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(72) Inventors:  
• **ZHOU, Mingchen**  
**Jiangsu 215500 (CN)**  
• **GUAN, Ruiliang**  
**Jiangsu 215500 (CN)**  
• **YU, Xiaofeng**  
**Jiangsu 215500 (CN)**

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(74) Representative: **Witte, Weller & Partner**  
**Phoenixbau**  
**Königstrasse 5**  
**70173 Stuttgart (DE)**

(71) Applicant: **Changshu Switchgear Mfg. Co., Ltd.**  
**(FORMER CHANGSHU SWITCHGEAR PLANT)**  
**No.8 Jianye Road**  
**Changshu**  
**Jiangsu 215500 (CN)**

(54) **MOVING CONTACT OF CIRCUIT BREAKER**

(57) A moving contact member of circuit breaker, which belongs to the technical field of low-voltage apparatuses, comprises: an insulating support, a pair of fixing plates, a grid plate base, a set of grid plate, a revolving support shaft, a set of parallel conductors, a flexible conductive connecting wire, and a conductive block, wherein, the moving contact member further comprises a fixing support, which is mounted on the insulating support or grid plate base, accompanied with the set of parallel conductor; at least one conductor in the set of parallel conductors is in the fixing support and at a position consistent with the other conductors; the set of grid plates are arranged on either the grid plate base or the insulating support. The advantages of the present invention include: the temperature rise during short circuit on the moving contacts and fixed contacts can be reduced and the performance of short-time current tolerance of the circuit breaker can be improved; the moving contact can be kept small, and the overall volume of the circuit breaker can be controlled effectively; the fixing support is simple in structure and easy to install, which is favorable for economical efficiency and industrial applicability.

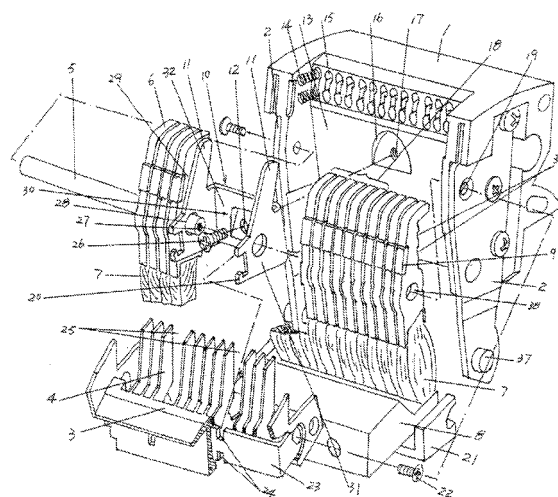


Figure 1

## Description

### Field of the Invention

**[0001]** The present invention relates to a moving contact member of circuit breaker, which is arranged in a moving contact cavity in the base of the circuit breaker, and cooperates with a fixed contact member to close/open the circuit. It belongs to the technical field of low-voltage apparatuses.

### Background of the Invention

**[0002]** It is well-known to the person skilled in the art that in actual application, the self-resistance of circuit breaker conductor and the contact resistance between moving contact member and fixed contact member play an important role in the performance of short-time tolerance for short-circuit current of the circuit breaker. For example, the higher the self-resistance of the conductor or the higher the contact resistance between moving contact member and fixed contact member, the higher the heat generated on the circuit breaker under short-circuit current, and the contacts on moving contact member and fixed contact member (movable contact on the moving contact member and fixed contacts on the fixed contact member) may be fusion welded and even damaged. In terms of the moving contact member of the circuit breaker, since there is fit clearance between the parallel contact plates (usually referred to parallel conductors) and the revolving support shaft, which can't be completely eliminated no matter how exquisite the workmanship is, the parallel conductors often tend to deflect to a side at the end of closing process of the circuit breaker, as causes bad contact between the movable contacts on moving contact member and the fixed contacts, and increases the contact resistance.

**[0003]** The structure of moving contact member in a circuit breaker in the prior art is shown in Fig. 4. It comprises an insulating support 1, a pair of fixing plates 2, a grid plate base 3, a set of grid plates 4, a revolving support shaft 5, a set of parallel conductors 6 composed of at least three conductors, a flexible conductive connecting wire 7, and a conductive block 8, wherein, the upper ends of a pair of fixing plates 2 are fixed to two sides of the insulating support 1, and the lower ends of a pair of fixing plates 2 are jointed to the conductive block 8; the grid plate base 3 covers the set of parallel conductors 6, with two ends being fixed to a pair of fixing plates 2; a set of grid plates 4 are distributed on the insulating support 1; the middle part of the set of parallel conductors 6 is pivot-mounted on the middle part of the revolving support shaft 5 two ends of which is fixed to the pair of fixing plates 2, and the set of parallel conductors 6 is jointed to one end of the flexible conductive connecting wire 7; the other end of the flexible conductive connecting wire 7 is fixed to the conductive block 8. Apparently, the set of grid plates 4 is designed to separate and retain the set of

