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(54) MOVING CONTACT PROTECTIVE SLEEVE, CONTACT MODULE HAVING SAME AND ISOLATING SWITCH

(57) The present invention relates to a moving contact protective sleeve, a contact module having same and an isolating switch. The moving contact protective sleeve comprises: a connecting body; a first protective plate, connected on one side of the connecting body; and a second protective plate, connected on another side of the connecting body; wherein the first protective plate, the connecting body and the second protective plate together form a cavity for accommodating a moving contact of the isolating switch. The moving contact protective sleeve according to the present invention is structurally simple and low-cost, can effectively protect the moving contact, and accelerate the extinguishing of an arc. It can enhance the reliability with which current is broken and established, and increase the safety and reliability of the entire contact module and the isolating switch.

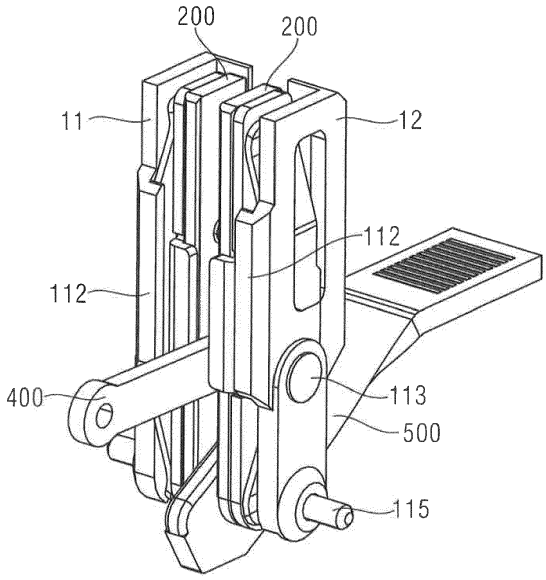

Fig. 2

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Description

Technical field

[0001] The present invention relates to the field of low-voltage electricity, in particular to a moving contact protective sleeve, a contact module having same and an isolating switch.

Background art

[0002] As is known, a moving contact and a static contact are disposed inside a contact module of an isolating switch. An arc will be generated at the moving contact and static contact during breaking, and under the action of the high temperature of the arc, a certain gas may be produced in an arc extinguishing chamber. Thus, a gas hole will generally always be provided in a housing of the contact module of the isolating switch. The gas hole enables gas in the arc extinguishing chamber to be discharged from the interior of the housing, so as to assist in the extinguishing of the arc inside the housing, to ensure the safety and reliability of the product.

[0003] However, in the prior art, the gas flow is relatively limited and the gas discharge channel is long; as a result, the arc lingers for a long time. Since the speed of arc extinguishing is slow, the arc easily bums the contacts, so the safety and reliability of the entire isolating switch have room for improvement.

Content of the invention

[0004] The object of the present invention is to provide a moving contact protective sleeve for an isolating switch, which is structurally simple and convenient to fit, and not only can protect a moving contact effectively, but also accelerates the extinguishing of an arc. The moving contact protective sleeve comprises: a connecting body; a first protective plate, connected on one side of the connecting body; and

a second protective plate, connected on another side of the connecting body; wherein the first protective plate, the connecting body and the second protective plate together form a cavity for accommodating a moving contact of the isolating switch. Having the moving contact accommodated in the cavity formed by the protective sleeve can effectively reduce burning of the moving contact by a high-temperature arc, and enhance the reliability with which current is broken and established; the safety and reliability of the entire contact module and the isolating switch can be increased.

[0005] According to one aspect of the present invention, one end of the connecting body has a slot. This design enables gas produced when an arc burns the slot to squeeze the arc so as to cut it off, thereby accelerating the extinguishing of the arc.

[0006] According to another aspect of the present invention, multiple projecting ribs are also provided on an outer wall of the connecting body, the projecting ribs being close to the slot. Since arc burning only occurs near the slot, and cannot extend to another region, the multiple projecting ribs disposed close to the slot make arc burning more complete, in order to produce more gas. The burning time of the moving contact can be reduced significantly, further accelerating the extinguishing of the arc, and extending the service life of the product.

[0007] According to another aspect of the present invention, the first protective plate and the second protective plate are both perpendicular to the connecting body, one end of the first protective plate and one end of the second protective plate are each provided with a locating rib, said ends being remote from the connecting body, the locating ribs being used for retaining the moving contact in the cavity, in order to ensure the tightness of the connection between the moving contact and the protective sleeve, and thereby enhance the reliability of operation.

[0008] According to another aspect of the present invention, a first fastening element is also connected to the first protective plate and second protective plate, the first fastening element being used to fix the moving contact to a connecting rod.

[0009] According to another aspect of the present invention, the first fastening element is a first locating pin, the first protective plate and the second protective plate are each provided with a first locating hole, and the first locating pin can pass through the first locating holes in the first protective plate and the second protective plate respectively, to fix the moving contact and the connecting rod between the first protective plate and second protective plate.

