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

(11) EP 3 929 952 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
29.12.2021 Bulletin 2021/52

(51) Int Cl.:
H01H 1/22 *(2006.01)* ***H01H 19/46*** *(2006.01)*
H01H 50/54 *(2006.01)*

(21) Application number: **21305848.0**

(22) Date of filing: **21.06.2021**

(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 MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **24.06.2020 CN 202010589038**

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(54) BREAKING UNIT WITH AUXILIARY SHUNT COMPONENT AND DUAL-POWER TRANSFER SWITCH

(57) A breaking unit with an auxiliary shunt component, including a first power supply static contact, a second power supply static contact, a first electromotive force compensator, a second electromotive force compensator, a moving contact component which are accommodated in a shell of the breaking unit, and a soft pigtail wire connected between the moving contact component and the first electromotive force compensator and the second electromotive force compensator; the auxiliary shunt component includes a first shunt member and a second shunt member; the first shunt member is connected with the first electromotive force compensator; the second shunt member is connected with the second electromotive force compensator; when the moving contact component is in contact with the first power supply static contact, the moving contact component is in contact with the first shunt member, and the current flowing through the first shunt member is greater than the current flowing through the soft pigtail wire; when the moving contact component is in contact with the second power supply static contact, the moving contact component is in contact with the second shunt member, and the current flowing through the second shunt member is greater than the current flowing through the soft pigtail wire. A dual-power transfer switch, including the breaking unit as described above.

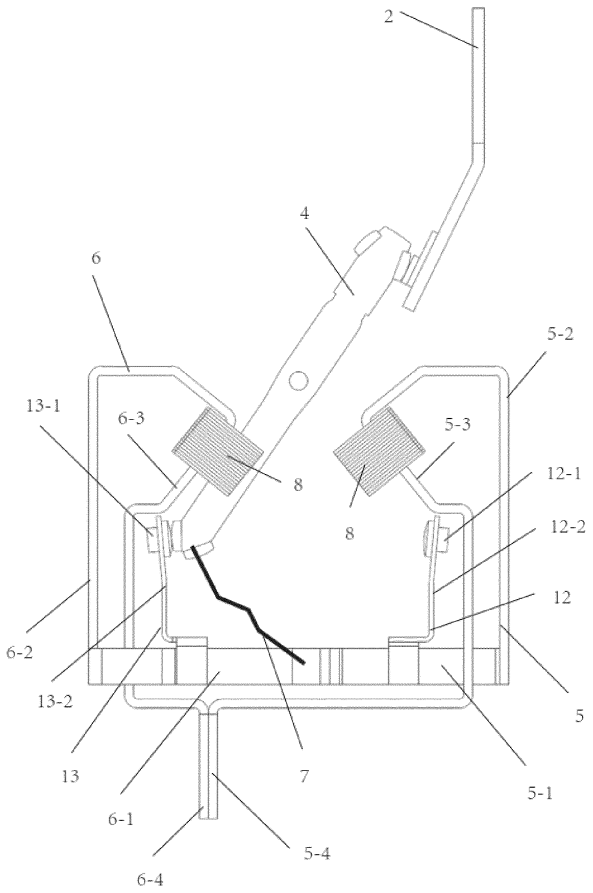


Fig.7

EP 3 929 952 A1

Description

Technical field

[0001] The present disclosure relates to a breaking unit with an auxiliary shunt component. The present disclosure further relates to a dual-power transfer switch including the breaking unit with the auxiliary shunt component.

Background

[0002] Short-time withstand current value Icw is an important performance parameter in the application of the dual-power transfer switch. Through a contact pressure compensation circuit, a clapping contact structure with excellent electrical operation performance can also have a better Icw. However, a soft pigtail wire at a tail of a moving contact still hinders the opening movement of the moving contact, thus reducing its electrical operation performance.

[0003] The softness of the soft pigtail wire is related to the opening speed of the moving contact. Technically, a soft pigtail wire that is soft enough is needed, and the section area of the soft pigtail wire is the key factor to determine its softness. How to use soft pigtail wire with sufficiently small section area is the direction of technicians' efforts.

Summary

[0004] According to the present disclosure, an auxiliary shunt component is used, so that the section area of the soft pigtail wire can be reduced to the greatest extent, such that the soft pigtail wire has better softness, and the dual-power transfer switch can obtain a higher opening speed, thereby having better electrical operation performance.

[0005] In order to solve the above-mentioned one or more defects in the prior art, according to a first aspect of the present disclosure, a breaking unit with an auxiliary shunt component is provided, wherein the breaking unit includes a first power supply static contact, a second power supply static contact, a first electromotive force compensator, a second electromotive force compensator, a moving contact component which are accommodated in a shell of the breaking unit, and soft pigtail wires connected between the moving contact component and the first electromotive force compensator and between the moving contact component and the second electromotive force compensator.

[0006] The auxiliary shunt component includes a first shunt member and a second shunt member.

[0007] The first shunt member is connected with the first electromotive force compensator.

[0008] The second shunt member is connected with the second electromotive force compensator.

[0009] When the moving contact component is in contact with the first power supply static contact, the moving contact component is in contact with the first shunt member, and the current flowing through the first shunt member is greater than the current flowing through the soft pigtail wire.

[0010] When the moving contact component is in contact with the second power supply static contact, the moving contact component is in contact with the second shunt member, and the current flowing through the second shunt member is greater than the current flowing through the soft pigtail wire.

[0011] According to the above-described first aspect of the present disclosure, the first shunt member includes a first elastic current-carrying member and a first contact point arranged on one end of the first elastic current-carrying member, and the first elastic current-carrying member and the first contact point are made of conductive materials.

[0012] Another end of the first elastic current-carrying member is connected to the first electromotive force compensator.

[0013] The second shunt member includes a second elastic current-carrying member and a second contact point arranged on one end of the second elastic current-carrying member, and the second elastic current-carrying member and the second contact point are made of conductive materials.

[0014] Another end of the second elastic current-carrying member is connected to the second electromotive force compensator.

[0015] According to a second aspect of the present disclosure, the first shunt member includes a first shunt contact piece, a first shunt spring and a first shunt pigtail wire.

[0016] A lower end of the first shunt contact piece is pivotally connected with the shell of the breaking unit, an upper end of the first shunt contact piece is provided with a first shunt contact surface contacting with the moving contact component and a first shunt motion range limiting surface matched with the shell of the breaking unit; the first shunt spring is able to exert a force on the first shunt contact piece to make the first shunt contact piece abut against the moving contact component and provide a contact pressure between them; and the lower end of the first shunt contact piece is further connected with the first electromotive force compensator through the first shunt pigtail wire.

[0017] The second shunt member includes a second shunt contact piece, a second shunt spring and a second shunt pigtail wire.

[0018] A lower end of the second shunt contact piece is pivotally connected with the shell of the breaking unit, an upper end of the second shunt contact piece is provided with a second shunt contact surface contacting with the moving contact component and a second shunt motion range limiting surface matched with the shell of the breaking unit; the second shunt spring is able to exert a force on the second shunt contact piece to make the sec-

ond shunt contact piece abut against the moving contact component and provide a contact pressure between them; and the lower end of the second shunt contact piece is further connected with the second electromotive force compensator through the second shunt pigtail wire.

[0019] According to the above-described second aspect of the present disclosure, the force exerted by the first shunt contact piece passes through a pivot center of the moving contact component, so that the contact pressure between the first shunt contact piece and the moving contact component does not reduce the contact pressure between the moving contact component and the first power supply static contact, and does not hinder the opening of the moving contact component relative to the first power supply static contact.

[0020] The force exerted by the second shunt contact piece passes through the pivot center of the moving contact component, so that the contact pressure between the second shunt contact piece and the moving contact component does not reduce the contact pressure between the moving contact component and the second power supply static contact, and does not hinder the opening of the moving contact component relative to the second power supply static contact.

[0021] According to the above-described first and second aspects of the present disclosure, when the moving contact component is in contact with the first power supply static contact, a current direction in the first electromotive force compensator is consistent with a current direction in the moving contact component, so as to generate mutually attractive electromotive forces, and then form a torque driving the moving contact component to rotate, so as to increase a contact pressure between the moving contact component and the first power supply static contact.

[0022] When the moving contact component is in contact with the second power supply static contact, a current direction in the second electromotive force compensator is consistent with a current direction in the moving contact component, so as to generate mutually attractive electromotive forces, and then form a torque driving the moving contact component to rotate, so as to increase a contact pressure between the moving contact component and the second power supply static contact.