parallel conductors 6. However, in view of the volume of the entire moving contacts and the space utilization of parallel conductors 6 to increase the cross-sectional area of current flow and reduce temperature rise of the circuit breaker, it is impossible and not permitted to increase the thickness of each grid plate in the set of grid plates 4 without limitation, so the thickness often have to be restricted. In view of the situation, the thickness of the grid plate is usually designed as thin as a paper. which have some contributions for reducing volume of the entire moving contacts and increase space utilization of the parallel conductors 6 as well as the cross-sectional area of current flow. However this can't relieve the side-deflection phenomenon of the parallel conductors 6 when the circuit breaker is closed, because the clearance between the parallel conductors 6 and the revolving support shaft 5 can't be eliminated, as described above by the applicant; and the misalignment between the movable contacts 9 on the parallel conductors 6 and the fixed contacts on the fixed contact member increases the contact resistance. To solve the problem, the current practice is just to increase the strength of grid plates 4 at the expense of miniaturization of the volume of moving contact, namely to increase the thickness of each grid plate in the set of grid plates 4.

**[0004]** Even though efforts have been made in the industry to find a balance point which can ensure the contact effect between moving contact member and fixed contact member and not excessively affect the space utilization of parallel conductors, there is neither literal report on success nor actual product up to now.

### Summary of the Invention

**[0005]** The task of the present invention is to provide a moving contact member of circuit breaker, which can not only effectively prevent side-deflection of the parallel conductors to reduce contact resistance, but also ensure small volume and simple structure to increase short-time tolerance for short-circuit current.

**[0006]** The task of the present invention is accomplished as follows: a moving contact member of circuit breaker, comprising an insulating support, a pair of fixing plates, a grid plate base, a set of grid plates, a revolving support shaft, a set of parallel conductors, a flexible conductive connecting wire, and a conductive block, wherein, the upper ends of the pair of fixing plates are fixed to the two sides of the insulating support, and the lower ends of the pair of fixing plates are jointed to the conductive block; the grid plate base covers the set of parallel conductors, with two ends being fixed to the pair of fixing plates; the middle part of the set of parallel conductors is pivot-jointed to the middle part of the revolving support shaft the ends of which are fixed to the pair of fixing plates, and the set of parallel conductors are jointed to one end of the flexible conductive connecting wire; the other end of the flexible conductive connecting wire is fixed to the conductive block; it is **characterized in that**: the moving

contact member also comprises a fixing support, which is mounted on the insulating support or the grid plate base and accompanied to a set of parallel conductors; at least one conductor in the set of parallel conductors is in the fixing support and at a position consistent with the other conductors; the set of grid plates are arranged on either the grid plate base or the insulating support.

**[0007]** In an embodiment of the present invention, the fixing support has a parallel conductor receiving cavity designed to receive at least one parallel conductor in the set of parallel conductors; in addition, a pair of side walls of the parallel conductor receiving cavity are perpendicular to the revolving support shaft, and the bottom wall of the parallel conductor receiving cavity is fixed to the insulating support or grid plate base.

**[0008]** In another embodiment of the present invention, shaft holes which are corresponding to each other and arranged on the pair of side walls are designed to leave a way for the revolving support shaft and provide a path for the revolving support shaft, and the bottom wall is fixed to the insulating support; in addition, a first pin is arranged on the edge of the pair of side walls at the side where the pair of side walls face the grid plate base, and the first pin is inserted into the first pin receiving slot on the grid plate base.

**[0009]** In another embodiment of the present invention, slots which are corresponding to each other and arranged on the pair of side walls are designed to leave a way for the revolving support shaft and provide a path for the revolving support shaft, and the bottom wall is fixed to the grid plate base; in addition, a second pins is arranged on the pair of side walls in a reduced manner at the side where the pair of side walls face the insulating support, and the second pin is inserted into second pin receiving slot on the insulating support.

**[0010]** In another embodiment of the present invention, the said bottom wall is fixed to the middle part of the insulating support.

**[0011]** In another embodiment of the present invention, the said bottom wall is fixed to the middle part of the grid plate base.

**[0012]** In another embodiment of the present invention, a support clip is arranged on each upper side of the pair of side walls respectively.

**[0013]** In another embodiment of the present invention, the set of grid plates are arranged on the grid plate base, and they are embedded in the gaps between the conductors in the set of parallel conductors.

**[0014]** In another embodiment of the present invention, the set of grid plates are arranged on the insulating support, and they are embedded in the gaps between the conductors in the set of parallel conductors.

**[0015]** In another embodiment of the present invention, a reinforcing support is coupled to the grid plate base.

**[0016]** Compared to the prior art, the present invention has the following advantages: since a fixing support is added, excessive deflection of the parallel conductors

can be effectively prevented when the circuit breaker is closed, so that the movable contacts of the moving contact member on the set of parallel conductors can contact well with the fixed contacts of the fixed contact member of the circuit breaker, and lower contact resistance can be achieved; therefore, the temperature rise on the movable contact member and fixed contact member can be reduced in case of short circuit, and thereby the performance of short-time current tolerance of the circuit breaker can be improved; the arrangement of the fixing support changes the design thought of relieving side-deflection merely by increasing the thickness of each conductor in the set of parallel conductors in the prior art, and therefore the moving contact member can be kept small, and the overall size of the circuit breaker can be controlled effectively; the fixing support is simple in structure and easy to install, which is favorable for economical efficiency and industrial applicability.

