(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 768 005 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
21.12.2016 Bulletin 2016/51

(21) Application number: **12840034.8**

(22) Date of filing: **24.09.2012**

(51) Int Cl.:
H01H 71/00 *(2006.01)* ***H01H 73/04*** *(2006.01)*
H01H 1/20 *(2006.01)*

(86) International application number:
PCT/CN2012/081807

(87) International publication number:
WO 2013/053283 (18.04.2013 Gazette 2013/16)

(54) ROTATION DOUBLE-BREAKPOINT MOVABLE CONTACT MODULE

BEWEGLICHES UND ROTIERENDES KONTAKTMODUL MIT DOPPELTEM HALTEPUNKT

MODULE À CONTACTS MOBILES ROTATIFS À DOUBLES POINTS D'OUVERTURE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **13.10.2011 CN 201110310339**

(43) Date of publication of application:
20.08.2014 Bulletin 2014/34

(73) Proprietors:
- **Seari Electric Technology Co., Ltd.**
  Shanghai 200063 (CN)
- **Zhejiang Chint Electrics Co., Ltd.**
  Yueqing, Zhejiang 325603 (CN)

(72) Inventors:
- **GU, Xiang**
  Shanghai 200063 (CN)
- **LI, Jia**
  Shanghai 200063 (CN)
- **WANG, Chuanzheng**
  Shanghai 200063 (CN)
- **LI, Li**
  Shanghai 200063 (CN)
- **SUN, Liangquan**
  Shanghai 200063 (CN)

(74) Representative: **Osha Liang**
2, rue de la Paix
75002 Paris (FR)

(56) References cited:
WO-A2-01/69638
CN-A- 101 114 556
CN-A- 101 320 659
CN-A- 101 320 659
CN-A- 102 103 948
CN-A- 102 103 948
CN-Y- 201 397 785
DE-A1-102004 059 407
US-A- 6 084 489
US-B1- 6 259 048

EP 2 768 005 B1

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to contact module of circuit breaker, more particularly, relates to rotary dual breakpoint moving contact module in operation mechanism of circuit breaker.

2. The Related Art

[0002] Dual breakpoint structure is a trend of modern molded case circuit breakers. As an important component of the molded case circuit breaker, contact modules has drawn great attention. Modern molded case circuit breakers with high breaking ability generally use rotary dual breakpoint moving contact structures, which are of various forms. Some of the conventional rotary moving contact structures have additional functions, the additional functions mainly include automatic lock of the moving contact after opening by electrodynamic repulsion force, so as to prevent rebound of the moving contact. The present invention provides a rotary dual breakpoint moving contact module having a different structure with the traditional products. A repulsion and lock apparatus with a simple structure, high reliability and less components is provided. When a contact bridge is opened to a relatively small angle by electrodynamic repulsion force, the apparatus may quickly lock the contact bridge at a limit position of a clearance distance of open contacts. Another problem that must be solved by the rotary dual breakpoint moving contact structure is to keep balance of the contact pressure applied to the contacts on both sides. The present invention is able to significantly improve the balance between the contact pressure on both sides, while both contact pressure satisfy the desire pressure requirements. The present invention also provides a spring protection mechanism to prevent the spring from damage caused by arc or metal particles.

[0003] The Chinese patent application with a publication number of CN101320659A, and an application number of 200810040543.0 discloses a rotary dual breakpoint structure of a molded case circuit breaker, comprising: a rod-shaped block rotor having a shaft hole at the axial geometrical center, a plurality of centrally symmetric connection rod through holes on both axial sides, centrally symmetric linkage holes on both axial ends, a contact bridge through hole at the radial center, sidewalls on both radial sides of the rod-shaped block rotor having openings for assembling the contact bridge; a contact bridge passing through the contact bridge through hole and assembled in the openings of the rod-shaped block rotor, the contact bridge having a second through hole at the axial geometrical center, the second through aligning with the shaft hole, a second shaft going through the second through hole and the shaft hole, the contact bridge having a plurality of centrally symmetric first through holes; a set of connection rods, each having a connection hole and a convex short axle, the connection hole aligning with one of the first through holes on the contact bridge, a set of first shafts going through the aligned connection holes and first through holes respectively, the convex short axle disposed in one connection rod through hole on the rod-shaped block rotor; a set of contact springs, the endpoints of each fixed on two centrally symmetric first shafts. Other examples of moving contact, circuit breaker and selector shaft unit are disclosed in CN102103948A, US6084489A and DE102004059407A1, respectively.

[0004] The contact bridge of the rotary dual breakpoint structure disclosed in the above patent application uses a slide block mechanism rather than a connection member. The mechanical movement trajectory of the slide block mechanism and the connection member mechanism are completely different. The slide block mechanism may cause sliding friction which may influence the moving flexibility. Further, the rod-shaped block rotor of the above application has a plurality of assembly holes, which may increase the complexity of the assemble procedure due to more assembly procedures.

SUMMARY

[0005] The present invention discloses a rotary dual breakpoint moving contact module with a new structure, which is used in a contact module of molded case circuit breaker. The present invention is able to realize large current short circuit breaking of rotary dual breakpoint moving contacts. The moving contacts may open quickly and rebound of the moving contacts is prevented, and the contact pressure on two contact points is balanced.

[0006] According to the present invention, a rotary dual breakpoint moving contact module as defined in appended claim 1 is provided. Such a rotary dual breakpoint moving contact module comprises among other features:

a rod-shaped block rotor, the rod-shaped block rotor is single phase independent and has a first through hole at the center, a first shaft is mounted in the first through hole, the rod-shaped block rotor has a first recess on each axial side face, a contact spring is mounted in each first recess, the contact spring is able to move within a range defined by the first recess;

a first connection member, the first connection member is mounted on the rod-shaped block rotor, second shaft goes through the first connection member;

a second connection member, the second shaft and a third shaft goes through the second connection member respectively;

a contact bridge, the contact bridge crosses through the rod-shaped block rotor, the outer profile of the contact bridge is centrally symmetric, the first shaft and the third shaft go through the contact bridge re-

spectively, contacts are welded to the end points on both sides of the contact bridge.

[0007] According to an embodiment, the rod-shaped block rotor has two linkage holes and two semicircle slot holes on each axial side face, the two linkage holes are symmetric along the center of the rod-shaped rotor, the two semicircle slot holes are symmetric along the center of the rod-shaped rotor, a fixed angle is between a line connecting the geometric centers of the two linkage holes on a same axial side face and a line connecting the geometric centers of the two semicircle slot holes on the same axial side face, the linkage holes on different axial side faces are axial concentric, and the semicircle slot holes on different axial side faces are axial concentric. The rod-shaped block rotor has an irregular through hole in radial direction, the width of the irregular through hole allows the contact bridge to cross through, the rod-shaped block rotor also has second recesses in radial direction, each second recess surrounds a semicircle slot hole.

[0008] According to an embodiment, the irregular through hole has two first curved faces which are centrally symmetric, the first curved faces match with the outer profile of the contact bridge to define an initial pressure position and a maximum open position of the contact bridge.

[0009] According to an embodiment, the outer profile of the contact bridge has two second curved faces which are centrally symmetric, the second curved faces match with the first curved faces.

[0010] According to an embodiment, the first connection member is mounted within the two semicircle slot holes which are axial concentric, the first connection member slides within the second recesses using the semicircle slot hole as the rotation center, the angle of rotation of the first connection member is limited by the length of the second recess.

[0011] According to an embodiment, the first connection member has a second through hole and a convex short shaft on both sides, the short shaft matches with the semicircle slot hole, the second through hole matches with the second shaft. A plane thickness of the first connection member is not larger than a depth of the second recess.

[0012] According to an embodiment, the second connection member has a third through hole and a fourth through hole on both ends, the third through hole matches with the second shaft, the fourth through hole matches with the third shaft.

[0013] According to an embodiment, the contact bridge has two fifth through holes which are centrally symmetric, the third shaft is mounted within the fifth holes. The contact bridge has a slotted hole at the center, the first shaft passed through the slotted hole and is able to slide within the slotted hole along the longitudinal direction, the longitudinal direction of the slotted hole has a fixed angle to a contact welding surface of the contacts welded on the contact bridge.

