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(54) **MOLDED CASE CIRCUIT BREAKER HAVING PRESSURIZED CONTACT FIXING STRUCTURE**

(57) This application includes a moveable element being rotatably installed on a main body, the moveable element forming a pressure unit with a constant gradient in one side thereof, a moveable contact being formed to correspond to the gradient of the pressure unit to be fixed by the pressure unit and a fixable element being in a contact with the moveable contact. This application provides a molded case circuit breaker. The molded case circuit breaker may prevent a moveable contact deviation according to a solder fusion between a moveable ele-

ment and a moveable contact although a temperature of a current carrying unit excessively increases when a fault current flows in, may form a moveable contact of a gradient shape corresponding to a pressure unit shape to increase a current carrying reliability despite inflow of the fault current and may prepare a weld unit between a pressure unit and a moveable contact to have a pressurized contact structure capable of maintaining a fixed factor such as re-welding the pressure unit and the moveable contact despite melting and cooling.

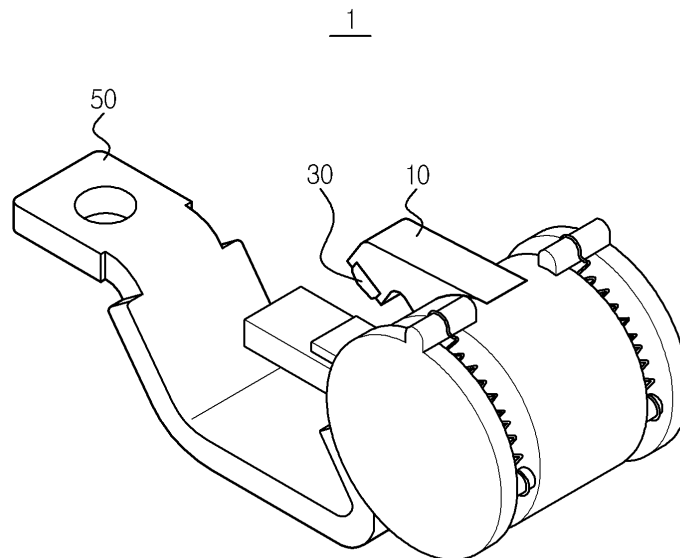


FIG. 4

Description

[Technical Field]

[0001] This application relates to a molded case circuit breaker having a pressurized contact structure and more particularly to a molded case circuit breaker having a pressurized contact structure capable of preventing a deviation of a moveable contact according to a solder fusion between a movable element and a moveable contact although a temperature of a current carrying unit is abnormally increased due to an inflow of an accidental current.

[Background Art]

[0002] Generally, a molded case circuit breaker is a circuit breaker for an overload and short circuit protections and is accommodated in a molded case. The molded case circuit breaker is used for protecting low voltage in-house below an AC 600V or a DC 250V voltage and is usually called as an NFB.

[0003] Because the molded case circuit breaker is small and safely operable and does not require replacing a fuse, the molded case circuit breaker is widely used instead of a combination of a knife switch and fuse. A trip device is classified into a thermal trip (curved by heating a bimetal through a current flown into a circuit breaker), an overcurrent trip pulling an iron coil through an overcurrent, a thermal magnetic trip and an electric trip.

[0004] Herein, in trip characteristics, a trip is not operated when 100% of its rated current is continuously carried and a trip operation time is pre-determined when 125% and 200% of its rated current is carried. The molded case circuit breaker is a device for automatically blocking a circuit in an electrical overload state to protect a circuit and load, and includes a movable element and a fixable element being in contact or in noncontact to configure a circuit for flowing a constant current.

[0005] FIG. 1 is a diagram illustrating a conventional circuit breaker, FIG. 2 is a diagram extracting a switchgear unit in FIG. 1 and FIG. 3 is a diagram separating a movable element from a fixable element in FIG. 2.

[0006] Referring to FIG. 1, a conventional circuit breaker includes a cover 1 containing components thereof, a switchgear unit 3 mechanically turning ON/OFF a case 2 and an electric line, a trip unit 4 detecting an abnormal current and a fault current, an arc chamber unit 5 removing an arc being generated between contact points in a circuit interruption and a current limiter limiting a fault current by an electronic repulsion.