[0010] According to another aspect of the present invention, a second fastening element is also connected to the first protective plate and second protective plate, the second fastening element being used to fix the moving contact to a fixed plate.

[0011] According to another aspect of the present invention, the second fastening element is a second locating pin, the first protective plate and the second protective plate are each provided with a second locating hole, and the second locating pin can pass through the second locating holes in the first protective plate and the second protective plate respectively, to fix the moving contact and the fixed plate between the first protective plate and second protective plate.

[0012] According to another aspect of the present invention, the moving contact protective sleeve is a plastic element,

which is easy to process and fit, and is low-cost. The plastic element is preferably a fire retardant material, which can produce a fire retardant gas when burnt by an arc, helping to accelerate the extinguishing of the arc.

[0013] The present invention also discloses a contact module. The contact module comprises: a housing; a pair of static contacts, disposed on the housing; a main shaft, rotatably connected to the housing; a pair of fixed plates, connected to the housing and located on two sides of the main shaft; a pair of connecting rods, rotatably connected on two sides of the main shaft; and a pair of moving contacts, each having one end connected in a fixed manner to the fixed plate and another end capable of rotating under the driving action of the connecting rod, so as to enable the moving contact to switch between a disconnected position and a contact position relative to the static contact, wherein a moving contact protective sleeve having the structure and characteristics described above is provided round the moving contact, and the shape of the slot matches the outer contour of an end of the static contact. Since the moving contact protective sleeve can effectively protect the moving contact and accelerate the extinguishing of the arc, the safety and reliability of the entire contact module are enhanced.

[0014] The present invention also discloses an isolating switch. The isolating switch comprises a drive module and a plurality of contact modules having the structure and characteristics described above. Since the moving contact protective sleeve of the isolating switch can effectively protect the moving contact and accelerate the extinguishing of the arc, the safety and reliability of the entire isolating switch are increased.

Description of the accompanying drawings

[0015] The present invention is explained in detail below in conjunction with the accompanying drawings and particular embodiments, wherein:

Fig. 1 is a longitudinal sectional schematic diagram of a contact module according to an embodiment of the present invention;
Fig. 2 is a partial structural schematic diagram of the contact assembly in Fig. 1;
Fig. 3 is an exploded schematic diagram of the structure in Fig. 2; and
Figs. 4A, 4B and 4C are schematic positional relationship diagrams of the moving contact protective sleeve as the moving contact and static contact move from a contact position to a disconnected position.

Key to labels

moving contact protective sleeve 100	first protective plate 11
connecting body 10	second protective plate 12
slot 101	locating rib 112
projecting rib 102	cavity 120
moving contact 200	connecting rod 400
first fastening element 113	fixed plate 500
first locating hole 114	main shaft 600
second fastening element 115	housing 700
second locating hole 116	contact module 800
static contact 300	

Particular embodiments

[0016] To enable clearer understanding of the technical features, object and effects of the presnt invention, particular embodiments of the present invention are now explained with reference to the accompanying drawings, in which identical labels indicate structurally identical components or components with similar structures but identical functions.

[0017] As used herein, "schematic" means "serving as an instance, example or illustration". No drawing or embodiment described herein as "schematic" should be interpreted as a more preferred or more advantageous technical solution.

[0018] To make the drawings appear uncluttered, only those parts relevant to the present invention are shown schematically in the drawings; they do not represent the actual structure thereof as a product. Furthermore, to make the drawings appear uncluttered for ease of understanding, in the case of components having the same structure or function in certain drawings, only one of these is drawn schematically, or only one is marked.

[0019] As used herein, "top", "bottom", "front", "rear", "left" and "right" etc. are merely used to indicate a positional relationship between relevant parts, not to define their absolute positions.

[0020] As used herein, "first" and "second" etc. are merely used to differentiate between parts, not to indicate their

order or degree of importance, etc.

[0021] As used herein, "parallel" and "perpendicular" etc. are not strict limitations in the mathematical and/or geometric sense, but include errors which can be understood by those skilled in the art and are permitted in manufacture or use, etc.

[0022] Reference is made to Fig. 1, which is a longitudinal sectional schematic view of a contact module 800 for an isolating switch, and clearly shows the approximate structure of the interior of the contact module.

[0023] Referring to Figs. 1 and 2, specifically, the contact module 800 comprises: a housing 700; a pair of static contacts 300, disposed on the housing 700; a main shaft 600, rotatably connected to the housing 700, for driving movement of moving contacts 200, to realize separation and connection of the moving contacts 200 and the static contacts 300; a pair of fixed plates 500, which are connected to the housing 700 and located on two sides of the main shaft 600, and may be used for mounting wiring boards; a pair of connecting rods 400, rotatably connected on two sides of the main shaft 600, for transmitting a driving force of the main shaft 600; and a pair of moving contacts 200, each having one end connected in a fixed manner to the fixed plate 500 and another end capable of rotating under the driving action of the connecting rod 400, so as to enable the moving contact 200 to switch between a disconnected position and a contact position relative to the static contact 300. It is worth pointing out that in order to reduce burning of the moving contact by the high-temperature arc, a moving contact protective sleeve 100 is provided round the outside of the moving contact 200 in the present invention. It is worth pointing out that the moving contact protective sleeve 100 is a plastic element. Preferably, the moving contact protective sleeve 100 is of a fire-retardant plastic material.

