



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
11.10.2023 Bulletin 2023/41

(51) International Patent Classification (IPC):
H01H 9/28 ^(2006.01) **H01H 3/22** ^(2006.01)

(21) Application number: **23305432.9**

(52) Cooperative Patent Classification (CPC):
H01H 3/227; H01H 9/281; H01H 9/282;
H01H 2300/018

(22) Date of filing: **29.03.2023**

(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

(72) Inventors:
• **ZENG, Xiaojing**
Shanghai, 201203 (CN)
• **WU, Jian**
Shanghai, 201203 (CN)
• **LI, Sha**
Shanghai, 201203 (CN)
• **DING, Dayou**
Shanghai, 201203 (CN)

(30) Priority: **07.04.2022 CN 202210373710**

(71) Applicant: **Schneider Electric Industries SAS**
92500 Rueil Malmaison (FR)

(74) Representative: **Manitz Finsterwald**
Patent- und Rechtsanwaltspartnerschaft mbB
Martin-Greif-Strasse 1
80336 München (DE)

(54) **PADLOCK STRUCTURE FOR AUTOMATIC TRANSFER SWITCH AND AUTOMATIC TRANSFER SWITCH**

(57) The present disclosure relates to a padlock structure for an automatic transfer switch, which includes: a padlock member, arranged in a housing and configured to be movable between an extended position and a retracted position, at the extended position, a part of the padlock member can be extended outside the housing to perform a padlock operation, at the retracted position, the padlock member is located in the housing and cannot perform the padlock operation, and the mode selector is configured to prevent the padlock member from moving to the extended position at the first position and allow the padlock member to move to the extended position at the second position; the padlock structure further includes a stopper, which is arranged on the state indicator and can rotate together with the state indicator, and the stopper is configured to block a part of the mode selector at the closed indication position of the state indicator to prevent the mode selector from moving to the second position, thereby preventing the padlock element from moving to the extended position, and allow the mode selector to move to the second position at the double separation indication position of the state indicator, thereby allowing the padlock element to move to the extended position.

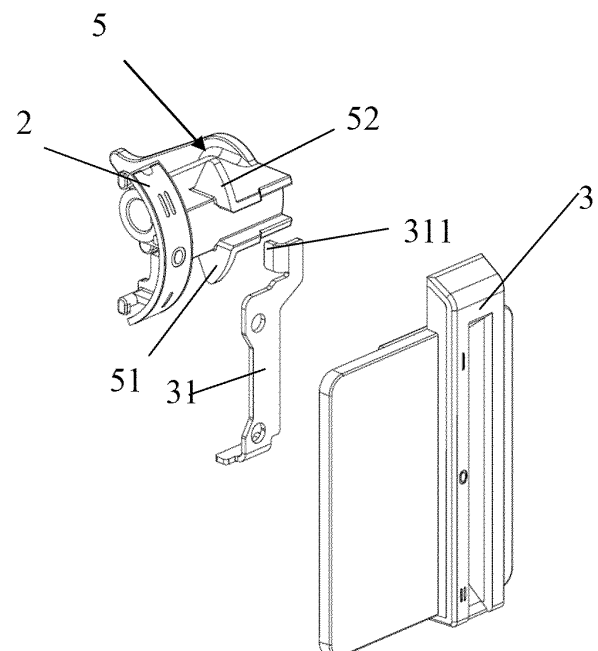


Fig. 2

Description

TECHNICAL FIELD

[0001] The present disclosure relates to a padlock structure for an automatic transfer switch and an automatic transfer switch.

BACKGROUND

[0002] Dual-power automatic transfer switch (ATS) is widely used in an emergency power supply system. In order to ensure the reliable operation of the load, the load and electrical equipment need to be overhauled regularly, so an ATS is needed to reliably power off. In order to prevent the maintenance personnel from misoperation, the ATS is required to have isolation function. In the case that the ATS has the isolation function, users can padlock in the double separation (OFF) position to ensure the isolation between the power end and the load end, and allow the maintenance personnel safely maintain the electrical equipment. After the padlock is cancelled, the switch can be automatically or manually switched to the closed position (S1 or S2). Usually, ATS has the isolation function to padlock at the OFF position, and it is not allowed to padlock at the S1 and S2 closed positions.

[0003] In addition, in the case that the isolation function is not needed in some applications, it is also needed to be able to padlock in the closed state, in order to prevent the consequences of equipment power failure caused by misoperation of opening. In this case, it is generally needed to padlock in both the double separation position and the closed position.