[0007] Referring to FIG. 2, the current limiter includes fixable elements 21a and 21 b being fixed on a main circuit, a moveable element 22 moving according to a turn-on or turn-off of the switchgear unit 3, a shaft 23 enclosing the moveable element 22 and performing a rotary motion according to a turn-on or turn-off of the switchgear unit 3, a contact spring 24 maintaining a contact force when the moveable element 22 and the fixable

elements 21 a and 21 b are contacted, a moveable element pin 25 connecting the contact spring 24, the moveable element 22 and the shaft 23 and a contact spring pin 26 supporting one side of the contact spring 24.

[0008] Referring to FIG. 2 and FIG. 3, the fixable element 21 a is connected to a power supply terminal and the fixable element 21 b is connected to a load terminal. When a short circuit current flows into a main circuit unit (the fixable element - the moveable element - a terminal unit), an electronic repulsion (Fe) and an arc are generated between the fixable elements 21 a and 21 b and the moveable element 22 to lift the moveable element 22.

[0009] In this case, a current is decreased by an arc voltage thereby the electronic repulsion (Fe) is decreased. When the electronic repulsion (Fe) is smaller than a contact force (Fs) by the contact spring 24, the moveable element 22 is contacted with the fixable elements 21 a and 21 b as described in FIG. 2.

[0010] Therefore, in a conventional current limiter having a contact structure of the moveable element 22 and fixable element 21 a, a tensile force of the contact spring 24 is not constantly maintained according to a movement trajectory increase generated due to an O.T (value of converting a rotation angle of the shaft to a distance) of the moveable element 22 and a separation distance increase generated when the moveable element 22 is separated.

[0011] Korean Patent Publication No. 10-2009-0085976 relates to a molded case circuit breaker and discloses a structure of the molded case circuit breaker where a moveable contact and a fixed contact may not be in contact.

[0012] However, such molded case circuit breaker has a problem that a temperature of a current carrying unit increases when the fault current flows in, a contact deviation is generated due to a solder fusion between the moveable element and the contact point, a contact deviation occurs after a break operation of the molded case circuit breaker not to guarantee a current carrying reliability. These problems may cause a rapid decrease of circuit breaker duration and product manufacturer reliability thereby sales for other products of the manufacturer may be decreased.

[Technical Problem]

[0013] To solve the above described problem, this application proposes to provide the molded case circuit breaker having a pressurized contact unit for preventing a moveable contact deviation according to a solder fusion between a moveable element and a moveable contact although a temperature of a current carrying unit excessively increases in an inflow of a fault current.

[0014] This application proposes to provide a molded case circuit breaker that prepares for a physical fixing structure between the moveable element and the moveable contact to prevent a moveable contact deviation despite a solder fusion and to increase duration and current

carrying reliability despite an inflow of a fault current.

[0015] This application proposes to provide a molded case circuit breaker that forms a gradient moveable contact corresponding to a pressure unit shape for preventing a deviation when the molded case circuit breaker operates due to an abnormal temperature increase of a current carrying unit to increase a physical fixability.

[0016] This application proposes to provide a molded case circuit breaker that prepares for a weld unit between a pressure unit and a moveable contact for preventing a deviation when the molded case circuit breaker operates due to an abnormal temperature increase of a current carrying unit to retain a same fixability after a fusion between a pressure unit and a moveable contact is heated and cooled.

[Technical Solution]

[0017] According to an embodiment of the invention, this application uses a molded case circuit breaker with a pressurized contact unit including a moveable element being rotatably installed on a main body and the moveable element forming a pressure unit with a constant gradient in one side thereof, a moveable contact being formed with correspond to the gradient of the pressure unit to be fixed by the pressure unit and a fixable element being in a contact with the moveable contact to solve technical problems.

