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(54) **Static contact support for circuit breaker and circuit breaker thereof**

Statischer Kontaktträger für einen Schutzschalter und Schutzschalter damit

Support de contact statique pour disjoncteur et disjoncteur associé

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Description

Technical field

[0001] The present invention relates to a static contact support, in particular to a static contact support for a small circuit breaker.

Background art

[0002] In a small circuit breaker, the current in a circuit under normal operating conditions can be established, carried and cut off by joining and separating a moving contact and a static contact. A micro circuit breaker can also carry and cut off an abnormal current within a given time in specified scenarios, for example under abnormal operating conditions such as overload and open circuit.

[0003] A static contact is mounted on a static contact support. When the moving contact separates from the static contact, the static contact support carries a very large current, and must also channel the arc produced between the moving and static contacts to an arc extinguishing system disposed in the circuit breaker. Existing static contact supports are made of copper-plated steel or pure copper. Static contact mounting supports of copper-plated steel have very good mechanical strength, but high resistivity, so generate a lot of heat when carrying a current. Static mounting supports of pure copper have low resistivity, but also low mechanical strength and low magnetic permeability, so they are unable to extinguish the arc produced between the moving and static contacts.

[0004] Further, in WO 2006/120140 A1 an electrical contact device, in particular for low-voltage switches and contractors is disclosed. The electrical contact device comprises a contact element produced in one piece. Said contact element comprises in particular a first conducting area and a second contact area, said first area and said second area being produced with materials of different type.

[0005] Furthermore, in WO 2010/079106 A1 a moving element for a low voltage switching device and a switching device comprising said moving element is disclosed. The moving element comprises for each pole a housing unit suitable to receive an elastic element which interacts with an electrical contact. This latter comprises a first contact portion susceptible to contact a further electrical contact and a second portion connectable to a conductive element of the switching device.

Further, in GB 1164164 A a switch-gear contact with electrodynamic reinforcement of contact pressure is disclosed, which comprises a resiliently mounted pivotal part for abutting engagement with a contact and supported on a rigid part having portions substantially at right angles, with the part parallel and close to the pivotal part so that the current assists contact pressure. In breaking circuit the contact is tilted by a spring so that the leading edge first makes contact before a break is made at the raised portion so that arcing at the portion is avoided. Owing to the hairpin shape of the current path the arc tends to be blown outwards by the electrodynamic forces.

[0006] Moreover, in US 2,788,421 a multi-pole circuit breaker is disclosed which includes a base and a cover of molded insulating material, an operating mechanism and a trip device.

Content of the invention

[0007] An object of the present invention is to provide a static contact support for a circuit breaker, which can help to extinguish an arc produced between a moving contact and a static contact in a circuit breaker.

[0008] Another object of the present invention is to provide a circuit breaker which uses the static contact support.

[0009] The present invention provides a static contact support for a circuit breaker, comprising a base layer and a reinforcing layer. The base layer is for transferring current passing through the circuit breaker. The reinforcing layer is superposed on the base layer, can provide the base layer with structural support, and can attract an arc produced between a moving contact and a static contact in the circuit breaker into an arc extinguishing mechanism of the circuit breaker, wherein the reinforcing layer and the base layer are superposed by a process for combining metals.

[0010] In the static contact support of the circuit breaker, an electrically conductive base layer on the one hand means that current flowing through the static contact support produces very little heat; on the other hand, good heat-conducting properties in the base layer enable the static contact support to cool the arc, helping to extinguish it. The reinforcing layer has good mechanical strength and magnetic permeability. On the one hand, this means it can reinforce the mechanical strength of the base layer; on the other hand, the magnetically permeable reinforcing layer can channel the arc into the arc extinguishing mechanism of the circuit breaker, so it is extinguished quickly. Furthermore, being superposed, the base layer and reinforcing layer can be conveniently fitted into the circuit breaker.

[0011] In another schematic embodiment of the static contact support of the circuit breaker, the base layer is made of copper metal. In another schematic embodiment of the static contact support of the circuit breaker, the reinforcing layer is made of steel.

[0012] In another schematic embodiment of the static contact support of the circuit breaker, the ratio of the thickness of the base layer to the thickness of the reinforcing layer is 1 - 2.5 : 1.

[0013] The present invention also provides a circuit breaker, comprising a moving contact assembly and a static contact assembly. The moving contact assembly comprises a moving contact support and a moving contact disposed on the moving contact support. The static contact assembly comprises a static contact support as

described above, and a static contact disposed on the static contact support and capable of contacting the moving contact.

[0014] In another schematic embodiment of the circuit breaker, the side of the static contact support which is close to the moving contact assembly is the base layer, while the side of the static contact support which is remote from the moving contact assembly is the reinforcing layer.