SUMMARY

[0004] Therefore, in order to overcome one or more problems in the existing art, the present disclosure provides a padlock structure for an automatic transfer switch, which includes a housing, a state indicator installed in the housing, and a mode selector slidably installed in the housing, the state indicator is configured to rotate between a closed indication position and a double separation indication position, indicate that the automatic transfer switch is in a closed state at the closed indication position, and indicate that the automatic transfer switch is in a double separation state at the double separation indication position, and the mode selector is configured to move between a first position and a second position, the first position corresponds to a non-padlock mode of the automatic transfer switch, and the second position corresponds to a padlock mode of the automatic transfer switch,

the padlock structure includes:

a padlock member, arranged in the housing and configured to be movable between an extended position and a retracted position, wherein, at the extended

position, a part of the padlock member can be extended outside the housing to perform a padlock operation, at the retracted position, the padlock member is located in the housing and cannot perform the padlock operation, and the mode selector is configured to prevent the padlock member from moving to the extended position at the first position and allow the padlock member to move to the extended position at the second position,

a stopper, which is arranged on the state indicator and can rotate together with the state indicator, and the stopper is configured to block a part of the mode selector at the closed indication position of the state indicator to prevent the mode selector from moving to the second position, thereby preventing the padlock element from moving to the extended position, and allow the mode selector to move to the second position at the double separation indication position of the state indicator, thereby allowing the padlock element to move to the extended position.

[0005] Advantageously, the mode selector includes a slider, installed to the mode selector to form the part of the mode selector.

[0006] Advantageously, the slider includes a fitting part extending from a main body of the slider toward the state indicator, and is configured to abut against the stopper at the closed indication position of the state indicator and be blocked by the stopper, and be not blocked by the stopper at the double separation indication position of the state indicator, thereby allowing the mode selector to move to the second position.

[0007] Advantageously, the closed state of the automatic transfer switch includes a first power closed state and a second power closed state, and the stopper includes a first blocking portion and a second blocking portion, the first blocking portion is configured to block the part of mode selector in the first power closed state and the second blocking portion is configured to block the part of mode selector in the second power closed state.

[0008] Advantageously, the stopper is further configured to be movable on the state indicator between a blocking position and a releasing position, at the blocking position, the stopper is configured to block the part of the mode selector at the closed indication position of the state indicator, and, at a releasing position, the stopper is configured to not block the movement of mode selector at the closed indication position and the double separation indication position of the state indicator.

[0009] Advantageously, the state indicator includes a groove with threads, the stopper includes a screw, and the stopper is installed to the state indicator by screwing the screw into the groove, and the stopper is movable between the blocking position and the releasing position by screwing the screw in the groove.

[0010] Advantageously, the stopper further has a protrusion, and the groove has a first notch and a second notch, and a shape of the protrusion is configured to ex-

tend into the first notch at the blocking position of the stopper to keep the stopper at the blocking position and into the second notch at the releasing position of the stopper to keep the stopper at the releasing position.

[0011] Advantageously, further including a spring arranged around the screw and between the stopper and the state indicator, the spring is configured to be compressed at the releasing position of the stopper, and to release stored energy upon the stopper moving from the releasing position to the blocking position to promote the movement of the stopper.

[0012] The present disclosure further provides an automatic transfer switch, including the abovementioned padlock structure as described above.

BRIEF DESCRIPTION OF DRAWINGS

[0013] The advantages and objectives of the present disclosure can be better understood in the following detailed description of preferred embodiments of the present disclosure with reference to the accompanying drawings. The drawings are not drawn to scale in order to better show the relationship between the components in the drawings. In the attached drawings:

Fig. 1 shows an external view of a part of an automatic transfer switch according to a first embodiment of the present disclosure, which shows a mode selector.

Fig. 2 shows an exploded view of a state indicator, a mode selector and a slider according to a first embodiment of the present disclosure.

Fig. 3 shows a perspective view at another viewing angle according to a first embodiment of the present disclosure, which shows that a slider is installed to a mode selector.

Fig. 4 is a schematic diagram showing that, at a double separation position, a mode selector of a padlock structure according to the first embodiment of the present disclosure is at a first position, which cuts a part of the housing away to show an internal structure.

Fig. 5 shows a perspective view of Fig. 4, which shows only a relationship between a slider and a state indicator.

Fig. 6 shows a schematic diagram showing that, at a double separation position, a mode selector of a padlock structure according to the first embodiment of the present disclosure moves to a second position, which cuts a part of the housing away to show an internal structure.

Fig. 7 shows a perspective view in which a mode selector of the padlock structure according to the first embodiment of the present disclosure is at a first position at the closed position.

Fig. 8 shows a perspective view of Fig. 7, which shows only a relationship between the slider and the state indicator.

Fig. 9 shows a perspective view of a state indicator of an automatic transfer switch according to a second embodiment of the present disclosure, and a stopper of a padlock structure is arranged on the state indicator and is at a blocking position.

Fig. 10 shows a perspective view of a state indicator of an automatic transfer switch according to a second embodiment of the present disclosure, and a stopper of a padlock structure is arranged on the state indicator and is at a releasing position.

Fig. 11 shows a schematic diagram of a relationship between a slider and a stopper of a mode selector of a padlock structure according to a second embodiment of the present disclosure at a double separation position, in this case, the stopper is at a blocking position.

Fig. 12 shows a schematic diagram of a relationship between a slider and a stopper of a mode selector of a padlock structure according to a second embodiment of the present disclosure at a double separation position, in this case, the stopper is at a releasing position.

Fig. 13 shows a schematic diagram of a relationship between a slider and a stopper of a mode selector of a padlock structure according to a second embodiment of the present disclosure at a closed position, in this case, the stopper is at a blocking position.