## 20 Brief Description of the Drawings

### [0017]

Fig. 1 is a structural diagram of a first embodiment of the moving contact member of circuit breaker in the present invention.

Fig. 2 is a structural diagram of a second embodiment of the moving contact member of circuit breaker in the present invention.

Fig. 3 is a schematic diagram of embodiment that the moving contact member of circuit breaker in the present invention is mounted on a circuit breaker.

Fig. 4 is a schematic diagram of the moving contact member of circuit breaker in the prior art.

## 40 Detailed Description of the Embodiments

**[0018]** To make the examiner and especially the public further understand the substance and beneficial effects of the present invention, hereafter the present invention will be described in embodiments,. However, these embodiments shall not be deemed as limitation to the technical scheme of the present invention.

### Embodiment 1:

**[0019]** Please see Fig.1for details. An insulating support 1, preferably made of plastic material, is shown. One side of the insulating support 1 facing a set of parallel conductors 6 is processed into an insulating bevel 13; corresponding spring holes 15 (also referred to spring seat) in the same quantity as the conductors in the set of parallel conductors 6 are arranged on the upper area of the insulating bevel 13; the spring holes 15 hold one

end of springs 14 respectively, and the other end of the springs 14 prop against the spring containing cavities 36 on the parallel conductors 6. On the middle part of the insulating support 1, more specifically, in middle of the upper part of the insulating bevel 13, a cavity 16 is arranged to receive a fixing support 10 (to be detailed below), with a screw hole 17 at the center of the cavity 16. The pair of fixing plates 2 are preferably in the same shape, and are preferably made of a metal material; the upper end of each of the fixing plates 2 is fixed to the insulating support 1 with screws (the quantity of the screws is not limited to the quantity shown in the drawing), and the lower end of each of the fixing plates 2 is jointed to the mounting seat 21 of a conductive block 8 via a transition shaft 37.

**[0020]** In this embodiment, a set of grid plates 4 (also referred to comb plates) are arranged on a grid plate base 3 at the side where the grid plate base 3 faces the parallel conductors 6, that is, the set of grid plates 4 are formed on the grid plate base 3 during the molding process of the grid plate base 3; the grid plate cavities 25 between each of the grid plates 4 are designed to compensate (or contain) the parallel conductors 6; when the grid plate base 3 covers the set of parallel conductors 6 and is fixed to the fixing plate 2 at two ends with screws 22, the set of grid plates 4 and the set of parallel conductors 6 form compensation relationship between them. The so-called compensation relationship refers to: each grid plate 4 is embedded into the gap 29 between adjacent parallel conductors 6, while each parallel conductor 6 is embedded into the corresponding grid plate cavity 25. A reinforcing support 23 can be coupled to the grid plate base 3 by insertion or screw fastening, or by other similar positioning method; in addition, a pair of first pin receiving slots 24 are arranged on the reinforcing support 23; of course, the first pin receiving slots 24 function as plug.

**[0021]** As well-known by those skilled in the art, the quantity of the conductors in the set of parallel conductors 6 may be varied from 3 to a dozen or more, depending on different operating requirement. Therefore, the quantity shown in the drawings shall not be deemed as limitation to the technical scheme of the present invention. A movable contact 9 (usually also referred to silver contact) corresponding to the fixed contact on the fixed contact member of the circuit breaker is arranged on each of the conductors in the set of parallel conductors 6, the middle part of each conductor is pivot jointed through a shaft hole 38 to the middle part of a revolving support shaft 5, and the lower end of each conductor is electrically jointed to one end of a flexible conductive connecting wire 7; the other end of the flexible conductive connecting wire 7 is fixed to a conductive block 8; the two ends of the revolving support shaft 5 are inserted into preformed shaft holes 19 on the fixing plate 2. In a preferred but not limited scheme, a screw hole 27 can be arranged on the end face at both ends or at least one end of the revolving support shaft 5, and a screw can be screwed into the

screw hole 27 to prevent play of the revolving support shaft 5 in horizontal direction on the fixing plate 2.

