S-pole shunt trip 8 that are cascaded side by side in sequence, where the fit manner between the L-pole circuit breaker 6 and the N-pole circuit breaker 7 is the same as that between the L3-pole circuit breaker 3 and the N-pole circuit breaker 4 in Embodiment 1. The lock catch shaft 61 of the L-pole circuit breaker 6 passes through the waist-shaped opening on the lock catch of the N-pole circuit breaker 7 and extends into the S-pole shunt tripper 8, the effect of which is the same as that in Embodiment 1, and the post-opening of the of the N-pole circuit breaker in remote tripping is realized.

[0033] The difference between this embodiment and Embodiment 1 is that there is only one L-pole circuit breaker. Obviously, the number of the L-pole circuit breaker provided does not affect the fit with the N-pole circuit breaker. No matter in the solution of this embodiment with only one L-pole circuit breaker, or in the solution of Embodiment 1 with three L-pole circuit breakers, the above-mentioned structure with the N-pole being post-opened can be adopted.

Claims

1. A circuit breaker, comprising an L-pole circuit breaker (3, 6), an N-pole circuit breaker (4, 7) and a remote opening controller (5, 8), wherein the L-pole circuit breaker (3, 6) comprises an L-pole lock catch (31) for realizing tripping and opening thereof, and the N-pole circuit breaker (4, 7) comprises an N-pole lock catch (41) for realizing tripping and opening thereof, **characterized in that:**
the circuit breaker further comprises a lock catch shaft (32, 61); the N-pole lock catch (41) is provided with a socket (411) for realizing delayed tripping; one end of the lock catch shaft (32, 61) is connected and fitted with the remote opening controller (5,8), the lock catch shaft (32, 61) passes through the socket (411) on the N-pole lock catch (41), and another end of the lock catch shaft (32, 61) is connected and fitted with the L-pole lock catch (31); a shape of the socket (411) is configured to be capable of accommodating the lock catch shaft (32, 61) to abut against the socket (411) after the lock catch shaft (32, 61) conducts a certain movement stroke; the remote opening controller (5,8) receives a remote signal and drives the lock catch shaft (32, 61) to generate a tripping stroke;

the L-pole lock catch (31) connected and fitted with another end of the lock catch shaft (32, 61) is driven to trip and open synchronously, but, since the lock catch shaft (32, 61) only abuts against the socket (411) after moving for a certain stroke, the N-pole lock catch (41) is driven to trip and open in a delayed manner.

2. The circuit breaker according to claim 1, **characterized in that** the shape of the socket (411) is a shape of an oblong hole (411) matching with a tripping stroke route of the lock catch shaft (32, 61). 5
3. The circuit breaker according to claim 2, **characterized in that** a width of the oblong hole (411) is slightly larger than an outer diameter of the lock catch shaft (32, 61). 10
4. The circuit breaker according to any one or more of claims 1-3, **characterized in that** another end of the lock catch shaft (32, 61) is plug-fitted and fixed with the L-pole lock catch (31). 15
5. The circuit breaker according to any one or more of claims 1-4, **characterized in that:** the circuit breaker is a multi-pole circuit breaker comprising an L1-pole circuit breaker (1), an L2-pole circuit breaker (2) and an L3-pole circuit breaker (3) corresponding to three-phase current; the L1-pole circuit breaker (1), the L2-pole circuit breaker (2), the L3-pole circuit breaker (3), the N-pole circuit breaker (4) and the remote opening controller (5) are arranged and cascaded in sequence, and the L-pole lock catch (31) is provided on the L3-pole circuit breaker (3) adjacent to the N-pole circuit breaker (4). 20
6. The circuit breaker according to claim 5, **characterized in that:** the L1-pole circuit breaker (1) comprises a first lock catch (11) for realizing tripping and opening thereof; the L2-pole circuit breaker (2) comprises a second lock catch (21) for realizing tripping and opening thereof; the L3-pole circuit breaker (3) comprises a third lock catch (31) for realizing tripping and opening thereof as the L-pole lock catch (31); and the first lock catch (11), the second lock catch (21) and the third lock catch (31) are connected in linkage. 25
7. The circuit breaker according to claim 6, **characterized in that:** the L1-pole circuit breaker (1) further comprises a first lock catch shaft (12) with one end plugged and fixed on the first lock catch (11); the L2-pole circuit breaker (2) further comprises a second lock catch shaft (22) with one end plugged and fixed on the second lock catch (21); another end of the first lock catch shaft (12) is plugged into the second lock catch (21); and another end of the second lock catch shaft (22) is plugged into the third lock catch (31), such that when the third lock catch (31) moves, the second lock catch (21) is linked to move first, and then the first lock catch (11) is linked to move by the second lock catch (21). 30

