

(43) International Publication Date
26 October 2012 (26.10.2012)

- (51) **International Patent Classification:**
H01H 73/02 (2006.01) *H01R 13/03* (2006.01)
- (21) **International Application Number:**
PCT/CN2011/072918
- (22) **International Filing Date:**
18 April 2011 (18.04.2011)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
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- (81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) **Designated States** (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

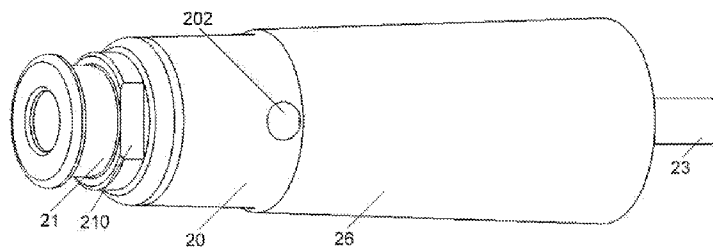
(54) **Title:** CONTACT ARM FOR SWITCH DEVICE AND CIRCUIT BREAKER THEREOF

Fig. 2C

(57) **Abstract:** A contact arm for switch device is provided. The contact arm comprises a main conductor (20) which is solid and is made of aluminum or aluminum alloy. The main conductor (20) is connected with a tulip contact (22) by an anterior connect adaptor (21) at one end and is connected with a pole (29) at the other end. The main conductor (20) is connected with the anterior connect adaptor (21) and the pole (29) via a double start thread bolt (24). Thus, the main conductor (20) has a sufficient contact surface with the pole (29). The anterior connect adaptor (21) is made of copper and is silver plating. A plurality of heat elimination grooves (201) are provided on the surface of the main conductor (20) near the anterior connect adaptor (21) end. The heat elimination grooves (201) can increase the heat dissipation performance. The main conductor made of aluminum or aluminum alloy greatly cuts the costs of the contact arm. Furthermore, the main conductor made of aluminum or aluminum alloy is much lighter; this enables a better fastening with the pole and a longer service life of the circuit breakers.

CONTACT ARM FOR SWITCH DEVICE AND CIRCUIT BREAKER THEREOF

FIELD OF THE INVENTION

This invention relates to the field of power products, and more particularly to a contact arm for the switch devices.

5 BACKGROUND OF THE INVENTION

In general, a vacuum circuit breaker is a device for protecting an electric power system, in which a vacuum interrupter is made of an arc extinguishing material so as to deliberately perform power transmission, switching, termination and the like and fast perform an automatic blocking of the electric power system when any breakdown occurs. The vacuum circuit breaker
10 serves to quickly break off a circuit by an arc extinguishing operation by which an arc product generated upon opening and closing a normal load and cutting off a fault current is rapidly dispersed within a vacuum container, thus to protect circuit and other equipment.

Such vacuum circuit breaker is provided with a main circuit section, a truck mechanism or a moving carriage, a cradle and an auxiliary element. The truck mechanism is integrally coupled
15 to the main circuit section, and provided with a mechanical part which selectively moves the main circuit section to the cradle. The coupling or separation between the main circuit section and the cradle is allowed by a tulip contactor of the main circuit section and a cradle terminal of to the cradle. During operation in a state of the main circuit section being coupled to the cradle, a current is introduced into a vacuum interrupter installed inside the main circuit section via an
20 upper terminal, and the introduced current is discharged via a lower terminal. During the operation, if any accident occurs, the vacuum interrupter instantaneously cuts off the current.

The tulip contactor is connected with a contact arm, and the contact arm is fastened to a pole. Fig. 1 shows the contact arm which is generally used now. Fig. 1 is the section view of the contact arm. The contact arm is hollow and is made of copper. The contact arm can meet the
25 requirement of conductivity and heat dissipation. But the contact arm made of copper is very heavy and expensive. The heavy contact arm may make it fastness with the pole unsound, and in extreme cases the fastness between the contact arm and the pole may break off.

SUMMARY OF THE INVENTION

To overcome above mentioned shortcomings, the present invention provides a contact arm
30 for switch device and the circuit breaker thereof.

According to one aspect of the present invention, a contact arm for switch device is

provided. The contact arm comprises a main conductor which is adapted to connect with a pole. The main conductor is solid and is made of aluminum or aluminum alloy.

According to one preferred embodiment of the present invention, the contact arm further comprises an anterior connect adaptor at the tulip contact end of the main conductor configured to connect with a tulip contact.