**[0022]** Please continue to see Fig.1. A fixing support 10 is implanted among the set of parallel conductors 6, separates the set of parallel conductors 6 into 3 areas, and supports the parallel conductors 6 in lateral direction. In order to keep a pair of side walls 31 of the fixing support 10 that are perpendicular to the revolving support shaft 5 accompany the parallel conductors 6 and from hindering or blocking the arrangement of the revolving support shaft 5 on the pair of fixing plates 2, therefore, shaft holes 28 corresponding to each other in position is arranged on the pair of side walls 31 to provide a pass or leave a way for the revolving support shaft 5. A screw hole 12 is arranged on the bottom wall 32 of the parallel conductor receiving cavity 30, and a screw 26 is passed through the screw fixing hole 12 and then screwed into the screw hole 17 described above, so as to fix the fixing support 10 to the insulating support 1 and ensure the pair of side walls 31 described above are perpendicular to the revolving support shaft 5 adequately. To facilitate the public to understand the present invention, the applicant has arranged a plurality of conductors 18 at the middle of the set of parallel conductors 6 in the above parallel conductor receiving cavity 30; in addition, the conductors 18 are at the consistent positions with the other conductors. A support clip 11 extends on the upper side of the pair of side walls 31 of the parallel conductor receiving cavity 30 to further enhance the effect of the fixing support 10 for preventing side deflection of the tips of parallel conductors 6 situated at the two ends of the fixing support 10. In addition, first pins 20 (with shape and construction not limited to those shown in the drawings) are arranged on the edges of the pair of side walls at the end where the pair of side walls 31 face the grid plate base 3; the first pins 20 are inserted into first pin receiving slots 24 formed on the reinforcing support 23 and the structure can further enhance stability of the fixing support 10.

Embodiment 2:

**[0023]** Please see Fig.2 for details. In another embodiment of the present invention, a set of grid plates 4 are arranged on the insulating bevel 13 of an insulating support 1. Slots 33 corresponding to each other in position are arranged on a pair of side walls 31 of the parallel conductor receiving cavity 30 of the fixing support 10; the slots 33 have a function similar to shaft holes 28; Similarly, in order to keep a pair of side walls 31 of the fixing support 10 accompany the parallel conductors 6 and from hindering the arrangement of the revolving support shaft 5 on the pair of fixing plates 2; thus, the slots 33 cross the revolving support shaft 5. Second pins 34 is arranged on a pair of side walls 31 in a reduced manner in the direction in which the pair of side walls 31 face the insulating support 1; to compensate the second pins 34, a pair of second pin receiving slots 35 are arranged on the insulating bevel 13 of the insulating support 1. The bottom

wall of the parallel conductor receiving cavity 30 is fixed to the grid plate base 3 with screws or in a similar way, so as to ensure the pair of side walls 31 of the fixing support 10 perpendicular to the revolving support shaft 5. The rest description is identical to the description of embodiment 1.

**[0024]** It can be easily understood from the two embodiments described above that the fixing support 10 can be fixed in two ways, i.e., the fixing support 10 can be fixed to the insulating support 1 or fixed to the grid plate base 3. The set of grid plates 4 can be formed on the grid plate base 3 or the insulating support 1. In addition, if the number of the parallel conductors 6 is as small as 3, the parallel conductor receiving cavity 30 of the fixing support 10 can be correspondingly narrowed down, and the middle conductor among the three conductors can be arranged in the parallel conductor receiving cavity 30; if the number of parallel conductors 6 is as much as 10, three or four intermediate conductors (not limited to the absolute quantity) among the parallel conductors 6 can be arranged in the parallel conductor receiving cavity 30 as required, and so on.

Application example:

**[0025]** Please see Fig. 3 for details. A base 39 of circuit breaker is shown. The moving contact member in the structure shown in embodiment 1 and 2 in the present invention is arranged in a moving contact cavity 40 on the base 39, and it is mounted in the same way as the prior art.

**[0026]** At the end of closing of the circuit breaker, the tendency of side deflection of parallel conductors 6 can be suppressed by the fixing support 10, because the pair of side walls 31 of the fixing support 10 and the support clips 11 arranged on the side walls 31 accompany a set of parallel conductors 6 and separate the set of parallel conductors 6 into three areas. They can provide firm and reliable fixing and retaining effect for the parallel conductors 6 in lateral direction, reduce the influence of accumulative side play, and ensure good contact between the movable contacts 9 and the fixed contacts of the fixed contact member of the circuit breaker, and finally achieve low contact resistance.

**[0027]** In conclusion, the specific shape and construction of the fixing support 10 are not limited to the embodiments described above. Any variations or modifications to the embodiments shall be deemed as falling into the protection scope of the technical scheme of the present invention, as long as the fixing support 10 is implanted among the parallel conductors 6 and thereby can separate and retain the parallel conductors 6 in lateral direction.

## Claims

1. A moving contact member of circuit breaker, com-

prising an insulating support (1), a pair of fixing plates (2), a grid plate base (3), a set of grid plates (4), a revolving support shaft (5), a set of parallel conductors (6), a flexible conductive connecting wire (6), and a conductive block (8), wherein, the upper ends of the pair of fixing plates (2) are fixed to the two sides of the insulating support (1), and the lower ends of the pair of fixing plates (2) are jointed to the conductive block (8); the grid plate base (3) covers the set of parallel conductors (6), with two ends being fixed to the pair of fixing plates (2); the middle part of the set of parallel conductors (6) is pivot-mounted on the middle part of the revolving support shaft (5) the two ends of which are fixed to the pair of fixing plates (2), and the parallel conductors (6) is jointed to one end of the flexible conductive connecting wire (7); the other end of the flexible conductive connecting wire (7) is fixed to the conductive block (8); it is **characterized in that:** the moving contact member further comprises a fixing support (10), which is mounted on the insulating support (1) or grid plate base (3), accompanying the set of parallel conductors (6); at least one conductor in the set of parallel conductors (6) is in the fixing support (10) and at a position consistent with the other conductors; the set of grid plates (4) are arranged on either the grid plate base (3) or the insulating support (1).

