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(54) UNIVERSAL CIRCUIT BREAKER ENERGY STORAGE HANDLE ANTI-JAMMING APPARATUS

(57) An anti-jamming device for an energy storage handle of a universal circuit breaker comprises a circuit breaker body, and an operating mechanism mounted on one side of the circuit breaker body. The energy storage handle is mounted on the outside wall of one side of the operating mechanism. The energy storage handle is rotated to manually store energy for the operating mechanism. The operating mechanism comprises a V-shaped rotating shaft, wherein one end of the V-shaped rotating shaft extends out of one sidewall of the operating mechanism, and the other end of the V-shaped rotating shaft is sleeved with a ratchet which is in linkage with the energy storage handle. A latch which is in linkage with the ratchet is arranged on one side, facing the ratchet, of the energy storage handle. The energy storage handle is rotated to drive the ratchet to rotate through the latch. An anti-jamming structure which prevents the latch and the ratchet from being jammed is arranged between the latch and the ratchet. The anti-jamming structure comprises an anti-jamming plate. The anti-jamming plate is configured to separate the latch from the ratchet when the energy storage handle is in an initial state.

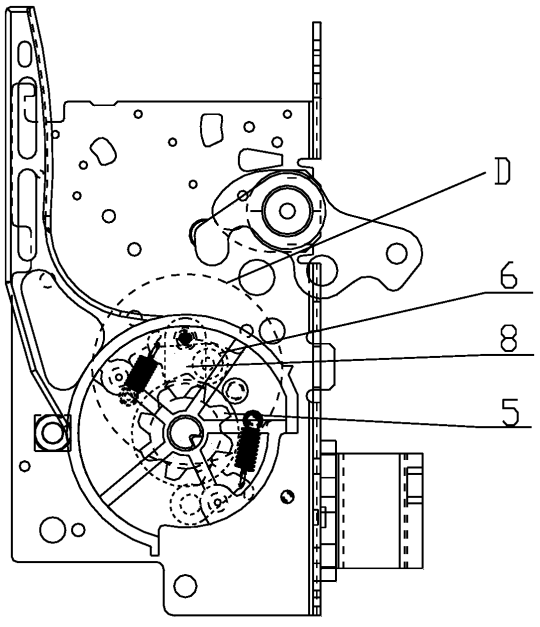

Fig.13

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Description

TECHNICAL FIELD

[0001] The present invention relates to the field of low-voltage apparatuses, in particular to a universal circuit breaker.

BACKGROUND ART

[0002] A universal circuit breaker realizes switching-in and switching-off of a product through an operating mechanism. When the universal circuit breaker stores energy manually, an energy storage handle is rotated by an external force. A latch on the energy storage handle and a ratchet on the operating mechanism drive a V-shaped shaft to rotate, such that an energy storage spring of the operating mechanism is compressed to complete manual energy storage. After the operating mechanism releases energy, the ratchet returns to an initial position. In the initial position, a torque is not transferred between the latch on the energy storage handle and the ratchet on the operating mechanism, and the energy storage handle needs to be rotated by a certain angle to buckle the latch with the ratchet to transfer the torque. At present, when the operating mechanism releases energy, the ratchet rotates excessively due to machining error and fitting error of the components, so that the ratchet is in contact with the buckled surface of the latch on the energy storage handle. In this case, it is unnecessary to rotate the energy storage handle by a certain angle to start energy storage. Since a gap between the energy storage handle in an initial state and a mask is very small, there is no enough space to move the energy storage handle, and therefore, it is difficult to complete the energy storage operation.

[0003] The universal circuit breaker drives the V-shaped shaft of the operating mechanism by an electromotor to realize electric energy storage. The electric energy storage process achieves energy storage of the operating mechanism in such a manner: the electromotor is electrified to rotate, the electromotor reduces a rotating speed by gear transmission to the last gear (an aluminum disk), and a blind hole (or a through hole) in the aluminum disk cooperates with the V-shaped shaft of the operating mechanism to transfer the torque to the operating mechanism. In this case, a blind hole (or a through hole) having the same cross section as the V-shaped shaft of the operating mechanism is machined in the aluminum disk, and the torque is transferred through cooperating the blind hole (or through hole) with the V-shaped shaft. The aluminum disk is an integral part made of aluminum, and is in clearance fit with the V-shaped shaft due to product assembly requirements. During the transmission process, the aluminum disk is in line contact with the V-shaped shaft, and the blind hole (or the through hole) of the aluminum disk of the electromotor is worn out greatly during the electric energy storage process, and is thus short in life.

[0004] A main circuit of the universal circuit breaker is divided into four phases of N/A/B/C or three phases of A/B/C. The main circuit of each phase consists of two parts: a static contact and a moving contact. When the circuit breaker is switched on, a large rotating shaft of the operating mechanism rotates, and the moving contact is driven by a connecting rod to rotate by a certain angle along the rotating center, and then contacts the static contact, and the main circuit is turned on. During the switching-on operation, a contact spring of the moving contact continues to be compressed after the moving contact is in point contact with the static contact, thereby forming an overtravel and increasing the final pressure of the contacts to meet the performance requirements of the product. At present, due to the initial structural design of the universal circuit breaker, in the case of using the same components, the overtravel of the remaining phase away from a B phase will be worse than that of the B phase, accompanied with the risks of insufficient overtravel and insufficient final pressure of the moving contact.

SUMMARY OF THE INVENTION

[0005] An objective of the present invention is to overcome the defects of the prior art and to provide a universal circuit breaker which has stable and stable performances and a simple and compact structure, and can achieve good user experiences.

[0006] To fulfill the said objective, the present invention adopts the following technical solution:

an anti-jamming device for an energy storage handle of a universal circuit breaker comprises a circuit breaker body 1, and an operating mechanism 2 mounted on one side of the circuit breaker body 1; the energy storage handle 3 is mounted on the outside wall of one side of the operating mechanism 2; the energy storage handle 3 is rotated to manually store energy for the operating mechanism 2; the operating mechanism 2 comprises a V-shaped rotating shaft 4, wherein one end of the V-shaped rotating shaft 4 extends out of one sidewall of the operating mechanism 2, and the other end of the V-shaped rotating shaft 4 is sleeved with a ratchet 5 which is in linkage with the energy storage handle 3; a latch 6 which is in linkage with the ratchet 5 is arranged on one side, facing the ratchet 5, of the energy storage handle 3; the energy storage handle 3 is rotated to drive the ratchet 5 to rotate through the latch 6; the anti-jamming structure which prevents the latch 6 and the ratchet 5 from being jammed is arranged between the latch 6 and the ratchet 5; the anti-jamming structure comprises an anti-jamming plate 8; the anti-jamming plate 8 is configured to separate the latch 6 from the ratchet 5 when the energy storage handle 3 is in an initial state.