(31), such that when the third lock catch (31) moves, the second lock catch (21) is linked to move first, and then the first lock catch (11) is linked to move by the second lock catch (21).

8. The circuit breaker according to claim 7, **characterized in that:** the L3-pole circuit breaker (3) further comprises a third lock catch shaft (32) with one end plugged and fixed on the third lock catch (31) as the lock catch shaft (32); the remote opening controller (5) is a shunt trip, comprising a shunt push rod (51) for driving opening; the third lock catch shaft (32) extends through the socket (411) on the N-pole lock catch (41) into the shunt trip, and acts under push of the shunt push rod (51). 35
9. The circuit breaker according to claim 8, **characterized in that** one end of the first lock catch shaft (12), the second lock catch shaft (22) and the third lock catch shaft (32) for plug-fit and fixation is knurled. 40
10. The circuit breaker according to any one or more of the preceding claims, **characterized in that:** a moving contact (44) of the N-pole circuit breaker (4) and a moving contact (14, 24, 34) of the L-pole circuit breaker (1, 2, 3) coincide with each other in an arrangement direction of the circuit breaker, and a static contact (43) of the N-pole circuit breaker (4) is arranged more forward than a static contact (13, 23, 33) of the L-pole circuit breaker (1, 2, 3), such that a spacing between the moving contact (44) and the static contact (43) in the N-pole circuit breaker (4, 7) is smaller than a spacing between the moving contact (14, 24, 34) and the static contact (13, 23, 33) in the L-pole circuit breaker (1, 2, 3). 45