[0018] In one embodiment, this application uses a molded case circuit breaker with a pressurized contact unit being comprised of the pressure unit that is formed with a constant gradient at both of the one side of the moveable element to solve technical problems.

[0019] In one embodiment, this application uses a molded case circuit breaker with a pressurized contact unit being comprised of the pressure unit that is formed with a constant gradient along an outer peripheral of the one side of the movable element to solve technical problems.

[0020] In one embodiment, this application uses a molded case circuit breaker with a pressurized contact unit further including a weld unit being welded to attach the moveable contact and the pressure unit to contact surfaces of the moveable contact and the pressure unit to solve technical problems.

[0021] In one embodiment, this application uses a molded case circuit breaker with a pressurized contact unit further including a weld unit being welded to attach the moveable contact and the moveable element to contact surfaces of the moveable contact and the moveable element to solve technical problems.

[Technical Effects]

[0022] As described above, a disclosed technology of this application proposes to solve the above described technical problems and provides various effects. The various effects are corresponded to ① preventing a move-

able contact deviation according to a solder fusion between a moveable element and a moveable contact although a temperature of a current carrying unit excessively increases in an inflow of a fault current, ② preparing for a physical fixing structure between the moveable element and the moveable contact to prevent a moveable contact deviation despite a solder fusion and to increase duration and current carrying reliability despite an inflow of a fault current, ③ forms a gradient moveable contact corresponding to a pressure unit shape for preventing a deviation when the molded case circuit breaker operates due to an abnormal temperature increase of a current carrying unit to increase a physical fixability and ④ preparing for a weld unit between a pressure unit and a moveable contact for preventing a deviation when the molded case circuit breaker operates due to an abnormal temperature increase of a current carrying unit to retain a same fixability after a fusion between a pressure unit and a moveable contact is heated and cooled.

[Description of Drawings]

[0023]

FIG. 1 is a diagram illustrating a conventional circuit breaker.

FIG. 2 is a diagram extracting a switchgear unit in FIG. 1.

FIG. 3 is a diagram separating a movable element from a fixable element in FIG. 2.

FIG. 4 is a perspective diagram illustrating a molded case circuit breaker having a pressurized contact unit according to a disclosure of this application.

FIG. 5 is a side elevation diagram illustrating a molded case circuit breaker having a pressurized contact unit according to a disclosure of this application.

FIG. 6 is a side elevation diagram illustrating a before and after pressure application.

FIG. 7 is a cross-sectional diagram illustrating a molded case circuit breaker having a pressurized contact unit according to a disclosed invention of this application.

[Mode for Invention]

[0024] The embodiments and the configurations depicted in the drawings are illustrative purposes only and do not represent all technical scopes of the invention, so it should be understood that various equivalents and modifications may exist at the time of filing this application. Although a preferred embodiment of the disclosure has been described for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

[0025] Terms and words used in the specification and the claims shall be interpreted as to be relevant to the

technical scope of the invention based on the fact that the inventor may properly define the concept of the terms to explain the invention in best ways.

[0026] The terms "first" and "second" can be used to refer to various components, but the components may not be limited to the above terms. The terms will be used to discriminate one component from the other component. For instance, the first component may be referred to the second component and vice versa without departing from the right of the disclosure.

[0027] When a component is referred to as being "connected to" or "linked to" another component, the component may be directly connected to or linked to another component or an intervening component may be present therebetween. In contrast, if a component is referred to as being "directly connected to" or "directly linked to" another component, an intervening component may not be present therebetween.

[0028] The terms used in the specification are for the purpose of explaining specific embodiments and have no intention to limit the disclosure. Unless the context indicates otherwise, the singular expression may include the plural expression. In the following description, the term "include" or "has" will be used to refer to the feature, the number, the step, the operation, the component, the part or the combination thereof without excluding the presence or addition of one or more features, the numbers, the steps, the operations, the components, the parts or the combinations thereof.

[0029] Unless defined otherwise, the terms including technical and scientific terms used in this specification may have the meaning that can be commonly apprehended by those skilled in the art. The terms, such as the terms defined in the commonly-used dictionary, must be interpreted based on the context of the related technology and must not be interpreted ideally or excessively.

