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(54) **MINIATURE CIRCUIT BREAKER**

(57) The present disclosure relates to a circuit breaker. The circuit breaker includes at least one pole arranged in sequence in a first direction, and each pole includes: a shell including a first cavity and a second cavity separated by a spacer; a stationary contact assembly including a first stationary contact disposed in the first cavity and a second stationary contact disposed in the second cavity, wherein the first stationary contact and the second stationary contact are separated from each other; a movable contact assembly including a movable contact body, a first movable contact extending from the movable contact body into the first cavity and a second movable contact extending from the movable contact body into the second cavity, wherein the first movable contact and the second movable contact can be respectively in contact with or separated from the first stationary contact and the second stationary contact at the same time; a first arc extinguishing system disposed in the first cavity and configured to extinguish a first electric arc generated when the first movable contact is separated from the first stationary contact; and a second arc extinguishing system disposed in the second cavity and configured to extinguish a second electric arc generated when the second movable contact is separated from the second stationary contact.

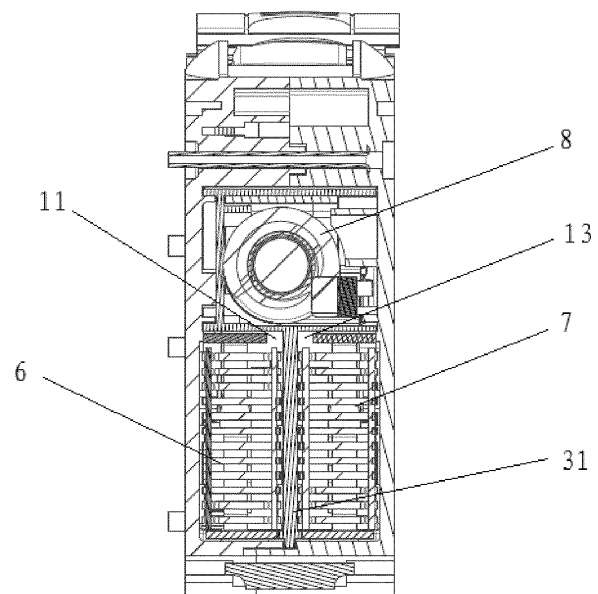


Fig. 4

Description

TECHNICAL FIELD

[0001] The present disclosure relates to a miniature circuit breaker.

BACKGROUND

[0002] Miniature circuit breaker is key equipment to ensure electricity safety and circuit switching, and is widely used in various power distribution devices for electrical terminals. The miniature circuit breaker is consisted of an opening-closing mechanism, a contact mechanism, a tripping mechanism, a current thermal assembly, an arc extinguishing system and the like. A working principle of the miniature circuit breaker includes: the tripping mechanism and the current thermal assembly are utilized to realize overload and short-circuit protection. When a value of current passing through a coil in the current thermal assembly is greater than a preset current value, a movable iron core of the electromagnetic tripping device acts and pushes a striking rod to hit against an operating mechanism, so that the operating mechanism is unlocked, and the circuit breaker is opened to break the circuit, thus realizing the overload and short-circuit protection for the circuit. When the fault of the circuit is eliminated, the circuit is conducted by a closing operation of the opening-closing mechanism.

[0003] An electric arc will be generated when a movable contact and a stationary contact in the contact mechanism are separated, thus the arc extinguishing system is needed to extinguish the electric arc so as to reduce a corrosion of the circuit breaker. Due to a volume limitation of the miniature circuit breaker and also a large volume of the tripping mechanism, a volume of the arc extinguishing system is small, which limits an arc extinguishing effect, and hence limits a breaking capacity and a rated current of the miniature circuit breaker.

[0004] Moreover, the existing miniature circuit breaker usually only has one pair of movable contact and stationary contact. Due to the volume limitation of the miniature circuit breaker, a contact separation is limited, so it is impossible to achieve higher rated voltage and current.

[0005] In recent years, people have increasingly required the miniature circuit breaker to have higher rated voltage and current to meet continuously developing application demands. Generally, in some direct current (DC) applications, e.g., data centers with high demand for energy storage, it is necessary to increase the rated voltage and rated current of the miniature circuit breakers for purpose of improving power distribution efficiency and saving energy consumption and space. In some special applications such as photovoltaic industry, because photovoltaic panel strings have higher voltage up to 1500 V, for example, miniature circuit breakers with higher rated voltage and current are required.

SUMMARY

[0006] Therefore, the objective of the present disclosure is to provide a miniature circuit breaker having two pairs of movable contacts and stationary contacts connected in series and two corresponding arc extinguishing systems, which increases the contact separation and raises a voltage of the electric arc, so that the miniature circuit breaker has higher rated voltage and current.

[0007] The present disclosure achieves the above objective by providing a miniature circuit breaker. The miniature circuit breaker includes at least one pole arranged in sequence in a first direction, each pole of the at least one pole includes an input terminal assembly and an output terminal assembly. Each pole further includes: a shell including a first cavity and a second cavity separated by a spacer; a stationary contact assembly including a first stationary contact disposed in the first cavity and a second stationary contact disposed in the second cavity, wherein the first stationary contact and the second stationary contact are separated from each other; a movable contact assembly including a movable contact body, a first movable contact extending from the movable contact body into the first cavity and a second movable contact extending from the movable contact body into the second cavity, wherein the first movable contact and the second movable contact can be respectively in contact with or separated from the first stationary contact and the second stationary contact at the same time; a first arc extinguishing system disposed in the first cavity and configured to extinguish a first electric arc generated when the first movable contact is separated from the first stationary contact; and a second arc extinguishing system disposed in the second cavity and configured to extinguish a second electric arc generated when the second movable contact is separated from the second stationary contact.