[0024] Referring to Fig. 3, specifically, the moving contact protective sleeve 100 comprises: a connecting body 10, a first protective plate 11, and a second protective plate 12. The first protective plate 11 is connected on one side of the connecting body 10. The second protective plate 12 is connected on another side of the connecting body 10. It is worth pointing out that the first protective plate 11, the connecting body 10 and the second protective plate 12 together form a cavity 120 for accommodating the moving contact 200 of the isolating switch.

[0025] One end of the connecting body 10 has a slot 101. On the one hand, the slot 101 may be used to accommodate the static contact 300 of the isolating switch in a fitting manner, to allow the moving contact 200 to maintain contact with the static contact 300 in a certain switching state, so as to complete the circuit. On the other hand, since gas is only generated at surfaces burnt by the arc, and the arc connects the moving and static contacts, and inevitably passes through the slot 101, the gas generated in the slot 101 squeezes the arc, and cuts off the arc. Moreover, these gases themselves have a fire retardant component, and will dilute charged particles in the arc, increasing the insulating strength of the surrounding space, and helping to extinguish the arc. Preferably, the shape of the slot 101 matches the outer contour of an end of the static contact 300, and can ensure the reliability when the static contact 300 is in contact with the moving contact 200.

[0026] In order to better fix the moving contact 200 inside the moving contact protective sleeve 100, such that the structural connection is more compact, the first protective plate 11 and the second protective plate 12 are both perpendicular to the connecting body 10, one end of the first protective plate 11 and one end of the second protective plate 12 are each provided with a locating rib 112, said ends being remote from the connecting body 10, the locating ribs being used for retaining the moving contact 200 in the cavity 120, and preventing the moving contact 200 from coming out of the cavity 120 during movement, so the reliability of operation can be ensured.

[0027] It is worth pointing out that a first fastening element 113 is also connected to the first protective plate 11 and second protective plate 12, the first fastening element 113 being used to fix the moving contact 200 to a connecting rod 400. Specifically, in a preferred embodiment, the first fastening element 113 is preferably a first locating pin, the first protective plate 11 and the second protective plate 12 are each provided with a first locating hole 114, and the first locating pin can pass through the first locating holes 114 in the first protective plate 11 and the second protective plate 12 respectively, to fix the moving contact 200 and the connecting rod 400 between the first protective plate 11 and second protective plate 12.

[0028] It is worth pointing out that a second fastening element 115 is also connected to the first protective plate 11 and second protective plate 12, the second fastening element 115 being used to fix the moving contact 200 to a fixed plate 500. Specifically, in a preferred embodiment, the second fastening element 115 is preferably a second locating pin, the first protective plate 11 and the second protective plate 12 are each provided with a second locating hole 116, and the second locating pin can pass through the second locating holes 116 in the first protective plate 11 and the second protective plate 12 respectively, to fix the moving contact 200 and the fixed plate 500 between the first protective plate 11 and second protective plate 12.

[0029] Reference is made to Figs. 4 - 6, which are schematic diagrams showing the positional relationships between the protective sleeve 100 and the static contact 300 as the moving contact 200 and static contact 300 of the isolating switch of the present invention gradually move from a contact position to a disconnected position.

[0030] Under the driving action of the main shaft 600, the connecting rod 400 drives the moving contact 200 to rotate in a direction away from the static contact 300. At the instant when the moving contact 200 and the static contact 300 are separated, an arc will be generated. Since the moving contact protective sleeve 100 is made of a fire retardant plastic material, burning will occur at the position of the slot 101 of the moving contact protective sleeve 100 under the action

of the high-temperature arc, and this burning will inevitably produce gas. Since the housing 700 is provided with a gas hole, the gas will flow towards the gas hole, and the gas flow can promote extinguishing of the arc. To increase gas flow, preferably, multiple projecting ribs 102 are also provided on an outer wall of the connecting body 10. The projecting ribs 102 are close to the slot 101, therefore, when an arc occurs, burning is more complete because the effective contact area between the moving contact protective sleeve 100 and the arc is increased, and the amount of fire retardant gas produced will increase accordingly. The release of a large amount of fire retardant gas also effectively accelerates extinguishing of the arc.

[0031] Due to the presence of the moving contact protective sleeve 100, arc burning only occurs close to the slot 101, and will not extend to another region. Moreover, the fire retardant gas produced by the protective sleeve 100 can greatly reduce the burning time of the moving contact, so is effective at protecting the moving contact 200. Since the moving contact protective sleeve 100 is of a plastic material, processing and assembly are very convenient, costs are low, and the weight of the entire structure is not affected.