Fig. 14 shows a schematic diagram of a relationship between a slider and a stopper of a mode selector of a padlock structure according to a second embodiment of the present disclosure at a closed position, in this case, the stopper is at a releasing position.

DETAILED DESCRIPTION

[0014] Various embodiments according to the present disclosure will be described in detail with reference to the accompanying drawings. Herein, it should be noted that, in the drawings, the same reference numerals are given to components having basically the same or similar structures and functions, and repeated descriptions about them will be omitted. The term "including A, B, C, etc. in sequence" only indicates the arrangement order of included components A, B, C, etc., and does not exclude the possibility of including other components between A and B and/or between B and C.

[0015] The accompanying drawings in this specification are schematic diagrams to help explain the concept of the invention, and schematically show the shapes of various parts and their relationships.

[0016] Hereinafter, with reference to Figs. 1 to 14, preferred embodiments according to the present disclosure will be described in detail.

[0017] As illustrated by Fig. 1, the automatic transfer switch includes a housing 1, a state indicator 1 installed in the housing, and a mode selector 3 slidably installed in the housing. The state indicator 1 is configured to rotate between a closed indication position and a double sep-

aration indication position, indicate that the automatic transfer switch is in a closed state at the closed indication position, and indicate that the automatic transfer switch is in a double separation state at the double separation indication position. The mode selector 3 is configured to move between a first position and a second position, the first position corresponds to a non-padlock mode of the automatic transfer switch and the second position corresponds to a padlock mode of the automatic transfer switch. Those skilled in the art will understand that the non-padlock mode corresponds to a manual operation mode or an automatic operation mode of the automatic transfer switch. The specific operations of the state indicator and the mode selector are well known to those skilled in the art and will not be described in detail here.

[0018] In addition, it is well known to those skilled in the art that the padlock structure of the automatic transfer switch includes a padlock member 4 (as illustrated by Fig. 6), which is arranged in the housing and is configured to be movable between an extended position and a retracted position, at the extended position, a part of the padlock member can be extended outside the housing to perform a padlock operation, and at the retracted position, the padlock member is located in the housing and cannot perform the padlock operation. At the first position of the mode selector, the mode selector can prevent the padlock member from moving to the extended position, and at the second position of the mode selector, the mode selector can allow the padlock member to move to the extended position. The relationship between the padlock member and the mode selector is well known to those skilled in the art, and the relationship between the padlock member and the mode selector is not the purpose of the present disclosure, so it will not be described in detail here. The present disclosure mainly focuses on how to allow or prevent the padlock member from moving to the extended position upon the automatic transfer switch being at the closed position as required.

[0019] The padlock structure of the present disclosure further includes a stopper 5 (made of plastic, for example), which is arranged on the state indicator as illustrated by Fig. 2. At the closed position of the automatic transfer switch, the stopper 5 is configured to block a part of the mode selector (for example, located on a moving path of the mode selector), so that the mode selector cannot move to the second position, and thus the padlock member cannot move to the extended position. At the double separation position of the automatic transfer switch, the stopper 5 is configured not to block the mode selector, so that the mode selector can move to the second position, and then the padlock member can move to the extended position.

[0020] In this example, a slider 31 is installed to the mode selector as the part of the mode selector abutting against the stopper 5. As illustrated by Fig. 3, the slider 31 may be fixedly installed to the mode selector by a screw to move together with the mode selector. Alternatively, the slider 31 may be integrally formed with the

mode selector 3. Hereinafter, taking the slider 31 as an example to describe an operation process of the padlock structure. Those skilled in the art will also understand that any structure of the mode selector can be used to abut against the stopper 5, so as to realize the blocking of the mode selector by the stopper.

[0021] As illustrated by Fig. 4, at the double separation position of the automatic transfer switch, the state indicator is located at the double separation indication position, in this case, the stopper does not abut against the slider 31, so that the mode selector 3 can freely move from the first position shown in Fig. 4 to the second position shown in Fig. 5. At the position shown in Fig. 5, the padlock member 4 can move to the extended position, so that a padlock operation can be performed. Fig. 6 shows a positional relationship between a slider and a stopper upon the mode selector moving to the second position. As can be seen from the figure, the mode selector can move freely.

[0022] As illustrated by Fig. 7, at the closed position of the automatic transfer switch, the state indicator is located at the closed indication position. In this example, the case that the automatic transfer switch is at a first power closed position is described as an example, but it should be understood that the padlock structure can also be applied to a second power closed position. Advantageously, the stopper 5 includes a first blocking portion 51 for blocking the slider in the first power-on position and a second blocking portion 52 for blocking the slider in the unshown second power-on position. At the position shown in Fig. 7, the mode selector is located at the first position, and the stopper will block the slider 31, so that the mode selector 3 cannot move freely from the first position to the second position. As an example, the slider 31 includes a fitting part 311 (as illustrated by Fig. 3), the fitting part 311 extends from a main body of the slider toward the state indicator and is configured to be blocked by the stopper.