2. The moving contact member of circuit breaker according to claim 1, wherein, the fixing support (10) has a parallel conductor receiving cavity (3) designed to receive at least one of the conductors in the set of parallel conductors (6); a pair of side walls (31) of the parallel conductor receiving cavity (30) are perpendicular to the revolving support shaft (5), and the bottom wall (32) of the parallel conductor receiving cavity (30) is fixed to the insulating support (1) or the grid plate base (3).

3. The moving contact member of circuit breaker according to claim 2, wherein, shaft holes (28) corresponding to each other in position are arranged on the pair of side walls (31) and are designed to leave a way and provide a path for the revolving support shaft (5); and the bottom wall (32) is fixed to the insulating support (1); in addition, first pins (20) are arranged on the edges of the pair of side walls (32) at the side where the pair of side walls (31) face the grid plate base (3), and the first pins (20) are inserted into first pin receiving slots (24) on the grid plate base (3).

4. The moving contact member of circuit breaker according to claim 2, wherein, slots (33) corresponding to each other in position and designed to leave a way and provide a path for the revolving support shaft (5) are arranged on the pair of side walls (31), and the bottom wall (32) is fixed to the grid plate base (3); in

addition, second pins (34) are arranged on the pair of side walls (31) in a reduced manner in the direction in which the pair of side walls (31) face the insulating support (1), and the second pins (34) are inserted into second pin receiving slots (35) on the insulating support (1). 5

5. The moving contact member of circuit breaker according to claim 3, wherein, the bottom wall (32) is fixed to the middle part of the insulating support (1). 10
6. The moving contact member of circuit breaker according to claim 4, wherein, the bottom wall (32) is fixed to the middle part of grid plate base (3). 15
7. The moving contact member of circuit breaker according to claim 3 or 4, wherein, a support clip (11) is arranged on the upper part of each side wall in the pair of side walls (31). 20
8. The moving contact member of circuit breaker according to claim 1, wherein, the set of grid plates (4) are arranged on the grid plate base (3), and are embedded in the gaps (29) between the conductors in the set of parallel conductors (6). 25
9. The moving contact member of circuit breaker according to claim 1, wherein, the set of grid plates (4) are arranged on the insulating support (1), and are embedded in the gaps (29) between the conductors in the set of parallel conductors (6). 30
10. The moving contact member of circuit breaker according to claim 1 or 8, wherein, a reinforcing support (23) is coupled to the grid plate base (3). 35

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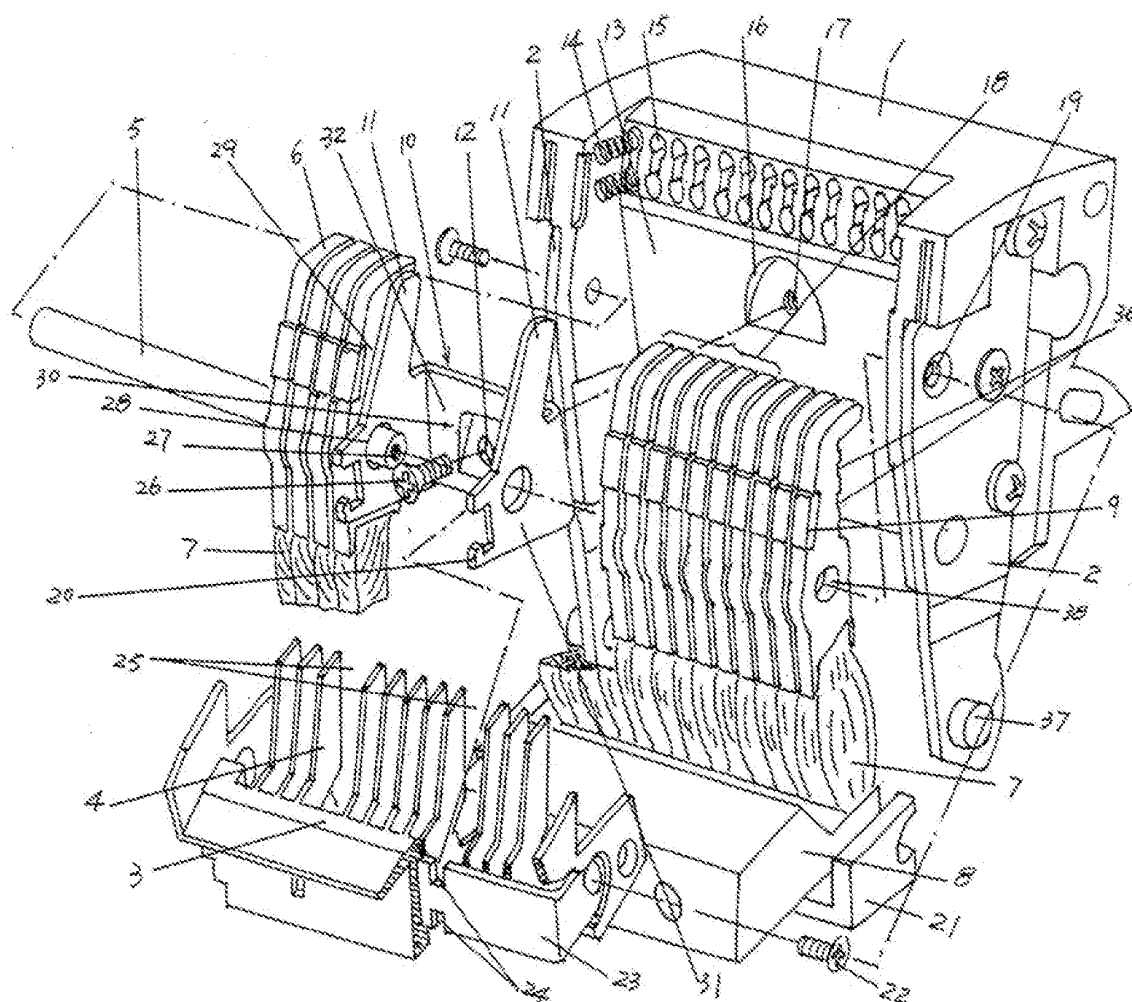