According to one preferred embodiment of the present invention, the main conductor comprises a concave part at the pole end of the main conductor adapted to accommodate an external protrusion for connecting with the pole. The concave part can be a cylindrical hole or an internal screw thread adapted to connect with the pole by a bolt.

According to one preferred embodiment of the present invention, the main conductor is cylindrical or conical. And the diameter of the conical main conductor is decreasing towards the tulip contact end.

According to one preferred embodiment of the present invention, the contact arm further comprises a conductor protrusion configured to connect with the anterior connect adaptor. The conductor protrusion can be a bolt and preferably a double start thread bolt.

According to one preferred embodiment of the present invention, the anterior connect adaptor is made of copper.

According to another preferred embodiment of the present invention, the anterior connect adaptor is made of aluminum or aluminum alloy and is an integral structure with the main conductor.

According to one preferred embodiment of the present invention, the external surface of said anterior connect adaptor is silver plating.

According to one preferred embodiment of the present invention, the contact arm further comprises a tulip contact.

According to one preferred embodiment of the present invention, the main conductor is covered by insulating material except the concave part.

According to one preferred embodiment of the present invention, a plurality of heat elimination grooves are provided on the surface of the main conductor near the anterior connect adaptor end. The heat elimination grooves can increase the heat dissipation performance.

According to another aspect of the invention, a circuit breaker is provided. The circuit breaker comprises a pole, and a contact arm according to anyone of above. The contact arm is fastened to the pole.

According to one preferred embodiment of the present invention, in the circuit breaker, the contact arm is also fastened to the pole by glue.

The contact arm of the present invention is much cheaper and much lighter. Thus the contact arm is more stable after fixed on the pole even after long use. The contact arm of the present invention greatly cuts the costs of the circuit breakers.

BRIEF DESCRIPTION OF THE DRAWINGS

5 The subject matter of the invention will be explained in more details in the following description with reference to preferred exemplary embodiments which are illustrated in the drawings, in which:

Fig. 1 is the section view of the contact arm which is generally used now;

Fig. 2A, 2B and 2C show the structure of the contact arm of the present invention; wherein,
10 Fig. 2A is the exploded view of the contact arm, Fig. 2B is the section view of the contact arm, Fig. 2C is the three-dimensional view of the contact arm.

Fig. 3 shows the structure of the contact arm of the present invention according to another preferred embodiment;

Fig. 4 is the three-dimensional view of the contact arm with tulip contact;

15 Fig. 5 is the three-dimensional view of the contact arms fasten on the pole.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

With reference to the above-mentioned figures, preferred embodiments of the present invention are provided.

Fig. 2A, 2B and 2C show the structure of the contact arm of the present invention
20 according to a preferred embodiment; wherein, Fig. 2A is the exploded view of the contact arm, Fig. 2B is the section view of the contact arm, Fig. 2C is the three-dimensional view of the contact arm. The contact arm for switch device comprises a main conductor 20 which is adapted to connect with a pole 29. The main conductor 20 is solid and is made of aluminum or aluminum alloy. The material and the structure of the main conductor are the prominent
25 substantive features and represent a notable progress compared with the existing contact arm. The main conductor made of aluminum or aluminum alloy greatly cuts the costs of the contact arm. Furthermore, the main conductor made of aluminum or aluminum alloy is much lighter, this enables a better fastening with the pole and a longer service life of the circuit breakers. As shown in Fig. 2B, the contact area between the main conductor 20 and the pole 29 greatly
30 increased comparing with the generally used contact arm now.

The contact arm further comprises an anterior connect adaptor 21 at the tulip contact end of the main conductor 20 configured to connect with a tulip contact 22. The other end of the main conductor 20 is fastened to the pole 29. According to a preferred embodiment of the

present invention, the anterior connect adaptor 21 is made of copper and it is connected with the main conductor 20 by a double start thread bolt 24. The main conductor 20 is fastened to the pole by a double start thread bolt 23. The anterior connect adaptor 21 comprises an internal screw thread 25 adapted to the double start thread bolt 24. Similarly, the pole 29 comprises an internal screw thread adapted to the double start thread bolt 23.

As the main conductor 20 is cylindrical or conical, it is difficult to rotate. A hole 202 is provided in the main conductor 20 to facilitate the rotation of the main conductor 20 when fasten it to the pole 29. Two parallel notches, such as the parallel notches 210 on the anterior connect adaptor 21, can also be used to facilitate the rotation of the main conductor 20 instead of the hole 202.