[0014] According to an embodiment, the contact spring is suspended on two second shafts which are centrally symmetric, and moves within the first recess on the rod-shaped block rotor.

[0015] The rotary dual breakpoint moving contact module of the present invention is able to realize large current short circuit breaking of rotary dual breakpoint moving contacts. The moving contacts may open quickly and rebound of the moving contacts is prevented, and the contact pressure on two contact points is balanced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The above and other features, natures, and advantages of the invention will be apparent by the following description of the embodiments incorporating the drawings, wherein,

Figs. 1a, 1b, 1c, 1d and 1e illustrate the assembly structure of the rotary dual breakpoint moving contact module according to an embodiment of the present invention.

Figs. 2a and 2b illustrate the contact bridge of the rotary dual breakpoint moving contact module according to an embodiment of the present invention.

Figs. 3a, 3b, 3c and 3d illustrate the rod-shaped block rotor of the rotary dual breakpoint moving contact module according to an embodiment of the present invention.

Figs 4a, 4b and 4c illustrate the first connection member of the rotary dual breakpoint moving contact module according to an embodiment of the present invention.

Figs. 5a and 5b illustrate the second connection member of the rotary dual breakpoint moving contact module according to an embodiment of the present invention.

Fig. 6 illustrates the structural view of the rotary dual breakpoint moving contact module at an opening position or a tripping position according to an embodiment of the present invention.

Fig. 7 illustrates the structural view of the rotary dual breakpoint moving contact module at a closing position according to an embodiment of the present invention.

Fig. 8 illustrates the structural view of the rotary dual breakpoint moving contact module at a dead point according to an embodiment of the present invention.

Fig. 9 illustrates the structural view of the rotary dual breakpoint moving contact module at a maximum open position according to an embodiment of the present invention.

Figs. 10a and 10b illustrate the structural view of the rotary dual breakpoint moving contact module at an imbalanced stress position according to an embodiment of the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS

[0017] The present invention discloses a rotary dual breakpoint moving contact module. Figs. 1~10 illustrate a rotary dual breakpoint moving contact module according to an embodiment of the present invention. The rotary dual breakpoint moving contact module comprises a rod-shaped block rotor 101, a first connection member 102, a second connection member 103, a contact bridge 104, a first shaft 105, second shafts 106, a third shaft 107 and contact springs 108.

[0018] The rod-shaped block rotor 101 is single-phase independent. The rod-shaped block rotor 101 has a first through hole 110 at the center. The first shaft 105 is mounted in the first through hole 110. The rod-shaped block rotor 101 has a first recess 111 on each axial side face. The contact spring 108 is mounted in each first recess 111. The contact spring 108 is able to move within a range defined by the first recess 111.

[0019] The first connection member 102 is mounted on the rod-shaped block rotor 101. The second shaft 106 goes through the first connection member 102.

[0020] The second shaft 106 and the third shaft 107 goes through the second connection member 103 respectively.

[0021] The contact bridge 104 crosses through the rod-shaped block rotor 101. The outer profile of the contact bridge 104 is centrally symmetric. The first shaft 105 and the third shaft 107 go through the contact bridge 104 respectively. Contacts are welded to the end points on both sides of the contact bridge 104.

[0022] Figs. 3a, 3b, 3c and 3d illustrate the rod-shaped block rotor of the rotary dual breakpoint moving contact module according to an embodiment of the present invention. On each axial side face of the rod-shaped block rotor 101, there are two linkage holes 112 and two semicircle slot holes 113. The two linkage holes 112 are symmetric along the center of the rod-shaped rotor, and the two semicircle slot holes 113 are also symmetric along the center of the rod-shaped rotor. There are four linkage holes 112 in total and four semicircle slot holes 113 in total. A fixed angle is between a line connecting the geometric centers of the two linkage holes 112 on a same axial side face and a line connecting the geometric centers of the two semicircle slot holes 113 on the same axial side face. The linkage holes 112 on different axial side faces are axial concentric, and the semicircle slot holes 113 on different axial side faces are also axial concentric. The rod-shaped block rotor 101 has an irregular through hole 114 in radial direction. The width of the irregular through hole 114 allows the contact bridge 104 to cross through. The irregular through hole 114 has two first curved faces 116 which are centrally symmetric. The first curved faces 116 match with the outer profile of the contact bridge 104 to define an initial pressure position and a maximum open position of the contact bridge 104. The rod-shaped block rotor 101 also has second recesses 115 in radial direction. Each second recess 115 surrounds a semicircle slot hole 113. The total number of the second recesses 115 is also four.

[0023] Figs. 2a and 2b illustrate the contact bridge of the rotary dual breakpoint moving contact module according to an embodiment of the present invention. The contact bridge 104 has two fifth through holes 140 which are centrally symmetric. The third shaft 107 is mounted within the fifth holes 140. The third shaft 107 fits in the fifth holes 140 with small clearance. The contact bridge 104 has a slotted hole 141 at the center. The first shaft 105 passes through the slotted hole 141. The first shaft 105 fits in the slotted hole 141 with small clearance and is able to slide within the slotted hole 141 along the longitudinal direction. The longitudinal direction of the slotted hole 141 has a fixed angle to a contact welding surface of the contacts welded on the contact bridge 104. The angle may be optimized by calculation so as to keep balance of contact pressure applied to the contacts on both sides. The outer profile of the contact bridge 104 has two second curved faces 142 which are centrally symmetric. The second curved faces 142 match with the first curved faces 116 on the irregular through hole 114, the first curved face 116 fits in the second curved face 142 with small clearance.

[0024] Figs 4a, 4b and 4c illustrate the first connection member of the rotary dual breakpoint moving contact module according to an embodiment of the present invention. The first connection member 102 is mounted within the two semicircle slot holes 113 which are axial concentric. The first connection member 112 slides within the second recesses 115 using the semicircle slot hole 113 as the rotation center. The angle of rotation of the first connection member 102 is limited by the length of the second recess 115. The first connection member 102 has a second through hole 121 and a convex short shaft 120 on both sides. The short shaft 120 matches with the semicircle slot hole 113. The second through hole 121 matches with the second shaft 106. A plane thickness of the first connection member 102 is not larger than a depth of the second recess 115, so that the second recesses 115 can effectively limit the movement range of the first connection member 102. The outer profile of the first connection member 102 does not influence the rotation of itself within a range.

[0025] Figs. 5a and 5b illustrate the second connection member of the rotary dual breakpoint moving contact module according to an embodiment of the present invention. The second connection member 103 has a third

through hole 130 and a fourth through hole 131 on both ends, the third through hole 130 matches with the second shaft 106, the fourth through hole 131 matches with the third shaft 107.

[0026] The first shaft 105 crosses through the first through hole 110 of the rod-shaped block rotor 101 and the slotted hole 141 of the contact bridge 104 along the axial direction of the rod-shaped block rotor 101. The first shaft 105 fits in the first through hole 110 and the slotted hole 141 with small clearance. Two second shafts 106, which are disposed in a centrally symmetric manner, cross through the second though hole 121 of the first connection member 102 and the third through hole 130 of the second connection member 103 along the axial direction of the rod-shaped block rotor 101. The contact spring 108 is suspended on two second shafts 106 which are centrally symmetric. The contact spring 108 moves within the first recess 111 on both axial sides of the rod-shaped block rotor 101. The third shafts 107 are disposed in a centrally symmetric manner and cross through the fourth through hole 131 of the second connection member 103 and the fifth through hole 140 of the contact bridge 104 along the axial direction of the rod-shaped block rotor 101.

[0027] Figs. 6~10 illustrate the working process of the rotary dual breakpoint moving contact module according to an embodiment of the present invention. Wherein Fig. 6 illustrates the structural view at an opening position or a tripping position, Fig. 7 illustrates the structural view at a closing position, Fig. 8 illustrates the structural view at a dead point, Fig. 9 illustrates the structural view at a maximum open position, Fig. 10 illustrates the structural view at an imbalanced stress position.