[0030] Hereinafter, embodiments of this application will be described with references to example figures.

[0031] FIG. 4 is a perspective diagram illustrating a molded case circuit breaker having a pressurized contact unit according to a disclosure of this application. Referring to FIG. 4, the molded case circuit breaker with a pressurized contact unit 1 includes a moveable element 10, a moveable contact 30 and a fixable element 50.

[0032] The moveable element 10 is rotatably installed on a main body and is in contact with the fixable element 50 through the moveable contact 30. One side of the moveable element 10 is not plane shaped but projection shaped along both of the one side or along an outer peripheral to fix the moveable contact 30.

[0033] The moveable contact 30 includes a gradient corresponding to the projection shape of the moveable element 10 so that the moveable contact 30 may be physically fixed at a projection of the moveable element 10. Therefore, the moveable contact 30 does not physically deviate despite a solder fusion between the moveable element 10 and the moveable contact 30.

[0034] The fixable element 50 has a fixed contact at

one side thereof and is in contact with the moveable contact 30 in a general current carrying status. A repulsive force between the moveable contact 30 and the fixed contact is generated when a fault current flows in or other accidents occur. When an arc between these contacts is generated, the moveable element 10 rotates to clockwise direction and a shaft is guided by the shaft wall to downward slide.

[0035] In such procedures, a temperature is increased when a fault current flows in or other accidents occur. When a solder fused, the moveable contact 30 does not deviate from the moveable element 10 and retains a contact due to a physically fixed structure of the moveable contact 30 and the moveable element 10

[0036] FIG. 5 is a side elevation diagram illustrating a molded case circuit breaker having a pressurized contact unit according to a disclosure of this application. Referring to FIG. 5, the moveable element 10 includes a pressure unit 11 having a constant gradient at one side thereof.

[0037] The pressure unit 11 may be formed so that the pressure unit 11 has a constant gradient at both of the one side of the moveable element 10 and has a constant gradient along an outer peripheral of the one side of the movable element 10. Herein, a shape of the pressure unit 11 may be varied in a condition when the pressure unit 11 may physically fix the moveable contact 30 and this variation may be obvious to those skilled in the art.

[0038] The pressure unit 11 is a projection shaped so that the pressure unit 11 is projected toward the moveable contact 30 and has a gradient fixing the moveable contact 30. Although the diagram illustrates a structure having projections at both sides, any shape for physically fixing the moveable contact 30 may be used in a condition when the pressure unit 11 may physically fix the moveable contact 30 and this variation may be obvious to those skilled in the art.

[0039] In one embodiment, the molded case circuit breaker includes a weld unit 13. The weld unit 13 may directly connect the moveable contact 30 and the moveable element 10 by applying a heat and pressure without the pressure unit 11 or may strongly connect the moveable contact 30 and the moveable element 10 by applying a heat and pressure with the pressure unit 11. These structures are may be changed according to each of the procedures and circumstances of a manufacturer and the changes may be obvious to those skilled in the art.

[0040] FIG. 6 is a side elevation diagram illustrating a before and after pressure application. Referring to FIG. 6, the pressure unit is illustrated at both of a bottom side of the moveable element and the movable contact is illustrated. A left diagram illustrates a case before the pressure unit applies pressure to the moveable contact and a right diagram illustrates a case after the pressure unit applies pressure to the moveable contact.

[0041] The movable contact may be fixed when the pressure is applied along the both sides or the outer periphery and may be formed in a structure that increases

reliability, decreases process complexity and remarkably decreases a manufacture cost.

[0042] FIG. 7 is a cross-sectional diagram illustrating a molded case circuit breaker having a pressurized contact unit according to a disclosed invention of this application. Referring to FIG. 7, the molded case circuit breaker includes the pressure unit 11 to fix the moveable contact 30 thereby the moveable contact 30 may not deviate with an up and down movement of the moveable element 10 and may prevent the deviation with a temperature increase due to a fault current inflow.