[0023] When the current increases, the electromotive force increases.

[0024] According to the above-described first and second aspects of the present disclosure, the moving contact component rotates between a first position and a second position.

[0025] In the first position, the moving contact component is in contact with the first power supply static contact.

[0026] In the second position, the moving contact component is in contact with the second power supply static contact.

[0027] According to the above-described first and second aspects of the present disclosure, the first power supply static contact, the second power supply static contact, the first electromotive force compensator and the second electromotive force compensator are arranged roughly around the moving contact component.

[0028] According to the above-described first and second aspects of the present disclosure, the first electromotive force compensator includes a first current inlet end, a first current flow section, a first electromotive force compensation section and a first load terminal section.

[0029] According to the above-described first and second aspects of the present disclosure, the second electromotive force compensator includes a second current inlet end, a second current flow section, a second electromotive force compensation section and a second load terminal section.

[0030] According to the above-described first and second aspects of the present disclosure, the moving contact component includes a moving contact bracket and a moving contact finger mounted on the moving contact bracket.

[0031] The moving contact finger and the moving contact bracket have the same pivot center position or different pivot center positions.

[0032] According to the above-described first aspect of the present disclosure, one end of the moving contact finger is connected to the first current inlet end and the second current inlet end through the soft pigtail wire.

[0033] The first elastic current-carrying member is connected to the first current inlet end.

[0034] The second elastic current-carrying member is connected to the second current inlet end.

[0035] According to the above-described second aspect of the present disclosure, one end of the moving contact finger is connected to the first current inlet end and the second current inlet end through the soft pigtail wire.

[0036] The first shunt contact piece is connected to the first current inlet end through the first shunt pigtail wire.

[0037] The second shunt contact piece is connected to the second current inlet end through the second shunt pigtail wire.

[0038] According to the above-described first aspect of the present disclosure, when the moving contact component is in the first position, current flows through the moving contact finger, the soft pigtail wire and the first elastic current-carrying member connected together in parallel, the first current inlet end, the first current flow section, the first electromotive force compensation section and the first load terminal section, and a current direction flowing through the first electromotive force compensation section is consistent with a current direction flowing through the moving contact finger;

[0039] When the moving contact component is in the second position, current flows through the moving contact finger, the soft pigtail wire and the second elastic current-carrying member connected together in parallel, the second current inlet end, the second current flow section, the second electromotive force compensation section and the second load terminal section, and a current

direction flowing through the second electromotive force compensation section is consistent with the current direction flowing through the moving contact finger.

[0040] According to the above-described second aspect of the present disclosure, when the moving contact component is in the first position, current flows through the moving contact finger, the soft pigtail wire and the first shunt contact piece and the first shunt pigtail wire that are connected together in parallel, the first current inlet end, the first current flow section, the first electromotive force compensation section and the first load terminal section, and a current direction flowing through the first electromotive force compensation section is consistent with a current direction flowing through the moving contact finger.

[0041] When the moving contact component is in the second position, current flows through the moving contact finger, the soft pigtail wire and the second shunt contact piece and the second shunt pigtail wire that are connected together in parallel, the second current inlet end, the second current flow section, the second electromotive force compensation section and the second load terminal section, and a current direction flowing through the second electromotive force compensation section is consistent with the current direction flowing through the moving contact finger.

[0042] According to the above-described first and second aspects of the present disclosure, the first electromotive force compensation section and the second electromotive force compensation section are respectively provided with at least one magnetizer.

[0043] According to another aspect of the present disclosure, a dual-power transfer switch is provided, wherein the dual-power transfer switch includes at least one breaking unit as described above.

[0044] By means of shunt, the current required to be carried by the soft pigtail wire is very small, so that it can have a smaller section area to obtain better softness, thus when the moving contact is opened, the resistance affecting the movement of the moving contact is greatly reduced, the opening speed is ensured, and the electrical operation performance of the switch is further improved.

[0045] So far, in order that the detailed description of the present disclosure can be better understood and the contribution of the present disclosure to the prior art can be better recognized, the present disclosure has summarized the content of the present disclosure quite broadly. Of course, embodiments of the present disclosure will be described below and will form the subject matter of the appended claims.

[0046] Likewise, those skilled in the art will recognize that the concepts on which the present disclosure is based can be easily used as a basis for designing other structures, methods and systems for carrying out several purposes of the present disclosure. Therefore, it is important that the appended claims should be considered to include such equivalent structures as long as they do not go beyond the spirit and scope of the present disclosure.

Brief description of the drawings

[0047] Those skilled in the art will have a better understanding of the present disclosure through the following drawings, and the advantages of the present disclosure can be more clearly reflected. The drawings described herein are only for illustrative purposes of selected embodiments, not all possible implementations and are not intended to limit the scope of the present disclosure.

FIGS. 1 to 3 illustrate schematic diagrams of various components of a breaking unit according to the present disclosure, in which an auxiliary shunt component is omitted;

FIGS. 4 to 5 illustrate schematic wireframe views of a breaking unit according to the present disclosure;

FIG. 6 schematically illustrates a plurality of breaking units with electromotive force compensation according to the present disclosure;

FIG. 7 illustrates a schematic diagram of each component of the breaking unit according to the present disclosure, including an auxiliary shunt component according to one embodiment of the present disclosure; and

FIG. 8 illustrates a schematic diagram of each component of the breaking unit according to the present disclosure, including an auxiliary shunt component according to another embodiment of the present disclosure.

Detailed description

[0048] The specific embodiments of the present disclosure will be described in detail with reference to the accompanying drawings.

[0049] As a main structure of ATSE, the architecture of a breaking unit is directly related to the key performance of ATSE, such as: use category, short-term withstand current and so on; and customer maintenance functions, such as contact wear inspection and so on.

[0050] The architecture of the breaking unit in this technology consists of unipolar architecture and multipolar architecture. FIGS. 1 to 5 illustrate typical unipolar architectures.

[0051] Two static contacts are arranged in the shell of a breaking unit, which are respectively connected to the incoming connection terminals of two power supplies. A common arc extinguishing chamber 10 as illustrated in FIG. 4 (or two separate arc extinguishing chambers 10 as illustrated in FIG. 5) is arranged between the two static contacts. A moving contact finger is arranged below the arc extinguishing chamber and between the two static contacts, and an electromotive force compensation circuit is arranged on the two sides of the moving contact finger to provide the contact pressure for the moving contact to abut against the static contact in case of short

circuit, so that it has a higher short-time withstand current performance. An electrical connection is arranged between the moving contact finger and the compensation circuit, and the rear end of the compensation circuit is provided with a connection terminal for connecting loads. Therefore, the working current and short-circuit current flow from the incoming side of the first power supply or the second power supply to the load through the load connection terminal after flowing through the static contact, the moving contact finger and the compensation circuit.

[0052] According to an embodiment of the present disclosure, as illustrated in FIGS. 1 to 3, a breaking unit A with electromotive force compensation is provided, wherein the breaking unit includes a first power supply static contact 1, a second power supply static contact 2, a first electromotive force compensator 5, a second electromotive force compensator 6, a moving contact component which are accommodated in the shell 9 of the breaking unit, and soft pigtail wires 7 connected between the moving contact component and the first electromotive force compensator 5 and between the moving contact component and the second electromotive force compensator 6.

[0053] The moving contact component is pivotally arranged on the shell 9 of the breaking unit.

[0054] The first power supply static contact 1, the second power supply static contact 2, the first electromotive force compensator 5 and the second electromotive force compensator 6 are fixedly arranged on the shell 9 of the breaking unit.

[0055] The first power supply static contact 1 is connected to a corresponding first power supply (not illustrated). The second power supply static contact 2 is connected to a corresponding second power supply (not illustrated).

[0056] When the moving contact component is in contact with the first power supply static contact 1, the current direction in the first electromotive force compensator 5 is consistent with the current direction in the moving contact component, so as to generate mutually attractive electromotive forces, and then form a torque to drive the moving contact component to rotate, so as to increase the contact pressure between the moving contact component and the first power supply static contact 1.

[0057] When the moving contact component is in contact with the second power supply static contact 2 (as illustrated in FIG. 3), the current direction in the second electromotive force compensator 6 is consistent with the current direction in the moving contact component, so as to generate mutually attractive electromotive forces, and then form a torque driving the moving contact component to rotate, so as to increase the contact pressure between the moving contact component and the second power supply static contact 2.

[0058] The breaking unit further includes an auxiliary shunt component (as illustrated in FIG. 7 and FIG. 8) accommodated in the shell of the breaking unit. The auxiliary shunt component includes a first shunt member 12 and a second shunt member 13.