[0008] In an embodiment, when the miniature circuit breaker is in a closed state, current flows through the input terminal assembly, the first stationary contact, the first movable contact, the movable contact body, the second movable contact, the second stationary contact and the output terminal assembly, in sequence.

[0009] In an embodiment, the stationary contact assembly further includes a conductive member located between the first movable contact and the second movable contact, a first end of the conductive member is electrically connected with the input terminal assembly, and a second end of the conductive member is electrically connected with the first stationary contact, so that the current flows to the first stationary contact through the conductive member.

[0010] In an embodiment, each pole further includes an electromagnetic tripping assembly, the electromagnetic tripping assembly is disposed in the shell and at least partially outside the first cavity and the second cavity, and the first cavity includes a first opening opened towards the electromagnetic tripping assembly and a second opening opened towards a gas outlet of the min-

miniature circuit breaker.

[0011] In an embodiment, the second cavity includes a third opening opened towards the electromagnetic tripping assembly and a fourth opening opened towards the gas outlet of the miniature circuit breaker.

[0012] In an embodiment, each pole further includes a first gas generator and a second gas generator, the first gas generator is disposed at a side of the spacer facing the first cavity so as to be able to generate a first gas under an action of the first electric arc, and the second gas generator is disposed at a side of the spacer facing the second cavity so as to be able to generate a second gas under an action of the second electric arc.

[0013] In an embodiment, a part of the first gas flows through the first movable contact and the first stationary contact, the first arc extinguishing system, the first opening, the electromagnetic tripping assembly, the first movable contact and the first stationary contact, in sequence; and the other part of the first gas flows through the first movable contact and the first stationary contact, the first arc extinguishing system, the second opening and the gas outlet, in sequence.

[0014] In an embodiment, a part of the second gas flows through the second movable contact and the second stationary contact, the second arc extinguishing system, the third opening, the electromagnetic tripping assembly, the second movable contact and the second stationary contact, in sequence; and the other part of the second gas flows through the second movable contact and the second stationary contact, the second arc extinguishing system, the fourth opening and the gas outlet, in sequence.

[0015] In an embodiment, each pole further includes: a first guide plate disposed at the second opening and configured to guide the first gas, and a second guide plate disposed at the fourth opening and configured to guide the second gas.

[0016] In an embodiment, at least one of the first guide plate and the second guide plate extends obliquely from a rear wall of the shell towards an interior of the shell.

[0017] In an embodiment, the movable contact assembly has a U-shape.

[0018] In an embodiment, the conductive part is integrally formed with the first stationary contact.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] Advantages and objective(s) of the present disclosure will be better understood from the following detailed description of the preferred embodiments of the present disclosure in conjunction with the accompanying drawings. In order to better illustrate relationships among various components in the drawings, the drawings are not drawn to scale. In the drawings:

Fig. 1 illustrates an internal cross-sectional view of a miniature circuit breaker according to an embodiment of the present disclosure, viewed in a first di-

rection;

Fig. 2 illustrates an internal cross-sectional view of a miniature circuit breaker according to an embodiment of the present disclosure, viewed in a direction opposite to the first direction;

Fig. 3 illustrates a partial cross-sectional view of a miniature circuit breaker according to an embodiment of the present disclosure, in which conductive parts of a movable contact assembly and a stationary contact assembly are illustrated;

Fig. 4 illustrates a partial cross-sectional view of a miniature circuit breaker according to an embodiment of the present disclosure, in which a first arc extinguishing system and a second arc extinguishing system are illustrated;

Fig. 5 illustrates a partial schematic diagram of a first cavity of a miniature circuit breaker according to an embodiment of the present disclosure;

Fig. 6 illustrates a partial internal schematic diagram of a miniature circuit breaker according to an embodiment of the present disclosure;

Fig. 7 illustrates a partial internal schematic diagram of a miniature circuit breaker according to an embodiment of the present disclosure, viewed in a direction opposite to the first direction, in which a current direction is illustrated; and

Fig. 8 illustrates a partial internal schematic diagram of a miniature circuit breaker according to an embodiment of the present disclosure, viewed in the first direction, in which a current direction is illustrated.

DETAILED DESCRIPTION

[0020] In order to make objects, technical details and advantages of the embodiments of the disclosure apparent, the technical solutions of the embodiments will be described in a clearly and fully understandable way in connection with the drawings related to the embodiments of the disclosure. Apparently, the described embodiments are just a part but not all of the embodiments of the disclosure. Based on the described embodiments herein, those skilled in the art can obtain other embodiment(s), without any inventive work, which should be within the scope of the disclosure.