[0028] At an opening position of the circuit breaker, the connection members perform counterclockwise rotation under the action of the spring force of the contact springs. The force is transferred to the first connection member through the first shaft and drives the first connection member to perform counterclockwise rotation. The first connection member, the second connection member and the contact bridge form a four-member connection mechanism, which enables the force to further drive the contact bridge to perform counterclockwise rotation. The second curved faces of the contact bridge touch and rely on the first curved faces of the rod-shaped block rotor finally. The rotary dual breakpoint moving contact module maintains the status as show in Fig. 6.

[0029] At a re-lock position of the circuit breaker, the status is the same as that of the opening position, the descriptions will not be repeated.

[0030] At a closing position of the circuit breaker, the connection members perform counterclockwise rotation under the action of the spring force of the contact springs. The force is transferred to the first connection member through the first shaft and drives the first connection member to perform counterclockwise rotation. The first connection member, the second connection member and the contact bridge form a four-member connection mechanism, which enables the force to further drive the contact bridge to perform counterclockwise rotation. The moving contacts on the contact bridges touch the static contacts finally, the rotary dual breakpoint moving contact module maintains the status as show in Fig. 7.

[0031] The rotary dual breakpoint moving contact module of the present invention is able to realize large current short circuit breaking of rotary dual breakpoint moving contacts, the moving contacts may open quickly and rebound of the moving contacts is prevented, and the contact pressure on two contact points is balanced.

Claims

1. A rotary dual breakpoint moving contact module, comprising:

a single-phase independent rod-shaped block rotor (101) having a first through hole (110) at the center thereof, a first recess (111) and two semicircle slot holes (113) on each axial side face thereof, and second recesses (115) in radial direction, the two semicircle slot holes (113) being symmetric along the center of the rod-shaped rotor (10), and the semicircle slot holes (113) on different axial side faces being axially aligned, and each second recess (115) surrounding a semicircle slot hole (113);

a first shaft (105) mounted in the first through hole (110);

a contact spring (108) mounted in each first recess (111), the contact spring (108) being able to move within a range defined by the first recess (111);

a first connection member (102) mounted on the rod-shaped block rotor (101),

the first connection member (102) being mounted within the two semicircle slot holes (113) which are axially aligned, the first connection member (102) being configured to slide within the second recesses (115) using the semicircle slot hole (113) as a rotation center, and the angle of rotation of the first connection member (102) being limited by the length of the second recess (115),

the first connection member (102) having a second through hole (121), a convex short shaft (120) on both sides of the first connection member (102) and a plane thickness, the short shaft (120) matching with the semicircle slot hole (113), the second through hole (121) matching with a second shaft (106), and the plane thickness being not larger than a depth of the second recess (115) so that the second recess (115) can effectively limit a movement range of the

first connection recess (102);
the second shaft (106) going through the first connection member (102) for suspending the contact spring (108);

a third shaft (107);
a second connection member (103) having a third through hole (130) and a fourth through hole (131) on both ends of the second connection member (103), the third through hole (130) matching with the second shaft (106) and the fourth through hole (131) matching with the third shaft (107);
the second shaft (106) and the third shaft (107) going through the second connection member (103) respectively; and
a contact bridge (104) crossing through the rod-shaped block rotor (101), the outer profile of the contact bridge (104) being centrally symmetric,

the first shaft (105) and the third shaft (107) going through the contact bridge (104) respectively, and contacts being welded to end points on both sides of the contact bridge (104).

2. The rotary dual breakpoint moving contact module according to claim 1, wherein
the rod-shaped block rotor (101) further has two linkage holes (112) on each axial side face thereof, the two linkage holes (112) are symmetric along the center of the rod-shaped rotor (101), wherein a fixed angle is between a line connecting the geometric centers of the two linkage holes (112) on a same axial side face and a line connecting the geometric centers of the two semicircle slot holes (113) on the same axial side face, wherein the linkage holes (112) on different axial side faces are axially aligned; and
the rod-shaped block rotor (101) has an irregular through hole (114) in radial direction, the width of the irregular through hole (114) allows the contact bridge (104) to cross through.

3. The rotary dual breakpoint moving contact module according to claim 2, wherein
the irregular through hole (114) has two first curved faces (116) which are centrally symmetric, and the first curved faces (116) match with the outer profile of the contact bridge (104) to define an initial pressure position and a maximum open position of the contact bridge (104).

4. The rotary dual breakpoint moving contact module according to claim 3, wherein
the outer profile of the contact bridge (104) has two second curved faces (142) which are centrally symmetric, and the second curved faces (142) match with the first curved faces (116).

5. The rotary dual breakpoint moving contact module according to claim 1, wherein
the contact bridge (104) has two fifth through holes (140) which are centrally symmetric, and the third shaft (107) is mounted within the fifth holes; and
the contact bridge (104) has a slotted hole (141) at the center, the first shaft (105) passed through the slotted hole (141) and is able to slide within the slotted hole (141) along the longitudinal direction, and the longitudinal direction of the slotted hole (141) has a fixed angle to a welding surface of the contacts welded on the contact bridge (104).

6. The rotary dual breakpoint moving contact module according to claim 1, wherein
the contact spring (108) is suspended on two second shafts (106) which are centrally symmetric, and is able to move within the first recess (111) on the rod-shaped block rotor (101).

Patentansprüche

1. Bewegliches und rotierendes Kontaktmodul mit doppeltem Haltepunkt, aufweisend:

einen einphasigen, unabhängigen stabförmigen Blockläufer (101), aufweisend ein erstes Durchgangsloch (110) in seiner Mitte, jeweils eine erste Aussparung (111) und zwei halbkreisförmige Langlöcher (113) an jeder seiner axialen Seitenflächen sowie zweite Aussparungen (115) in radialer Richtung, wobei die beiden halbkreisförmigen Langlöcher (113) symmetrisch entlang der Mitte des stabförmigen Läufers (10) verlaufen und die halbkreisförmigen Langlöcher (113) an verschiedenen axialen Seitenflächen axial ausgerichtet sind und jede zweite Aussparung (115) ein halbkreisförmiges Langloch (113) umgibt;
einen ersten Schaft (105), der in dem ersten Durchgangsloch (110) angebracht ist;
eine Kontaktfeder (108), die in jeder ersten Aussparung (111) angebracht ist, wobei die Kontaktfeder (108) in der Lage ist, sich in einem durch die erste Aussparung (111) festgelegten Bereich zu bewegen;
ein erstes Verbindungselement (102), das an dem stabförmigen Blockläufer (101) angebracht ist,

wobei das erste Verbindungselement (102) innerhalb der beiden halbkreisförmigen Langlöcher (113) angebracht ist, welche axial ausgerichtet sind, das erste Verbindungselement (102) konfiguriert ist, um innerhalb der zweiten Aussparungen (115) zu gleiten, wobei das halbkreisförmige Lang-

loch (113) als Rotationszentrum verwendet wird, und der Rotationswinkel des ersten Verbindungselements (102) durch die Länge der zweiten Aussparung (115) begrenzt ist,
das erste Verbindungselement (102) ein zweites Durchgangsloch (121), einen konvexen Kurzschaft (120) auf beiden Seiten des ersten Verbindungselements (102) und eine Ebenendicke aufweist, wobei der Kurzschaft (120) mit dem halbkreisförmigen Langloch (113) zusammenpasst, das zweite Durchgangsloch (121) mit einem zweiten Schaft (106) zusammenpasst,

und die Ebenendicke nicht größer als die Tiefe der zweiten Aussparung (115) ist, so dass die zweite Aussparung (115) wirksam den Bewegungsbereich des ersten Verbindungselements (102) begrenzen kann;
den zweiten Schaft (106) durch das erste Verbindungselement (102) verlaufend, um die Kontaktfeder (108) aufzuhängen;
einen dritten Schaft (107);
ein zweites Verbindungselement (103), aufweisend ein drittes Durchgangsloch (130) und ein viertes Durchgangsloch (131) auf beiden Seiten des zweiten Verbindungselements (103), wobei das dritte Durchgangsloch (130) mit dem zweiten Schaft (106) zusammenpasst und das vierte Durchgangsloch (131) mit dem dritten Schaft (107) zusammenpasst;
den zweiten Schaft (106) und den dritten Schaft (107) jeweils durch das zweite Verbindungselement (103) verlaufend;
eine Kontaktbrücke (104), die den stabförmigen Blockläufer (101) durchquert, wobei das Außenprofil der Kontaktbrücke (104) zentralsymmetrisch ausgebildet ist,
den ersten Schaft (105) und den dritten Schaft (107) jeweils durch die Kontaktbrücke (104) verlaufend und Kontakte, die an die Endpunkte auf beiden Seiten der Kontaktbrücke (104) angeschweißt sind.