[0059] The first shunt member 12 is connected with the first electromotive force compensator 5.

[0060] The second shunt member 13 is connected with the second electromotive force compensator 6.

[0061] When the moving contact component is in contact with the first power supply static contact 1, the moving contact component is in contact with the first shunt member 12, and the current flowing through the first shunt member 12 is greater than the current flowing through the soft pigtail wire 7.

[0062] When the moving contact component is in contact with the second power supply static contact 2, the moving contact component is in contact with the second shunt member 13, and the current flowing through the second shunt member 13 is greater than the current flowing through the soft pigtail wire 7.

[0063] According to the above embodiment of the present disclosure, the first shunt member 12 includes a first elastic current-carrying member 12-2 and a first contact point 12-1 arranged on one end of the first elastic current-carrying member 12-2, the first elastic current-carrying member 12-2 and the first contact point 12-1 are made of conductive materials.

[0064] The other end of the first elastic current-carrying member 12 is connected to the first electromotive force compensator.

[0065] The second shunt member 13 includes a second elastic current-carrying member 13-2 and a second contact point 13-1 arranged on one end of the second elastic current-carrying member 13-2, the second elastic current-carrying member 13-2 and the second contact point 13-1 are made of conductive materials.

[0066] The other end of the second elastic current-carrying member 13-2 is connected to the second electromotive force compensator.

[0067] According to another embodiment of the present disclosure (as illustrated in FIG. 8), the first shunt member includes a first shunt contact piece 14, a first shunt spring 15 and a first shunt pigtail wire 16.

[0068] The lower end of the first shunt contact piece 14 is pivotally connected with the shell 9 of the breaking unit, and the upper end of the first shunt contact piece 14 is provided with a first shunt contact surface 14-1 contacting with the moving contact component and a first shunting motion range limiting surface 14-2 matched with the shell 9 of the breaking unit. The first shunting spring 15 exerts a force on the first shunt contact piece 14 to make the first shunt contact piece 14 abut against the moving contact component and provide contact pressure between them. The lower end of the first shunt contact piece 14 is further connected with the first electromotive force compensator 5 through the first shunt pigtail wire 16.

[0069] The second shunt member includes a second shunt contact piece 17, a second shunt spring 18 and a second shunt pigtail wire 19.

[0070] The lower end of the second shunt contact piece 17 is pivotally connected with the shell 9 of the breaking unit, and the upper end of the second shunt contact piece 17 is provided with a second shunt contact surface 17-1 contacting with the moving contact component and a second shunt motion range limiting surface 17-2 matched with the shell 9 of the breaking unit. The second shunt spring 18 exerts a force on the second shunt contact piece 17 to make the second shunt contact piece 17 abut against the moving contact component and provide contact pressure between them. The lower end of the second shunt contact piece 17 is further connected with the second electromotive force compensator 6 through the second shunt pigtail wire 19.

[0071] According to another embodiment of the present disclosure, the force exerted by the first shunt contact piece 14 passes through the pivot center of the moving contact component, so that the contact pressure between the first shunt contact piece 14 and the moving contact component does not reduce the contact pressure between the moving contact component and the first power supply static contact 1, and does not hinder the opening of the moving contact component relative to the first power supply static contact 1.

[0072] The force exerted by the second shunt contact piece 17 passes through the pivot center of the moving contact component, so that the contact pressure between the second shunt contact piece 17 and the moving contact component does not reduce the contact pressure between the moving contact component and the second power supply static contact 2, and does not hinder the opening of the moving contact component relative to the second power supply static contact 2.

[0073] According to the above embodiments of the present disclosure, when the current increases, the electromotive force increases.

[0074] According to the above embodiments of the present disclosure, the moving contact component rotates between a first position and a second position.

[0075] In the first position, the moving contact component is in contact with the first power supply static contact 1.

[0076] In the second position, the moving contact component is in contact with the second power supply static contact 2.

[0077] According to the above embodiments of the present disclosure, the first power supply static contact 1, the second power supply static contact 2, the first electromotive force compensator 5 and the second electromotive force compensator 6 are arranged roughly around the moving contact component.

[0078] According to the above embodiments of the present disclosure, the first electromotive force compensator 5 includes a first current inlet end 5-1, a first current flow section 5-2, a first electromotive force compensation section 5-3 and a first load terminal section 5-4.

[0079] According to the above embodiments of the present disclosure, the second electromotive force compensator 6 includes a second current inlet end 6-1, a second current flow section 6-2, a second electromotive force compensation section 6-3 and a second load terminal section 6-4.

[0080] According to the above embodiments of the present disclosure, the moving contact component includes a moving contact bracket 3 and a moving contact finger 4 mounted on the moving contact bracket 3.

[0081] The moving contact finger 4 and the moving contact bracket 3 have the same pivot center position (as illustrated in FIGS. 1 and 3) or different pivot center positions (as illustrated in FIG. 2).

[0082] According to the above embodiments of the present disclosure, one end of the moving contact finger 4 is connected to the first current inlet end and the second current inlet end through the soft pigtail wire 7.

[0083] According to the above embodiment of the present disclosure, the first elastic current-carrying member 12-2 is connected to the first current inlet end 5-1; the second elastic current-carrying member 13-2 is connected to the second current inlet end 6-1.

[0084] According to the above embodiments of the present disclosure, when the moving contact component is in the first position under the action of the ATSE operating mechanism (not illustrated), current flows through the moving contact finger 4, the soft pigtail wire 7 and the first elastic current-carrying member 12-2 connected together in parallel as illustrated in FIG. 7 (or the soft pigtail wire 7 and the first shunt contact piece 14 and the first shunt pigtail wire 16 connected together in parallel as illustrated in FIG. 8), the first current inlet end 5-1, the first current flow section 5-2, the first electromotive force compensation section 5-3, the first load terminal section 5-4 in sequence. The current direction flowing through the first electromotive force compensation section 5-3 is consistent with the current direction flowing through the moving contact finger 4, so as to generate mutually attractive electromotive forces, and then form a torque to drive the moving contact component (the moving contact finger 4) to rotate, so as to prevent the moving contact finger from repelling and further increasing the contact pressure between the moving contact component (the moving contact finger 4) and the first power supply static contact 1.

[0085] When the moving contact component is in the second position under the action of the ATSE operating mechanism (not illustrated), current flows through the moving contact finger 4, the soft pigtail wire 7 and the second elastic current-carrying member 13-2 connected together in parallel as illustrated in FIG. 7 (or the soft pigtail wire 7 and the second shunt contact piece 17 and the second shunt pigtail wire 19 connected together in parallel as illustrated in FIG. 8), the second current inlet end 6-1, the second current flow section 6-2, the second electromotive force compensation section 6-3 and the second load terminal section 6-4. The current direction flowing through the second electromotive force compensation section 6-3 is consistent with the current direction

flowing through the moving contact finger 4 (as illustrated by the dotted arrow in FIG. 3), so as to generate mutually attractive electromotive forces, and then form a torque (clockwise torque in FIG. 3) to drive the moving contact component (the moving contact finger 4) to rotate, so as to prevent the moving contact finger from rotating counterclockwise, i.e., the repelling of the contact, thereby increasing the contact pressure between the moving contact component (the moving contact finger 4) and the second power supply static contact 2.

[0086] Taking FIG. 7 as an example, the working mode of this breaking unit will be explained in detail.

Working mode under normal current:

Current distribution:

[0087] A small part of current: (current flows into) the second power supply static contact 2 → moving contact finger 4 → soft pigtail wire 7 → second electromotive force compensator 6 (current flows out);

[0088] Most of the current: (current flows into) the second power supply static contact 2 → moving contact finger 4 → second elastic current-carrying member 13-2 → second electromotive force compensator 6 (current flows out).

[0089] In the present disclosure, the first elastic current-carrying member 12-2 and the second elastic current-carrying member 13-2 are made thick, while the soft pigtail wire 7 is thin, so that the current distributed to the second elastic current-carrying member 13-2 of the two member constituting the parallel circuit accounts for the vast majority. Secondly, each contact point on the moving contact finger 4 has a normal contact pressure (for example, 30 N), so as to obtain a lower temperature rise and ensure the normal operation of the switch.