[0021] Unless otherwise defined, all the technical and scientific terms used herein have the same meanings as commonly understood by one of ordinary skill in the art to which the present disclosure belongs. The terms "first," "second," etc., which are used in the present disclosure, are not intended to indicate any sequence, amount or importance, but distinguish various components. Also, the terms "comprise," "comprising," "include," "including," etc., are intended to specify that the elements or the objects stated before these terms encompass the elements or the objects and equivalents thereof listed after these terms, but do not preclude the other elements or objects. "On," "under," "right," "left" and the like are only

used to indicate relative position relationship, and when the position of the object which is described is changed, the relative position relationship may be changed accordingly.

[0022] The drawings accompanying the specification are schematic diagrams to assist in explaining the concept(s) of the present disclosure, and schematically represent the shapes of various components and their relationships.

[0023] Hereinafter, embodiments according to the present disclosure will be described in details with reference to Figs. 1-8.

[0024] Fig. 1 illustrates an internal cross-sectional view of a miniature circuit breaker according to an embodiment of the present disclosure, viewed in a first direction. Fig. 2 illustrates an internal cross-sectional view of a miniature circuit breaker according to an embodiment of the present disclosure, viewed in a direction opposite to the first direction. In Fig. 1, the first direction is an inward direction perpendicular to a paper plane of the drawings. In Fig. 2, the first direction is an outward direction perpendicular to the paper plane of the drawings.

[0025] The miniature circuit breaker according to the present disclosure may include at least one pole arranged in sequence in the first direction, and the internal cross-sectional views of one pole viewed from different directions are illustrated in Figs. 1 and 2. In other embodiments, the miniature circuit breaker may include two, three or four such poles. Each pole may include an input terminal assembly 1 and an output terminal assembly 2. The two circles in Fig. 1 only schematically illustrate positions of the input terminal assembly and the output terminal assembly, and not all the parts in the circles belong to the input terminal assembly or the output terminal assembly. Moreover, each pole also includes a shell 3, a stationary contact assembly 4, a movable contact assembly 5, a first arc extinguishing system 6, a second arc extinguishing system 7, and an electromagnetic tripping assembly 8. The shell 3 includes a first cavity and a second cavity separated by a spacer 31, as illustrated in Figure 4. The stationary contact assembly 3 includes a first stationary contact 41 disposed in the first cavity and a second stationary contact 42 disposed in the second cavity. The first stationary contact 41 and the second stationary contact 42 are separated from each other, as illustrated in Figs. 1 to 3. The movable contact assembly 5 includes a movable contact body 50, a first movable contact 51 extending from the movable contact body 50 into the first cavity, and a second movable contact 52 extending from the movable contact body 50 into the second cavity. The first movable contact 51 and the second movable contact 52 can be respectively in contact with or separated from the first stationary contact 41 and the second stationary contact 42 at the same time, thereby realizing the closing or opening of the circuit breaker. The first arc extinguishing system 6 is disposed in the first cavity and configured to extinguish a first electric arc generated when the first movable contact 51 is separated

from the first stationary contact 41. The second arc extinguishing system 7 is disposed in the second cavity and configured to extinguish a second electric arc generated when the second movable contact 52 is separated from the second stationary contact 42. The first arc extinguishing system 6 and the second arc extinguishing system 7 each have an arc extinguishing chamber and a plurality of arc extinguishing grids disposed in the arc extinguishing chamber.

[0026] In the embodiment of the present disclosure, the above two pairs of movable contacts and stationary contacts are electrically connected in series. Specifically, when the movable contact assembly 5 is in contact with the stationary contact assembly 4, that is, when the first movable contact 51 is in contact with the first stationary contact 41 and the second movable contact 52 is in contact with the second stationary contact 42, or when the miniature circuit breaker is in a closed state, the current flows through the following components in sequence: the input terminal assembly 1, the first stationary contact 41, the first movable contact 51, the movable contact body 50, the second movable contact 52, the second stationary contact 42, and the output terminal assembly 2.

[0027] Considering the size of the miniature circuit breaker and the arrangement of various components, the movable contact assembly may have a U-shape, as illustrated in Fig. 3. Of course, the present disclosure is not limited to this, and other shapes are also possible.

[0028] By arranging two pairs of movable contacts and stationary contacts in the shell, the contact separation of the miniature circuit breaker according to the present disclosure can be increased, for example, the contact separation can be twice that of the miniature circuit breaker provided with only one pair of movable contacts and stationary contacts.

[0029] Each pole of the miniature circuit breaker according to the present disclosure also includes a bimetallic strip 16 disposed in the shell 3, which can separate the movable contact assembly from the stationary contact assembly to realize the opening operation when the circuit is overloaded. After flowing into the miniature circuit breaker from the input terminal assembly 1, the current flows through the bimetallic strip 16 firstly, and then flows into the first stationary contact 41.

[0030] Moreover, as illustrated in Fig. 1, the stationary contact assembly 4 further includes a conductive member 43. As illustrated in Figs. 3 and 6, the conductive member 43 is located between the first movable contact 51 and the second movable contact 52. For example, the conductive member 43 can be located in the exactly middle between the first movable contact 51 and the second movable contact 52. As illustrated in Figs. 1 and 6, a first end (i.e., the end close to the bimetallic strip 16) of the conductive member 43 is electrically connected with the input terminal assembly 1, and a second end (i.e., the end away from the bimetallic strip 16) is electrically connected with the first stationary contact 41, so that the current flows through the conductive member 43 and

then flows into the first stationary contact 41. More specifically, the first end of the conductive member 43 is electrically connected to the bimetallic strip 16. In other words, the conductive member 43 is electrically connected to the bimetallic strip 16 by passing through the first movable contact 51 and the second movable contact 52.