[0023] The padlock structure of the first embodiment of the present disclosure has been described above, and the padlock structure of the second embodiment will be described below. The difference between the second embodiment and the first embodiment is that the stopper of the second embodiment can also move between a blocking position and a releasing position, at the blocking position, the stopper is configured to block the part of the mode selector at the closed indication position of the state indicator, and at the releasing position, the stopper is configured to not block the movement of the mode selector at the double separation indication position of the state indicator.

[0024] Figs. 9 and 10 show perspective views of the state indicator, respectively showing that the stopper 5 is at the blocking position and the releasing position. As can be seen from the figures, the stopper 5 at the blocking position shown in Fig. 9 moves downward toward the state indicator to the releasing position shown in Fig. 10.

[0025] As illustrated by Figs. 11 and 12, it is shown that

the state indicator is at the double separation indication position at the double separation position of the automatic transfer switch. In this case, no matter whether the stopper 5 is at the blocking position (as illustrated by Fig. 11) or the releasing position (as illustrated by Fig. 12), the stopper 5 will not block the slider 31 and the mode selector 3 from moving to the second position. The stopper 5 is installed in a groove 21 of the state indicator 2 and can move between a blocking position and a releasing position in the groove 21.

[0026] Fig. 13 shows that the state indicator is located at the closed indication position at the closed position of the automatic transfer switch, such as the first power closed position. The stopper 5 (more precisely, a first stopper part 51) is shown at the blocking position. In this case, the stopper 5 will block the fitting part 311 of the slider 31, thereby blocking the mode selector from moving to the second position, which is the same as that described with reference to Fig. 7, and therefore, the repeated portions are omitted herein.

[0027] Fig. 14 shows that the stopper 5 moves from the blocking position to the releasing position, so as not to block the fitting part 311 of the slider 31, so that the mode selector 3 can move to the second position, and then the padlock member 4 can move to the extended position, thereby performing the padlock operation.

[0028] In order to realize the movement of the stopper 5 between the releasing position and the blocking position, in this example, the stopper 5 includes a screw 53, and the state indicator 2 includes a groove 22 with threads, and the stopper 5 is installed to the state indicator 2 by screwing the screw 53 into the groove 22. Therefore, by screwing the screw and changing an insertion depth of the screw into the groove 22, the stopper can move between the blocking position and the releasing position in the groove 21.

[0029] The stopper 5 includes a protrusion 54, and the state indicator 2 includes a first notch 23 and a second notch 24. The shape of the protrusion 54 is configured to extend into the first notch 23 at the blocking position of the stopper (as illustrated by Fig. 11) to keep the stopper at the blocking position, and extends into the second notch 24 at the releasing position of the stopper (as illustrated by Fig. 12) to keep the stopper at the releasing position.

[0030] In addition, the padlock structure also includes a spring 6, which is arranged around the screw 53 and between the stopper 5 and the state indicator 2, and is configured to be compressed at the releasing position of the stopper, and release the stored energy upon the stopper moving from the releasing position to the blocking position to promote the movement of the stopper.

[0031] Those skilled in the art will understand that the movement of the stopper between the blocking position and the releasing position can be realized only by setting the screw 53 to move in the groove 22 without setting the protrusion of the stopper and the spring 6. In addition, the protrusion 54 of the stopper and the spring 6 can be

used together or separately.

[0032] Examples of realizing the movement of the stopper are described above, however, the present disclosure is not limited thereto, and those skilled in the art can think of any other way to realize the movement of the stopper as needed.

[0033] Through the padlock structure of the present disclosure, the padlock can be reliably realized at the double separation position of the ATS, and in addition, the padlock can be reliably realized as required upon the ATS being in the closed position and the double separation position, thus meeting various requirements.

[0034] The above description is only an explanation of the present disclosure, so that those skilled in the art can fully implement the present technical solution, but it is not a limitation of the present disclosure. The technical features disclosed above are not limited to the combination with other features, and those skilled in the art can also combine other technical features according to the purpose of the invention, so as to achieve the purpose of the present disclosure.

Claims

1. A padlock structure for an automatic transfer switch, the automatic transferring switch comprising a housing, a state indicator installed in the housing, and a mode selector slidably installed in the housing, wherein the state indicator is configured to rotate between a closed indication position in which the state indicator indicates that the automatic transfer switch is in a closed state and a double separation indication position in which the state indicator indicates that the automatic transfer switch is in a double separation state, and wherein the mode selector is configured to move between a first position corresponding to a non-padlock mode of the automatic transfer switch and a second position corresponding to a padlock mode of the automatic transfer switch, the padlock structure comprises:

a padlock member, arranged in the housing and configured to be movable between an extended position and a retracted position, wherein, at the extended position, a part of the padlock member can be extended outside the housing to perform a padlock operation, at the retracted position, the padlock member is located within the housing and cannot perform the padlock operation, and the mode selector is configured to prevent the padlock member from moving to the extended position at the first position and allow the padlock member to move to the extended position at the second position,

which is **characterized in that** the padlock structure further comprises a stopper, which is arranged on the state indicator and can rotate

together with the state indicator, and the stopper is configured to block a part of the mode selector at the closed indication position of the state indicator to prevent the mode selector from moving to the second position, thereby preventing the padlock element from moving to the extended position, and allow the mode selector to move to the second position at the double separation indication position of the state indicator, thereby allowing the padlock element to move to the extended position.