Opening operation:

[0090] Driven by an operating mechanism (not illustrated), the moving contact component rotates counterclockwise from the state illustrated in FIG. 7, and the moving contact finger 4 is disconnected from the second power supply static contact 2 and the second elastic current-carrying member 13-2 respectively. Then an arc occurs between the moving contact finger 4 and the second power supply static contact 2, and there is no arc between the moving contact finger 4 and the second elastic current-carrying member 13-2 (current flows out from the soft pigtail wire 7). Because the cross section of the soft pigtail wire 7 is small, it is soft and will not hinder the movement of the moving contact finger 4, so that it can open quickly and lengthen the arc, thus extinguishing the arc quickly and obtaining higher electrical operation performance. The closing operation process is opposite to the opening operation, so it will not be repeated here.

Working mode under short-circuit current:

[0091] Short-time withstand current (Icw): Most of the current flows into from the second power supply static contact 2 → the moving contact finger 4 → the second elastic current-carrying member 13-2 → and finally flows out from the second electromotive force compensator 6. An electromotive force to make the moving contact finger 4 rotate clockwise is generated between the second electromotive force compensation section 6-3 and the moving contact finger 4, so as to increase the contact pressure between the moving contact finger 4 and the second power supply static contact 2, and keep them closed (not repelled). Then, the second elastic current-carrying member 13-2 is repelled by the action of the electromotive force, so that all current flows into through the second power supply static contact 2 → the moving contact finger 4 → the soft pigtail wire 7 → and finally flows out from the second electromotive force compensator 6. After that, because the current flowing through the second elastic current-carrying member 13-2 disappears, the second elastic current-carrying member 13 is closed with the moving contact finger 4 again, and the current flows as before. In this way, the second elastic current-carrying member 13-2 and the soft pigtail wire 7 alternately carry large current, which meets the performance requirements of the product.

[0092] Short-circuit making current (Icm): The moving contact finger 4 is driven by the operating mechanism from the vertical middle position to the closing position illustrated in Figure 7. Then, most of the current flows in from the second power supply static contact 2 → the moving contact finger 4 → the second elastic current-carrying member 13-2 → and finally flows out from the second electromotive force compensator 6. An electromotive force to make the moving contact finger 4 rotate clockwise is generated between the second electromotive force compensation section 6-3 and the moving contact finger 4, so as to increase the contact pressure between the moving contact finger 4 and the second power supply static contact 2, and keep them closed (not repelled). Subsequently, the second elastic current-carrying member 13-2 is repelled by the action of the electromotive force, so that all the current flows in through the second power supply static contact 2 → the moving contact finger 4 → the soft pigtail wire 7 → and finally flows out from the second electromotive force compensator 6. Then, because the current flowing through the second elastic current-carrying member 13-2 disappears, the second elastic current-carrying member 13-2 is closed with the moving contact finger 4 again, and the current flows as before. In this way, the second elastic current-carrying member 13-2 and the soft pigtail wire 7 alternately carry large current, which meets the performance requirements of the product.

[0093] The second elastic current-carrying member 13-2 will receive the Laplace force from the second electromotive force compensator 6 and the holm force from

the moving contact finger 4. In the working mode of short-circuit current, the repulsion of the second elastic current-carrying member 13-2 is allowed, but it is desired to close immediately after being repelled, and repelled and closed again, so as to carry the heat of short-circuit current as much as possible. Therefore, the analysis of Laplace force is necessary, because it always exists in the time period when current flows. Experimental analysis proves that it is small enough to not affect repulsion, thus ensuring the performance.

[0094] At the same time, the experimental analysis also proves that when the second electromotive force compensation section 6-3 and the moving contact finger 4 are close to each other and the second electromotive force compensation section 6-3 (hypotenuse section) is short, the Laplace electromotive force repelling the second elastic current-carrying member 13-2 can be reduced.

[0095] The proportion of electromotive force provided by the first electromotive force compensation section and the second electromotive force compensation section to the moving contact finger is the largest, so it can be arranged on a plane different from the moving contact component, so that it coincides with the moving contact finger in Figure 2 to obtain larger electromotive force (in this case, no magnetizer is needed).

[0096] When the moving contact component is driven by the ATSE operating mechanism and rotates counterclockwise from the closing position illustrated in Figure 3 to perform the breaking current operation of ATSE, such as the breaking operation at AC-33A, the current at this time is only 10 times of the rated current, and the electric compensation force is quite small, so that the mechanism can easily overcome the electric compensation force to open the breaking arc of the moving contact. Therefore, it is easy to achieve both Icw and AC-33A by setting appropriate contact pressure, and obtain ATSE with higher Icw and AC-33A performance at the same time.

[0097] According to the above embodiments of the present disclosure, the first electromotive force compensation section 5-3 and the second electromotive force compensation section 6-3 are respectively provided with at least one magnetizer 8.

[0098] According to another embodiment of the present disclosure, a dual-power transfer switch is provided, wherein the dual-power transfer switch includes at least one breaking unit as described above.

[0099] In the unipolar breaking unit, a first unipolar breaking unit in a first state is formed by installing two power supply incoming static contacts, a connecting terminal and a compensation circuit. After the first pole of the moving contact component is put into the first unipolar breaking unit in the first state, connecting it to the compensation circuit with the pigtail wire at the tail of the moving contact finger. After the second pole of the moving contact component is put into a second unipolar breaking unit in the first state, connecting it to the compensation circuit with the pigtail wire at the tail of the moving contact finger. After the third pole of the moving contact component is put into a third unipolar breaking unit in the first state, connecting it to the compensation circuit with the pigtail wire at the tail of the moving contact finger. Finally, after the fourth pole of the moving contact component is put into a fourth unipolar breaking unit in the first state, connecting it to the compensation circuit with the pigtail wire at the tail of the moving contact finger. Then, a pole spacer plate (not illustrated) and the arc extinguishing chamber are installed. So far, the installation of the four-pole breaking unit is completed (as illustrated in Figure 6).

[0100] The four-pole breaking unit is connected with the ATS mechanism (not illustrated) through a coupling 11 to form a complete dual-power transfer switch (TSE, i.e., transfer switching equipment).

[0101] When the TSE is connected to the first power supply or the second power supply, when the short-circuit current passes through, because of the existence of the compensation circuit, the greater the short-circuit current, the greater the electric compensation force, so that the finger of the moving contact are always pressed against the corresponding static contact, so as to obtain higher short-circuit short-time tolerance, i.e., Icw.

[0102] When TSE receives a short-circuit current from double-off position, because of the existence of compensation circuit, the greater the short-circuit current, the greater the electric compensation force, thus always pressing the finger of the moving contact against the static contact, so as to obtain higher short-circuit making current, i.e., Icm.

[0103] When TSE switches on and breaks an overload ($\leq$10In) or a normal current (In), because the electromotive force of the compensation circuit is neglected relative to the contact pressure, the breaking speed of the moving contact is not affected by the electromotive force, so that the moving contact can be quickly separated from the static contact to obtain a better electrical switching-on and breaking performance.

[0104] With reference to specific embodiments, although the present disclosure has been described in the specification and drawings, it should be understood that various changes can be made by those skilled in the art without departing from the scope of the present disclosure as defined in the claims, and various changes and various equivalents can be substituted for various elements therein. Furthermore, the combination and collocation of technical features, elements and/or functions among specific embodiments in this paper are clear, so according to these disclosures, those skilled in the art can appreciate that the technical features, elements and/or functions of an embodiment can be combined into another specific embodiment as appropriate, unless otherwise described above. In addition, according to the teaching of the present disclosure, many changes can be made to adapt to special situations or materials without departing from the scope of the present disclosure. Therefore, the present disclosure is not limited to the spe-

cific embodiments illustrated in the drawings and the specific embodiments described in the specification as the best implementation mode presently contemplated for carrying out the present disclosure, but the present disclosure is intended to include all embodiments falling within the scope of the above description and the appended claims.

Claims

1. A breaking unit with an auxiliary shunt component,
wherein the breaking unit comprises a first power supply static contact, a second power supply static contact, a first electromotive force compensator, a second electromotive force compensator, a moving contact component which are accommodated in a shell of the breaking unit, and soft pigtail wires connected between the moving contact component and the first electromotive force compensator and between the moving contact component and the second electromotive force compensator;
wherein the auxiliary shunt component comprises a first shunt member and a second shunt member;
wherein the first shunt member is connected with the first electromotive force compensator;
wherein the second shunt member is connected with the second electromotive force compensator;
if the moving contact component is in contact with the first power supply static contact, the moving contact component is in contact with the first shunt member, and a current flowing through the first shunt member is greater than a current flowing through the soft pigtail wire;
if the moving contact component is in contact with the second power supply static contact, the moving contact component is in contact with the second shunt member, and a current flowing through the second shunt member is greater than a current flowing through the soft pigtail wire.