[0007] Further, the anti-jamming plate 8 is convexly provided with a flange 801 which is used for separating the ratchet 5 from the latch 6; when the operating mech-

anism releases energy, the latch 6 is laid on the flange 801 to prevent the latch 6 and the ratchet 5 from being jammed.

[0008] Further, the flange 801 is in a shape of a one-tenth arc; two ends of the flange 801 are provided with slopes 805 which are inclined downwards.

[0009] Further, the anti-jamming plate 8 is sheathed on the V-shaped rotating shaft 4 and located below the ratchet 5.

[0010] Further, the anti-jamming plate 8 comprises an annular plate 81 and a strip-shaped extension plate 82 extending toward one side of the annular plate 81; a circular mounting hole 802 is formed in the middle of the annular plate 81; the anti-jamming plate 8 is sheathed on the V-shaped rotating shaft 4 through the circular mounting hole 802; the end part of the extension plate 82 is provided with a screw fixing hole 803 for fixing the anti-jamming plate 8; the anti-jamming plate 8 is fixed to one sidewall of the operating mechanism 2 by screwing a screw to the screw fixing hole 803; the flange 801 is convexly arranged at the junction between the annular plate 81 and the extension plate 82.

[0011] Further, the anti-jamming device for the energy storage handle of the universal circuit breaker further comprises a reset spring 61 which is mounted on the energy storage handle 3 and used for resetting the latch 6; one end of the latch 6 is pivotally connected to the latch 6; the other end of the latch 6 is connected to one end of the reset spring 61; the other end of the reset spring 61 is fixed to the latch 6; the latch 6 is provided with a linkage protrusion 62, which is in linkage fit with the ratchet 5, in a manner of protruding toward one side; the other end of the latch 6 is provided with a spring hook 63 which is connected to the reset spring 61 and bent upwards.

[0012] Further, the linkage protrusion 62 is a pointed protrusion; the end part of a meshing tooth 51 of the ratchet 5, which contacts the linkage protrusion 62, is a pointed protrusion.

[0013] Further, a static contact 101 which corresponds to a conductive system in each pole is mounted on the circuit breaker body 1; a moving contact 102 which corresponds to the static contact 101 of the conductive system in each pole is mounted on the circuit breaker body 1; when the circuit breaker body 1 is switched on or switched off, a large rotating shaft 21 of the operating mechanism 2 drives the moving contact 102 to act to be in contact and separated from the static contact 101, such that a main circuit is turned on or turned off; one end of the moving contact 102 is pivotally connected to the circuit breaker body 1; a cantilever 211 which corresponds to the conductive system in each pole is mounted on the large rotating shaft 21; a connecting rod 212 which is in linkage with the cantilever 211 is mounted on one side, which faces the cantilever 211, of the moving contact 102; one end of the connecting rod 212 is connected to the moving contact 102; the other end of the connecting rod 212 is pivotally connected to the end part of the cantilever 211; a first connecting portion 2120 which is connected to the moving contact 102 is arranged at one end of the connecting rod 212, and a second connecting portion 2121 which is connected to the cantilever 211 is arranged at the other end of the connecting rod 212; a distance between the first connecting portion 2120 and the second connecting portion 2121 of the corresponding connecting rod 212 of the circuit breaker near the operating mechanism 2 of the circuit breaker is greater than a distance between a first connecting portion 2120 and the second connecting portion 2121 of the other corresponding connecting rod 212.

[0014] Further, the first connecting portion 2120 is a first through hole formed in the end part of the connecting rod 212; the sidewall of the moving contact 102, which faces the connecting rod 212 is provided with a mounting groove 1021 which is fitted to one end of the connecting rod 212; one end of the connecting rod 212 is mounted into the mounting groove 1021 through the first through hole and is pivotally connected to the moving contact 102.

[0015] Further, the second connecting portion 2121 is a second through hole formed in the other end of the connecting rod 212; one end of the cantilever 211 is provided with a cantilever mounting hole 2110 which is fitted to the second through hole.

[0016] According to the anti-jamming device for the energy storage handle of the universal circuit breaker of the present invention, the anti-jamming structure is arranged between the latch and the ratchet of the energy storage handle to prevent the latch and the ratchet from being jammed. When the energy storage handle is in an initial state, the latch and the ratchet are separated by the anti-jamming structure, thereby promoting the use handfeel of a customer. The ant-jamming plate is convexly provided with the flange for separating the ratchet from the latch. When the operating mechanism releases energy, the latch is laid on the flange to prevent the latch and the ratchet from being jammed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

Fig. 1 is a structural schematic diagram of a circuit breaker body of the present invention;

Fig. 2 is a structural schematic diagram of an energy storage handle of the present invention;

Fig. 3 is a structural schematic diagram of an operating mechanism of the present invention;

Fig. 4 is a side view of the operating mechanism of the present invention;

Fig. 5 is a structural schematic diagram of the energy storage handle in the initial state in the present invention;

Fig. 6 is an enlarged view of a portion A in Fig. 5 in the present invention;