[0031] For example, the conductive member 43 may be integrally formed with the first stationary contact 41. Of course, the conductive member 43 can also be separated from the first stationary contact and electrically connected to the first stationary contact 41 by other means. The conductive member 43 may be made of the same conductive material as the first stationary contact 41.

[0032] By providing the conductive member 43 in the middle, a current loop can be kept away from the shell, so that a temperature of the shell can be prevented from exceeding a standard temperature. For a high-current product, if the current loop is disposed at one side of the product, the heat generated by the current loop will be transferred to the shell, resulting in the temperature of the shell exceeding the standard temperature. The embodiment of the present disclosure avoids the above problems and achieves a longer service life.

[0033] Of course, the conductive member 43 of the present disclosure is not limited to be between the first movable contact 51 and the second movable contact 52, but may be merely located at the middle of the shell in some other embodiments.

[0034] As illustrated in Fig. 4, the shell is divided into two independent cavities by the spacer 31, so that the first electric arc and the second electric arc are separated from each other, thus avoiding a short circuit. For example, the spacer 31 is made of an insulating material, e.g., the same material as the shell, such as plastic.

[0035] It should be noted that, the first cavity and the second cavity of the present disclosure are not hermetically isolated from each other. As illustrated in Figs. 1 and 4, the first cavity includes a first opening 11 opened towards the electromagnetic tripping assembly 8 and a second opening 12 opened towards a gas outlet 15 of the miniature circuit breaker. As illustrated in Figs. 2 and 4, the second cavity includes a third opening 13 opened towards the electromagnetic tripping assembly 8 and a fourth opening 14 opened towards the gas outlet 15 of the miniature circuit breaker.

[0036] Each pole of the miniature circuit breaker further includes: a first gas generator (not illustrated in the figure), which is disposed at a side of the spacer 31 facing the first cavity (i.e. the left cavity in Fig. 4) to generate a first gas under the action of the first electric arc; and a second gas generator (not illustrated in the figure), which is disposed at a side of the spacer 31 facing the second cavity (i.e. the right cavity in Fig. 4) to generate a second gas under the action of the second electric arc. For example, the first gas generator and the second gas generator are made of a same material, which material can be rapidly decomposed to generate a large amount of

gas under the action of the electric arc generated when the movable contact is in contact with the stationary contact, and the gas as generated can push the electric arc so that the electric arc is accelerated to move to the arc extinguishing chamber. It should be noted that, the first gas and the second gas described herein may be different only in the cavity in which they are located.

[0037] Through the plurality of openings described above, the gas generated by the action of the electric arc can each have two flow channels. For example, as illustrated in Fig. 1, a part of the first gas flows through the following components: the first movable contact 51 and the first stationary contact 41, the first arc extinguishing system 6, the first opening 11, the electromagnetic tripping assembly 8, the first movable contact 51 and the first stationary contact 41. The other part of the first gas flows through the following components: the first movable contact 51 and the first stationary contact 41, the first arc extinguishing system 6, the second opening 12 and the gas outlet 15. For example, as illustrated in Fig. 2, a part of the second gas flows through the following components: the second movable contact 52 and the second stationary contact 42, the second arc extinguishing system 7, the third opening 13, the electromagnetic tripping assembly 8, the second movable contact 52 and the second stationary contact 42. The other part of the second gas flows through the following components: the second movable contact 52 and the second stationary contact 42, the second arc extinguishing system 7, the fourth opening 14 and the gas outlet 15.

[0038] As illustrated in Figs. 1, 2 and 5, each pole of the miniature circuit breaker further includes: a first guide plate 9 disposed at the second opening 12 and configured to guide the first gas; and a second guide plate 10 disposed at the fourth opening 14 and configured to guide the second gas. For example, at least one of the first guide plate 9 and the second guide plate 10 is inclined from a rear wall of the shell 3 towards the interior of the shell and extends away from the corresponding arc extinguishing system. The rear wall of the shell is the wall of the bottom illustrated in Figs. 1, 2 and 5. The inclined extension of the guide plate towards the interior of the shell is for the purpose of driving the first electric arc or the second electric arc to move towards the interior of the shell and prolonging a staying time of the first electric arc or the second electric arc in the corresponding arc extinguishing system, thereby improving the efficiency of arc extinguishing. The first guide plate 9 illustrated in Fig. 5 extends obliquely from the rear wall of the shell towards the upper left, which guides the first gas towards the wall of the shell, so that the first electric arc stays in the first arc extinguishing system for a prolonged time, thereby improving the efficiency of arc extinguishing.

[0039] Moreover, through the design of the double-flow channels and guide plates described above, the electric arcs can enter the arc extinguishing chambers more synchronously, thus providing better protection capability against short-circuit.