2. The breaking unit according to claim 1,
wherein the first shunt member comprises a first elastic current-carrying member and a first contact point arranged on one end of the first elastic current-carrying member, the first elastic current-carrying member and the first contact point being made of conductive materials;
wherein another end of the first elastic current-carrying member is connected to the first electromotive force compensator;
wherein the second shunt member comprises a second elastic current-carrying member and a second contact point arranged on one end of the second elastic current-carrying member, the second elastic current-carrying member and the second contact point being made of conductive materials;
wherein another end of the second elastic current-carrying member is connected to the second electromotive force compensator.

3. The breaking unit according to claim 1,
wherein the first shunt member comprises a first shunt contact piece, a first shunt spring and a first shunt pigtail wire;
wherein a lower end of the first shunt contact piece is pivotally connected with the shell of the breaking unit, an upper end of the first shunt contact piece is provided with a first shunt contact surface contacting with the moving contact component and a first shunt motion range limiting surface matched with the shell of the breaking unit; the first shunt spring is configured to exert a force on the first shunt contact piece to make the first shunt contact piece abut against the moving contact component and provide a contact pressure between them; and the lower end of the first shunt contact piece is further connected with the first electromotive force compensator through the first shunt pigtail wire;
wherein the second shunt member comprises a second shunt contact piece, a second shunt spring and a second shunt pigtail wire;
wherein a lower end of the second shunt contact piece is pivotally connected with the shell of the breaking unit, an upper end of the second shunt contact piece is provided with a second shunt contact surface contacting with the moving contact component and a second shunt motion range limiting surface matched with the shell of the breaking unit; the second shunt spring is configured to exert a force on the second shunt contact piece to make the second shunt contact piece abut against the moving contact component and provide a contact pressure between them; and the lower end of the second shunt contact piece is further connected with the second electromotive force compensator through the second shunt pigtail wire.

4. The breaking unit according to claim 3,
wherein the force exerted by the first shunt contact piece passes through a pivot center of the moving contact component, so that the contact pressure between the first shunt contact piece and the moving contact component does not reduce the contact pressure between the moving contact component and the first power supply static contact, and does not hinder the opening of the moving contact component relative to the first power supply static contact;
wherein the force exerted by the second shunt contact piece passes through the pivot center of the moving contact component, so that the contact pressure between the second shunt contact piece and the moving contact component does not reduce the contact pressure between the moving contact component and the second power supply static contact,

and does not hinder the opening of the moving contact component relative to the second power supply static contact.

5. The breaking unit according to claim 2,
wherein if the moving contact component is in contact with the first power supply static contact, a current direction in the first electromotive force compensator is consistent with a current direction in the moving contact component, so as to generate mutually attractive electromotive forces, and then form a torque driving the moving contact component to rotate, so as to increase a contact pressure between the moving contact component and the first power supply static contact;
wherein if the moving contact component is in contact with the second power supply static contact, a current direction in the second electromotive force compensator is consistent with a current direction in the moving contact component, so as to generate mutually attractive electromotive forces, and then form a torque driving the moving contact component to rotate, so as to increase a contact pressure between the moving contact component and the second power supply static contact;
wherein if the current increases, the electromotive force increases.

6. The breaking unit according to claim 5,
wherein the moving contact component is configured to rotate between a first position and a second position;
wherein in the first position, the moving contact component is in contact with the first power supply static contact;
wherein in the second position, the moving contact component is in contact with the second power supply static contact.

7. The breaking unit according to claim 6,
wherein the first power supply static contact, the second power supply static contact, the first electromotive force compensator and the second electromotive force compensator are arranged around the moving contact component.

8. The breaking unit according to claim 6,
wherein the first electromotive force compensator comprises a first current inlet end, a first current flow section, a first electromotive force compensation section and a first load terminal section.

9. The breaking unit according to claim 8,
wherein the second electromotive force compensator comprises a second current inlet end, a second current flow section, a second electromotive force compensation section and a second load terminal section.

10. The breaking unit according to claim 9,
wherein the moving contact component comprises a moving contact bracket and a moving contact finger mounted on the moving contact bracket;
wherein the moving contact finger and the moving contact bracket have the same pivot center position or different pivot center positions.

11. The breaking unit according to claim 10,
wherein one end of the moving contact finger is connected to the first current inlet end and the second current inlet end through the soft pigtail wires;
wherein the first elastic current-carrying member is connected to the first current inlet end;
wherein the second elastic current-carrying member is connected to the second current inlet end.

12. The breaking unit according to claim 11,
wherein if the moving contact component is in the first position, current flows through the moving contact finger, the soft pigtail wire and the first elastic current-carrying member connected together in parallel, the first current inlet end, the first current flow section, the first electromotive force compensation section and the first load terminal section, and a current direction flowing through the first electromotive force compensation section is consistent with a current direction flowing through the moving contact finger;
wherein if the moving contact component is in the second position, current flows through the moving contact finger, the soft pigtail wire and the second elastic current-carrying member connected together in parallel, the second current inlet end, the second current flow section, the second electromotive force compensation section and the second load terminal section, and a current direction flowing through the second electromotive force compensation section is consistent with the current direction flowing through the moving contact finger.

13. The breaking unit according to claim 10,
wherein the first electromotive force compensation section and the second electromotive force compensation section are respectively provided with at least one magnetizer.

14. A dual-power transfer switch, wherein the dual-power transfer switch comprises at least one breaking unit according to any one of claims 1-13.