[0032] At the same time, the present invention also discloses a contact module 800. The contact module 800 has a moving contact protective sleeve 100 with the structure and characteristics described above. The present invention further discloses an isolating switch, comprising a drive module and multiple contact modules 800 having the structure and characteristics described above.

[0033] In summary, through the use of the moving contact protective sleeve 100 of the present invention, burning of moving contacts 200 by the arc is avoided effectively, and the reliability with which current is broken and established is enhanced, such that the safety and reliability of the entire contact module 800 and even the isolating switch are increased significantly. At the same time, since the moving contact protective sleeve 100 of the present invention is of a fire retardant plastic material, the amount of fire retardant gas discharged can be increased, and the speed at which the arc is extinguished can be increased. Moreover, the protective sleeve 100 is structurally simple, low-cost and convenient to fit, so the market competitiveness of the product is enhanced.

[0034] It should be understood that although the description herein is based on various embodiments, it is by no means the case that each embodiment contains just one independent technical solution. Such a method of presentation is adopted herein purely for the sake of clarity. Those skilled in the art should consider the description in its entirety. The technical solutions in the various embodiments could also be suitably combined to form other embodiments capable of being understood by those skilled in the art.

[0035] The series of detailed explanations set out above are merely particular explanations of feasible embodiments of the present invention, which are not intended to limit the scope of protection thereof. All equivalent embodiments or changes made without departing from the artistic spirit of the present invention, such as combinations, divisions or repetitions, shall be included in the scope of protection of the present invention.

Claims

1. A moving contact protective sleeve (100) for an isolating switch, comprising:

   a connecting body (10);
   a first protective plate (11), connected on one side of the connecting body (10); and
   a second protective plate (12), connected on another side of the connecting body (10);
   wherein the first protective plate (11), the connecting body (10) and the second protective plate (12) together form a cavity (120) for accommodating a moving contact (200) of the isolating switch.

2. The moving contact protective sleeve as claimed in claim 1, wherein one end of the connecting body (10) has a slot (101).

3. The moving contact protective sleeve as claimed in claim 1, wherein multiple projecting ribs (102) are also provided on an outer wall of the connecting body (10), the projecting ribs (102) being close to the slot (101).

4. The moving contact protective sleeve as claimed in claim 1, wherein the first protective plate (11) and the second protective plate (12) are both perpendicular to the connecting body (10), one end of the first protective plate (11) and one end of the second protective plate (12) are each provided with a locating rib (112), said ends being remote from the connecting body (10), the locating ribs being used for retaining the moving contact (200) in the cavity.

5. The moving contact protective sleeve as claimed in claim 1, wherein a first fastening element (113) is also connected to the first protective plate (11) and second protective plate (12), the first fastening element (113) being used to fix the moving contact (200) to a connecting rod (400).

6. The moving contact protective sleeve as claimed in claim 5, wherein the first fastening element (113) is a first locating pin, the first protective plate (11) and the second protective plate (12) are each provided with a first locating hole (114), and the first locating pin can pass through the first locating holes (114) in the first protective plate (11) and the second protective plate (12) respectively, to fix the moving contact (200) and the connecting rod (400) between the first protective plate (11) and second protective plate (12).

7. The moving contact protective sleeve as claimed in claim 1, wherein a second fastening element (115) is also connected to the first protective plate (11) and second protective plate (12), the second fastening element (115) being used to fix the moving contact (200) to a fixed plate (500).