The threads of both parts are fine thread, which can improve tightness of the connection. The bolt 23 also can be complete thread, the advantage is to reduce the hole diameter and then increase the contact surface to the pole 29.

According to another preferred embodiment of the present invention, the anterior connect adaptor 21 is connected with the main conductor 20 by a cylindrical protrusion. The main conductor 20 is fastened to the pole by a cylindrical protrusion. The anterior connect adaptor 21 and the main conductor 20 both comprise a concave part adapted to the cylindrical protrusion. Similarly, main conductor 20 is fastened to the pole 29 by a cylindrical protrusion.

According to the preferred embodiment of the present invention, as shown in Fig. 2A- 2C, the main conductor 20 is conical and the diameter of the main conductor is decreasing towards the tulip contact end. In another preferred embodiment, the main conductor 20 can also be cylindrical.

The anterior connect adaptor 21 can also be made of aluminum or aluminum alloy and is an integral structure with the main conductor 20. But for big current application, it is better to be separated with two kinds of material to keep same withstand capability but get much cost saving.

According to the preferred embodiments of the present invention, the anterior connect adaptor 21 is silver plating. Thus, the anterior connect adaptor 21 has a better thermal dissipation performance and conductivity.

Fig. 3 shows the structure of the contact arm of the present invention according to another preferred embodiment. The contact arm 20 is cylindrical and the anterior connect adaptor 21 is made of aluminum or aluminum alloy and is an integral structure with the main conductor 20. A plurality of heat elimination grooves 201 are provided on the surface of the main conductor 20 near the anterior connect adaptor end. The heat elimination grooves 201 can increase the heat dissipation performance.

Fig. 4 shows the contact arm is connected with the tulip contact 22. The contact arm is

connected to a tulip contact 22 via the anterior connect adaptor 21. The main conductor 20 is covered by insulating material except the concave part 25. The insulating material 26 is to prevent high voltage arc between the main conductor 20 and the earthing parts.

5 In the other aspect, the present invention provides a circuit breaker. As shown in Fig. 5, the circuit breaker comprises a pole 29 and a tulip contact 22 and a contact arm according to anyone of above. The contact arm is fastened to the pole 29 at one end and contacted with the tulip contact 22 at the other end. The bolt is fastened on the contact arm by glue to prevent loose. To make sure the contact arm 20 and the pole 29 are demountable, the glue is used only at one end of the double start thread bolt 23. Since the other components of the circuit breaker are not
10 the inventive points of this invention, they are described in details here.

Experiments have been done on the contact arm of the present invention. It performed well both in temperature rise experiment and short-time withstands current test experiment.

Though the present invention has been described on the basis of some preferred embodiments, those skilled in the art should appreciate that those embodiments should by no means limit the scope of the present invention. Without departing from the spirit and concept of
15 the present invention, any variations and modifications to the embodiments should be within the apprehension of those with ordinary knowledge and skills in the art, and therefore fall in the scope of the present invention which is defined by the accompanied claims.

CLAIMS

1. A contact arm for switch device comprising a main conductor (20) which is adapted to connect with a pole (29), characterized in that said main conductor (20) is solid and is made of aluminum or aluminum alloy.
2. A contact arm according to claim 1, characterized in that it further comprises an anterior connect adaptor (21) at the tulip contact end of the main conductor (20) configured to connect with a tulip contact (22).
3. A contact arm according to claim 1, characterized in that the main conductor (20) comprises a concave part (25) at the pole end of the main conductor (20) adapted to accommodate an external protrusion (23) for connecting with the pole (29).
4. A contact arm according to claim 3, characterized in that said concave part is an internal screw thread (25) adapted to connect with the pole (29) by a bolt (23).
5. A contact arm according to any one of claims 1-4, characterized in that the main conductor (20) is cylindrical.
6. A contact arm according to any one of claims 1-4, characterized in that the main conductor (20) is conical and the diameter of the main conductor is decreasing towards the tulip contact end.
7. A contact arm according to claim 6, characterized in that it further comprises a conductor protrusion (24) configured to connect with the anterior connect adaptor (21).
8. A contact arm according to claim 7, characterized in that said conductor protrusion is a bolt and preferably a double start thread bolt (24).
9. A contact arm according to claim 2, characterized in that said anterior connect adaptor (21) is made of copper.
10. A contact arm according to claim 2, characterized in that said anterior connect adaptor (21) is made of aluminum or aluminum alloy and is an integral structure with the main conductor (20).
11. A contact arm according to any one of claims 2, 9 or 10, characterized in that the external surface of said anterior connect adaptor (21) is silver plating.
12. A contact arm according to claim 11, characterized in that it further comprises at least one heat elimination groove (201) on the surface of the main conductor (20) near the anterior connect

adaptor (21) end.