Figure 1

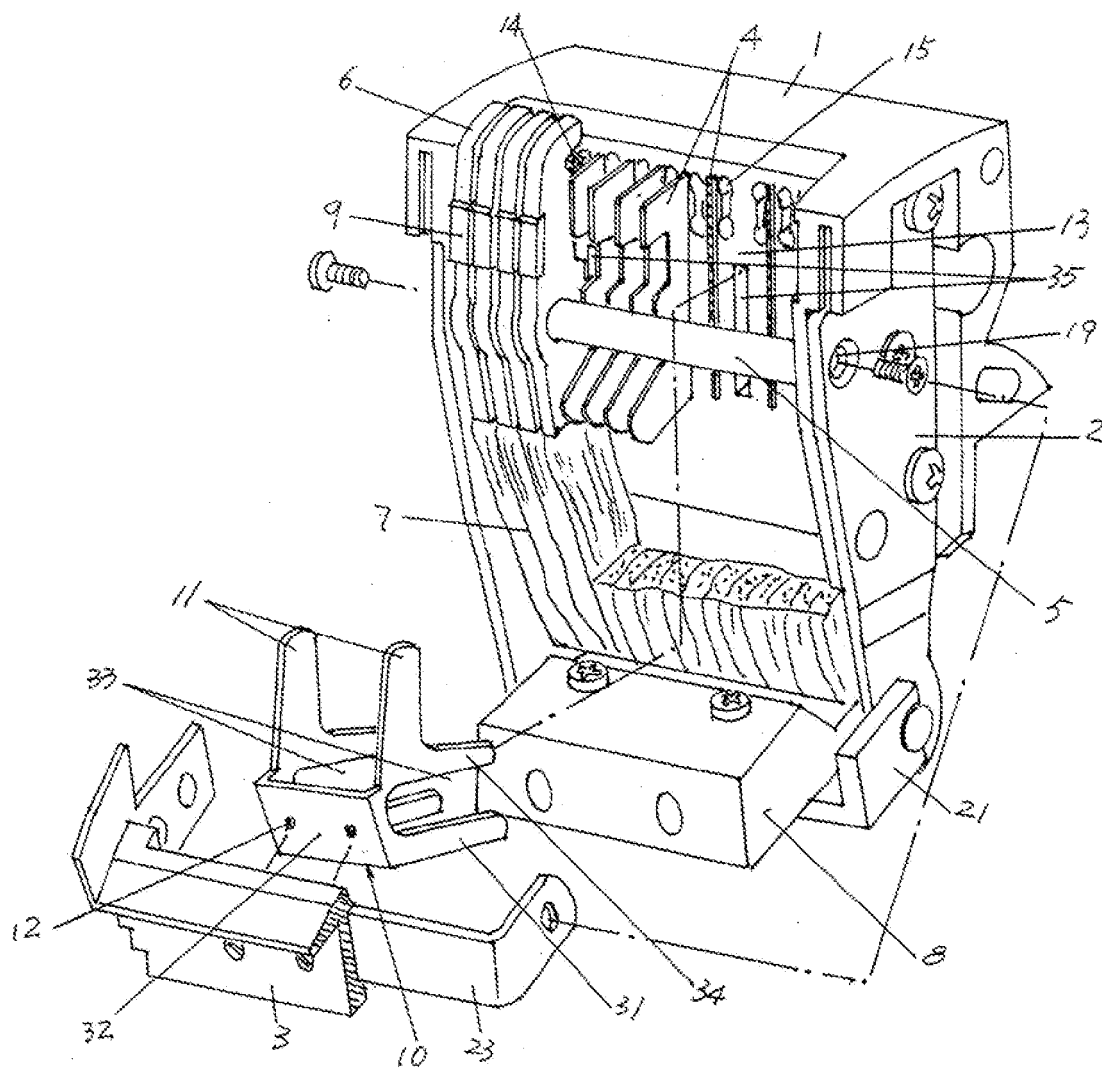


Figure 2



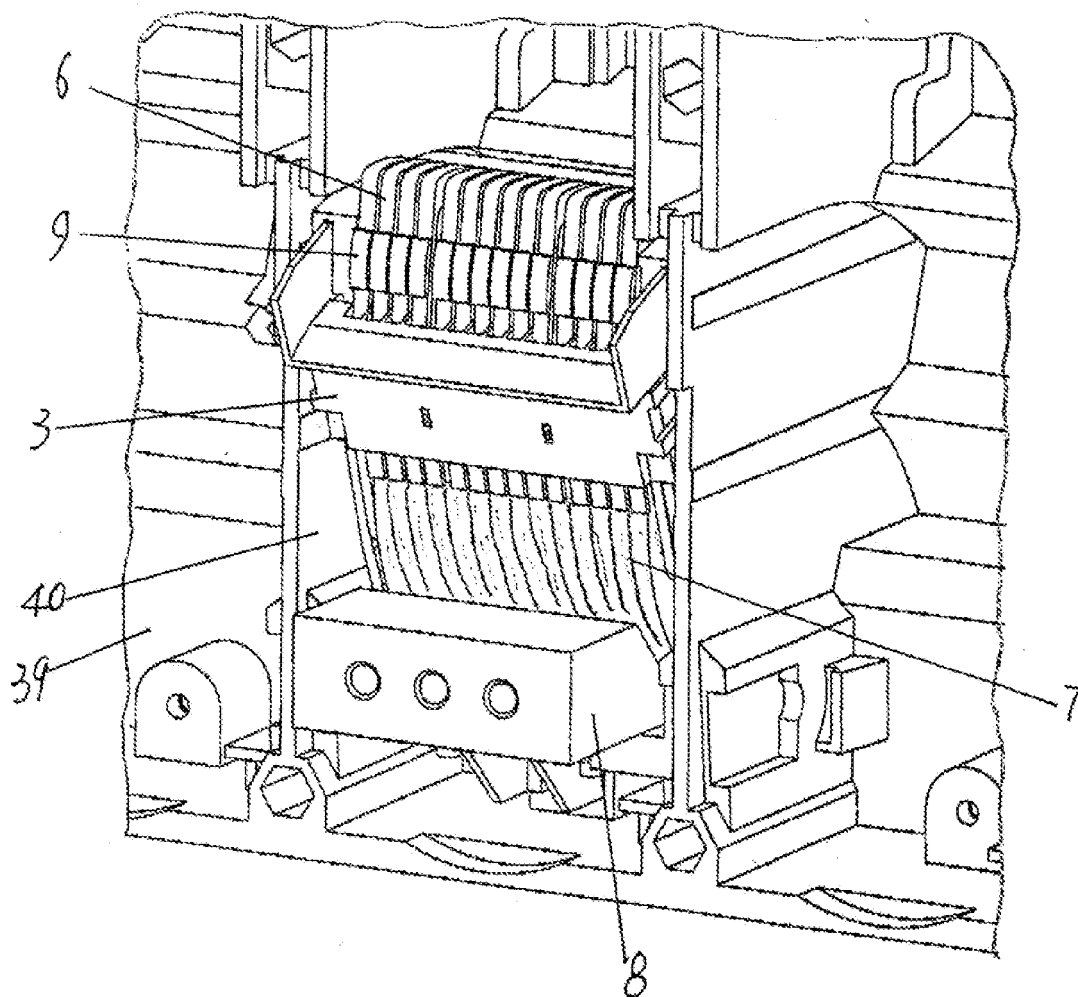


Figure 3

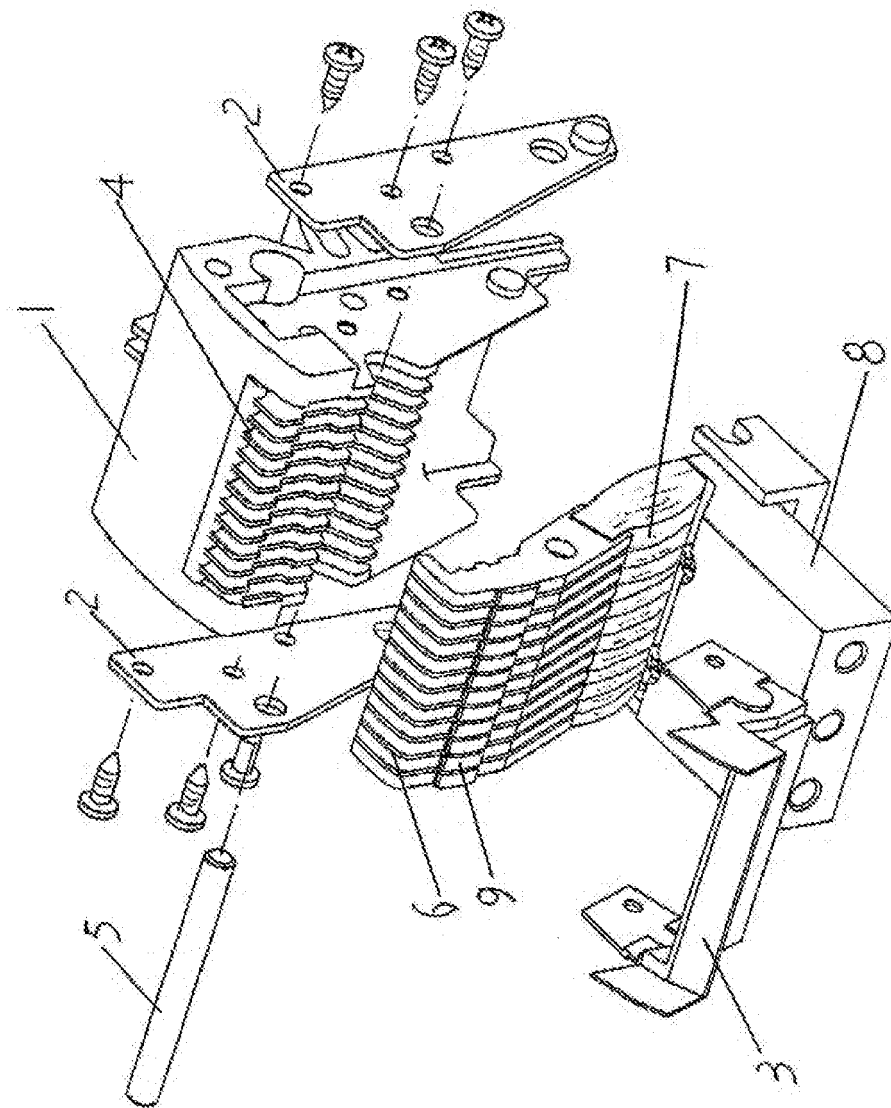


Figure 4

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2008/070873

## A. CLASSIFICATION OF SUBJECT MATTER

See the extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: H01H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNPAT;CNKI;WPI;EPODOC;PAJ: moving contact, movable contact, support, supporting, shaft, axis, grid

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 101106042 A (CHANGSHU SWITCHGEAR MFG CO LTD) 16 January 2008 (16.01.2008) claims 1-10	1-10
X	CN 1496572 A (SIEMENS AG) 12 May 2004 (12.05.2004) page 6 line 3-line 24, page 7 line 4-line 9 in the description and figures 1-2,4	1,8-10
A	CN 1372692 A (SIEMENS AG) 2 October 2002 (02.10.2002) the whole document	1-10