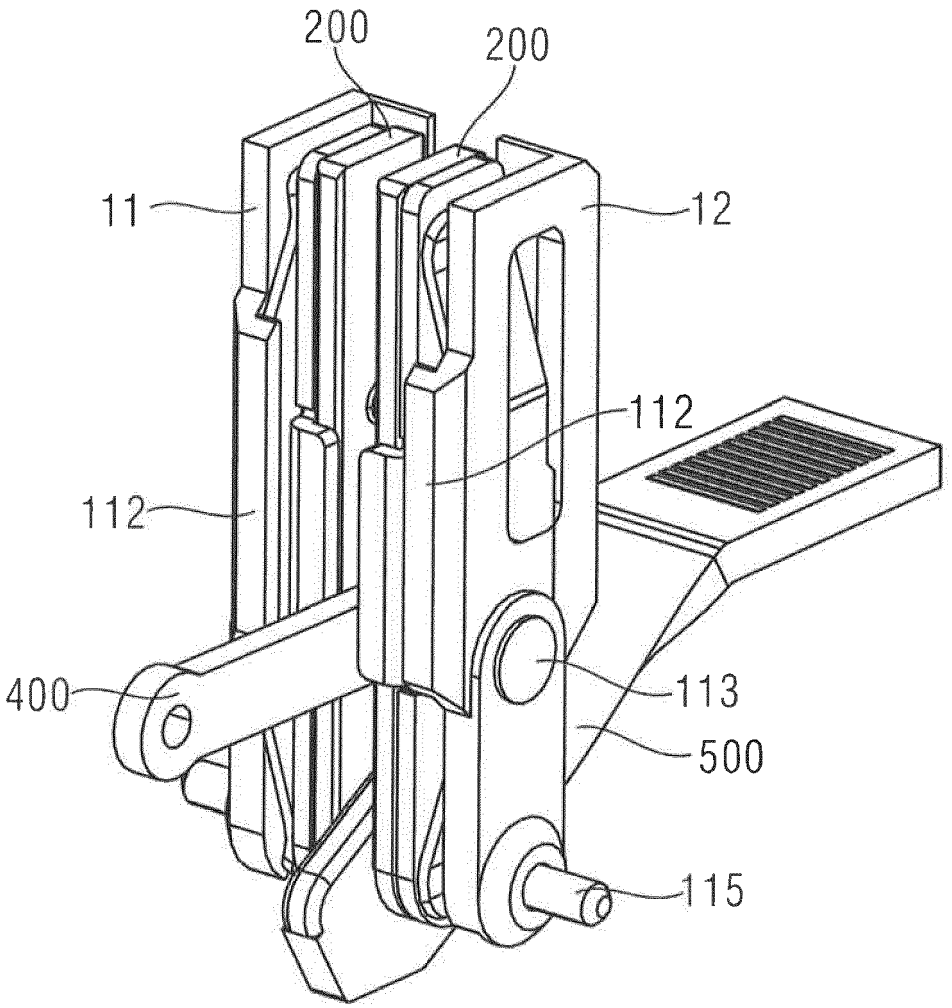
8. The moving contact protective sleeve as claimed in claim 7, wherein the second fastening element (115) is a second locating pin, the first protective plate (11) and the second protective plate (12) are each provided with a second locating hole (116), and the second locating pin can pass through the second locating holes (116) in the first protective plate (11) and the second protective plate (12) respectively, to fix the moving contact (200) and the fixed plate (500) between the first protective plate (11) and second protective plate (12).

9. The moving contact protective sleeve as claimed in claim 1, wherein the moving contact protective sleeve (100) is a plastic element.

10. A contact module (800), comprising:

a housing (700);
a pair of static contacts (300), disposed on the housing (700);
a main shaft (600), rotatably connected to the housing (700);
a pair of fixed plates (500), connected to the housing (700) and located on two sides of the main shaft (600);
a pair of connecting rods (400), rotatably connected on two sides of the main shaft (600); and
a pair of moving contacts (200), each having one end connected in a fixed manner to the fixed plate (500) and another end capable of rotating under the driving action of the connecting rod (400), so as to enable the moving contact (200) to switch between a disconnected position and a contact position relative to the static contact (300), wherein a moving contact protective sleeve (100) as claimed in any one of claims 1 - 9 is provided round the moving contact (200), and the shape of the slot (101) matches the outer contour of an end of the static contact (300).

11. An isolating switch, comprising: a drive module and a plurality of contact modules (800) as claimed in claim 10.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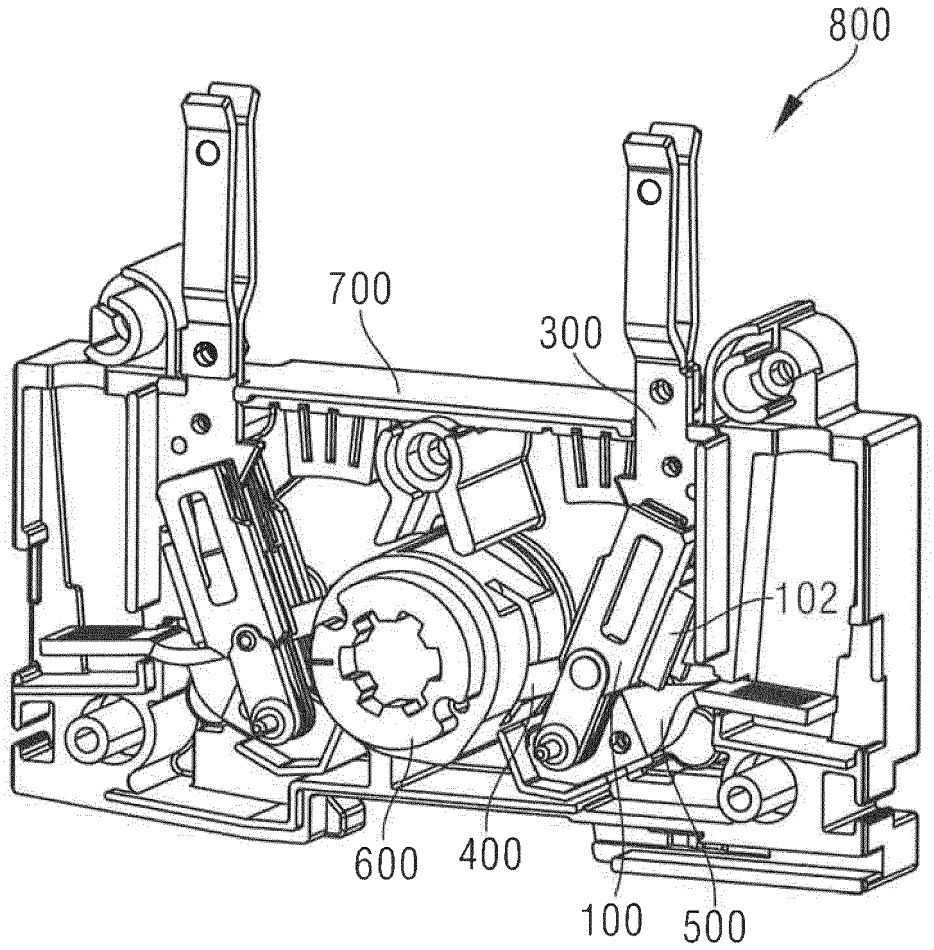