Fig. 7 is a structural schematic diagram of the energy storage handle during manual energy storage in the

present invention;
Fig. 8 is an enlarged view of a portion B in Fig. 7 in the present invention;
Fig. 9 is a schematic diagram in which a ratchet and a latch are jammed when the operating mechanism releases energy in the present invention;
Fig. 10 is an enlarged view of a portion C in Fig. 9 in the present invention;
Fig. 11 is another structural schematic diagram of the operating mechanism in the present invention;
Fig. 12 is another side view of the operating mechanism in the present invention;
Fig. 13 is a structural schematic diagram in which an anti-jamming plate is mounted in the present invention;
Fig. 14 is an enlarged view of a portion D in Fig. 13 in the present invention;
Fig. 15 is a stereoscopically structural schematic diagram of the anti-jamming plate in the present invention;
Fig. 16 is another structural schematic diagram of the circuit breaker body in the present invention;
Fig. 17 is another schematic diagram of the operating mechanism in the present invention;
Fig. 18 is a stereogram of an electromotor in the present invention;
Fig. 19 is a structural schematic diagram of a V-shaped rotating shaft in the present invention;
Fig. 20 is a top view of an aluminum disk in the present invention;
Fig. 21 is a stereogram of the aluminum disk in the present invention;
Fig. 22 is a schematic diagram showing the back of the aluminum disk in the present invention;
Fig. 23 is a structural schematic diagram of a further embodiment of the aluminum disk in the present invention;
Fig. 24 is a structural schematic diagram of a circuit breaker body in the present invention;
Fig. 25 is another structural schematic diagram of the operating mechanism in the present invention;
Fig. 26 is a structural schematic diagram of a moving contact in the present invention;
Fig. 27 is a structural schematic diagram of a connecting rod in the present invention; and
Fig. 28 is a structural schematic diagram of a first pin shaft in the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] The specific embodiments of a universal circuit breaker of the present invention will be further described below with reference to the embodiments given in Figs. 1 to 28. The universal circuit breaker of the present invention is not limited to the description of the following embodiments.

[0019] As shown in Figs. 1, 16, 17, 24 and 25, a universal circuit breaker of the present invention comprises a circuit breaker body 1. The circuit breaker body 1 comprises a circuit breaker base, an operating mechanism 2 mounted on one side of the circuit breaker body 1, and an electromotor. An energy storage handle 3 is mounted on the outside wall of one side of the operating mechanism 2. The energy storage handle 3 may be rotated to manually store energy for the operating mechanism 2. The electromotor 7 may electrically store energy for the circuit breaker through an external power source. The energy storage handle 3 is located between the operating mechanism 2 and the electromotor 7. The circuit breaker base further comprises multi-phase conductive copper bars which are arranged in a layered manner. A four-phase universal circuit breaker is shown in drawings, wherein the upper layer and the lower layer of each phase are provided with a first conductive copper bar 118 and a second conductive copper bar 119 respectively. It is apparent that a single-phase circuit breaker or a multi-phase circuit breaker may be available, and multiple layers of the conductive copper bars may also be arranged.

[0020] As shown in Figs. 1, 2, 3, 11, 12, 13 and 14, the universal circuit breaker of the present invention comprises an anti-jamming device for the energy storage handle. The operating mechanism 2 comprises a V-shaped rotating shaft 4 for storing energy, wherein one end of the V-shaped rotating shaft 4 extends out of one sidewall of the operating mechanism 2, and the other end of the V-shaped rotating shaft 4 is sleeved with a ratchet 5 which is in linkage with the energy storage handle 3. A latch 6 which is in linkage with the ratchet 5 is arranged on one side, facing the ratchet 5, of the energy storage handle 3. The energy storage handle 3 is rotated to drive the ratchet 5 to rotate through the latch 6. The anti-jamming structure which prevents the latch 6 and the ratchet 5 from being jammed is arranged between the latch 6 and the ratchet 5. The anti-jamming structure comprises an anti-jamming plate 8. The anti-jamming plate is configured to separate the latch 6 from the ratchet 5 when the energy storage handle 3 is in an initial state. According to the anti-jamming device for the energy storage handle of the universal circuit breaker of the present invention, the anti-jamming structure is arranged between the latch or the ratchet of the energy storage handle to prevent the latch and the ratchet from being jammed. When the energy storage handle is in an initial state or reset to the position of the initial state, the latch and the ratchet are separated by the anti-jamming structure to promote the use handfeel of the customer. As shown in Figs. 5 and 6, under normal conditions, when the energy storage handle 3 is in the initial state, the ratchet 5 and the latch 6 are not buckled with each other, the linkage protrusion 62 of the latch 6 is pressed over one side of a meshing tooth 51 of the ratchet 5.

[0021] As shown in Figs. 7 and 8, under normal conditions, when the energy storage handle 3 manually stores energy, it is necessary for the energy storage handle 3 to rotate by a certain angle first till the linkage pro-

trusion 62 of the latch 6 is buckled with the other side of the meshing tooth of the ratchet 5.

[0022] As shown in Figs. 9 and 10, when the operating mechanism releases energy, the V-shaped rotating shaft and the ratchet 5 are over-steered, and the ratchet 5 and the latch 6 are buckled with each other, thereby causing jamming. In this case, the user needs a large external force to store energy for the operating mechanism, thereby affecting the user experience.

[0023] As shown in Fig. 15, the anti-jamming structure comprises an anti-jamming plate 8 which is sheathed on the V-shaped rotating shaft 4 and located below the ratchet 5. The anti-jamming plate 8 is mounted between a side plate and the ratchet of the operating mechanism. When the operating mechanism is located in the position of the initial state, the latch 6 and the ratchet 5 are separated by the anti-jamming plate 8. In a preferred embodiment, the anti-jamming plate 8 is convexly provided with a flange 801 for separating the ratchet 5 from the latch 6. When the operating mechanism releases energy, the ratchet 5 resets and rotates to the position of the initial state, and the latch 6 is laid on the flange 801 to prevent the latch 6 and the ratchet 5 from being jammed. The latch 6 and the ratchet 5 are separated by the flange 801 to prevent the latch 6 and the ratchet 5 from being jammed. Of course, the latch 6 may also be jacked up with another structure, such as a laterally inclined protrusion; or, the latch 6 is provided with a matching arm or other structure, which cooperates with the anti-jamming plate 8.

[0024] As shown in Figs. 13 and 14, when the operating mechanism is located in the initial state or releases energy and resets to the position of the initial state, the linkage protrusion 62 of the latch 6 is rotated to the upper side of the flange 801 to prevent the latch 6 and the ratchet 5 from being jammed.

[0025] As shown in Fig. 15, specifically, the anti-jamming plate 8 comprises an annular plate 81 and a strip-shaped extension plate 82 which extends toward one side of the annular plate 81.A circular mounting hole 802 is formed in the middle of the annular plate 81. The anti-jamming plate 8 is sheathed on the V-shaped rotating shaft 4 through the circular mounting hole 802. The end part of the extension plate 82 is provided with a screw fixing hole 803 for fixing the anti-jamming plate 8. The anti-jamming plate 8 is fixed to one sidewall of the operating mechanism 2 by screwing a screw to the screw fixing hole 803. The flange 801 is convexly arranged at the junction between the annular plate 81 and the extension plate 82. The anti-jamming plate 8 is simple in structure, and easy to machine. The annular plate 81 is sheathed on the V-shaped rotating shaft 4 through the middle circular mounting hole 802. The extension plate 82 is fastened with a screw, and is thus stable and reliable in structure.