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search  
28 July 2008 (28.07.2008)Date of mailing of the international search report  
**14 Aug. 2008 (14.08.2008)**Name and mailing address of the ISA/CN  
The State Intellectual Property Office, the P.R.China  
6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China  
100088  
Facsimile No. 86-10-62019451Authorized officer  
**LIU Jingjing**  
Telephone No. (86-10)62411727

**INTERNATIONAL SEARCH REPORT**  
 Information on patent family members

International application No.

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Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 101106042 A	16.01.2008	NONE	
CN 1496572 A	12.05.2004	DE 20118493 U1	02.21.2002
		WO 02082482 A1	17.10.2002
		WO 02082481 A1	17.10.2002
		DE 10117844 A1	17.10.2002
		EP 1374263 A1	02.01.2004
		EP 1374263 B1	07.05.2008
		EP 1374264 A1	02.01.2004
		EP 1374264 B1	20.06.2007
		CN 1288684 C	06.12.2006
		US 2004094513 A1	20.05.2004
		US 6969816 B2	29.11.2005
		CN 1505824 A	16.06.2004
		CN 1230845 C	07.12.2005
		JP 2004523874 T	05.08.2004
		JP 2004523873 T	05.08.2004
		US 2005035835 A1	17.02.2005
		US 7068131 B2	27.06.2006
		HK 1062355 A1	24.02.2006
		HK 1061305 A1	09.03.2007
CN 1372692 A	02.10.2002	DE 29923674 U1	18.01.2001
		WO 0124207 A1	05.04.2001
		DE 19948695 A1	05.04.2001
		EP 1218898 A1	03.07.2002
		EP 1218898 B1	26.03.2003
		CN 1187772 C	02.02.2005
		HK 1046586 A1	13.05.2005
		DE 50001582 G	30.04.2003

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2008/070873

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H01H 73/04 (2006.01) i

H01H 71/00 (2006.01) i

H01H 1/22 (2006.01) i