Fig. 1

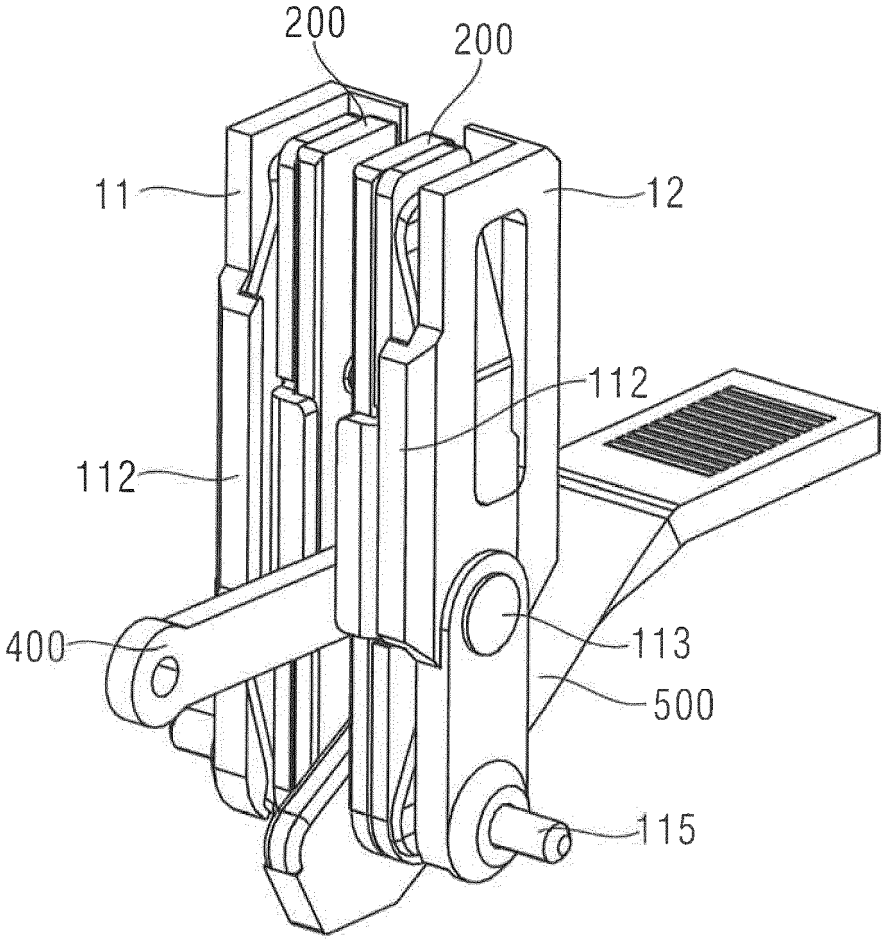

Fig. 2

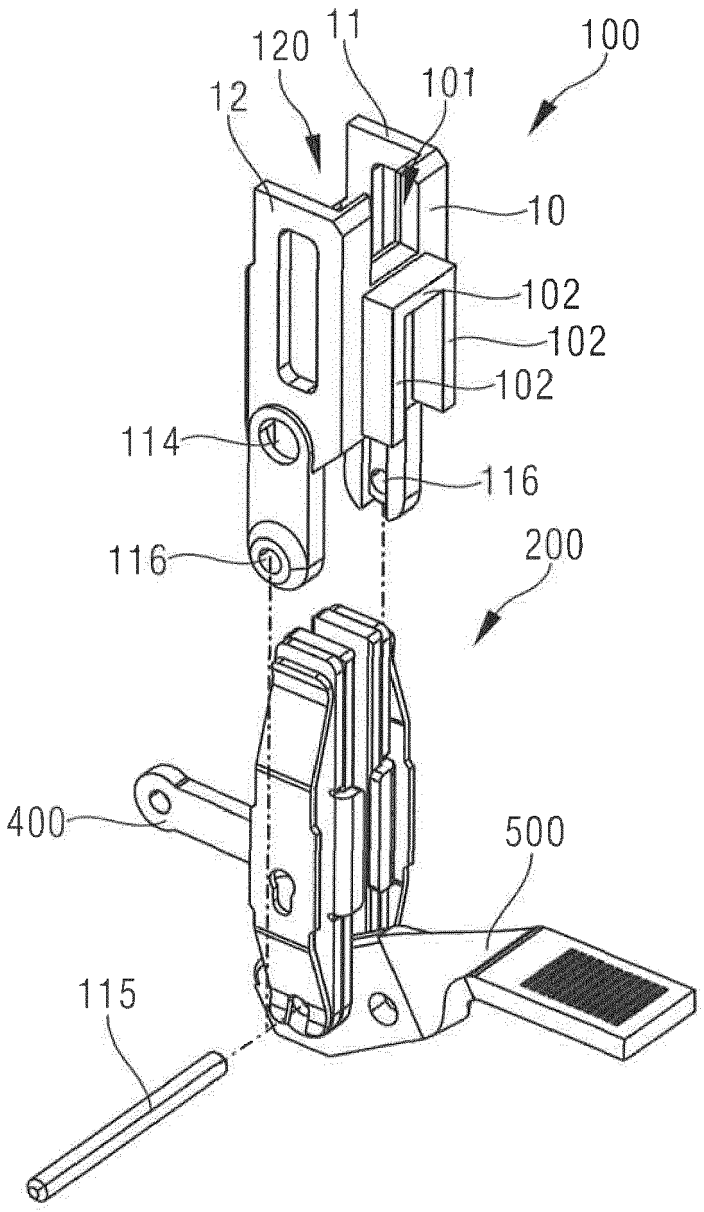

Fig. 3

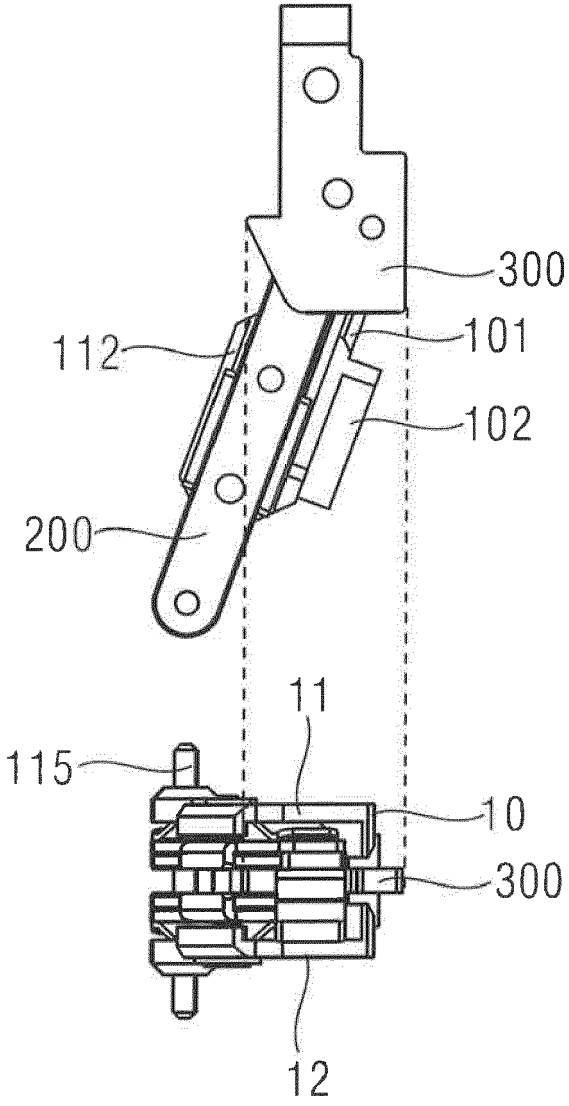

Fig. 4

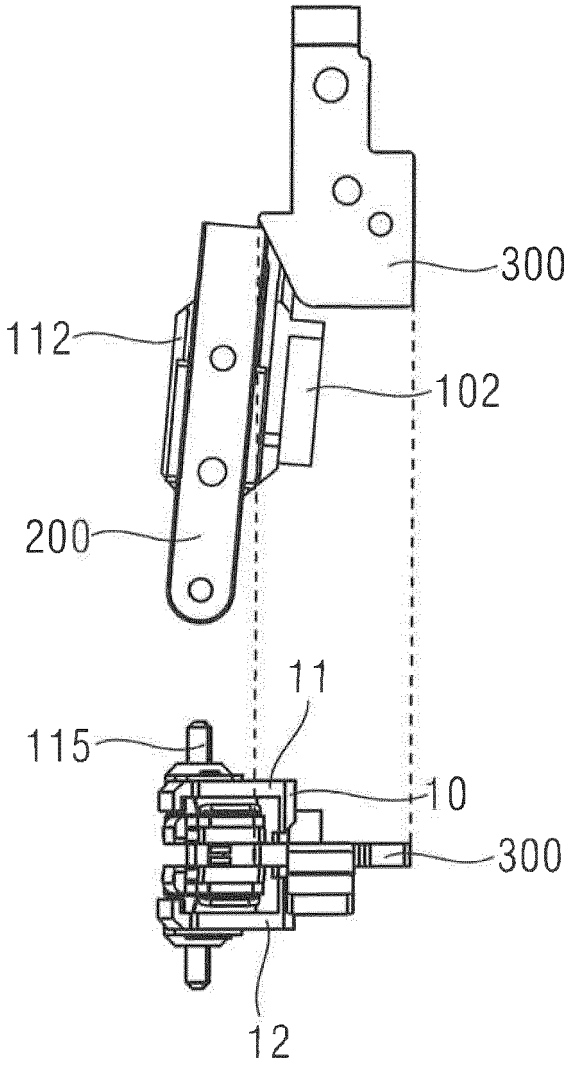

Fig. 5

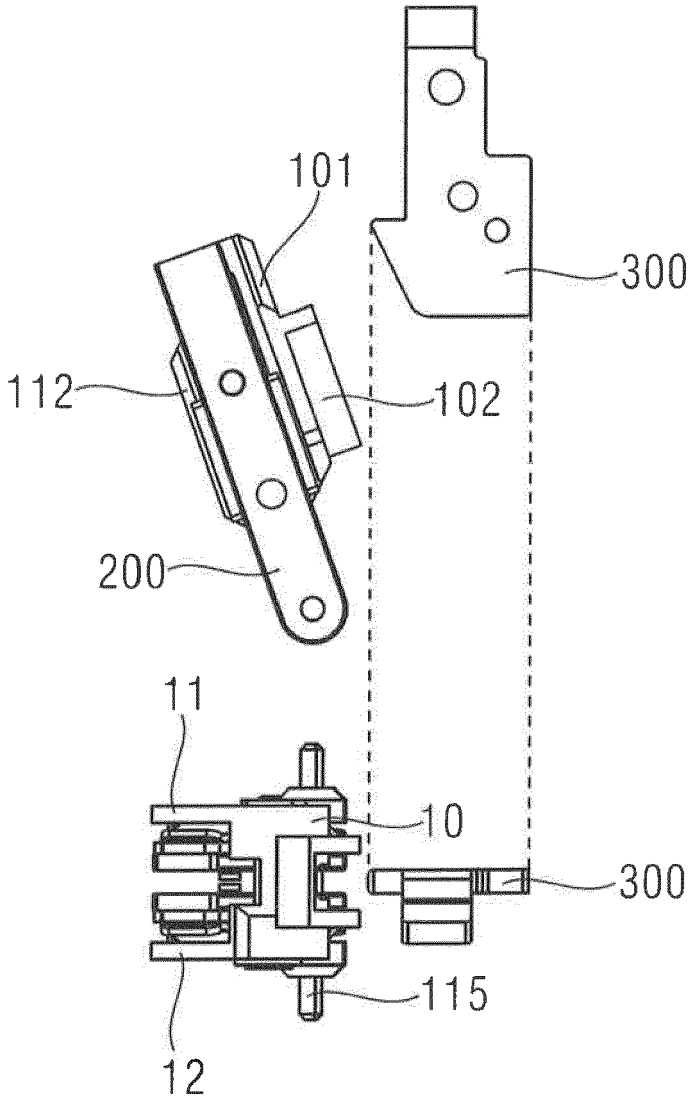

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 17 16 2877

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CN 102 184 814 A (JIANGSU PHONO ELECTRIC CO LTD) 14 September 2011 (2011-09-14)	1-6,9	INV. H01H31/28