[0015] In another schematic embodiment of the circuit breaker, the static contact is connected to the base layer.

Description of the accompanying drawing

[0016] The accompanying drawing below merely illustrates and explains the present invention schematically, without defining the scope thereof.

[0017] Key to labels

10	static contact assembly
12	static contact support
122	base layer
124	reinforcing layer
14	static contact
20	moving contact assembly
22	moving contact support
24	moving contact.

Particular embodiments

[0018] To give a clearer understanding of the technical features, objects and effects of the present invention, particular embodiments thereof are now explained with reference to the accompanying drawings, in which identical labels denote identical components.

[0019] In this text, "schematic" means "serving as a real instance, example or illustration". No drawing or embodiment described herein as "schematic" should be interpreted as being a more preferred or more advantageous technical solution.

[0020] To make the drawings uncluttered, only those parts which are relevant to the present invention are shown schematically in each drawing; these parts do not represent the actual structure of the present invention as a product. Moreover, to make the drawings uncluttered and easy to understand, in certain drawings where there are components having the same structure or function, only one of these components is drawn schematically, or only one is labeled.

[0021] In this text, "one" not only means "just this one", but may also mean "more than one".

[0022] In this text, "upper", "lower", "front", "rear", "left" and "right", etc. are used only to indicate the positional relationship between relevant parts, without defining their absolute positions.

[0023] Fig. 1 is a structural schematic diagram intended to illustrate a schematic embodiment of a static contact support for a circuit breaker. As the figure shows, the circuit breaker comprises a static contact assembly 10 and a moving contact assembly 20.

[0024] The static contact assembly 10 comprises a static contact support 12 and a static contact 14. The static contact 14 can be mounted on the static contact support 12.

[0025] The static contact support 12 comprises a base layer 122 and a reinforcing layer 124; the reinforcing layer 124 is superposed on the base layer 122. The base layer 122 is made of a material with good heat-conducting and electricity-conducting properties, such as copper metal; the reinforcing layer 124 is made of a material with good mechanical strength and magnetic permeability, such as steel. In a schematic embodiment of the static contact support for a circuit breaker, the reinforcing layer 124 is superposed on the base layer 122 by a process for combining two metals.

[0026] The moving contact assembly 20 comprises a moving contact support 22 and a moving contact 24; the moving contact 24 can be mounted on the moving contact support 22.

[0027] In a schematic embodiment of the static contact support for a circuit breaker, the side of the static contact support 12 which is close to the moving contact assembly 20 is the base layer 122, while the side of the static contact support which is remote from the moving contact assembly 20 is the reinforcing layer 124. The static contact 14 which contacts the moving contact 24 is connected to the base layer 122. With such an arrangement, the path formed by the static contact and base layer for conducting electricity and heat is the shortest, while the reinforcing layer can provide the base layer with mechanical support, and attract the arc between the moving contact and static contact into an arc extinguishing mechanism. In the static contact support for a circuit breaker, the base layer has good electricity-conducting and heat-conducting properties. On the one hand, this means that current flowing through the static contact support produces very little heat; on the other hand, the good heat-conducting properties of the base layer enable the static contact support to cool the arc, helping to extinguish it. The reinforcing layer has good mechanical strength and magnetic permeability. On the one hand, this means it can reinforce the mechanical strength of the base layer; on the other hand, the magnetically permeable reinforcing layer can channel the arc into the arc extinguishing mechanism of the circuit breaker, so it is extinguished quickly. Furthermore, being superposed, the base layer and reinforcing layer can be conveniently fitted into the circuit breaker.

In a schematic embodiment of the static contact support for a circuit breaker, by adjusting the ratio of the thicknesses of the base layer and reinforcing layer, it is possible to adjust the heat-conducting properties, electricity-conducting properties, mechanical strength and magnetic permeability of the static contact support correspondingly. When the base layer is thicker, the static contact support has better heat-conducting and electricity-conducting properties, whereas when the reinforcing layer

is thicker, the static contact support has better mechanical strength and magnetic permeability. For example, the ratio of the thickness of the base layer to the thickness of the reinforcing layer could be 2.5 : 1 or 1 : 1.

[0028] It should be understood that although the description given herein is based on different embodiments, it is by no means the case that each embodiment comprises just one independent technical solution. The description is written in this way purely for the sake of clarity. Those skilled in the art should consider the description in its entirety; technical solutions from different embodiments can also be suitably combined to form other embodiments capable of being understood by those skilled in the art.

[0029] The detailed explanations set out above are merely specific explanations of feasible embodiments, and are not intended to limit the scope of protection of the present invention.