[0040] As indicated by the arrows in Figs. 7 and 8, the current flows through the following components in sequence: the input terminal assembly 1, the bimetallic strip 16, the conductive component 43, the first stationary contact 41, the first movable contact 51, the movable contact body 50, the second movable contact 52, the second stationary contact 42, the electromagnetic tripping assembly 8, and the output terminal assembly 2. Therefore, the series connection of two pairs of movable contacts and stationary contacts is realized. It should be noted that, only parts of the input terminal assembly 1 and the output terminal assembly 2 are illustrated in Figs. 7 and 8.

[0041] The miniature circuit breaker according to the present disclosure increases the contact separation and the voltage of electric arc by providing two pairs of movable contacts and stationary contacts connected in series and two corresponding arc extinguishing systems, so that higher rated voltage and rated current can be realized. Moreover, the miniature circuit breaker according to the present disclosure has compact structure and longer service life.

[0042] The technical features disclosed above are not limited to be combined with other features as disclosed. Those skilled in the art may also make other combination(s) of various technical features according to the objective(s) of the present disclosure, as long as the objective(s) of the present disclosure can be achieved.

Claims

1. A miniature circuit breaker, comprising at least one pole arranged in sequence in a first direction, each pole of the at least one pole comprising an input terminal assembly (1) and an output terminal assembly (2), **characterized in that**, each pole further comprises:

a shell (3) comprising a first cavity and a second cavity separated by a spacer (31);

a stationary contact assembly (4) comprising a first stationary contact (41) disposed in the first cavity and a second stationary contact (42) disposed in the second cavity, wherein the first stationary contact and the second stationary contact are separated from each other;

a movable contact assembly (5) comprising a movable contact body (50), a first movable contact (51) extending from the movable contact body into the first cavity and a second movable contact (52) extending from the movable contact body into the second cavity, wherein the first movable contact and the second movable contact can be respectively in contact with or separated from the first stationary contact and the second stationary contact at the same time;

a first arc extinguishing system (6) disposed in the first cavity and configured to extinguish a

first electric arc generated when the first movable contact is separated from the first stationary contact; and

a second arc extinguishing system (7) disposed in the second cavity and configured to extinguish a second electric arc generated when the second movable contact is separated from the second stationary contact.

2. The miniature circuit breaker according to claim 1, **characterized in that**, when the miniature circuit breaker is in a closed state, current flows through the input terminal assembly (1), the first stationary contact (41), the first movable contact (51), the movable contact body (50), the second movable contact (52), the second stationary contact (42) and the output terminal assembly (2), in sequence.
3. The miniature circuit breaker according to claim 2, **characterized in that**, the stationary contact assembly further comprises a conductive member (43) located between the first movable contact and the second movable contact, a first end of the conductive member is electrically connected with the input terminal assembly, and a second end of the conductive member is electrically connected with the first stationary contact, so that the current flows to the first stationary contact through the conductive member.
4. The miniature circuit breaker according to claim 1, **characterized in that**, each pole further comprises an electromagnetic tripping assembly (8), the electromagnetic tripping assembly is disposed in the shell and at least partially outside the first cavity and the second cavity, and the first cavity comprises a first opening (11) opened towards the electromagnetic tripping assembly and a second opening (12) opened towards a gas outlet (15) of the miniature circuit breaker.
5. The miniature circuit breaker according to claim 4, **characterized in that**, the second cavity comprises a third opening (13) opened towards the electromagnetic tripping assembly and a fourth opening (14) opened towards the gas outlet of the miniature circuit breaker.
6. The miniature circuit breaker according to claim 5, **characterized in that**, each pole further comprises a first gas generator and a second gas generator, the first gas generator is disposed at a side of the spacer (31) facing the first cavity so as to be able to generate a first gas under an action of the first electric arc, and the second gas generator is disposed at a side of the spacer (31) facing the second cavity so as to be able to generate a second gas under an action of the second electric arc.

7. The miniature circuit breaker according to claim 6, **characterized in that**, a part of the first gas flows through the first movable contact (51) and the first stationary contact (41), the first arc extinguishing system (6), the first opening (11), the electromagnetic tripping assembly (8), the first movable contact (51) and the first stationary contact (41), in sequence; and the other part of the first gas flows through the first movable contact (51) and the first stationary contact (41), the first arc extinguishing system (6), the second opening (12) and the gas outlet (15), in sequence.
8. The miniature circuit breaker according to claim 6, **characterized in that**, a part of the second gas flows through the second movable contact (52) and the second stationary contact (42), the second arc extinguishing system (7), the third opening (13), the electromagnetic tripping assembly (8), the second movable contact (52) and the second stationary contact (42), in sequence; and the other part of the second gas flows through the second movable contact (52) and the second stationary contact (42), the second arc extinguishing system (7), the fourth opening (14) and the gas outlet (15), in sequence.
9. The miniature circuit breaker according to claim 6, **characterized in that**, each pole further comprises: a first guide plate (9) disposed at the second opening (12) and configured to guide the first gas, and a second guide plate (10) disposed at the fourth opening (14) and configured to guide the second gas.
10. The miniature circuit breaker according to claim 9, **characterized in that**, at least one of the first guide plate (9) and the second guide plate (10) extends obliquely from a rear wall of the shell towards an interior of the shell.
11. The miniature circuit breaker according to claim 1, **characterized in that**, the movable contact assembly has a U-shape.
12. The miniature circuit breaker according to claim 3, **characterized in that**, the conductive part (43) is integrally formed with the first stationary contact (41).