Y	* page 4, paragraph 0010 - paragraph 0013; figures 1,2 *	7,8,10, 11	H01H3/46
	-----		ADD.
X	DE 203 12 624 U1 (MOELLER GMBH [DE]) 23 December 2004 (2004-12-23)	1-6,9	H01H1/42 H01H31/12
Y	* page 2, paragraph 0010 - page 3, paragraph 0023; figures 1-3 *	7,8,10, 11	H01H9/30

X	CZ 298 548 B6 (OEZ [CZ]) 31 October 2007 (2007-10-31)	1-6,9	
Y	* page 2, line 45 - page 3, line 23; figures 1,2 *	7,8,10, 11	

Y	EP 2 963 665 A1 (SIEMENS AG [DE]) 6 January 2016 (2016-01-06)	7,8,10, 11	
A	* page 3, paragraph 0017 - paragraph 0027; figures 1,2 *	1-6,9	

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	18 July 2017	Pavlov, Valeri

CATEGORY OF CITED DOCUMENTS

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18-07-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 102184814 A	14-09-2011	NONE	
DE 20312624 U1	23-12-2004	NONE	
CZ 298548 B6	31-10-2007	NONE	
EP 2963665 A1	06-01-2016	CN 105336523 A	17-02-2016
		EP 2963665 A1	06-01-2016

EPO FORM P0459

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