[0043] Herein, the molded case circuit breaker has the weld unit 13 instead of the pressure unit 11 to prevent a deviation of the moveable contact 30 or has the pressure unit 11 and the weld unit 13 to prevent the deviation of the moveable contact 30 and these may be selected or changed.

[0044] Although embodiments have been described with reference to a number of illustrative embodiments thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this disclosure.

Claims

1. A molded case circuit breaker having a pressurized contact structure comprising:
 - a moveable element being rotatably installed on a main body, the moveable element forming a pressure unit with a constant gradient in one side thereof;
 - a moveable contact being formed to correspond to the gradient of the pressure unit to be fixed by the pressure unit; and
 - a fixable element being in a contact with the moveable contact.
2. The molded case circuit breaker of claim 1, wherein the pressure unit is formed with a constant gradient at both of the one side of the moveable element.
3. The molded case circuit breaker of claim 1, wherein the pressure unit is formed with a constant gradient along an outer peripheral of the one side of the moveable element.
4. The molded case circuit breaker in any one of claims 1, 2, and 3, further comprising:
 - a weld unit being welded to attach the moveable contact and the pressure unit to contact surfaces of the moveable contact and the pressure unit.
5. The molded case circuit breaker in any one of claims 1, 2, and 3, further comprising:

a weld unit being welded to attach the moveable contact and the moveable element to contact surfaces of the moveable contact and the moveable element.