13. A contact arm according to claim 6, characterized in that said main conductor (20) is covered by insulating layer (26) except the concave part (25).

14. A circuit breaker comprising a pole (29), characterized in that it comprises a contact arm according to any one of claims 1-13, and the contact arm is fastened to the pole (29).

15. A circuit breaker according to claim 14, characterized in that the contact arm is also fastened to the pole (29) by glue.

DRAWING

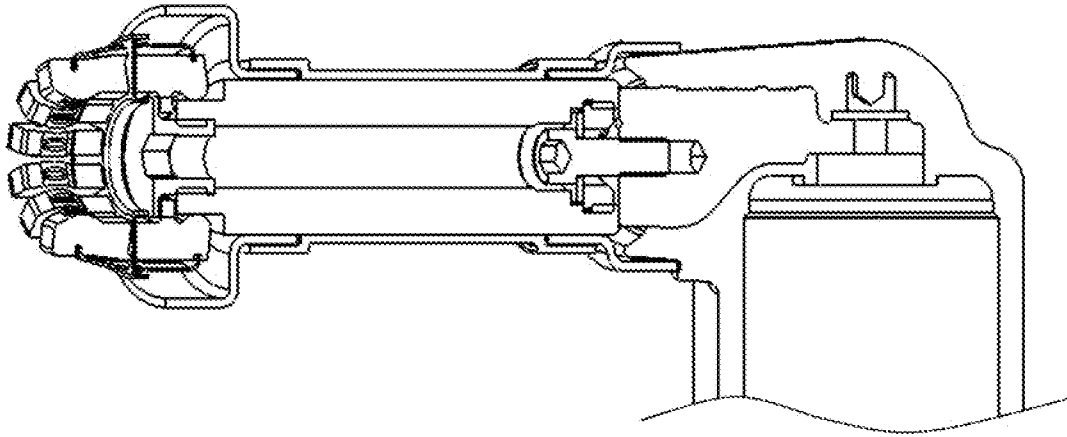


Fig. 1

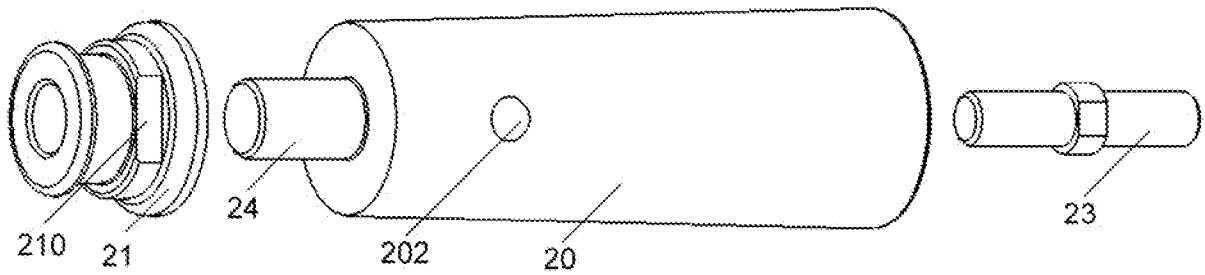


Fig. 2A

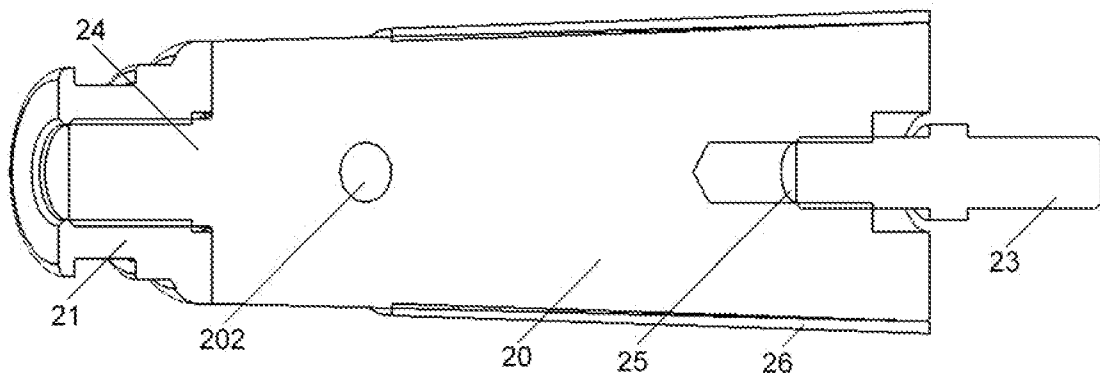


Fig. 2B

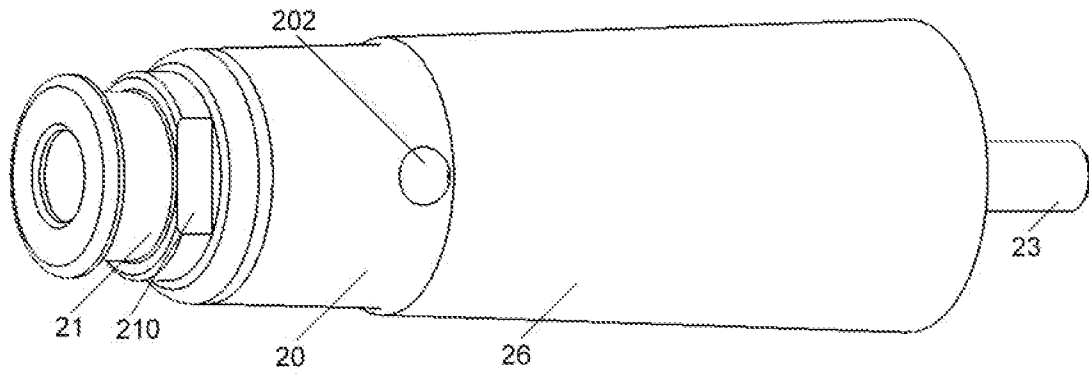


Fig. 2C

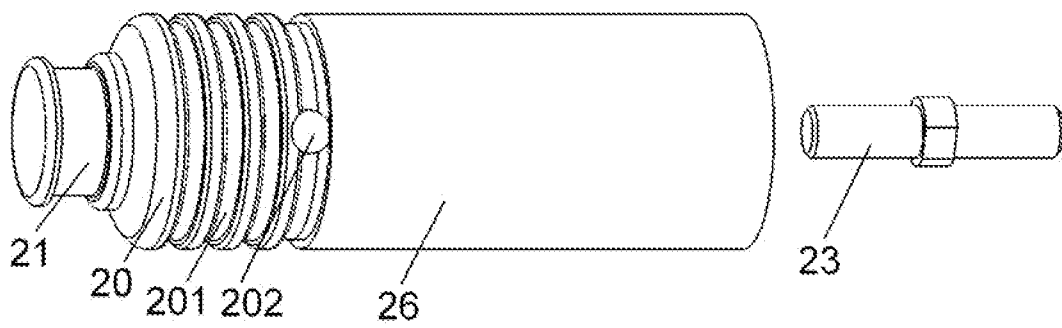


Fig. 3

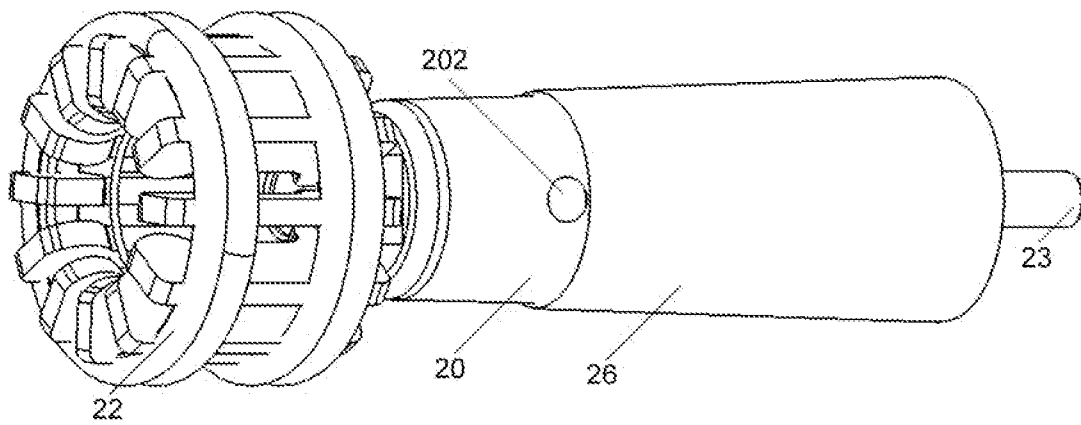