Claims

1. A static contact support (12) for a circuit breaker, **characterized in that** it comprises:

   a base layer (122) for transferring current passing through the circuit breaker; and
   a reinforcing layer (124), which is superposed on the base layer (122) and can provide the base layer (122) with structural support, **characterized in that** the reinforcing layer (124) can attract an arc produced between a moving contact and a static contact in the circuit breaker into an arc extinguishing mechanism of the circuit breaker, wherein the reinforcing layer (124) and the base layer (122) are superposed by a process for combining two metals.

2. The static contact support according to claim 1, wherein the base layer (122) is made of copper metal.

3. The static contact support according to any of the preceding claims, wherein the reinforcing layer (124) is made of steel.

4. The static contact support according to any of the preceding claims, wherein the ratio of the thickness of the base layer to the thickness of the reinforcing layer is 1 - 2.5 : 1.

5. A circuit breaker, **characterized in that** it comprises:

   a moving contact assembly (20), comprising a moving contact support (22) and a moving contact (24) disposed on the moving contact support (22); and
   a static contact assembly (10), comprising a static contact support (12) according to any one of claims 1 to 5 and a static contact (14) disposed on the static contact support (12) and capable of contacting the moving contact (24).

6. The circuit breaker according to claim 5, wherein the side of the static contact support (12) which is close to the moving contact assembly (20) is the base layer (122), while the side of the static contact support which is remote from the moving contact assembly (20) is the reinforcing layer (124).

7. The circuit breaker according to claim 5 or 6, wherein the static contact (14) is connected to the base layer (122).

Patentansprüche

1. Statischer Kontaktträger (12) für einen Schutzschalter, **dadurch gekennzeichnet, dass** er Folgendes umfasst:

   eine Basisschicht (122) zum Übertragen von Strom, der den Schutzschalter passiert; und
   eine Verstärkungsschicht (124), die auf der Basisschicht (122) überlagert ist und der Basisschicht (122) einen strukturellen Träger bereitstellen kann, **dadurch gekennzeichnet, dass** die Verstärkungsschicht (124) einen Lichtbogen, der zwischen einem beweglichen Kontakt und einem statischen Kontakt in dem Schutzschalter erzeugt wird, in einen Lichtbogenlösch-Mechanismus des Schutzschalters anziehen kann, wobei die Verstärkungsschicht (124) und die Basisschicht (122) durch einen Prozess zum Kombinieren von zwei Metallen überlagert sind.

2. Statischer Kontaktträger nach Anspruch 1, wobei die Basisschicht (122) aus Kupfer-Metall angefertigt ist.

3. Statischer Kontaktträger nach einem der vorhergehenden Ansprüche, wobei die Verstärkungsschicht (124) aus Stahl angefertigt ist.

4. Statischer Kontaktträger nach einem der vorhergehenden Ansprüche, wobei das Verhältnis der Dicke der Basisschicht zu der Dicke der Verstärkungsschicht 1 bis 2,5 : 1 beträgt.

5. Schutzschalter, **dadurch gekennzeichnet, dass** er Folgendes umfasst:

   eine bewegliche Kontakteinheit (20), die einen beweglichen Kontaktträger (22) und einen beweglichen Kontakt (24) umfasst, der auf dem beweglichen Kontaktträger (22) angeordnet ist; und

eine statische Kontakteinheit (10), die einen statischen Kontaktträger (12) nach einem der Ansprüche 1 bis 5 und einen statischen Kontakt (14) umfasst, der auf dem statischen Kontaktträger (12) angeordnet ist und in der Lage ist, den beweglichen Kontakt (24) zu kontaktieren.

6. Schutzschalter nach Anspruch 5, wobei die Seite des statischen Kontaktträgers (12), die der beweglichen Kontakteinheit (20) nahe ist, die Basisschicht (122) ist, während der Seite des statischen Kontaktträgers, die von der beweglichen Kontakteinheit (20) entfernt ist, die Verstärkungsschicht (124) ist.

7. Schutzschalter nach Anspruch 5 oder 6, wobei der statische Kontakt (14) mit der Basisschicht (122) verbunden ist.

Revendications

1. Support de contact statique (12) pour un disjoncteur, **caractérisé en ce qu'**il comprend :

une couche de base (122) pour transférer un courant passant par le disjoncteur ; et
une couche de renfort (124), qui est superposée à la couche de base (122) et peut apporter à la couche de base (122) un support structurel,

caractérisé en ce que la couche de renfort (124) peut attirer un arc produit entre un contact mobile et un contact statique dans le disjoncteur vers un mécanisme d'extinction d'arc du disjoncteur, la couche de renfort (124) et la couche de base (122) étant superposées par un processus permettant de combiner deux métaux.