2. Bewegliches und rotierendes Kontaktmodul mit doppeltem Haltepunkt gemäß Anspruch 1, wobei
der stabförmige Blockläufer (101) an jeder seiner axialen Seiten ferner zwei Verknüpfungslöcher (112) aufweist, die beiden Verknüpfungslöcher (112) symmetrisch entlang der Mitte des stabförmigen Blockläufers (101) angeordnet sind, wobei ein fester Winkel besteht zwischen einer Linie, welche die geometrischen Zentren der beiden Verknüpfungslöcher (112) auf einer gleichen axialen Seitenfläche verbindet, und einer Linie, welche die geometrischen Zentren der beiden halbkreisförmigen Langlöcher (113) auf derselben axialen Seitenfläche verbindet, wobei die Verknüpfungslöcher (112) auf verschiedenen axialen Seitenflächen axial ausgerichtet sind; und
der stabförmige Blockläufer (101) ein unregelmäßiges Durchgangsloch (114) in radialer Richtung aufweist, dessen Breite es der Kontaktbrücke (104) ermöglicht, es zu durchqueren.

3. Bewegliches und rotierendes Kontaktmodul mit doppeltem Haltepunkt gemäß Anspruch 2, wobei
das unregelmäßige Durchgangsloch (114) zwei erste gekrümmte Flächen (116) aufweist, die zentralsymmetrisch sind, und die ersten gekrümmten Flächen (116) mit dem Außenprofil der Kontaktbrücke (104) zusammenpassen, um eine Anfangsdruckposition sowie eine maximale Öffnungsposition der Kontaktbrücke (104) festzulegen.

4. Bewegliches und rotierendes Kontaktmodul mit doppeltem Haltepunkt gemäß Anspruch 3, wobei
das Außenprofil der Kontaktbrücke (104) zwei zweite gekrümmte Flächen (142) aufweist, die zentralsymmetrisch sind, und die zweiten gekrümmten Flächen (142) mit den ersten gekrümmten Flächen (116) zusammenpassen.

5. Bewegliches und rotierendes Kontaktmodul mit doppeltem Haltepunkt gemäß Anspruch 1, wobei
die Kontaktbrücke (104) zwei fünfte Durchgangslöcher (140) aufweist, die zentralsymmetrisch sind, und der dritte Schaft (107) innerhalb der fünften Löcher angebracht ist; und
die Kontaktbrücke (104) in der Mitte ein Langloch (141) aufweist, der erste Schaft (105) durch das Langloch (141) geführt wird und in der Lage ist, innerhalb des Langlochs (141) entlang der Längsrichtung zu gleiten, und die Längsrichtung des Langloches (141) in einem festen Winkel zu einer Anschweißfläche der an die Kontaktbrücke (104) angeschweißten Kontakte steht.

6. Bewegliches und rotierendes Kontaktmodul mit doppeltem Haltepunkt gemäß Anspruch 1, wobei
die Kontaktfeder (108) an zwei zweiten Schäften (106) aufgehängt ist, welche zentralsymmetrisch sind, und in der Lage ist, sich innerhalb der ersten Aussparung (111) an dem stabförmigen Blockläufer (101) zu bewegen.

Revendications

1. Module rotatif à contacts mobiles à doubles points de rupture, comprenant :

un rotor monophasé à blocs en forme de tiges indépendantes (101) présentent un premier trou traversant (110) au centre de celui-ci, une première cavité (111) et deux trous en forme de

fentes semi-circulaires (113) sur chaque face latérale axiale de celle-ci, et une deuxième cavité (115) dans une direction radiale, les deux trous en forme de fentes semi-circulaires (113) étant symétriques le long du centre du rotor en forme de tiges (10), et les trous en forme de fentes semi-circulaires (113) sur des faces latérales axiales différentes étant alignés axialement, et chaque deuxième cavité (115) entourant un trou en forme de fente semi-circulaire (113) ;
un premier arbre (105) monté dans le premier trou traversant (110) ;
un ressort de contact (108) monté dans chaque première cavité (111), le ressort de contact (108) étant capable de se déplacer dans une plage définie par la première cavité (111) ;
un premier élément de connexion (102) monté sur le rotor à blocs en forme de tiges (101),
le premier élément de connexion (102) étant monté dans les deux trous en forme de fentes semi-circulaires (113) qui sont alignés axialement, le premier élément de connexion (102) étant configuré pour coulisser dans la deuxième cavité (115) à l'aide du trou en forme de fente semi-circulaire (113) comme centre de rotation, et l'angle de rotation du premier élément de connexion (102) étant limité par la longueur de la deuxième cavité (115),
le premier élément de connexion (102) présentant un deuxième trou traversant (121), un arbre court convexe (120) de chaque côté du premier élément de connexion (102) et une épaisseur de plan, l'arbre court (120) coïncidant avec le trou en forme de fente semi-circulaire (113), le deuxième trou traversant (121) coïncidant avec un deuxième arbre (106), et l'épaisseur de plan n'étant pas plus grande qu'une profondeur de la deuxième cavité (115), de sorte que la deuxième cavité (115) peut limiter efficacement une plage de mouvement de la première cavité de connexion (102) ;
le deuxième arbre (106) traversant le premier élément de connexion (102) pour suspendre le ressort de contact (108) ;
un troisième arbre (107) ;
un deuxième élément de connexion (103) présentant un troisième trou traversant (130) et un quatrième trou traversant (131) aux deux extrémités du deuxième élément de connexion (103), le troisième trou traversant (130) coïncidant avec le deuxième arbre (106) et le quatrième trou traversant (131) coïncidant avec le troisième arbre (107) ;
le deuxième arbre (106) et le troisième arbre (107) traversant le deuxième élément de connexion (103) respectivement ; et
un pont de contact (104) traversant le rotor à blocs en forme de tiges (101), le profil extérieur du pont de contact (104) présentant une symétrie centrale,

le premier arbre (105) et le troisième arbre (107) traversant le pont de contact (104) respectivement, et des contacts étant soudés à des points d'extrémité des deux côtés du pont de contact (104).

2. Module rotatif à contacts mobiles à doubles points de rupture selon la revendication 1, dans lequel
le rotor à blocs en forme de tiges (101) comporte en outre deux trous de liaison (112) sur chaque face latérale axiale de celui-ci, les deux trous de liaison (112) étant symétriques le long du centre du rotor en forme de tiges (101), dans lequel un angle fixe est prévu entre une ligne reliant les centres géométriques des deux trous de liaison (112) sur une même face latérale axiale et une ligne reliant les centres géométriques des deux trous en forme de fentes semi-circulaires (113) sur la même face latérale axiale, dans lequel les trous de liaison (112) sur des faces latérales axiales différentes sont alignés axialement ; et
le rotor à blocs en forme de tiges (101) présente un trou traversant irrégulier (114) dans la direction radiale, la profondeur du trou traversant irrégulier (114) permettant au pont de contact (104) de s'étendre à travers.

3. Module rotatif à contacts mobiles à doubles points de rupture selon la revendication 2, dans lequel
le trou traversant irrégulier (114) présente deux premières faces courbes (116) à symétrie centrale, et les premières faces courbes (116) coïncident avec le profil extérieur du pont de contact (104) pour définir une position de pression initiale et une position ouverte maximale du pont de contact (104).

4. Module rotatif à contacts mobiles à doubles points de rupture selon la revendication 3, dans lequel
le profil extérieur du pont de contact (104) présente deux deuxièmes faces courbes (142) à symétrie centrale, et les deuxièmes faces courbes (142) coïncident avec les premières faces courbes (116).