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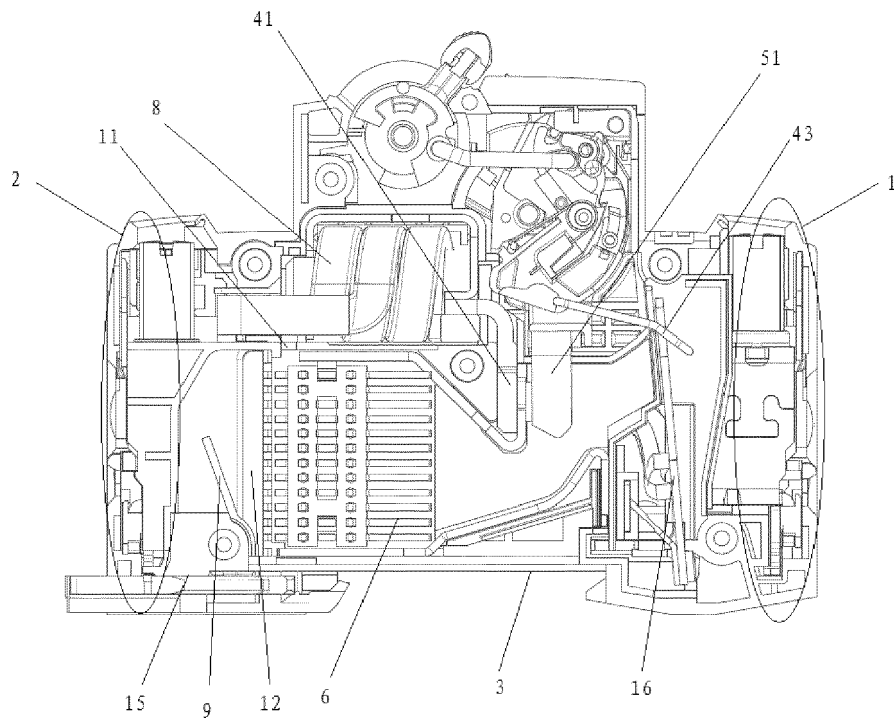