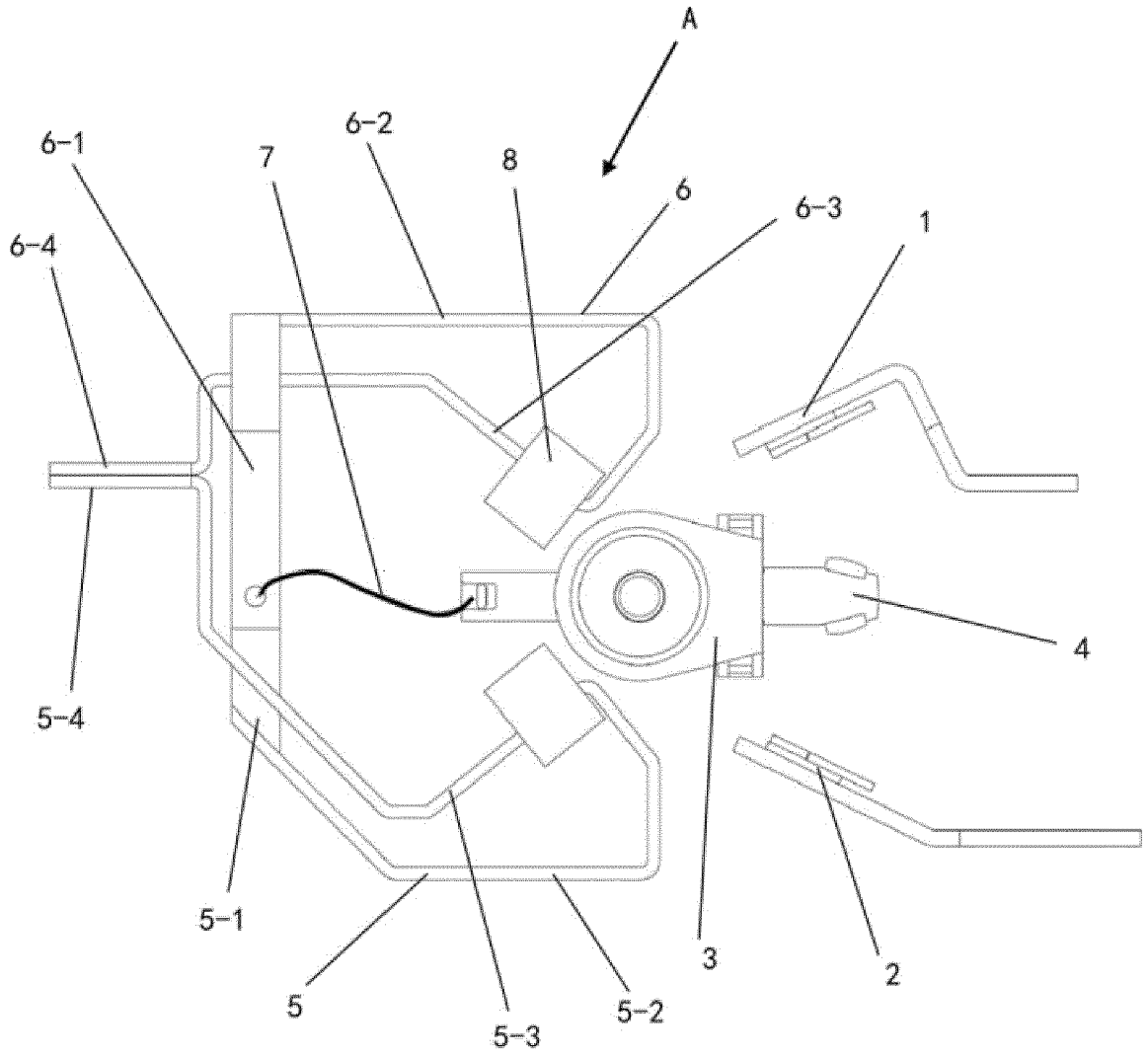


Fig. 1

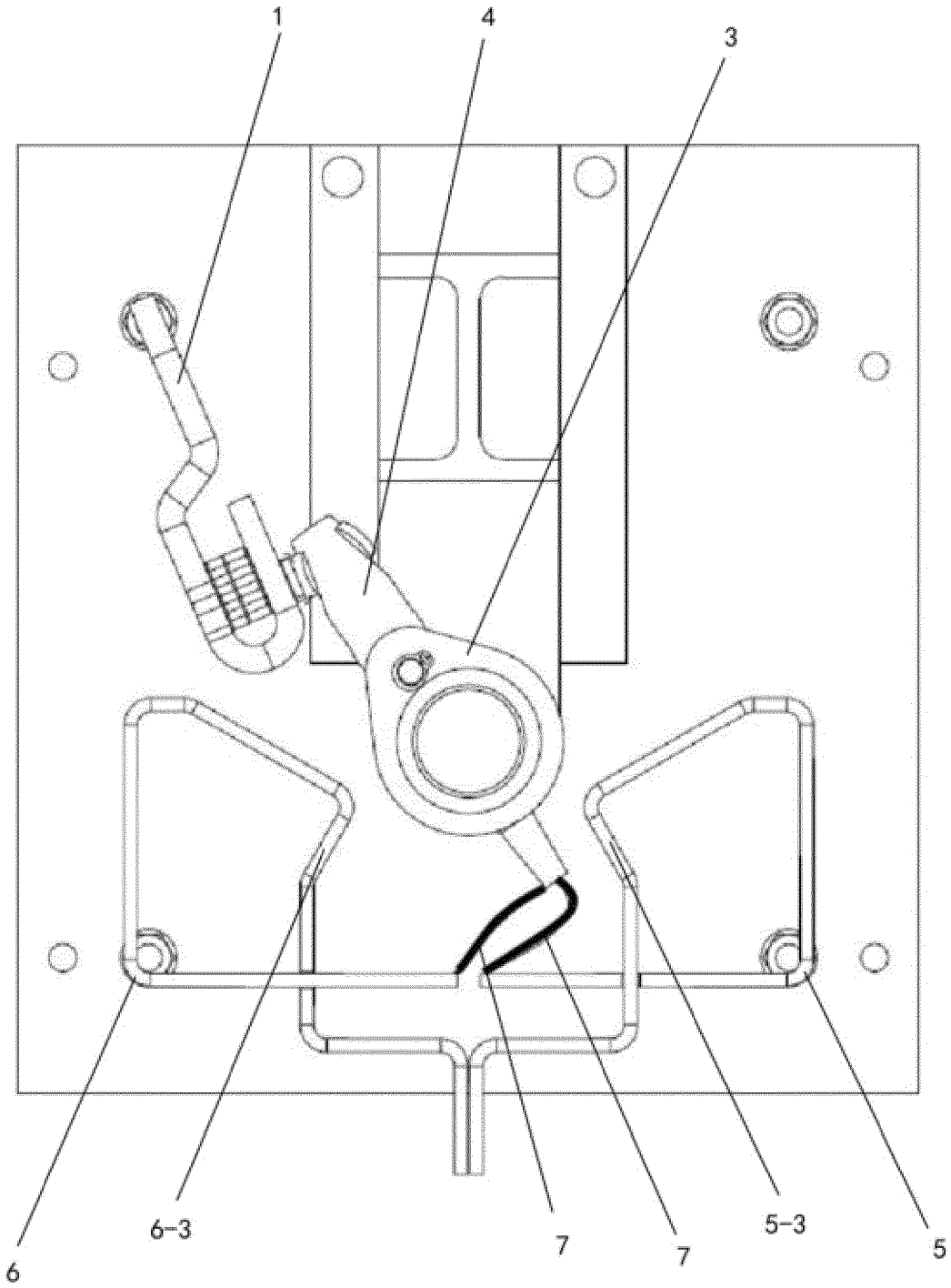


Fig.2

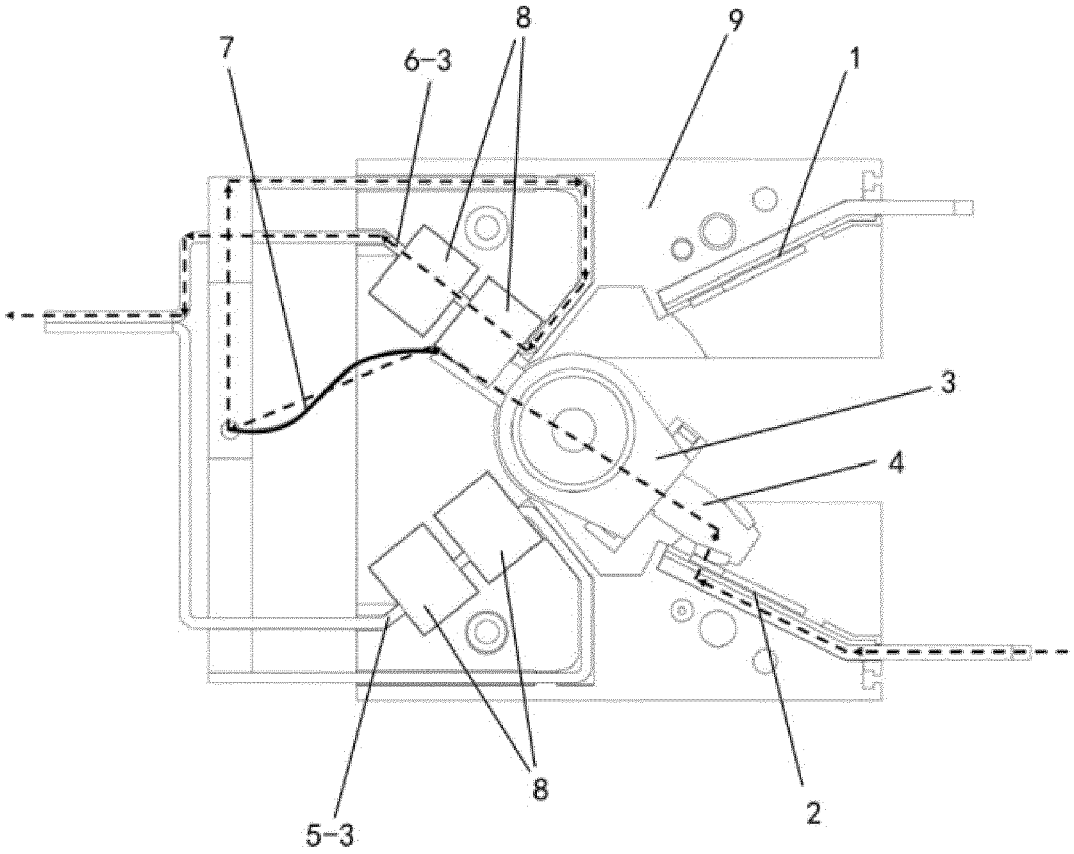


Fig.3

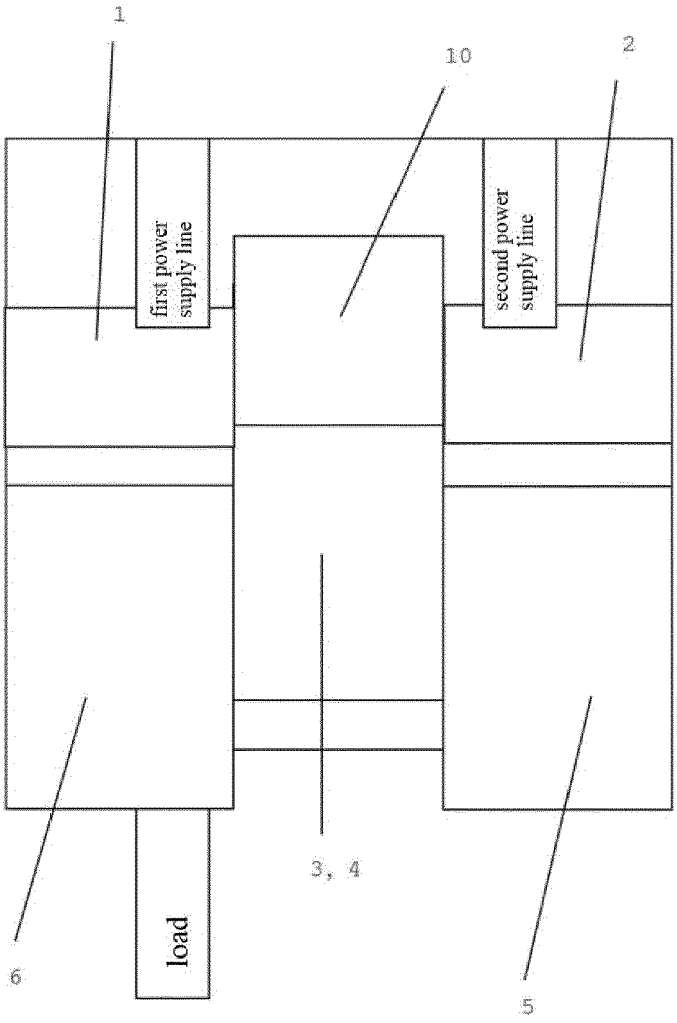
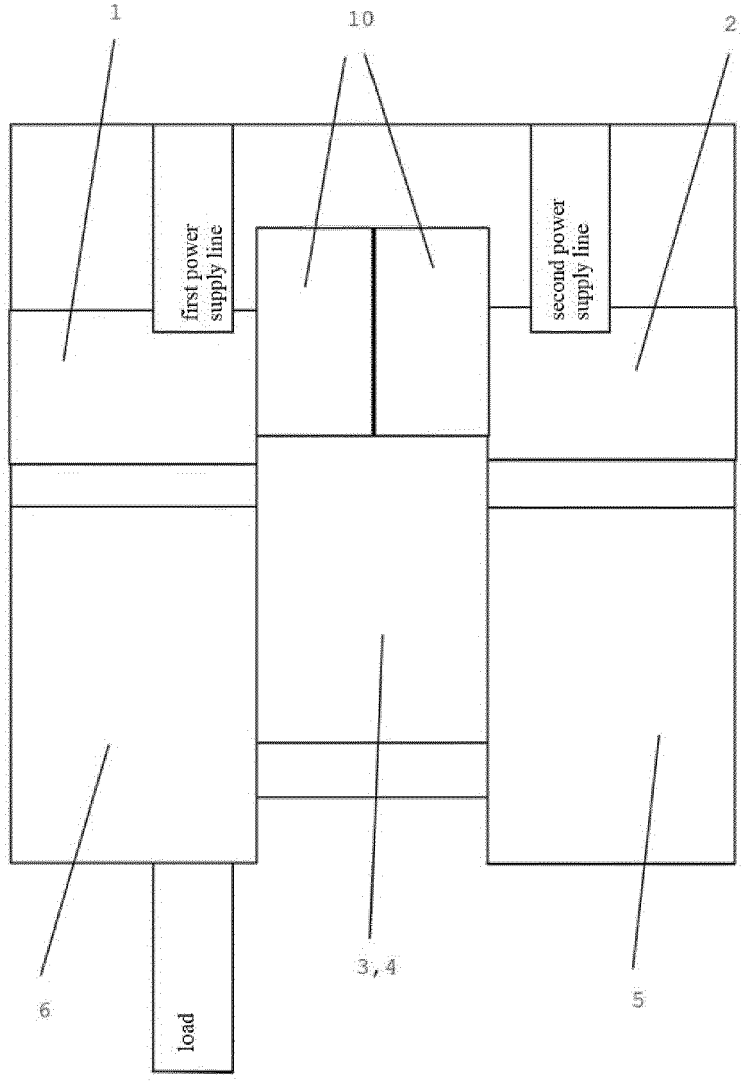

1
10
2
first power supply line
second power supply line
3, 4
load
6
5

Fig. 4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2
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second power supply line
3, 4
6
5
load