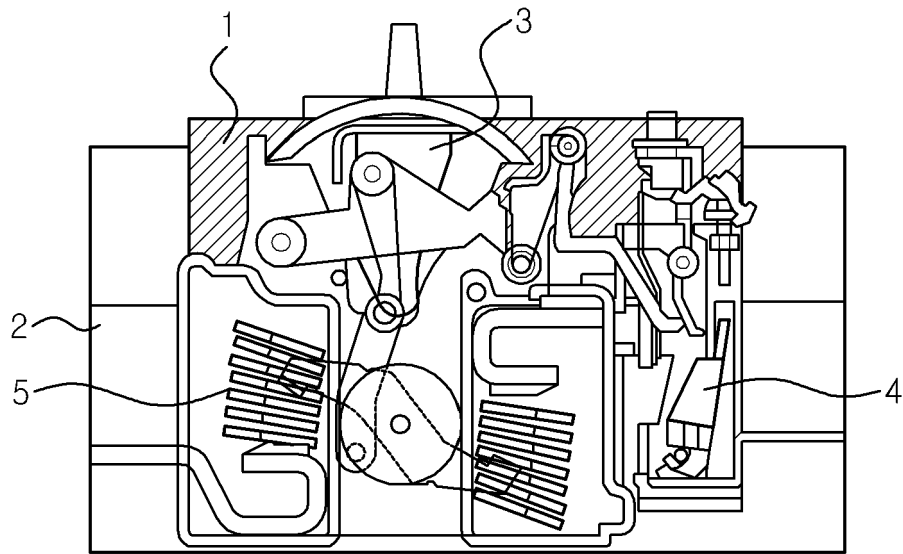


FIG. 1

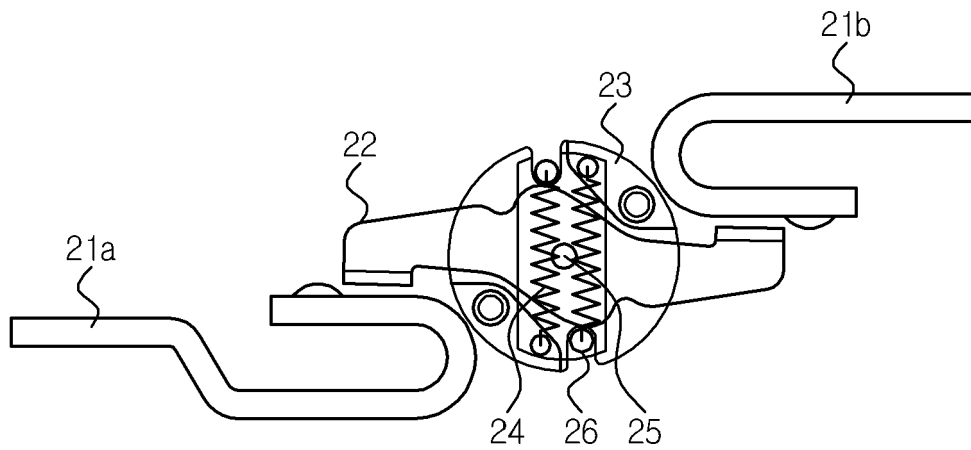


FIG. 2

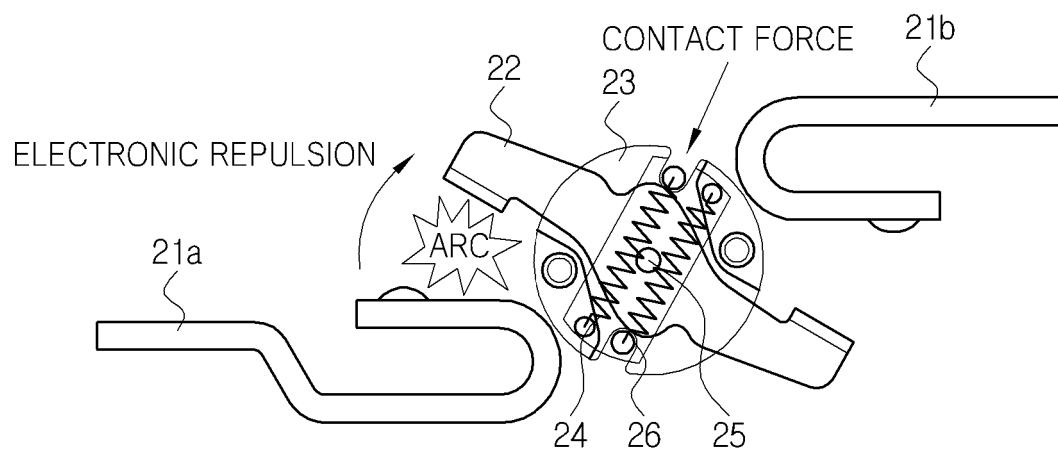


FIG. 3

1

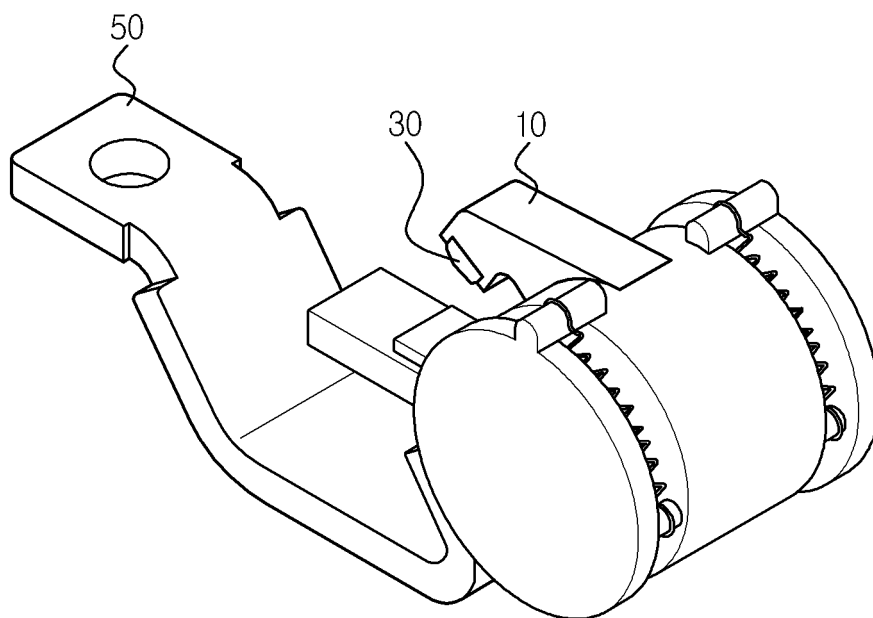


FIG. 4

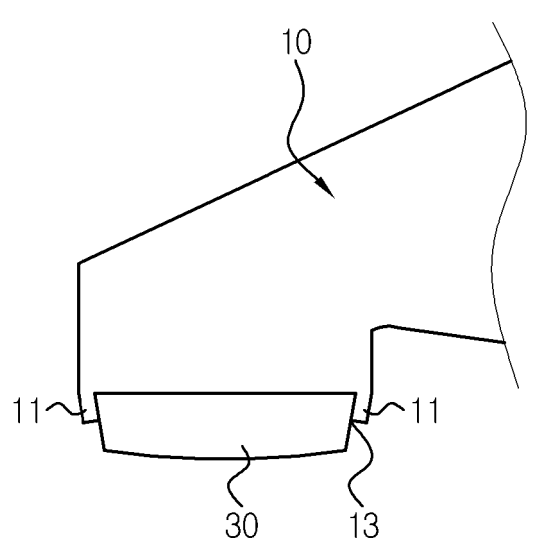


FIG. 5

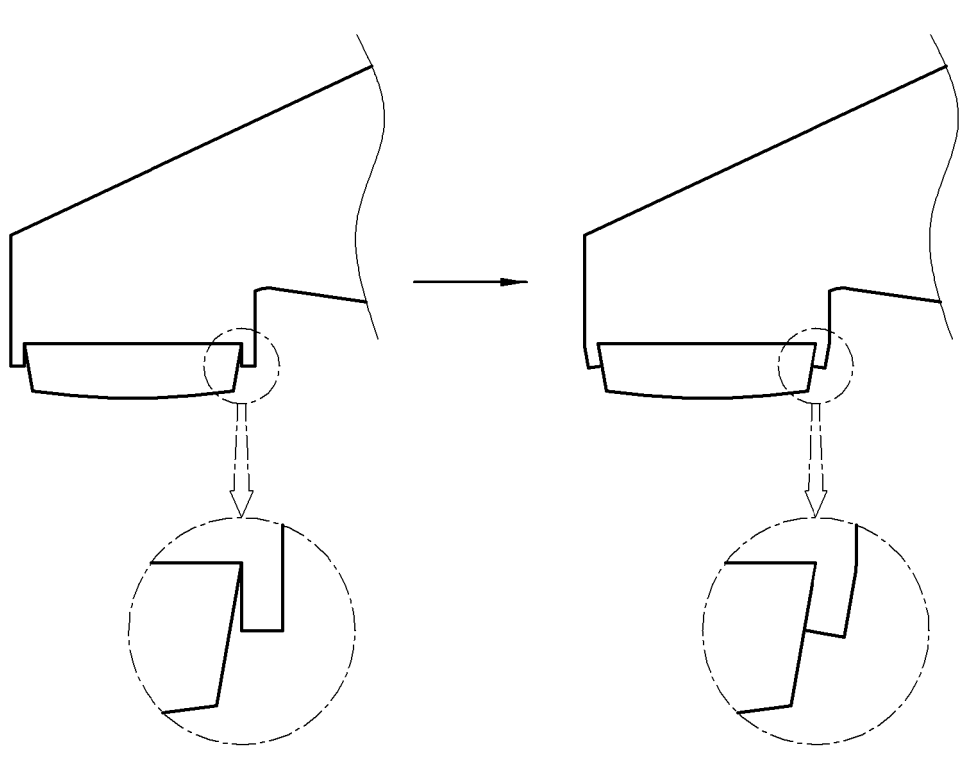


FIG. 6

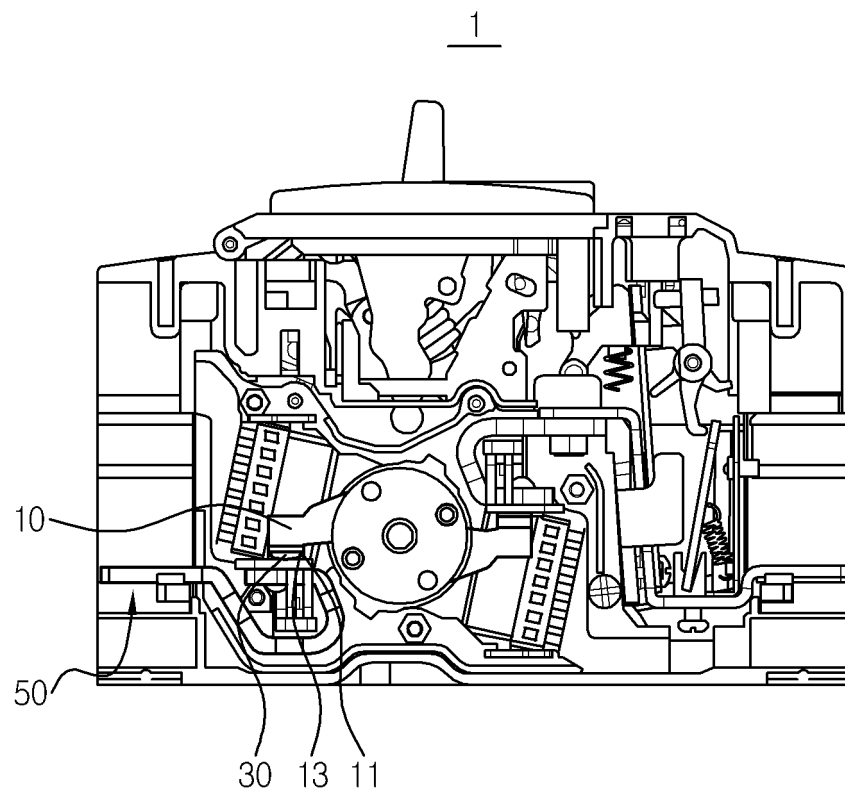


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2012/011332

A. CLASSIFICATION OF SUBJECT MATTER

H01H 71/10(2006.01); H01H 73/04(2006.01);

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)

H01H 71/10; H01H 73/02; H01H 33/02; H01H 73/04; H01H 33/42

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

Korean Utility models and applications for Utility models: IPC as above

Japanese Utility models and applications for Utility models: IPC as above