2. Support de contact statique selon la revendication 1, dans lequel la couche de base (122) est en cuivre métallique.

3. Support de contact statique selon l'une quelconque des revendications précédentes, dans lequel la couche de renfort (124) est en acier.

4. Support de contact statique selon l'une quelconque des revendications précédentes, dans lequel le rapport de l'épaisseur de la couche de base à l'épaisseur de la couche de renfort est 1 à 2,5:1.

5. Disjoncteur, **caractérisé en ce qu'**il comprend :

un ensemble contact mobile (20), comprenant un support (22) de contact mobile et un contact mobile (24) disposé sur le support (22) de contact mobile ; et
un ensemble contact statique (10), comprenant un support (12) de contact statique selon l'une quelconque des revendications 1 à 5 et un contact statique (14) disposé sur le support (12) de contact statique et susceptible d'entrer en contact avec le contact mobile (24).

6. Disjoncteur selon la revendication 5, dans lequel le côté du support (12) de contact statique qui est près de l'ensemble contact mobile (20) est la couche de base (122), pendant que le côté du support de contact statique qui est éloigné de l'ensemble contact mobile (20) est la couche de renfort (124).

7. Disjoncteur selon la revendication 5 ou 6, dans lequel le contact statique (14) est connecté à la couche de base (122).

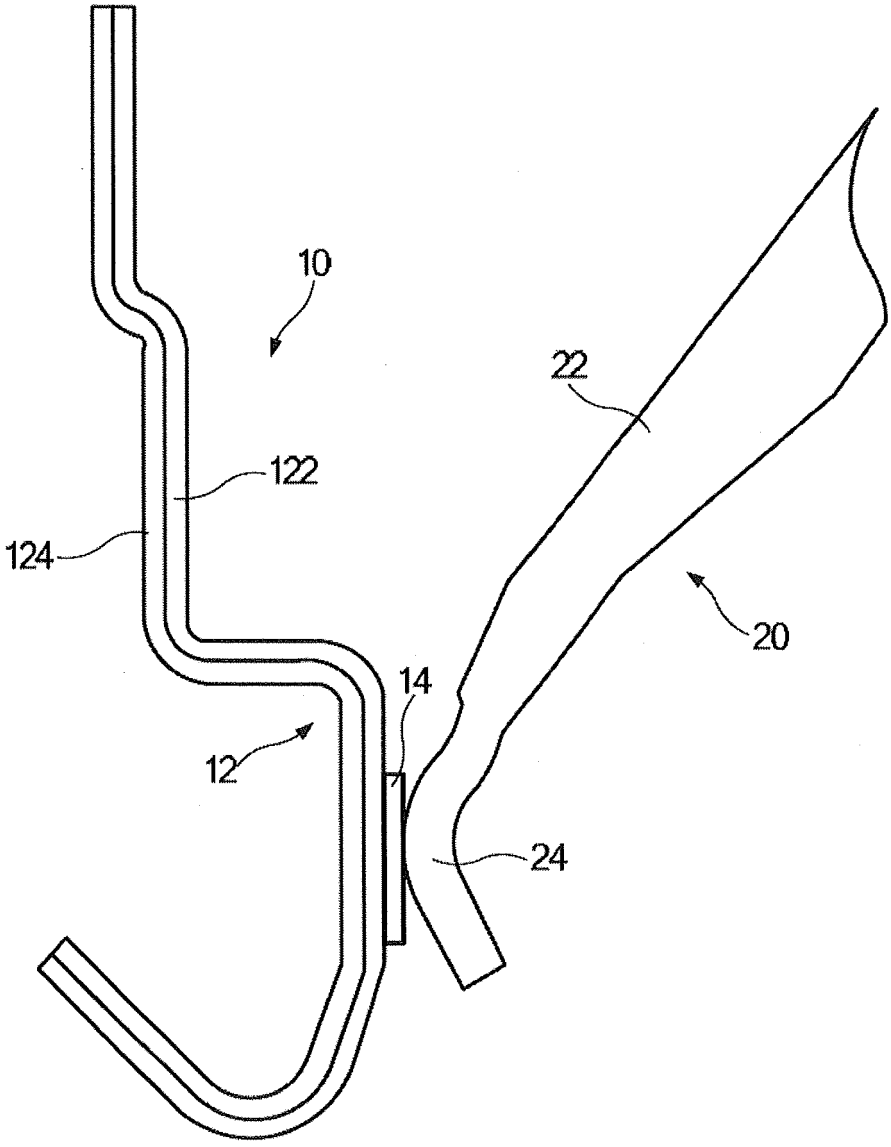


Fig. 1

REFERENCES CITED IN THE DESCRIPTION

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