Fig. 4

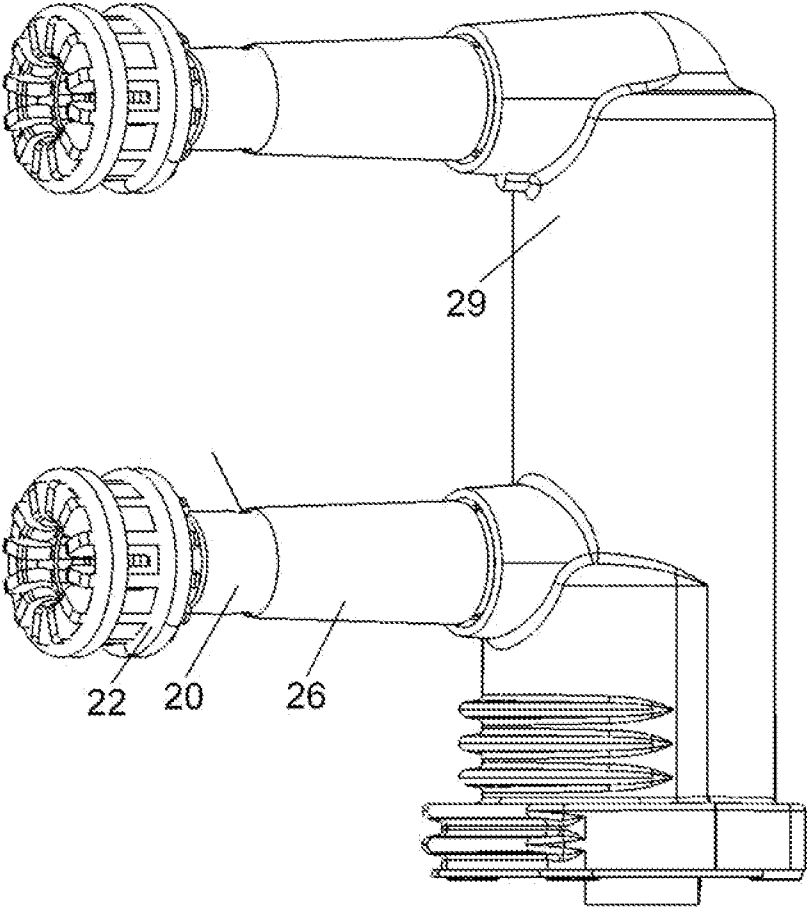


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2011/072918

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, H01R

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, WPI, EPODOC, CNKI, switch, breaker, conductor, bushing, tulip, contact, aluminum, alloy, al, heat

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 101330174 A (LIANG, Chuxin)24 Dec. 2008 (24.12.2008) pages 5,9 in the description,	1-11,14,15
Y	figs. 1-20	12-13
Y	CN 201435311 Y (FUJIAN SANXING ELECTRICAL DEVICE CO LTD) 31 Mar. 2010	12
A	(31.03.2010) the abstract, figs.1-6	1-11,13-15
Y	CN 201230155 Y (HENAN SENYUAN ELECTRIC CO LTD) 29 Apr. 2009 (29.04.2009) the	13
A	abstract, fig.2	1-12,14-15
A	JP11-265640 A (TOGAMI ELECTRIC MFG) 28 Sep. 1999 (28.09.1999) the whole document	1-15

☐ 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 19 Dec. 2011 (19.12.2011)	Date of mailing of the international search report 02 Feb. 2012 (02.02.2012)
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. 86-10-62019451	Authorized officer PENG Hui Telephone No. (86-10)62411726

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2011/072918

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 101330174 A	24.12.2008	None	
CN 201435311 Y	31.03.2010	None	
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		JP8-315688 A	29.11.1996
		JP2964473B2	18.10.1999

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2011/072918

A. CLASSIFICATION OF SUBJECT MATTER

H01H 73/02 (2006.01) i

H01R 13/03 (2006.01) i