5. Module rotatif à contacts mobiles à doubles points de rupture selon la revendication 1, dans lequel
le pont de contact (104) présente deux cinquièmes trous traversants (140) à symétrie centrale, et le troisième arbre (107) est monté dans les cinquièmes trous ; et
le pont de contact (104) présente un trou en forme de fente (141) au centre, le premier arbre (105) traverse le trou en forme de fente (141) et peut coulisser dans le trou en forme de fente (141) le long de la direction longitudinale, et la direction longitudinale du trou en forme de fente (141) présente un angle fixe par rapport à une surface de soudage des con-

tacts soudés sur le pont de contact (104).

6. Module rotatif à contacts mobiles à doubles points de rupture selon la revendication 1, dans lequel le ressort de contact (108) est suspendu à deux deuxièmes arbres (106) à symétrie centrale, et peut se déplacer dans la première cavité (111) sur le rotor à blocs en forme de tiges (101).

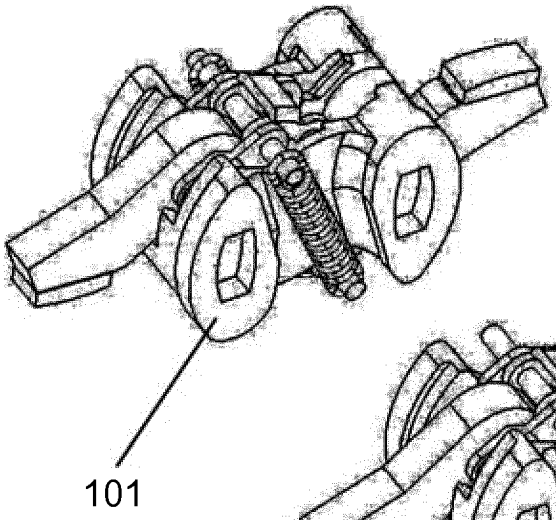

FIG 1a

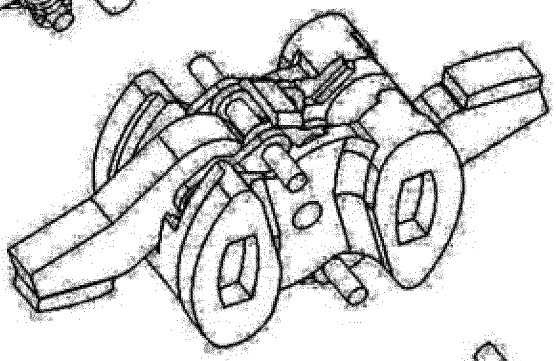

FIG 1b

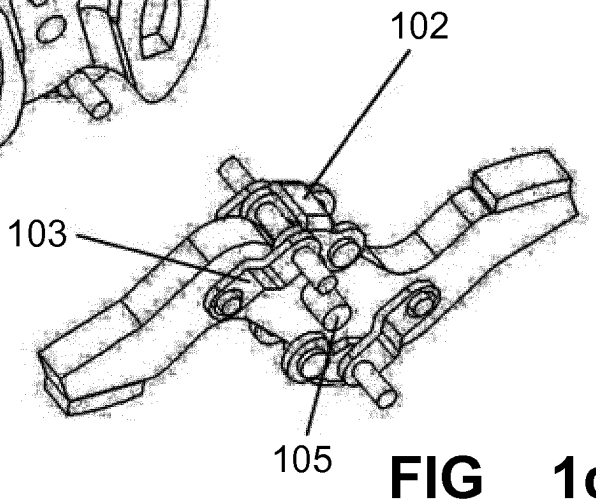

FIG 1c