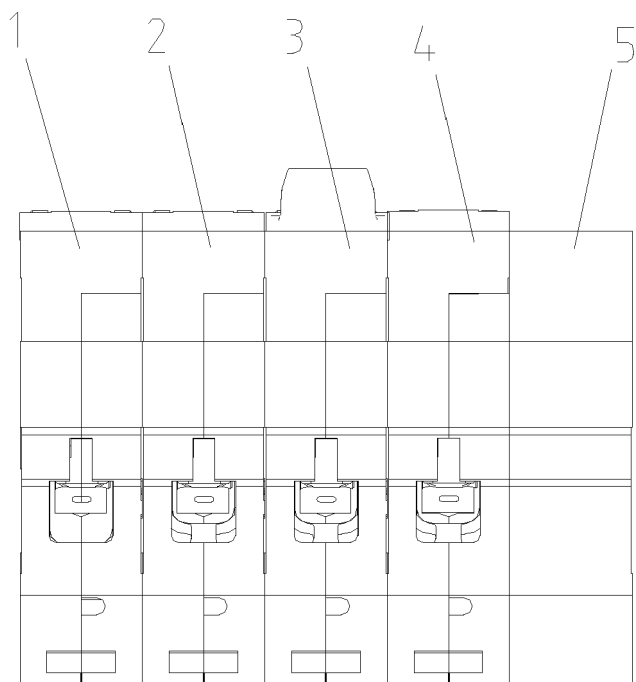


FIG.1

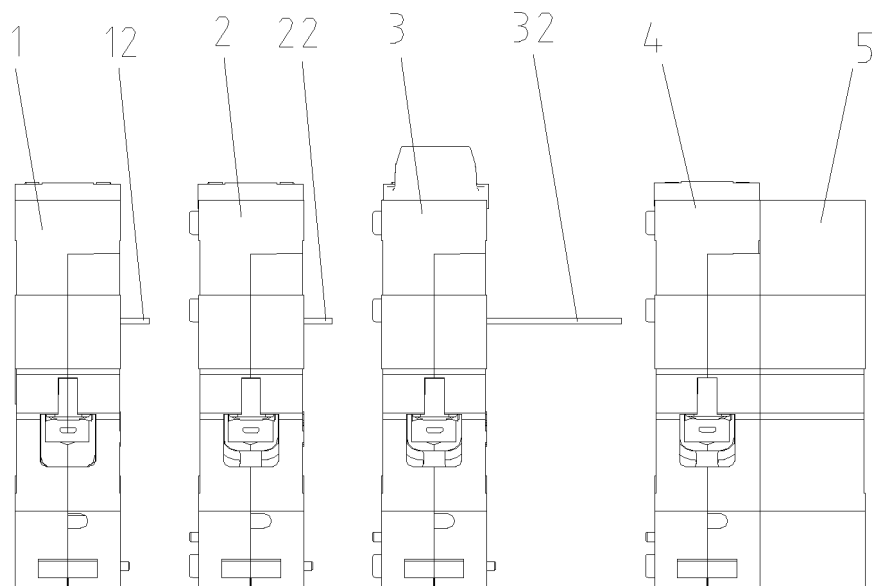


FIG.2

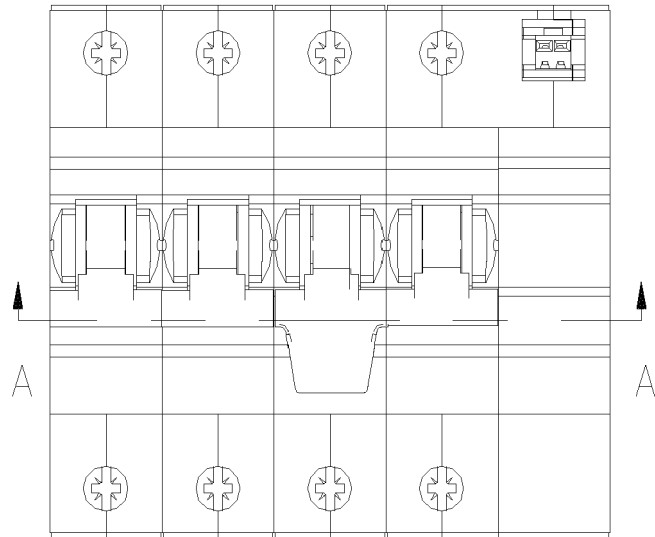


FIG.3

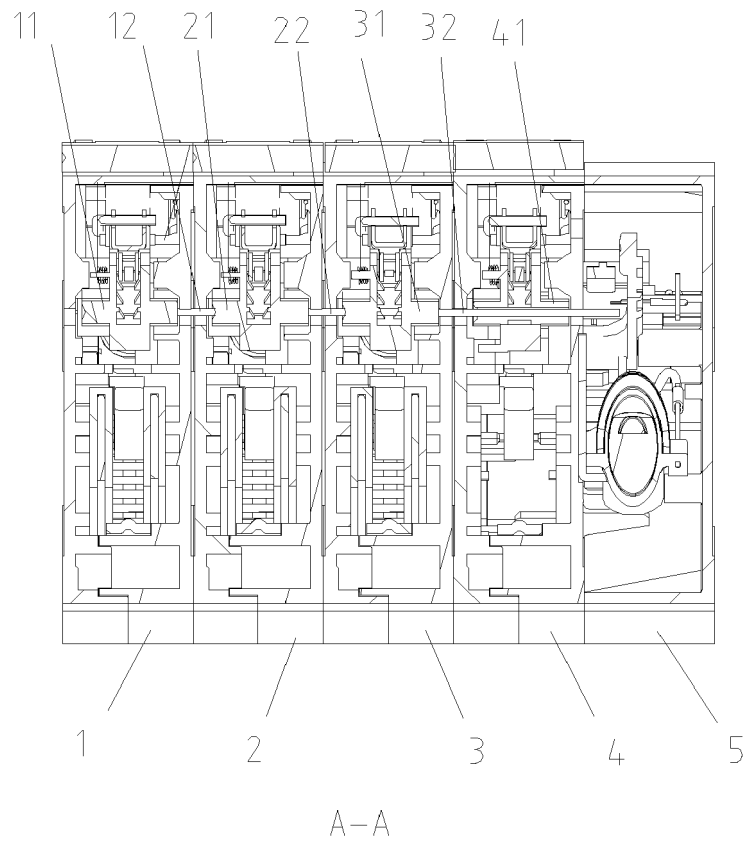


FIG.4

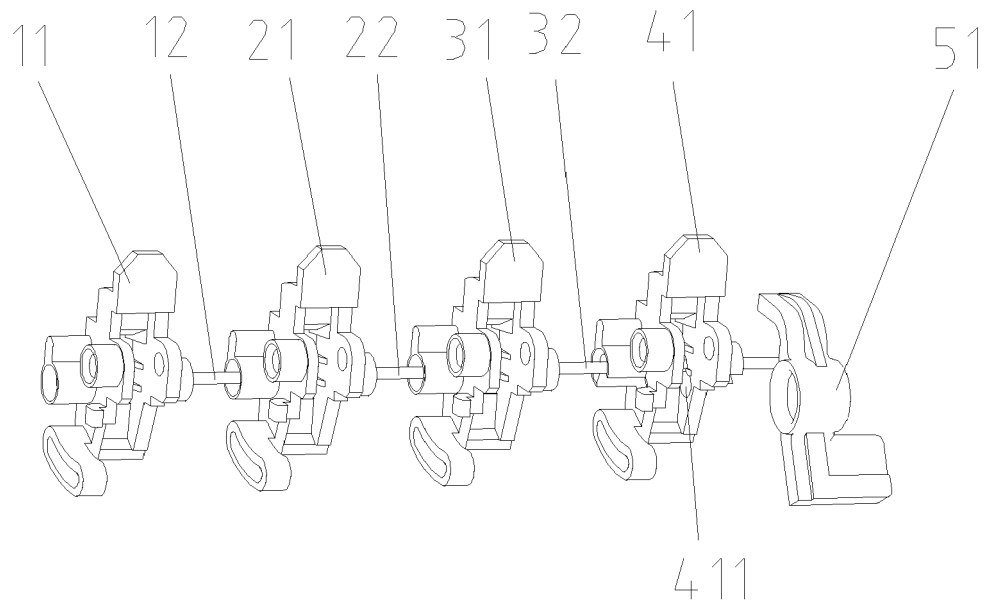


FIG. 5

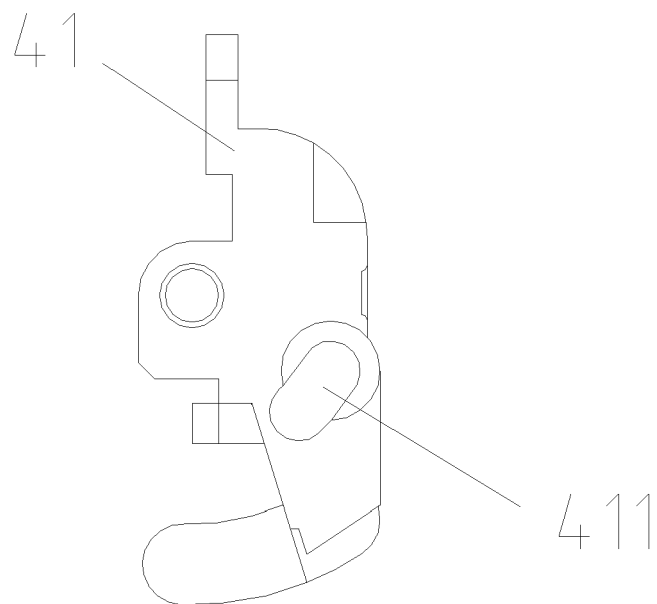


FIG. 6

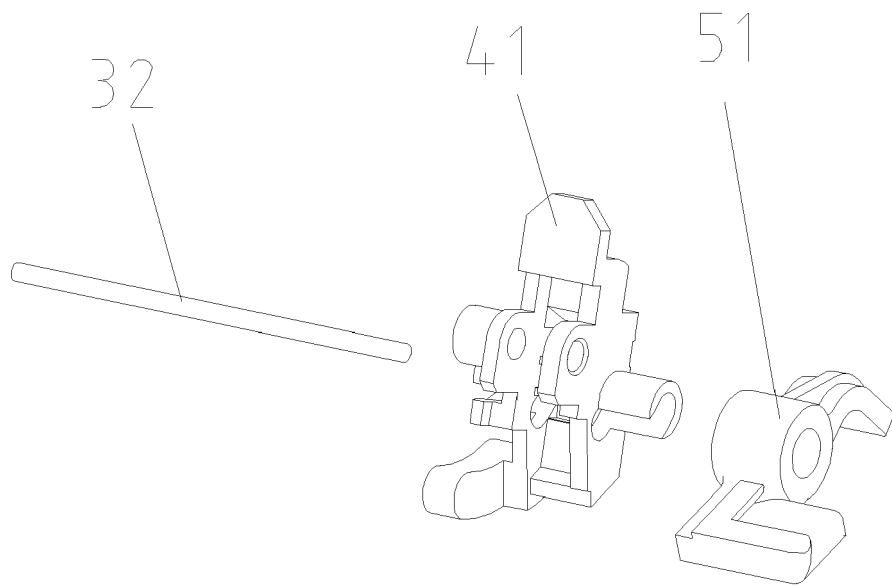


FIG. 7