2. The padlock structure as claimed in claim 1, which is **characterized in that** the mode selector comprises a slider, installed to the mode selector to form the part of the mode selector. 5
3. The padlock structure as claimed in claim 2, which is **characterized in that** the slider comprises a fitting part extending from a main body of the slider toward the state indicator, and is configured to abut against the stopper at the closed indication position of the state indicator and be blocked by the stopper, and be not blocked by the stopper at the double separation indication position of the state indicator, thereby allowing the mode selector to move to the second position. 10
4. The padlock structure as claimed in any one of claims 1 to 3, which is **characterized in that** the closed state of the automatic transfer switch comprises a first power closed state and a second power closed state, and the stopper comprises a first blocking portion and a second blocking portion, the first blocking portion is configured to block the part of mode selector in the first power closed state and the second blocking portion is configured to block the part of mode selector in the second power closed state. 15
5. The padlock structure as claimed in any one of claims 1 to 3, which is **characterized in that** the stopper is further configured to be movable on the state indicator between a blocking position and a releasing position, at the blocking position, the stopper is configured to block the part of the mode selector at the closed indication position of the state indicator, and, at the releasing position, the stopper is configured to not block the movement of mode selector at the closed indication position and the double separation indication position of the state indicator. 20
6. The padlock structure as claimed in claim 5, which is **characterized in that** the state indicator comprises a groove with threads, the stopper comprises a screw, and the stopper is installed to the state indicator by screwing the screw into the groove, and the stopper is movable between the blocking position and the releasing position by screwing the screw in 25

the groove.

7. The padlock structure as claimed in claim 6, which is **characterized in that** the stopper further has a protrusion, and the groove has a first notch and a second notch, and a shape of the protrusion is configured to extend into the first notch at the blocking position of the stopper to keep the stopper at the blocking position and into the second notch at the releasing position of the stopper to keep the stopper at the releasing position. 30
8. The padlock structure as claimed in claim 6 or 7, which is **characterized in that**, further comprising a spring arranged around the screw and between the stopper and the state indicator, the spring is configured to be compressed at the releasing position of the stopper, and to release stored energy upon the stopper moving from the releasing position to the blocking position to promote the movement of the stopper. 35
9. An automatic transfer switch, which is **characterized in that** the automatic transfer switch comprises the padlock structure as claimed in any one of claims 1 to 8. 40