Fig. 1

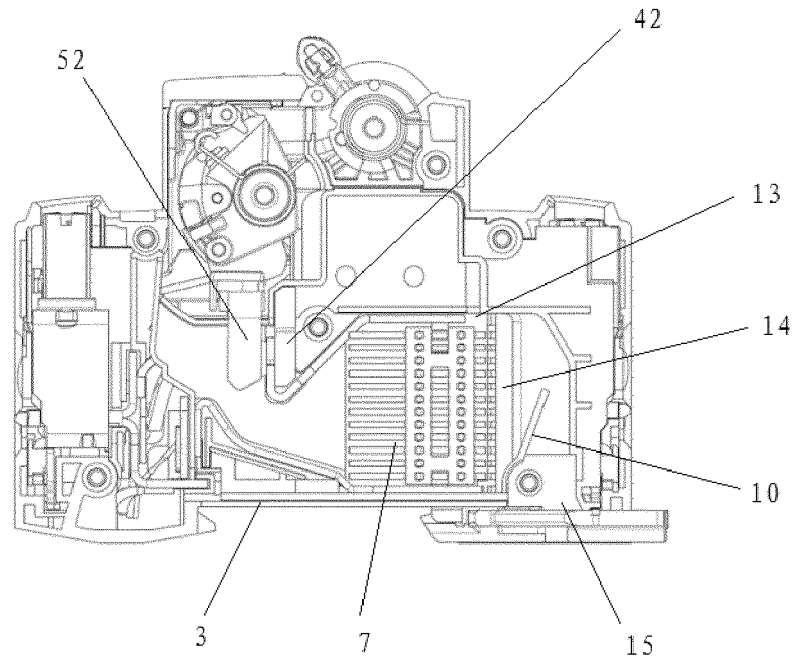


Fig. 2

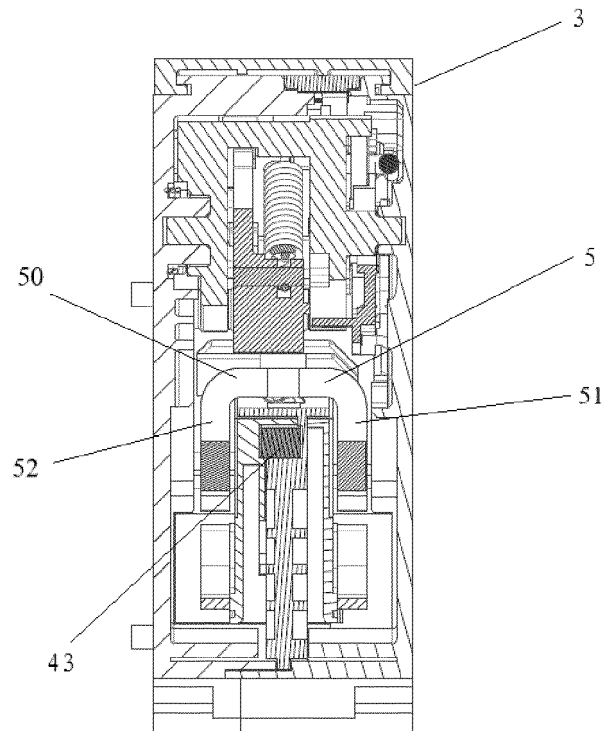


Fig. 3

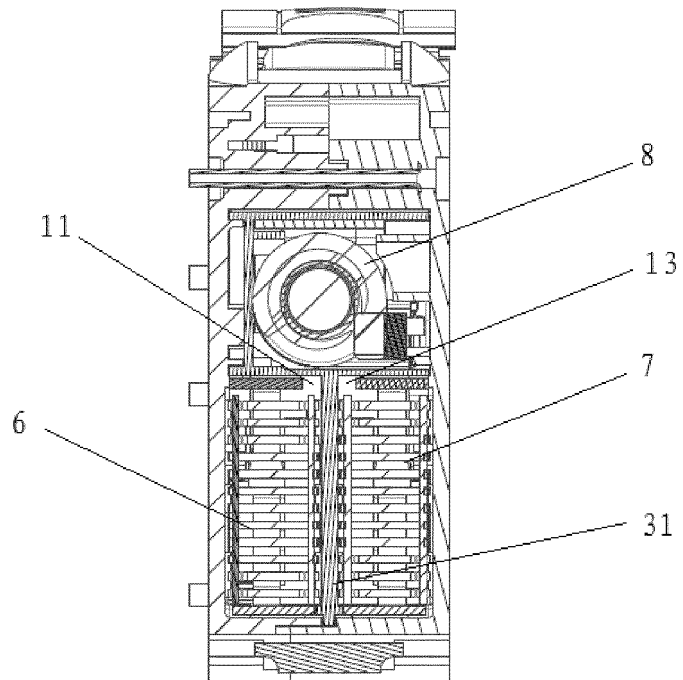


Fig. 4

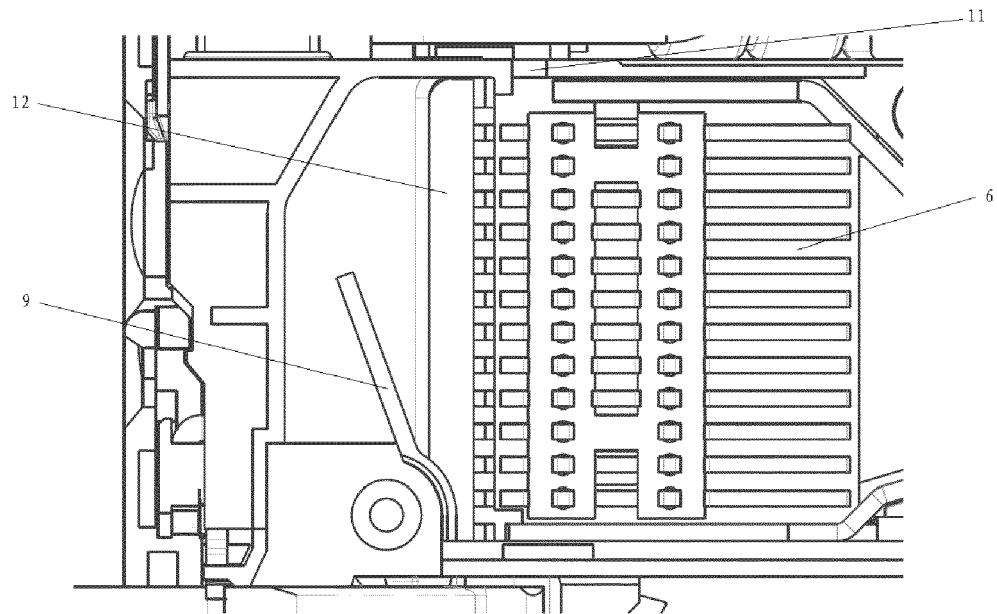


Fig. 5

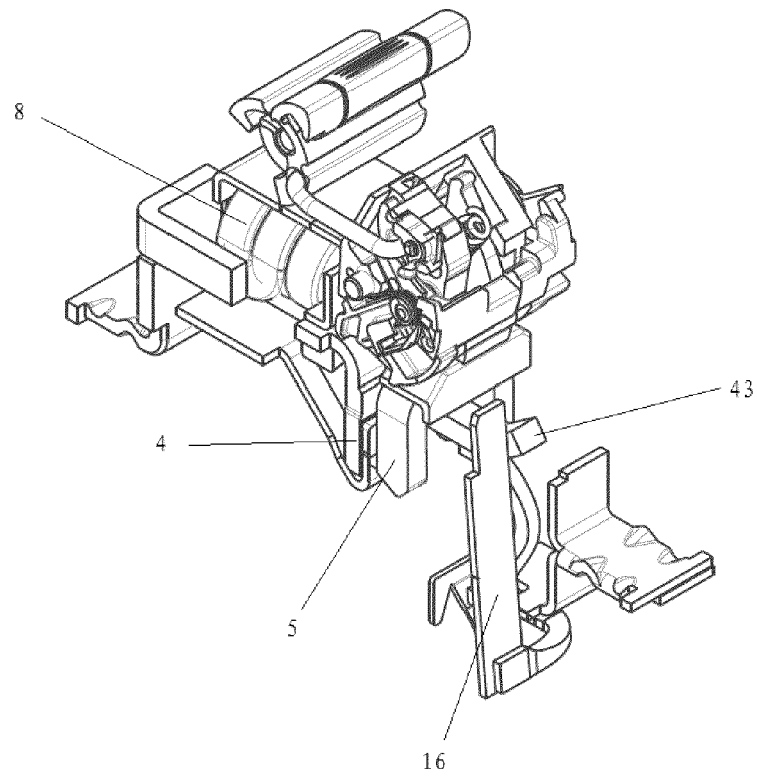


Fig. 6

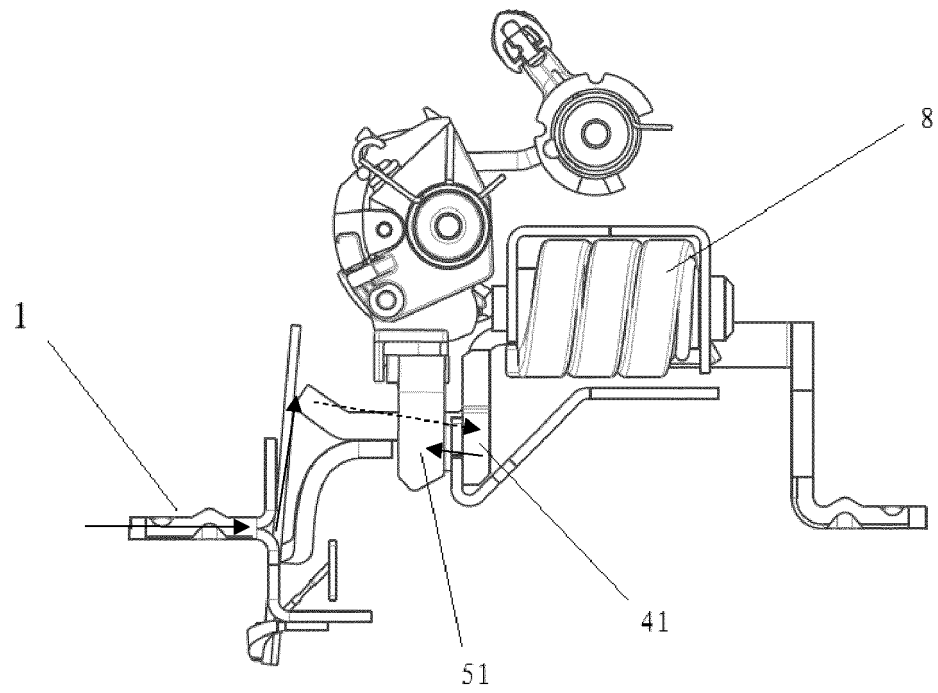