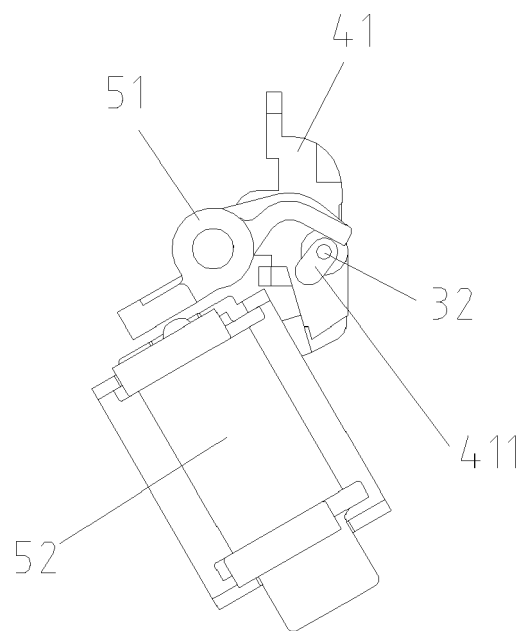


FIG. 8

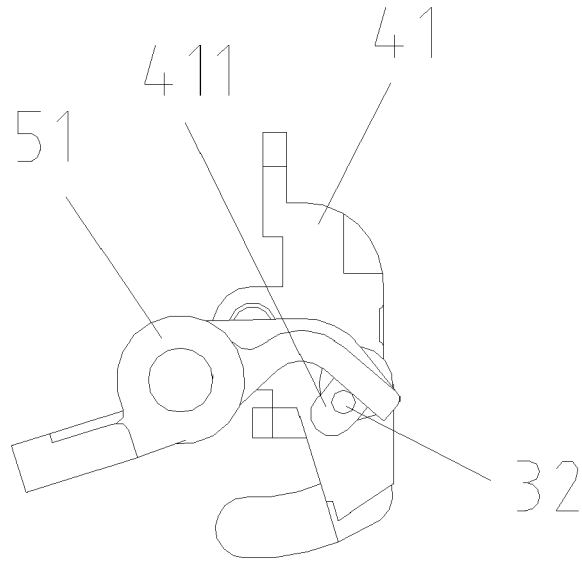


FIG. 9

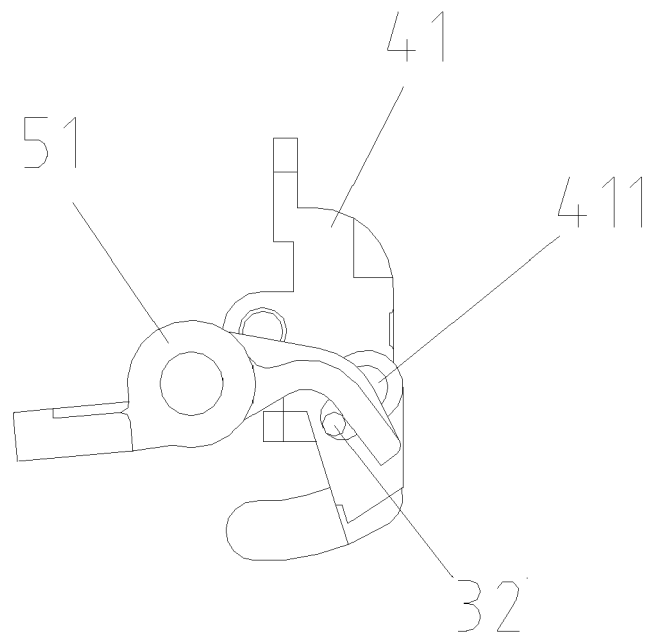


FIG. 10

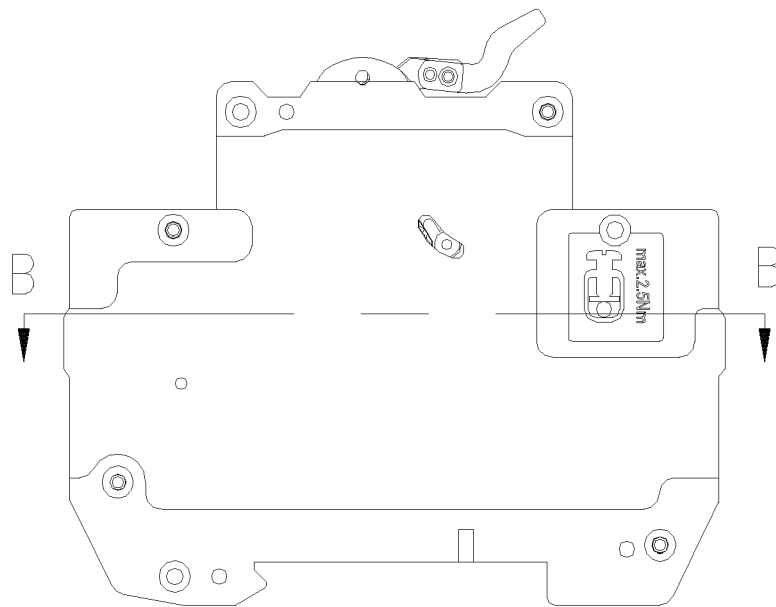


FIG.11

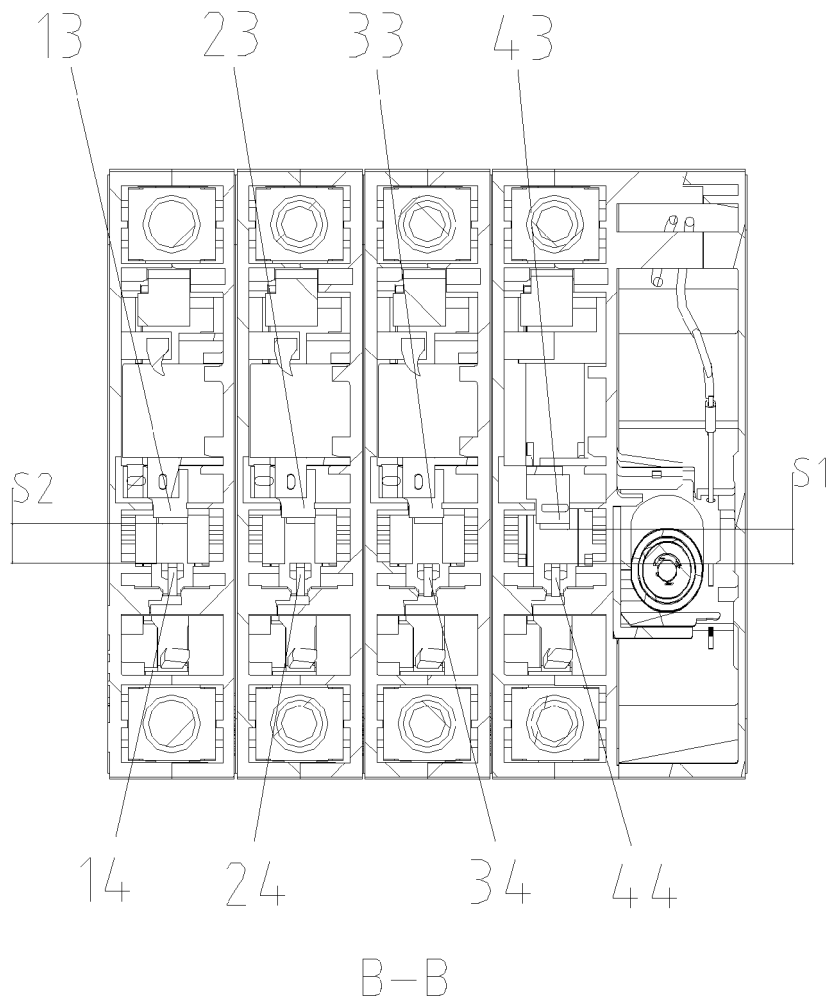


FIG. 12

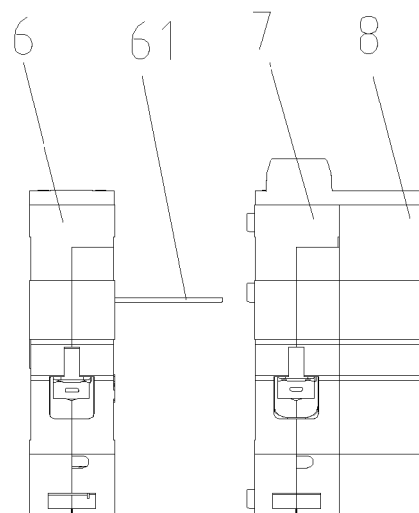


FIG. 13



EUROPEAN SEARCH REPORT

Application Number

EP 22 18 8427