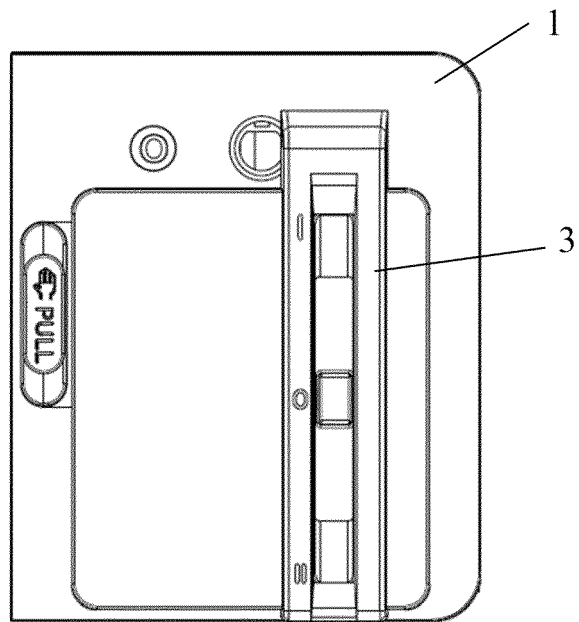


Fig. 1

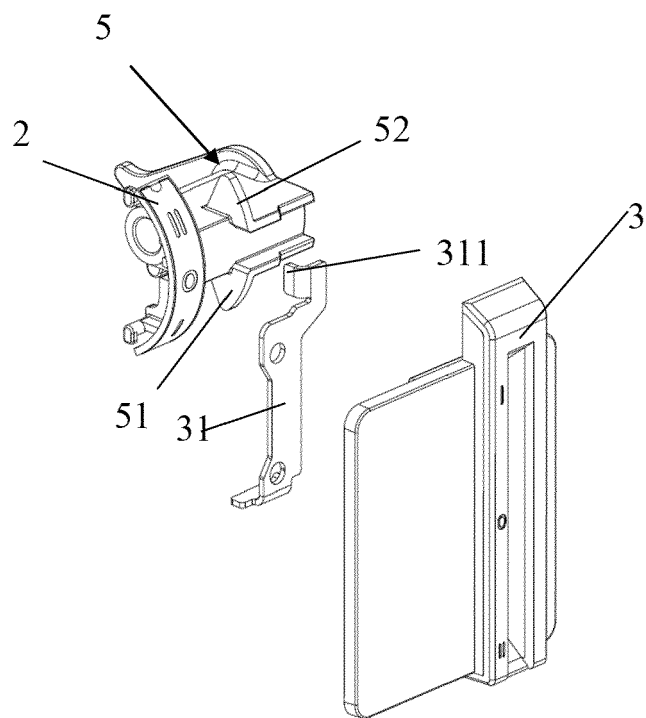


Fig. 2

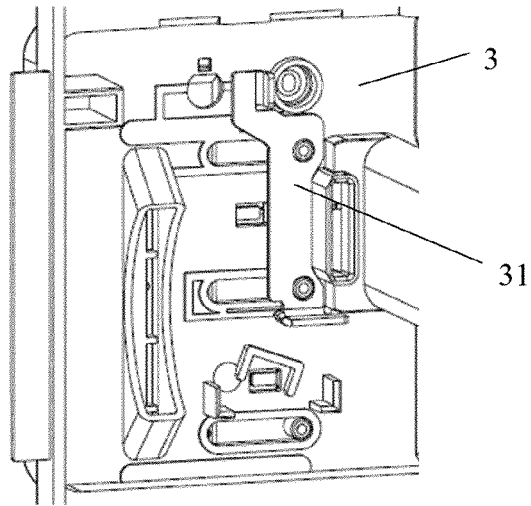


Fig. 3

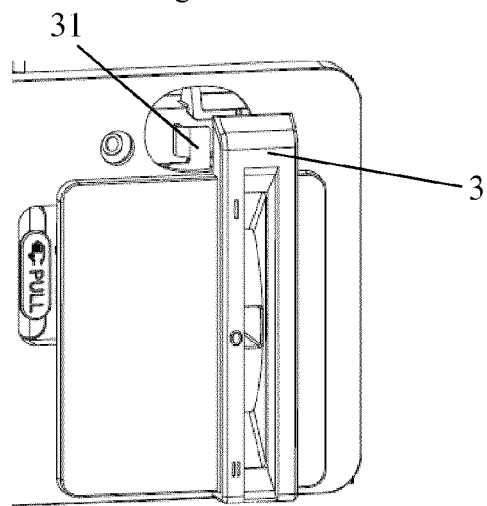


Fig. 4

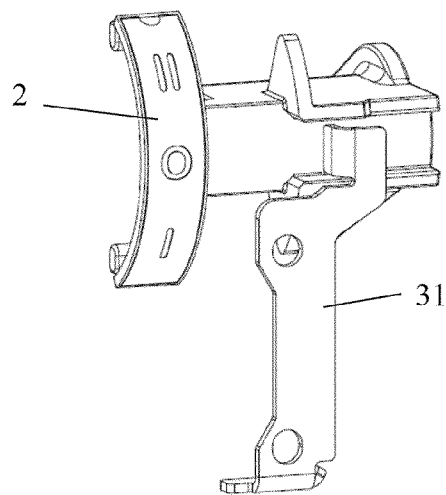


Fig. 5

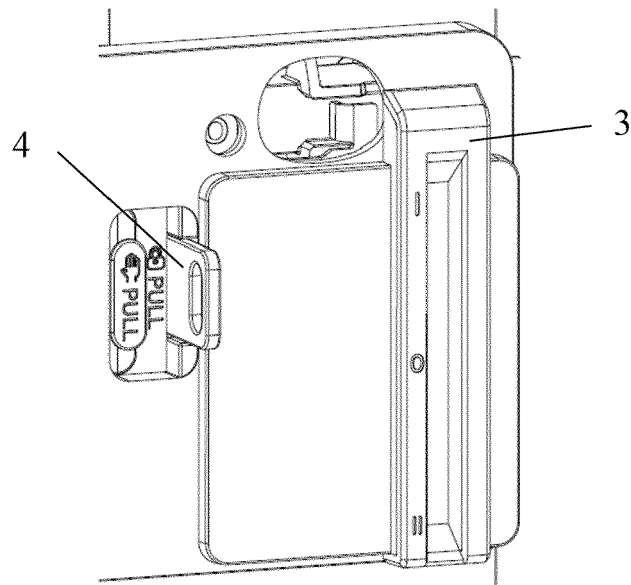


Fig. 6

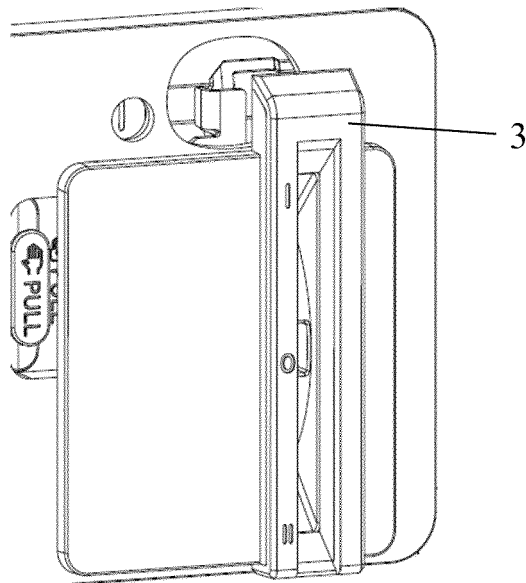


Fig. 7

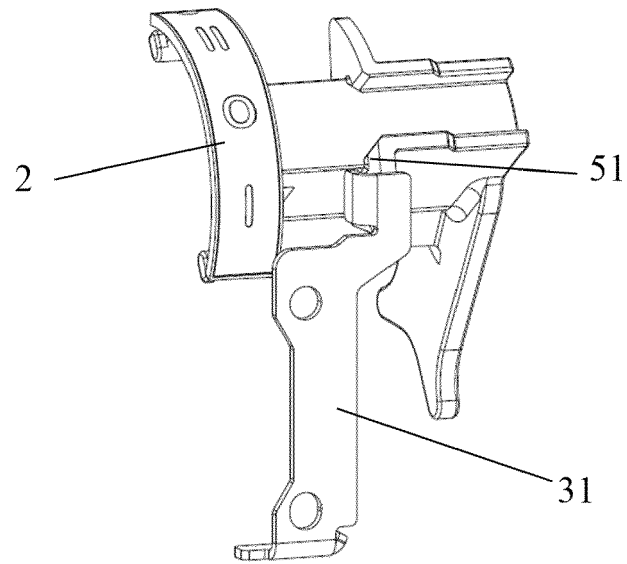


Fig. 8

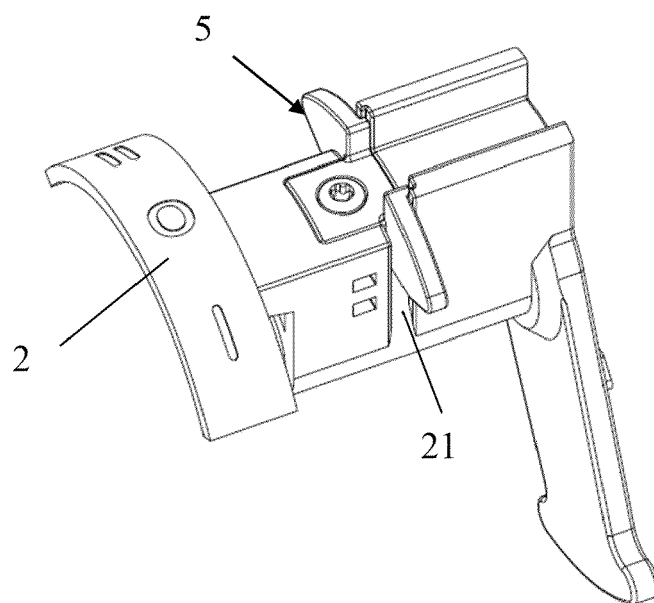


Fig. 9

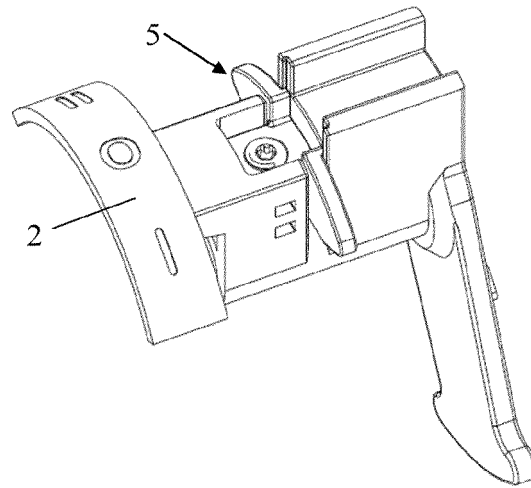


Fig. 10

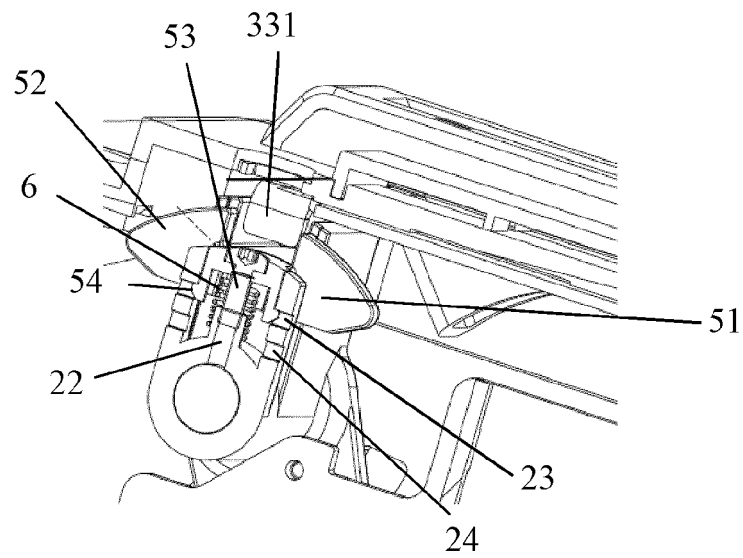


Fig. 11

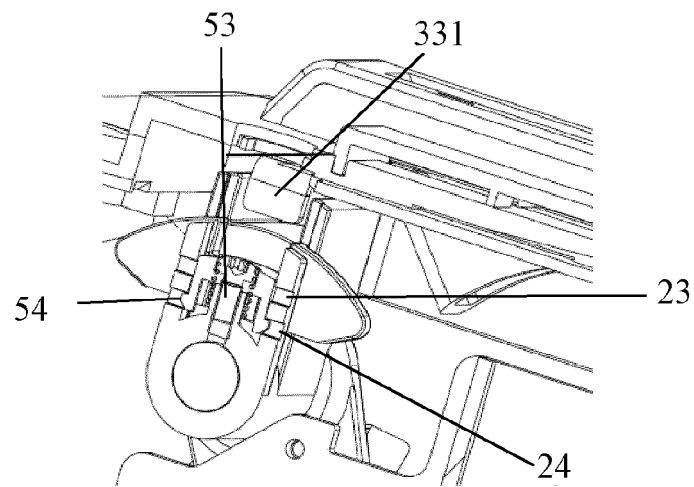


Fig. 12

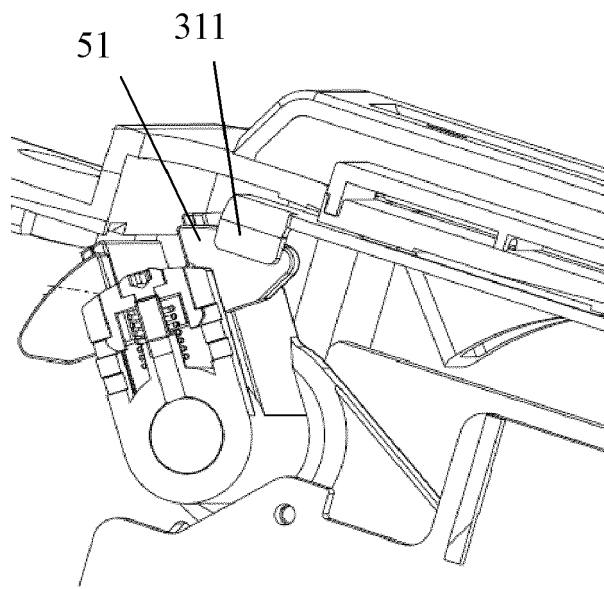


Fig. 13