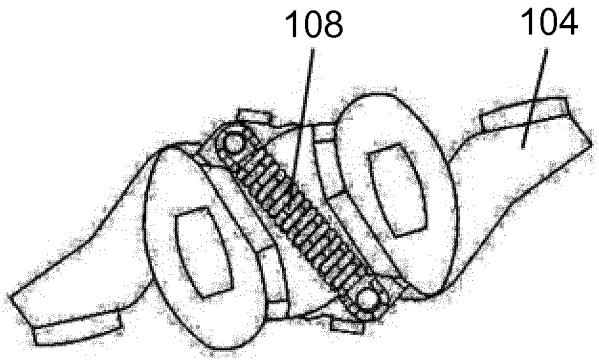

FIG 1d

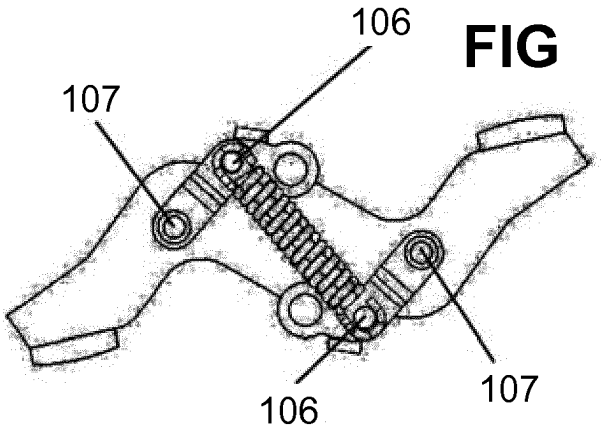

FIG 1e

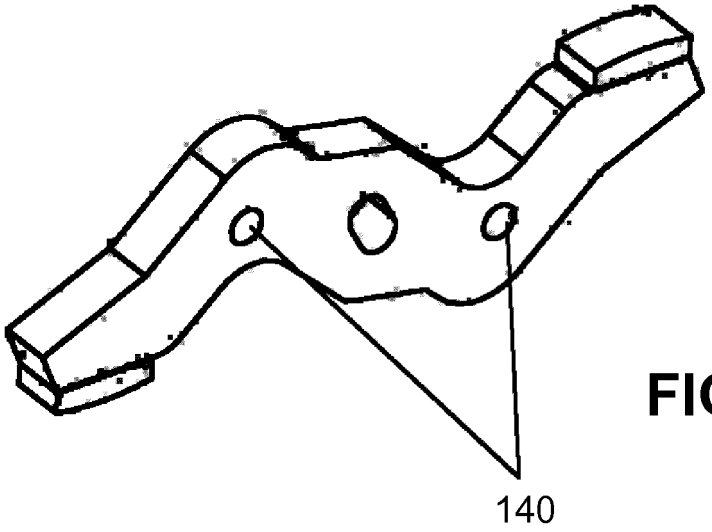

FIG 2a

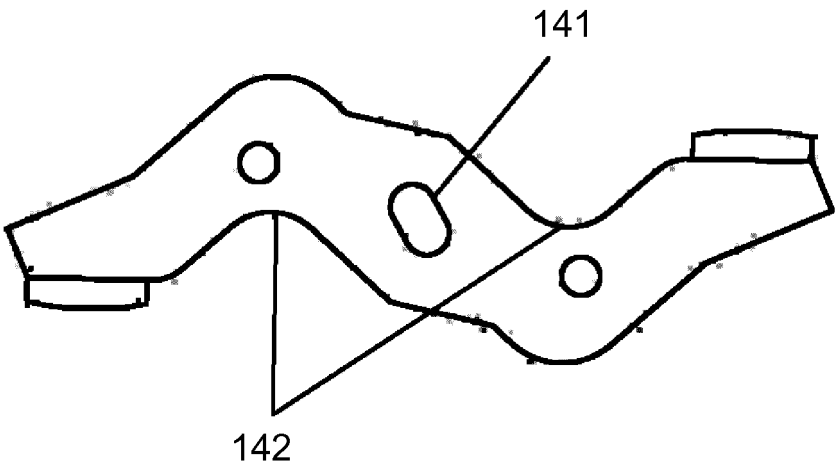

FIG 2b

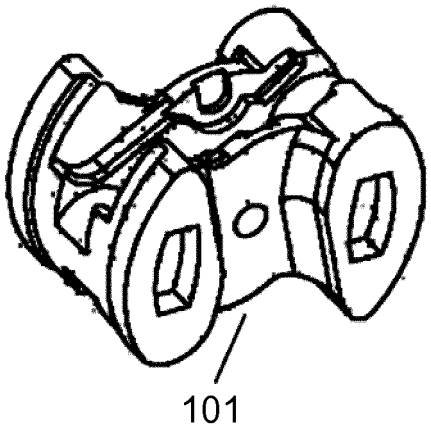

FIG 3a

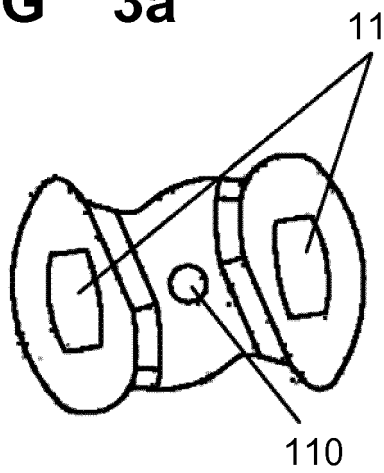

FIG 3b

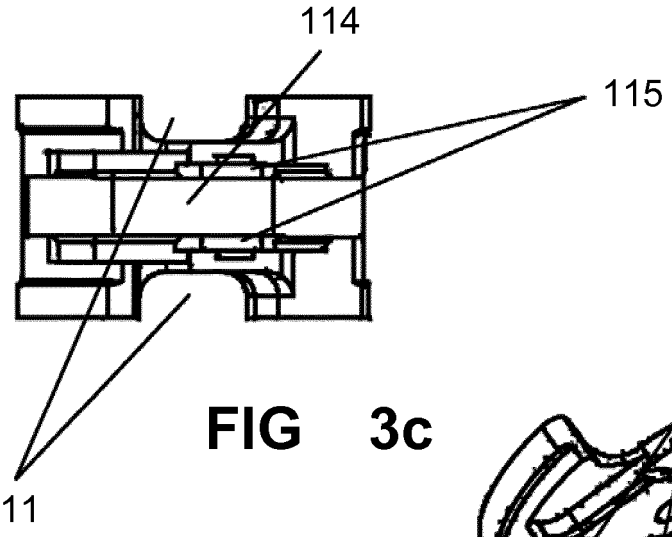

FIG 3c

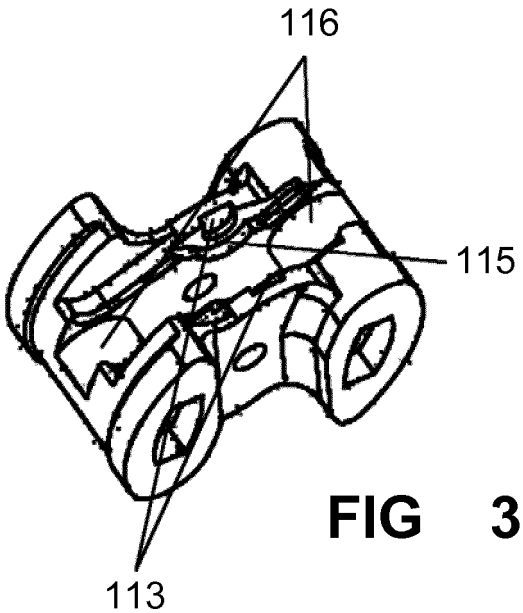

FIG 3d

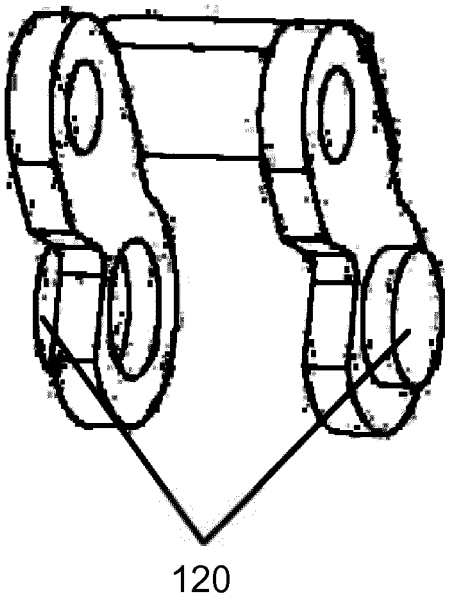

FIG 4a

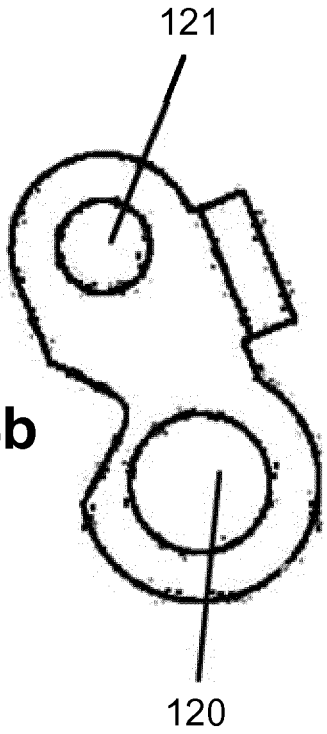

FIG 4b

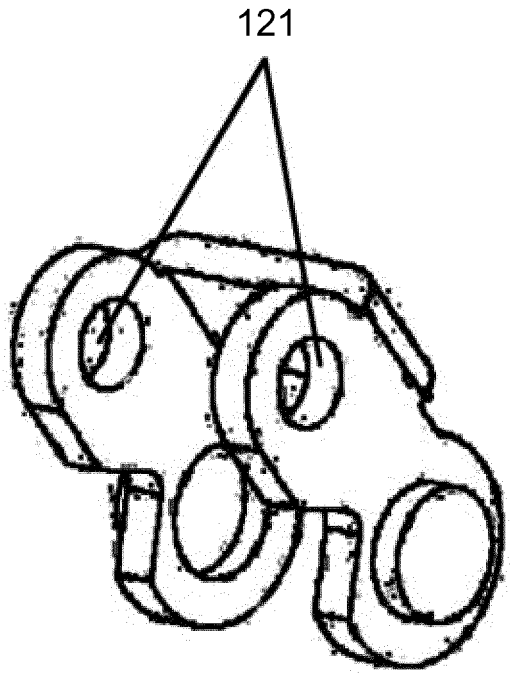

FIG 4c

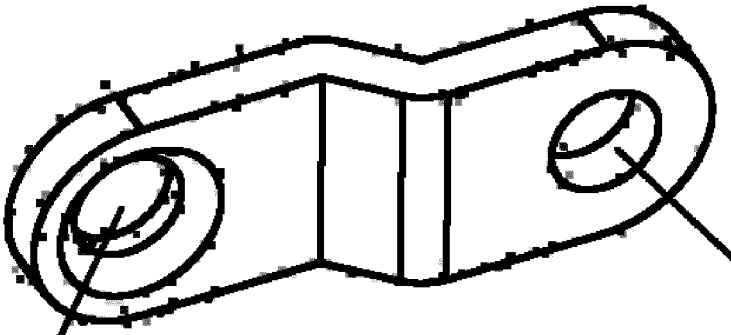