Fig. 7

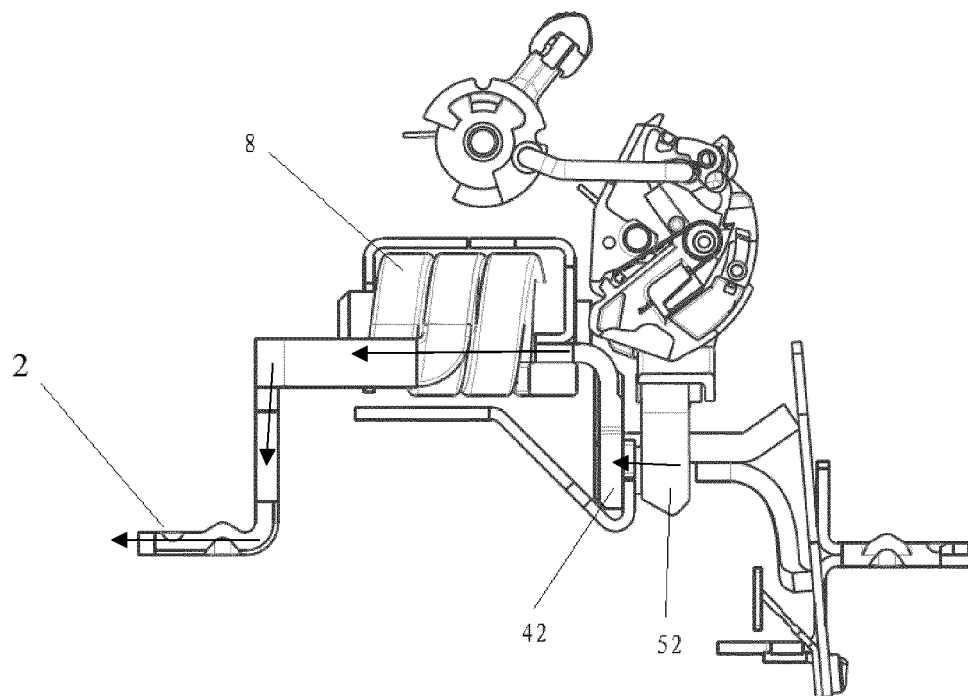


Fig. 8



EUROPEAN SEARCH REPORT

Application Number

EP 22 30 5939

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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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