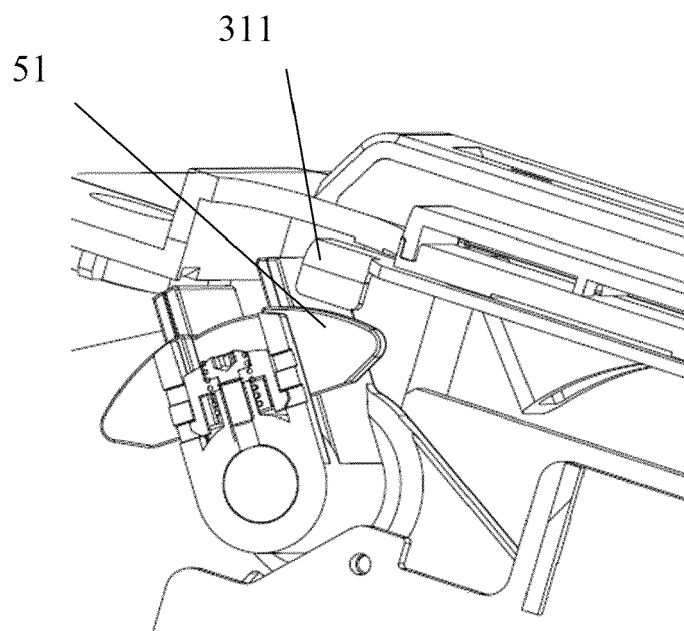


Fig. 14



EUROPEAN SEARCH REPORT

Application Number

EP 23 30 5432

5

10

15

20

25

30

35

40

45

50

55

1

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)
Y	CN 208 142 056 U (SCHNEIDER ELECTRIC IND SAS) 23 November 2018 (2018-11-23) * page 7, paragraph 0034 - page 9, paragraph 0046; figures 1-3C * -----	1-9	INV. H01H9/28 H01H3/22
Y	CN 103 021 705 B (SCHNEIDER WINGOAL TIANJIN ELECTRIC EQUIPMENT CO LTD) 26 November 2014 (2014-11-26) * page 4, paragraph 0014 - page 5, paragraph 0015; figure 2 * -----	1-9	
Y	CN 215 644 191 U (SCHNEIDER ELECTRIC IND SAS) 25 January 2022 (2022-01-25) * page 8, paragraph 0061 - page 10, paragraph 0091; figures 1-3 * -----	1-9	
Y	CN 109 524 254 A (CHANGSHU SWITCHGEAR MFG CO LTD FORMER CHANGSHU SWITCHGEAR PLANT) 26 March 2019 (2019-03-26) * page 8, paragraph 0083 - page 19, paragraph 0130; figure 5 * -----	6-8	
			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 28 July 2023	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 23 30 5432

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.

28-07-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 208142056 U	23-11-2018	NONE	
CN 103021705 B	26-11-2014	NONE	
CN 215644191 U	25-01-2022	AU 2022203223 A1	01-12-2022
		CN 215644191 U	25-01-2022
		EP 4089701 A1	16-11-2022
		US 2022367129 A1	17-11-2022
CN 109524254 A	26-03-2019	NONE	