Fig.5

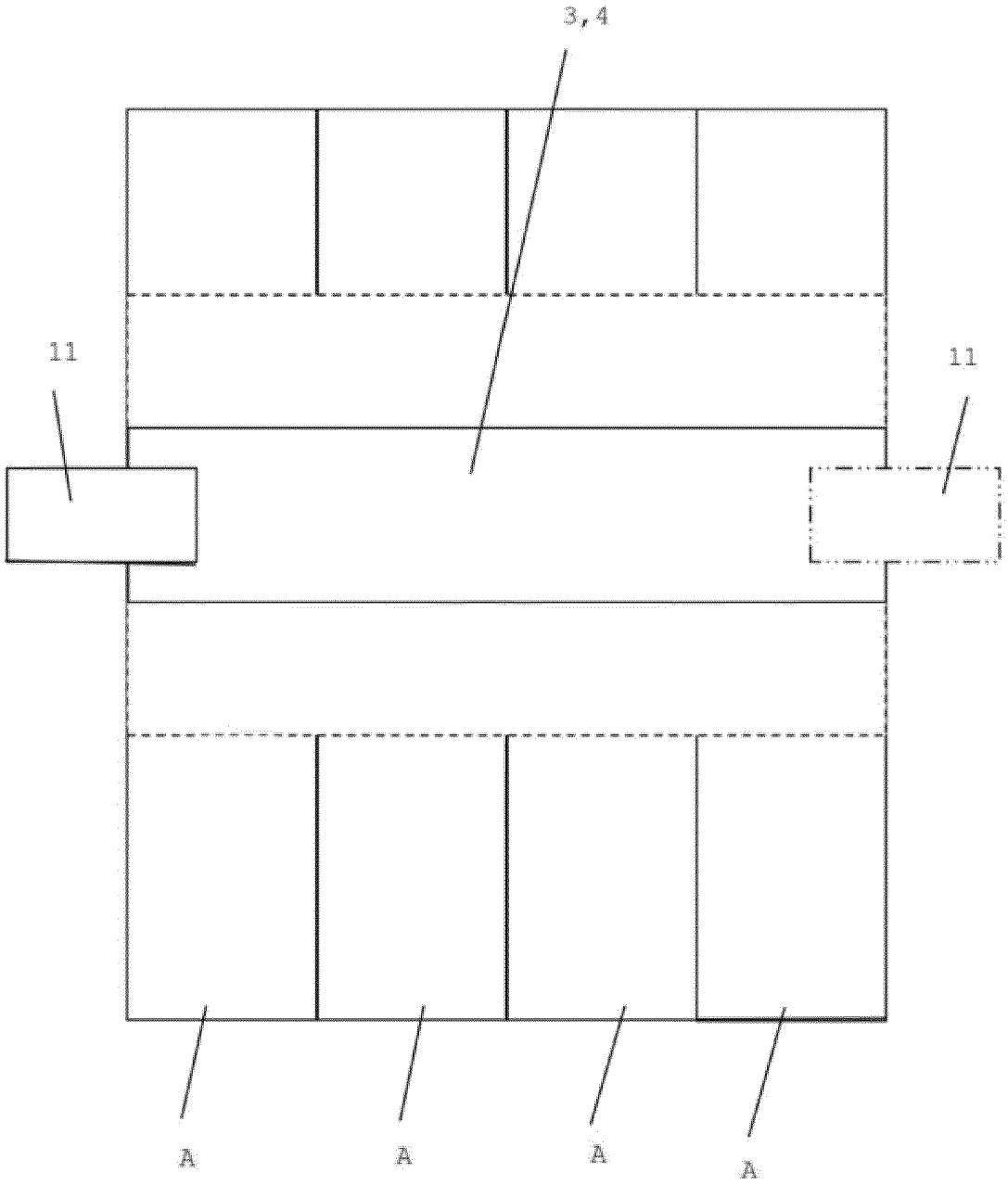

Fig.6

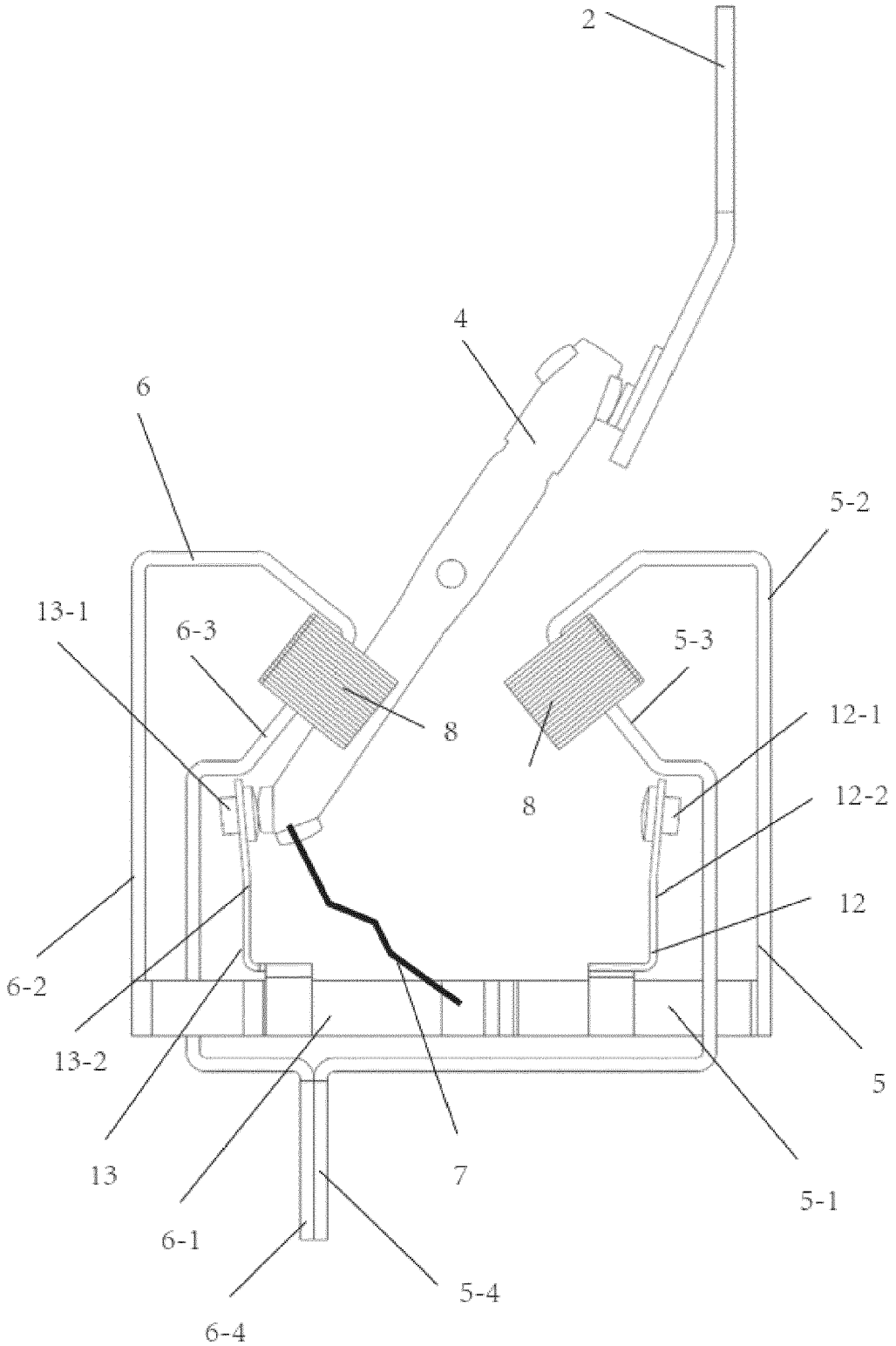

Fig.7

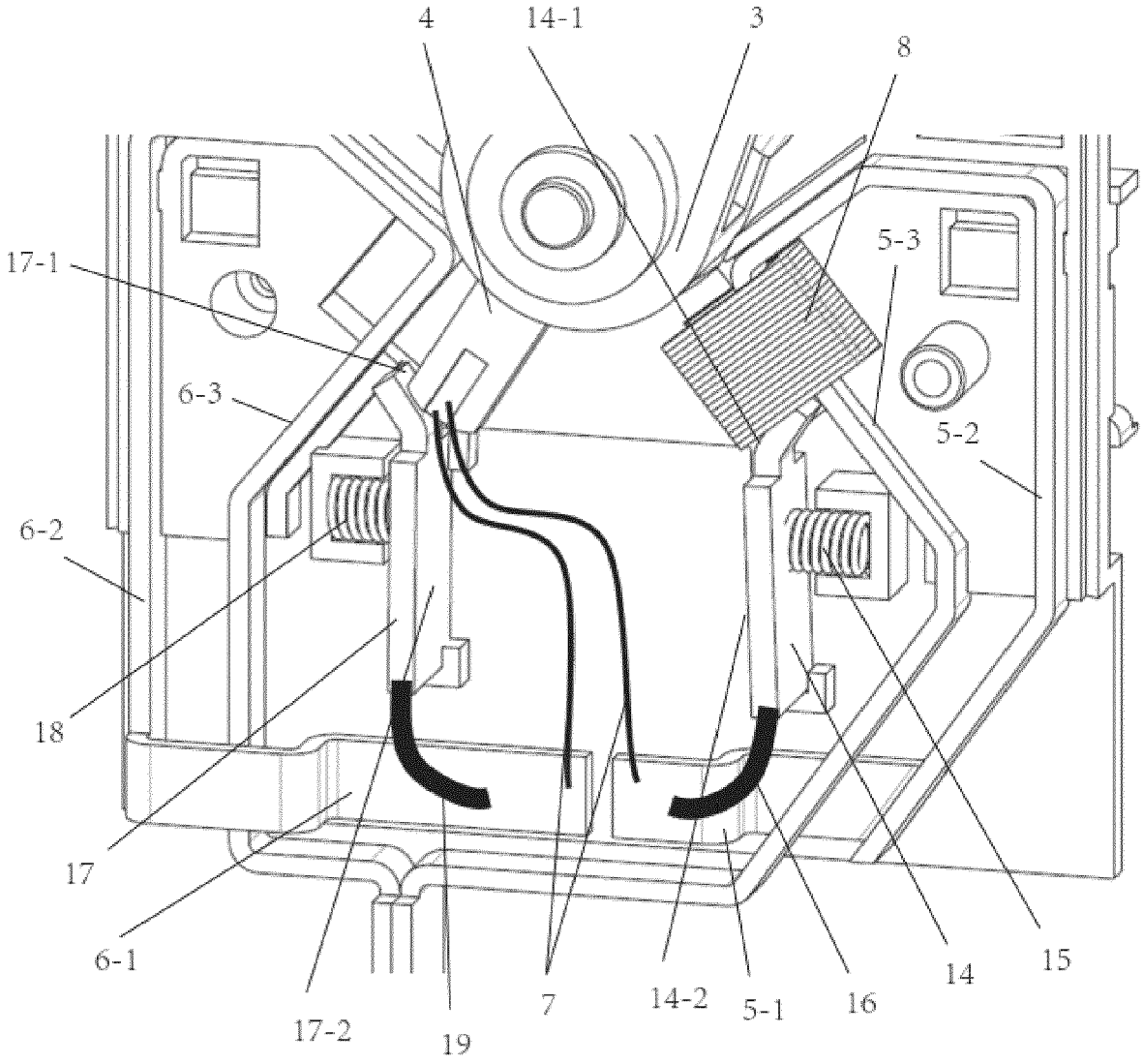

Fig.8

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EUROPEAN SEARCH REPORT

Application Number
EP 21 30 5848

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	US 4 849 590 A (BECKER JAMES A [US] ET AL) 18 July 1989 (1989-07-18) * column 3, line 62 - column 5, line 44 * * column 7, line 13 - column 8, line 17 * * figures 2, 3, 6, 7 *	1-14	INV. H01H1/22 H01H19/46 H01H50/54
A	US 2017/309423 A1 (DIRKS KEITH [US] ET AL) 26 October 2017 (2017-10-26) * paragraph [0057] - paragraph [0063] * * figures 14-19 *	1-14	
A	US 2018/130621 A1 (DIRKS KEITH [US] ET AL) 10 May 2018 (2018-05-10) * paragraph [0065] * * figures 14, 15 *	1-14	

TECHNICAL FIELDS SEARCHED (IPC)

H01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	16 November 2021	Fribert, Jan

CATEGORY OF CITED DOCUMENTS

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16-11-2021

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82