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	CN 206 877 941 U (ZHEJIANG CHINT ELECTRIC APPLIANCE CO LTD) 12 January 2018 (2018-01-12) * page 5, paragraph 0022 - page 7, paragraph 0030; figures 1-4 *	1-10	INV. H01H9/26 H01H7/00 H01H71/10
A	CN 102 568 952 B (BEIJING ABB LOW VOLTAGE ELECTRIC EQUIPMENT CO LTD) 16 September 2015 (2015-09-16) * page 9, paragraph 0058 - page 11, paragraph 0071; figures 1a, 1b, 2, 3a *	1-10	
A	WO 2013/114396 A2 (LARSEN & TOUBRO LTD [IN]; PATIL ROHIT [IN]; KULKARNI ONKAR [IN]) 8 August 2013 (2013-08-08) * page 4, paragraph 3 - page 7, paragraph 4; figures 2-10 *	1-10	
			TECHNICAL FIELDS SEARCHED (IPC)
			H01H
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 23 November 2022	Examiner Pavlov, Valeri
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 22 18 8427

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

23-11-2022

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 206877941 U	12-01-2018	NONE	
CN 102568952 B	16-09-2015	CN 102543601 A	04-07-2012
		CN 102568952 A	11-07-2012
WO 2013114396 A2	08-08-2013	NONE	