[0026] As shown in Figs. 2 and 4, the anti-jamming device for the energy storage handle of the universal circuit breaker further comprises a reset spring 61 which is mounted on the energy storage handle 3 and used for resetting the latch 6. One end of the latch 6 is pivotally connected to the latch 6. The other end of the latch 6 is connected to one end of the reset spring 61. The other end of the reset spring 61 is fixed to the latch 6. The latch 6 is provided with a linkage protrusion 62, which is in linkage fit with the ratchet 5, in a manner of protruding toward one side. The other end of the latch 6 is provided with a spring hook 63 which is connected to the reset spring 61 and bent upwards. The reset spring 61 is used for resetting the latch 6.

[0027] As shown in Figs. 2-4, specifically, the linkage protrusion 62 is a pointed protrusion. The end part of a meshing tooth 51 of the ratchet 5, which contacts the linkage protrusion 62, is a pointed protrusion. Both the linkage projection 62 and the meshing tooth 51 are provided as pointed protrusions, and are thus matched more tightly and stably. The flange 801 is in a shape of a one-tenth arc. Two ends of the flange 801 are provided with slopes 805 which are inclined downwards. The slopes 805 allow the latch 6 to more easily rotate over the flange 801.

[0028] As shown in Figs. 16-22, the operating mechanism 2 comprises a V-shaped rotating shaft 4 for storing energy. One end of the V-shaped rotating shaft 4 extends out of one sidewall of the operating mechanism 2 and is in linkage fit with an aluminum disk 72 of the electromotor 7. The sidewall of one end of the V-shaped rotating shaft 4 is provided with a first V-shaped groove 401 which is fitted to the aluminum disk 72. The aluminum disk 72 is provided with a reinforced connecting member having a higher hardness than the aluminum disk 72, and is in cooperative connection to the V-shaped rotating shaft 4 by the reinforced connecting member. According to an electromotor transmission mechanism of the universal circuit breaker of the present invention, the aluminum disk is provided with the reinforced connecting member having a higher hardness than the aluminum disk, and is in cooperative connection to the reinforced connecting member, such that the V-shaped rotating shaft undergoes a low wear and is long in life, the integral performance of the circuit breaker is improved and the cost is saved.

[0029] Specifically, the aluminum disk 72 is provided with an insertion hole 721 which is fitted to one end of the V-shaped rotating shaft 4. The reinforced connecting member is a wear preventing shaft 722 which is arranged on the sidewall of the insertion hole 721, has a higher hardness than the aluminum disk 72 and is in limiting fit with a first V-shaped groove 401. According to the electromotor transmission mechanism of the universal circuit breaker of the present invention, the wear preventing shaft which is in contact fit with the V-shaped rotating shaft is riveted in the insertion hole of the aluminum disk of the electromotor, and the wear preventing shaft has a higher hardness than the aluminum disk and has a high strength. The electric energy storage causes low wear and long life, and improves the integral performance of

the circuit breaker.

[0030] As shown in Fig. 18, the electromotor 7 further comprises a motor 71 and an electromotor mounting plate 73, wherein the motor 71 and the aluminum disk 72 are mounted on two sides of the electromotor mounting plate 73 respectively.

[0031] Specifically, the wear preventing shaft 722 penetrates through the aluminum disk 72. The wear preventing shaft is more stable in structure. The wear preventing shaft 722 is in surface contact with the sidewall of the insertion hole 721. Since the wear preventing shaft 722 is in surface contact with the insertion hole 721, the insertion hole of the aluminum disk during electric energy storage undergoes a small intensity of pressure and small wear and is thus long in life. The wear preventing shaft 722 is a cylindrical shaft or a square shaft, and apparently, other shapes may be employed.

[0032] As shown in Fig. 21, the aluminum disk 72 comprises a disc-shaped disk surface 7201. The middle portion of the disk surface 7201 is recessed to form a first groove 7202. A first boss 7203 is convexly arranged in the middle of the first groove 7201. A second boss 7204 which has a diameter smaller than the first boss 7203 is convexly arranged in the middle of the first boss 7203. An insertion hole 721 is formed in the middle of the second boss 7204. The integral structure of the aluminum disk 72 is reasonable in design.

[0033] As shown in Fig. 19, the sidewall of the other end of the V-shaped rotating shaft 4 is provided with a second V-shaped groove 402. The other sidewall of the operating mechanism 2 is provided with a fastener 411 which is fitted to the second V-shaped groove. The other end of the V-shaped rotating shaft 4 extends out of the other sidewall of the operating mechanism 2 and is then fixed by the fastener 411. The first V-shaped groove 401 and the second V-shaped groove 402 are respectively formed in two ends of the V-shaped rotating shaft 4, accompanied with simple structure and convenience in machining.

[0034] As shown in Fig. 23, in order to reduce the wear between the V-shaped rotating shaft 4 and the insertion hole 721, it is also possible to adopt the following manner: the reinforced connecting member is a splicing boss 74 which is arranged above the second boss 7204 of the aluminum disk and made of a splicing material having higher hardness, an insertion hole 721 is formed in the middle of the splicing boss 74, and the splicing boss 74 and the second boss 7204 may be riveted fixedly by adopting a rivet 7401. In this case, the cost is relatively high, but the wear of the insertion hole of the aluminum disk is smaller than that of the above embodiment.