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

eKOMPASS (KIPO internal) & Keywords: movable element, movable terminal, movable contact, movable contact, circuit breaker, grade, contact, contact, pressing part

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2010-287375 A (FUJI ELECTRIC FA COMPONENTS & SYSTEMS CO, LTD.) 24 December 2010 See paragraphs [0023], [0026]-[0028] and figure 6.	1-3
Y		4-5
Y	JP 2011-108545 A (FUJI ELECTRIC FA COMPONENTS & SYSTEMS CO, LTD.) 02 June 2011 See paragraph [0038].	4-5
A	JP 2010-287376 A (FUJI ELECTRIC FA COMPONENTS & SYSTEMS CO, LTD.) 24 December 2010 See abstract, claim 1 and figure 5.	1-5
A	KR 10-0676968 B1 (LSIS CO., LTD.) 02 February 2007 See abstract, claim 1 and figure 4.	1-5
A	KR 10-0574788 B1 (LSIS CO., LTD.) 27 April 2006 See abstract, claim 1 and figure 5.	1-5

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

* Special categories of cited documents:

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Date of the actual completion of the international search

26 JUNE 2013 (26.06.2013)

Date of mailing of the international search report

26 JUNE 2013 (26.06.2013)

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2012/011332

Patent document cited in search report	Publication date	Patent family member	Publication date
JP 2010-287375 A	24.12.2010	NONE	
JP 2011-108545 A	02.06.2011	NONE	
JP 2010-287376 A	24.12.2010	NONE	
KR 10-0676968 B1	02.02.2007	NONE	
KR 10-0574788 B1	27.04.2006	CN 1758404 A	12.04.2006
		JP 04012226 B2	21.11.2007
		JP 2006-108105 A	20.04.2006
		US 2006-0077022 A1	13.04.2006
		US 7145419 B2	05.12.2006

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- KR 1020090085976 [0011]