FIG 5a

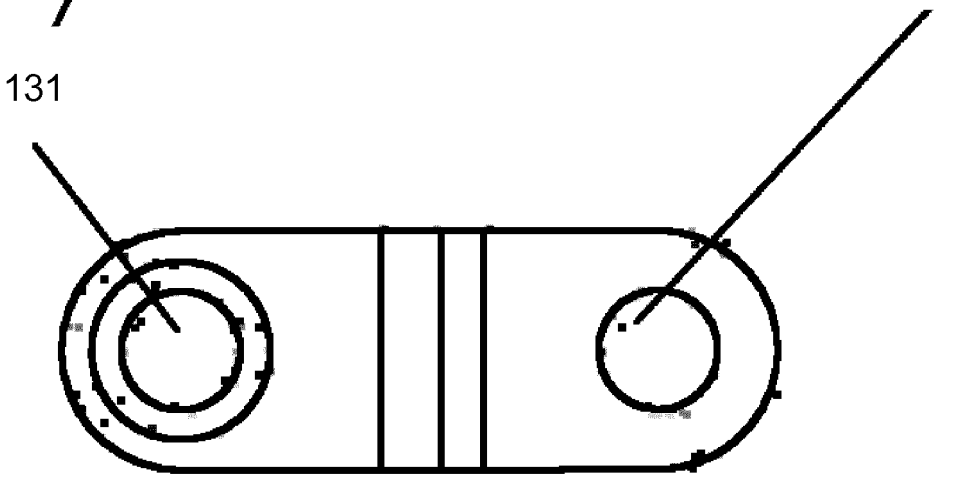

FIG 5b

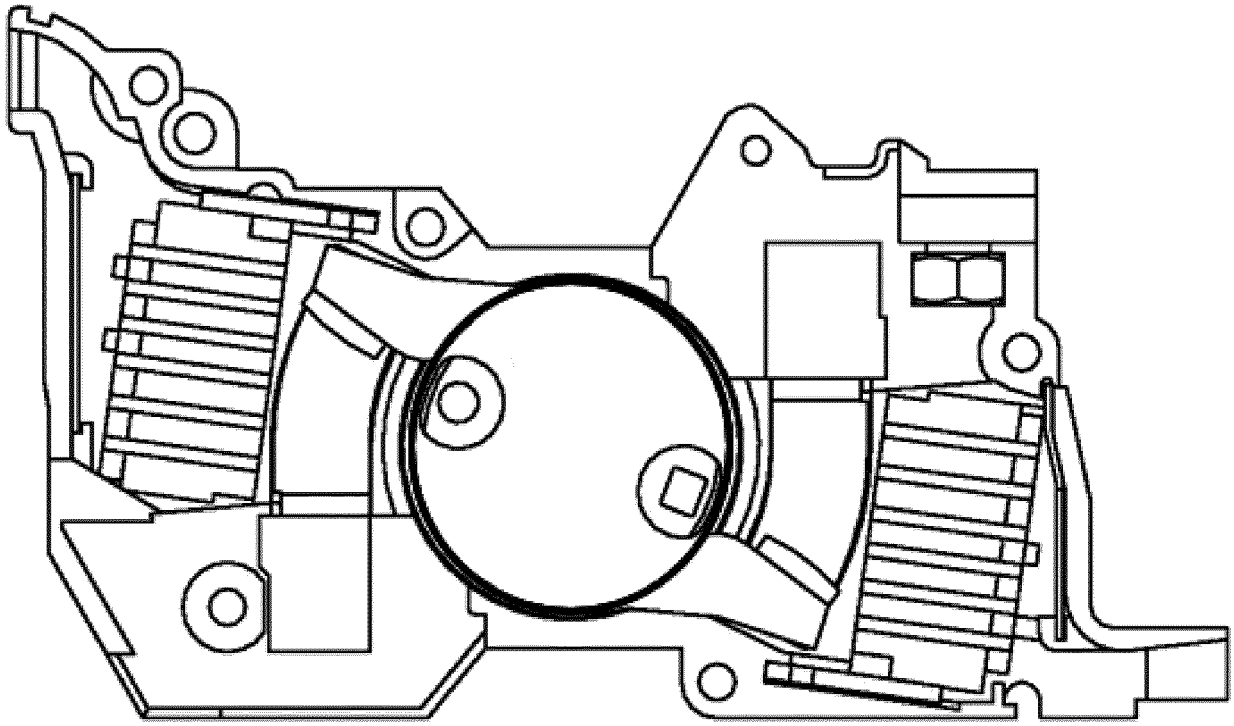

FIG 6

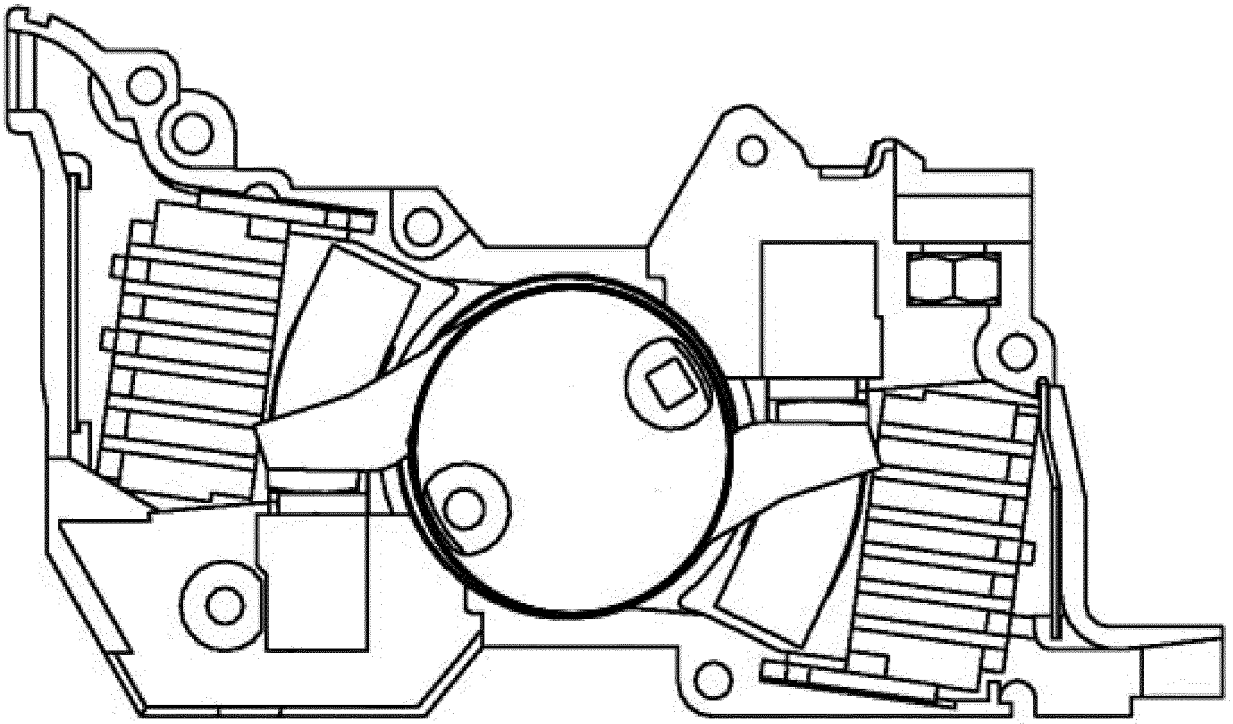

FIG 7

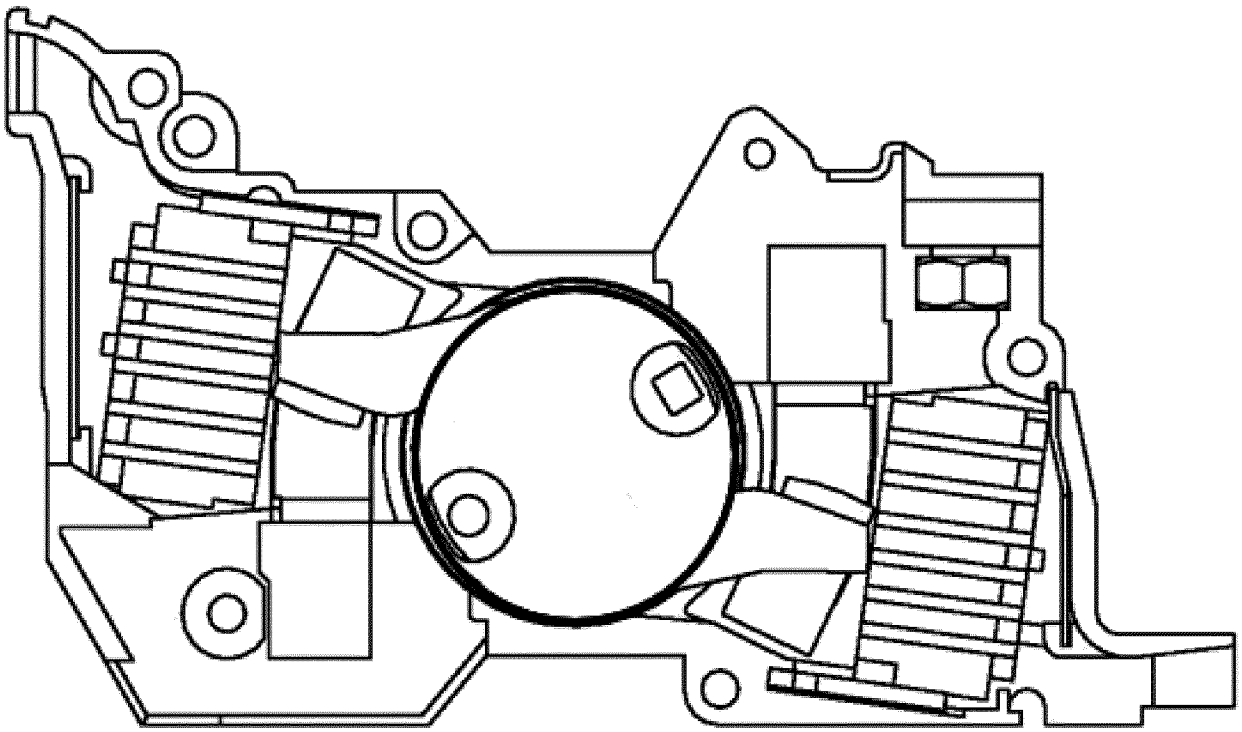

FIG 8

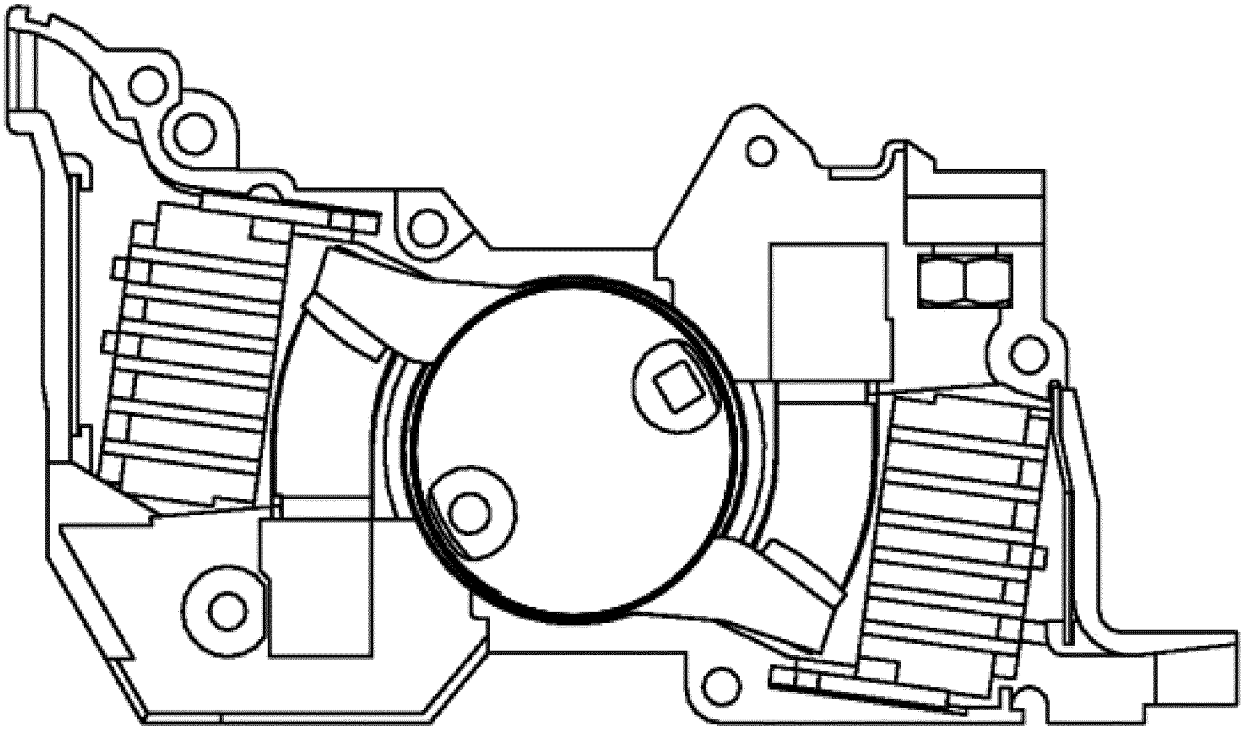

FIG 9

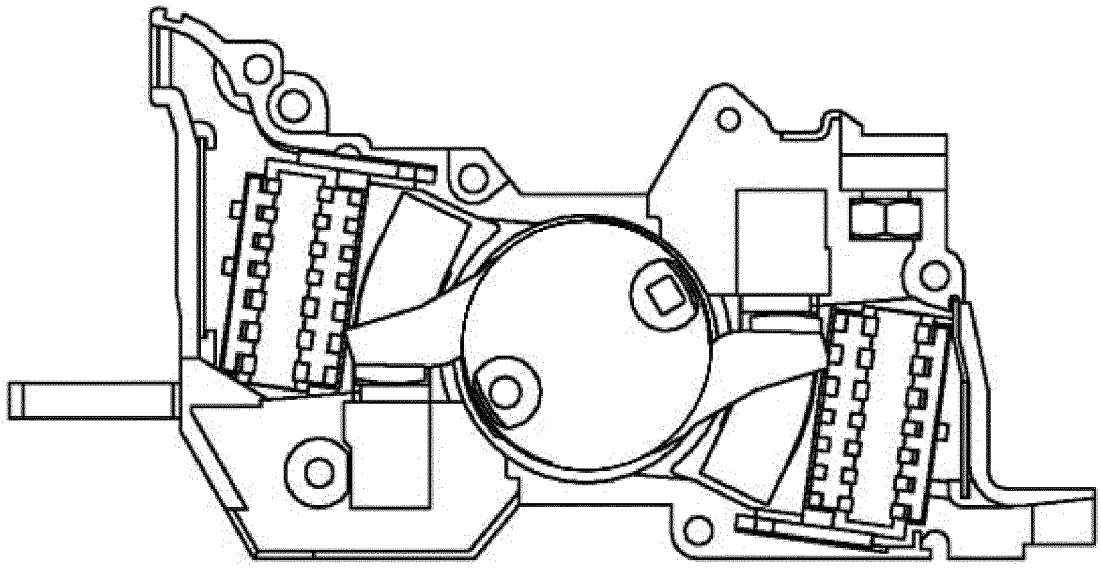

FIG 10a

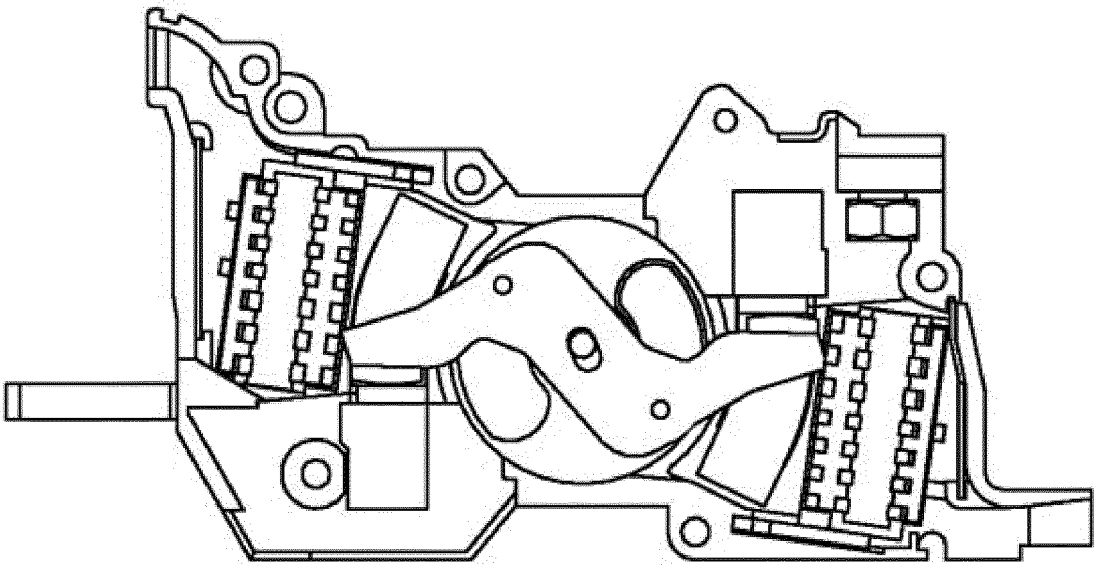

FIG 10b

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- CN 101320659 A **[0003]**
- WO 200810040543 A **[0003]**
- CN 102103948 A **[0003]**
- US 6084489 A **[0003]**
- DE 102004059407 A1 **[0003]**