[0035] As shown in Figs. 24-27, a plurality of static contacts 101 corresponding to conductive systems of various poles is mounted on the circuit breaker body 1. A plurality of moving contacts 102 corresponding to the static contacts 11 of the conductive systems of various poles is mounted on the circuit breaker body 1. When the circuit breaker body 1 is switched on or switched off, a large rotating shaft 21 of the operating mechanism 2 drives the moving contacts 102 to act to be in contact and separated from the static contacts 101, such that a main circuit is turned on or turned off. One end of each moving contact 102 is pivotally connected to the circuit breaker body 1. A cantilever 211 which corresponds to the conductive system in each pole is mounted on the large rotating shaft 21. A connecting rod 212 which is in linkage with the cantilever 211 is mounted on one side, which faces the cantilever 211, of the moving contact 102. One end of the connecting rod 212 is connected to the moving contact 102. The other end of the connecting rod 212 is pivotally connected to the end part of the cantilever 211. A first connection portion 2120 which is connected to the moving contact 102 is arranged at one end of the connecting rod 212, and a second connection portion 2121 which is connected to the cantilever 211 is arranged at the other end of the connecting rod 212. A distance between the first connecting portion 2120 and the second connecting portion 2121 of the corresponding connecting rod 212 of the circuit breaker away from the corresponding phase (N phase in drawings) of the operating mechanism 2 of the circuit breaker is greater than a distance between a first connecting portion 2120 and the second connecting portion 2121 of the other corresponding connecting rod 212.

[0036] According to the universal circuit breaker of the present invention, since the distance between the first connecting portion and the second connecting portion of the corresponding connecting rod of the circuit breaker away from the operating mechanism of the circuit breaker is greater than the distance between the first connecting portion and the second connecting portion of the other corresponding connecting rod, the overtravel distance of the corresponding phase near the operating mechanism of the circuit breaker is ensured, and the final pressure of the contacts is increased to maintain a reliable contact fit of the contacts.

[0037] The universal circuit breaker of the present embodiment comprises a circuit breaker A phase, a circuit breaker B phase, a circuit breaker C phase, and a circuit breaker N phase. The operating mechanism 2 is arranged close to the circuit breaker B phase. A distance between a first connecting portion 2120 and a second connecting portion 2121 of a connecting rod 212 of the circuit breaker N phase is greater than a distance between a first connecting portion 2120 and a second connecting portion 2121 of a connecting rod 212 of each of the circuit breaker A phase, the circuit breaker B phase, and the circuit breaker C phase. That is, under the actual overtravel condition of the circuit breaker, the N, A, B, and C phases are connected to the moving contacts and the operating mechanism by using the connecting rods of different lengths, thereby making up for the shortage of the overtravel of the other phases except the B phase. For example, the operating mechanism 2 is arranged close to the circuit breaker B phase. The distance between the first connecting portion 2120 and the second

connecting portion 2121 of the connecting rod 212 corresponding to the circuit breaker B phase may be smallest which is greater than the distance between the first connecting portion 2120 and the second connecting portion 2121 of the connecting rod 212 corresponding to each of the circuit breaker A phase and the circuit breaker C phase, and the distance between the first connecting portion 2120 and the second connecting portion 2121 of the connecting rod 212 corresponding to the circuit breaker N phase is largest. Of course, the distances may be adjusted according to actual conditions. Alternately, the distance between the first connecting portion 2120 and the second connecting portion 2121 of the connecting rod 212 corresponding to each of the circuit breaker A phase, the circuit breaker B phase and the circuit breaker C phase is identical, but the distance between the first connecting portion 21200 and the second connecting portion 2121 of the connecting rod 212 corresponding to the circuit breaker N is largest.

[0038] As shown in Figs. 24-26, the first connecting portion 2120 is a first through hole formed in the end part of the connecting rod 212. The sidewall of the moving contact 102, which faces the connecting rod 212 is provided with a mounting groove 1021 which is fitted to one end of the connecting rod 212. One end of the connecting rod 212 is mounted into the mounting groove 1021 through the first through hole and is pivotally connected to the moving contact 102. The second connecting portion 2121 is a second through hole formed in the other end of the connecting rod 212. One end of the cantilever 211 is provided with a cantilever mounting hole 2110 which is fitted to the second through hole. Preferably, the distance between the first through hole and the second through hole of the connecting rod 212 of the circuit breaker N phase is 34 mm. The distance between the first through hole and the second through hole of each of the circuit breaker A phase, the circuit breaker B phase, and the circuit breaker C phase is 33.5 mm.

[0039] Specifically, as shown in Fig. 26, the connecting rod 212 comprises a connecting rod insertion portion 212a that is fitted to the moving contact 102, and a cantilever connecting portion 212b that is connected to one end of the connecting rod insertion portion 212a and connected with the cantilever 211. The first connecting portion 2120 is arranged on the connecting rod insertion portion 212a, and the second connecting portion 2121 is arranged on the cantilever connecting portion 212b. The connecting rod insertion portion 212a is plate-shaped. The cantilever connecting portion 212b is of a lateral U-shaped structure connected to one end of the connecting rod insertion portion 212a. One side of two sidewalls of the U-shaped structure is simultaneously connected to the connecting rod insertion portion 212a. An opening of a U-shaped notch groove 2122 of the U-shaped structure faces one side of the connecting rod 212. The cantilever 211 is provided with a cantilever mounting hole 2110 corresponding to the second through hole. The connecting rod 212 further comprises a first pin shaft 215 which passes through the second through hole in one sidewall of the U-shaped structure, the cantilever mounting hole 2110 and the second through hole in the other sidewall of the U-shaped structure in sequence to connect the connecting rod 212 and the cantilever 211 together.

[0040] As shown in Fig. 27, the first pin shaft 215 comprises a pin shaft rod 2151 and a pin shaft cap 2152 arranged at the end part of the pin shaft rod 2151. The sidewall, which is close to the other end and surrounds the pin shaft rod 2151 is recessed to form an annular groove 2153. During mounting, the pin shaft rod 2151 of the first pin shaft 215 passes through the second through hole in one sidewall of the U-shaped structure, the cantilever mounting hole 2110 and the second through hole in the other sidewall of the U-shaped structure in sequence, such that the connecting rod 212, the second through hole in the other sidewall of the U-shaped structure and the annular groove 2153 are fixedly mounted. The pin shaft cap 2152 is buckled onto the outer sidewall of one side of the U-shaped structure. Since the connecting rod 212 and the cantilever 211 are mounted fixedly by adopting the first pin shaft 215, the mounting is convenient and the structure is stable and reliable. The other end of the pin shaft rod 2151 is provided with a chamfer 2155 for easy mounting, and the chamfer 2155 facilitates the mounting of the first pin shaft 215.

[0041] As shown in Fig. 26, the moving contact 102 is provided with a limiting protrusion 1025 for limiting a movement stroke of the connecting rod 212, in a manner of protruding toward one side of the cantilever 211. The limiting protrusion 1025 limits the movement stroke of the connecting rod 212.

[0042] As shown in Figs. 24 and 26, one end of the moving contact 102 is pivotally connected to a first conductive copper bar 118 of the circuit breaker, and a moving contact point arranged at the other end of the moving contact 102 faces a static contact point of the static contact 101, which is arranged toward the end part of a second conductive copper bar 119. The moving contact 102 rotates, such that the static contact point and the movable contact point are closed and the main circuit is turned on. The connecting rod further comprises a fixing support 112 and a second pin shaft 113, wherein the fixing support 112 is fixedly connected to the lower side of the end part of the first conductive copper bar 118. A U-shaped groove 1121 is formed in one side of the fixing support 112. The second pin shaft 113 passes through the U-shaped groove 1121 and is pivotally connected to the other end of the movable contact 102. The moving contact 102 is mounted on the first conductive copper bar 118 through the fixing support 112 and the second pin shaft 113, such that the structure is simple and compact.

[0043] The above content is a further detailed description of the present invention in connection with the specific preferred embodiments, but it cannot be considered that the specific embodiments of the present invention are only limited to these descriptions. It will be apparent to those ordinary skilled in the art that several simple

deductions or replacements may also be made without departing from the concept of the present invention, and these simple deductions or replacements should be considered to fall within the protection scope of the present invention.

Claims

1. An anti-jamming device for an energy storage handle of a universal circuit breaker, comprising a circuit breaker body (1), and an operating mechanism (2) mounted on one side of the circuit breaker body (1); the energy storage handle (3) is mounted on the outside wall of one side of the operating mechanism (2); the energy storage handle (3) is rotated to manually store energy for the operating mechanism (2); the operating mechanism (2) comprises a V-shaped rotating shaft (4), wherein one end of the V-shaped rotating shaft (4) extends out of one sidewall of the operating mechanism (2), and the other end of the V-shaped rotating shaft (4) is sleeved with a ratchet (5) which is in linkage with the energy storage handle (3); a latch (6) which is in linkage with the ratchet (5) is arranged on one side, facing the ratchet (5), of the energy storage handle (3); the energy storage handle (3) is rotated to drive the ratchet (5) to rotate through the latch (6); an anti-jamming structure which prevents the latch (6) and the ratchet (5) from being jammed is arranged between the latch (6) and the ratchet (5); the anti-jamming structure comprises an anti-jamming plate (8); the anti-jamming plate (8) is configured to separate the latch (6) from the ratchet (5) when the energy storage handle (3) is in an initial state.

2. The anti-jamming device for the energy storage handle of the universal circuit breaker according to claim 1, wherein the anti-jamming plate (8) is convexly provided with a flange (801) which is used for separating the ratchet (5) from the latch (6); when the operating mechanism releases energy, the latch (6) is laid on the flange (801) to prevent the latch (6) and the ratchet (5) from being jammed.

3. The anti-jamming device for the energy storage handle of the universal circuit breaker according to claim 2, wherein the flange (801) is in a shape of a one-tenth arc; two ends of the flange (801) are provided with slopes (805) which are inclined downwards.

4. The anti-jamming device for the energy storage handle of the universal circuit breaker according to claim 1, wherein the anti-jamming plate (8) is sheathed on the V-shaped rotating shaft (4) and located below the ratchet (5).

5. The anti-jamming device for the energy storage handle of the universal circuit breaker according to any one of claims 1 to 4, wherein the anti-jamming plate (8) comprises an annular plate (81) and a strip-shaped extension plate (82) extending toward one side of the annular plate (81); a circular mounting hole (802) is formed in the middle of the annular plate (81); the anti-jamming plate (8) is sheathed on the V-shaped rotating shaft (4) through the circular mounting hole (802); the end part of the extension plate (82) is provided with a screw fixing hole (803) for fixing the anti-jamming plate (8); the anti-jamming plate (8) is fixed to one sidewall of the operating mechanism (2) by screwing a screw to the screw fixing hole (803); the flange (801) is convexly arranged at the junction between the annular plate (81) and the extension plate (82).

6. The anti-jamming device for the energy storage handle of the universal circuit breaker according to claim 1, further comprising a reset spring (61) which is mounted on the energy storage handle (3) and used for resetting the latch (6); one end of the latch (6) is pivotally connected to the latch (6); the other end of the latch (6) is connected to one end of the reset spring (61); the other end of the reset spring (61) is fixed to the latch (6); the latch (6) is provided with a linkage protrusion (62), which is in linkage fit with the ratchet (5), in a manner of protruding toward one side; the other end of the latch (6) is provided with a spring hook (63) which is connected to the reset spring (61) and bent upwards.

7. The anti-jamming device for the energy storage handle of the universal circuit breaker according to claim 6, wherein the linkage protrusion (62) is a pointed protrusion; the end part of meshing teeth (51) of the ratchet (5), which contacts the linkage protrusion (62), is a pointed protrusion.

8. The anti-jamming device for the energy storage handle of the universal circuit breaker according to claim 1, wherein a static contact (101) which corresponds to a conductive system in each pole is mounted on the circuit breaker body (1); a moving contact (102) which corresponds to the static contact (101) of the conductive system in each pole is mounted on the circuit breaker body (1); when the circuit breaker is switched on or switched off, a large rotating shaft (21) of the operating mechanism (2) drives the moving contact (102) to act to be in contact and separated from the static contact (101), such that a main circuit is turned on or turned off; one end of the moving contact (102) is pivotally connected to the circuit breaker body (1); a cantilever (211) which corresponds to the conductive system in each pole is mounted on the large rotating shaft (21); a connecting rod (212) which is in linkage with the cantilever (211) is mounted on one side, which faces the can-

tilever (211), of the moving contact (102); one end of the connecting rod (212) is connected to the moving contact (102); the other end of the connecting rod (212) is pivotally connected to the end part of the cantilever (211); a first connecting rod portion (2120) which is connected to the moving contact (102) is arranged at one end of the connecting rod (212), and a second connecting portion (2121) which is connected to the cantilever (211) is arranged at the other end of the connecting rod (212); a distance between the first connecting portion (2120) and the second connecting portion (2121) of the corresponding connecting rod (212) of the circuit breaker near the operating mechanism (2) of the circuit breaker is greater than a distance between a first connecting portion (2120) and the second connecting portion (2121) of the other corresponding connecting rod (212).

9. The anti-jamming device for the energy storage handle of the universal circuit breaker according to claim 8, wherein the first connecting portion (2120) is a first through hole formed in the end part of the connecting rod (212); the sidewall of the moving contact (102), which faces the connecting rod (212) is provided with a mounting groove (1021) which is fitted to one end of the connecting rod (212); one end of the connecting rod (212) is mounted into the mounting groove (1021) through the first through hole and is pivotally connected to the moving contact (102).

10. The anti-jamming device for the energy storage handle of the universal circuit breaker according to claim 8, wherein the second connecting portion (2121) is a second through hole formed in the other end of the connecting rod (212); one end of the cantilever (211) is provided with a cantilever mounting hole (2110) which is in mounting fit with the second through hole.

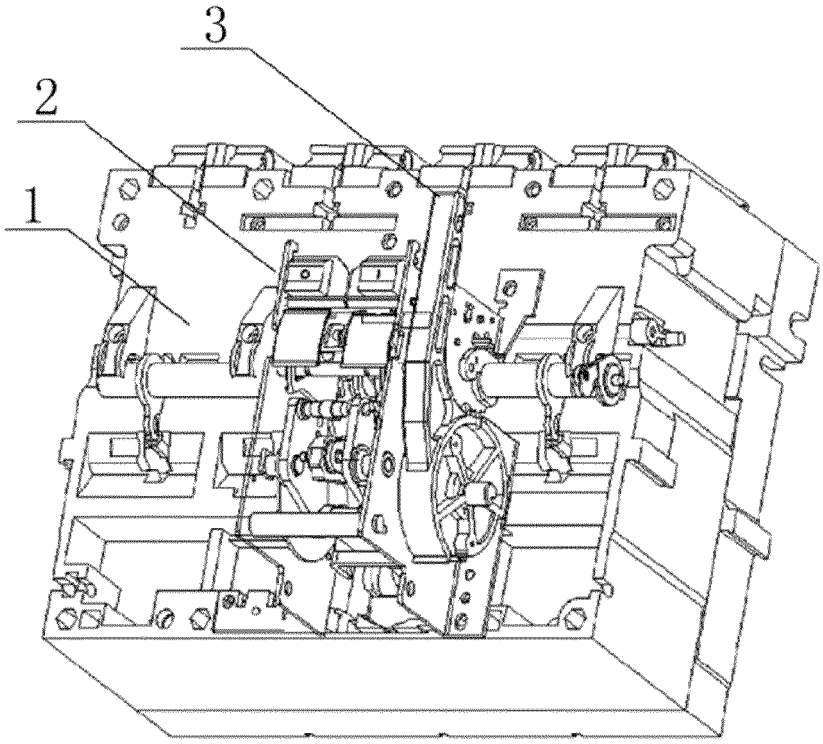


Fig.1

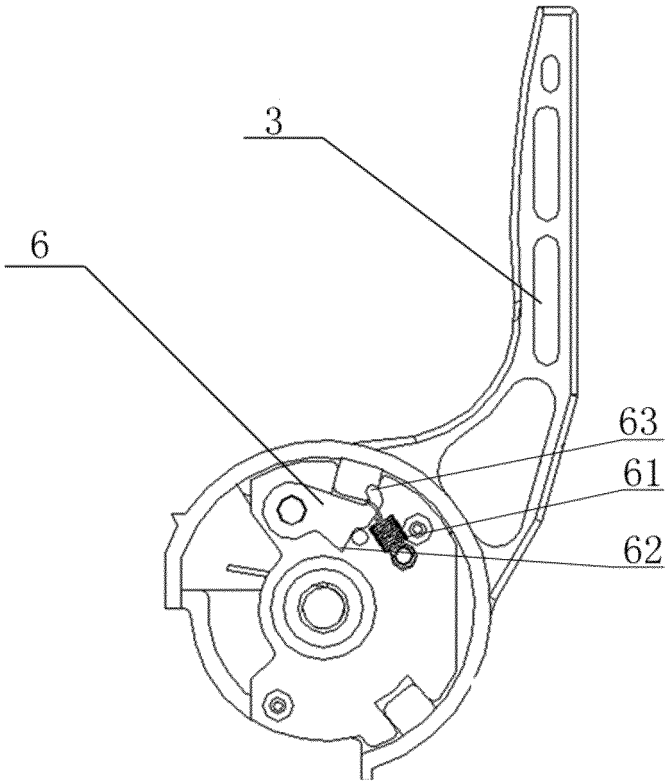


Fig.2

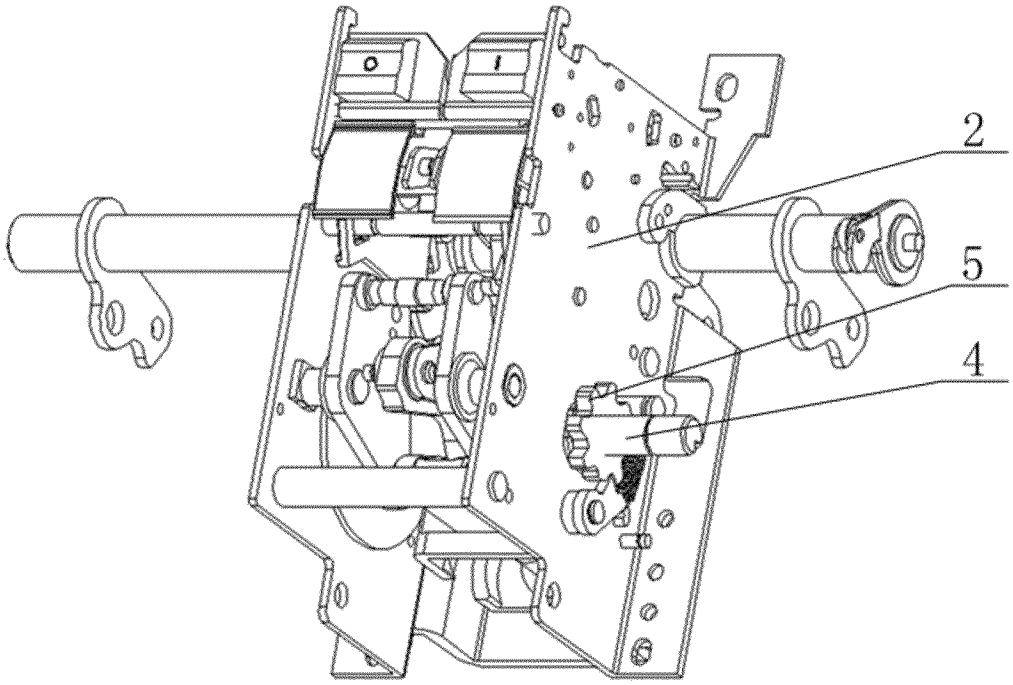


Fig.3

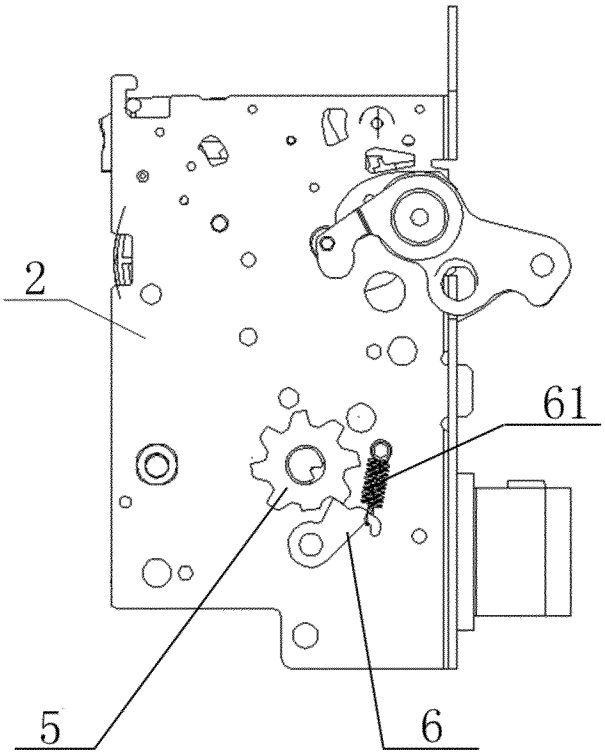


Fig.4

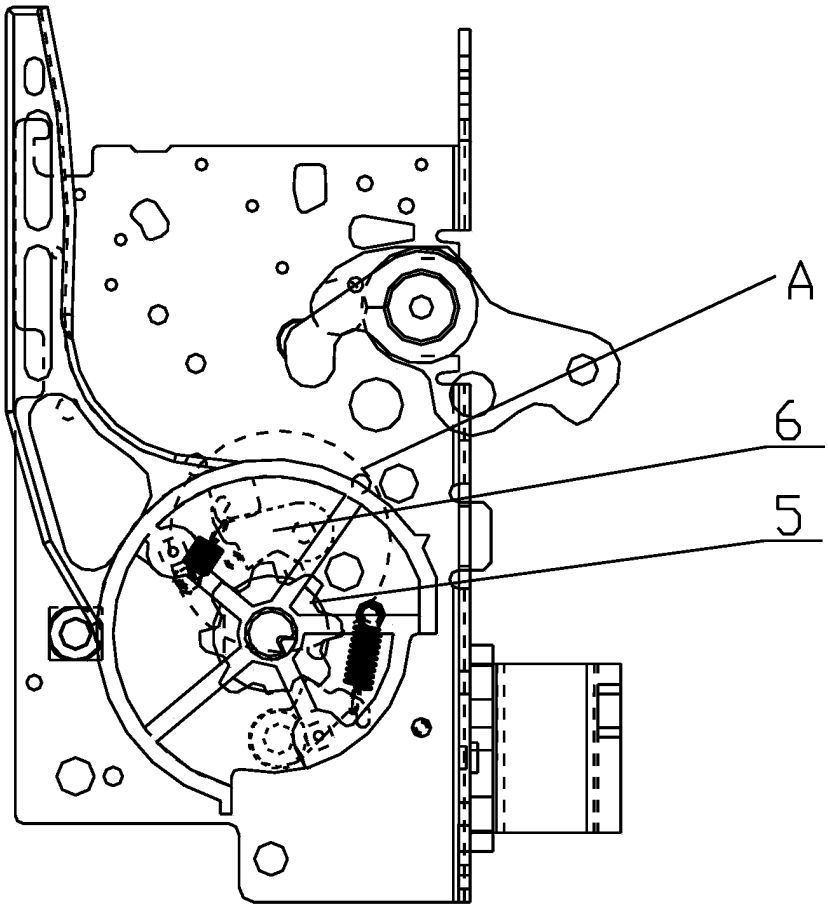


Fig.5

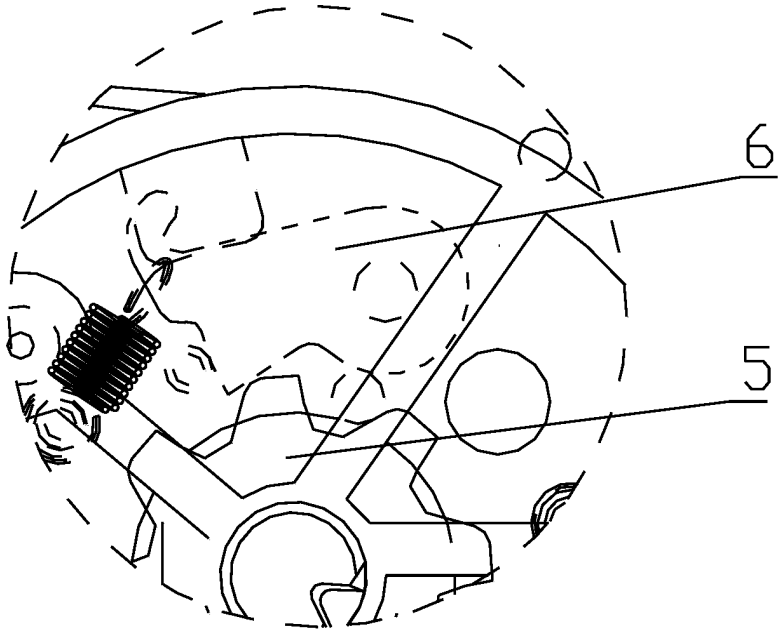


Fig.6

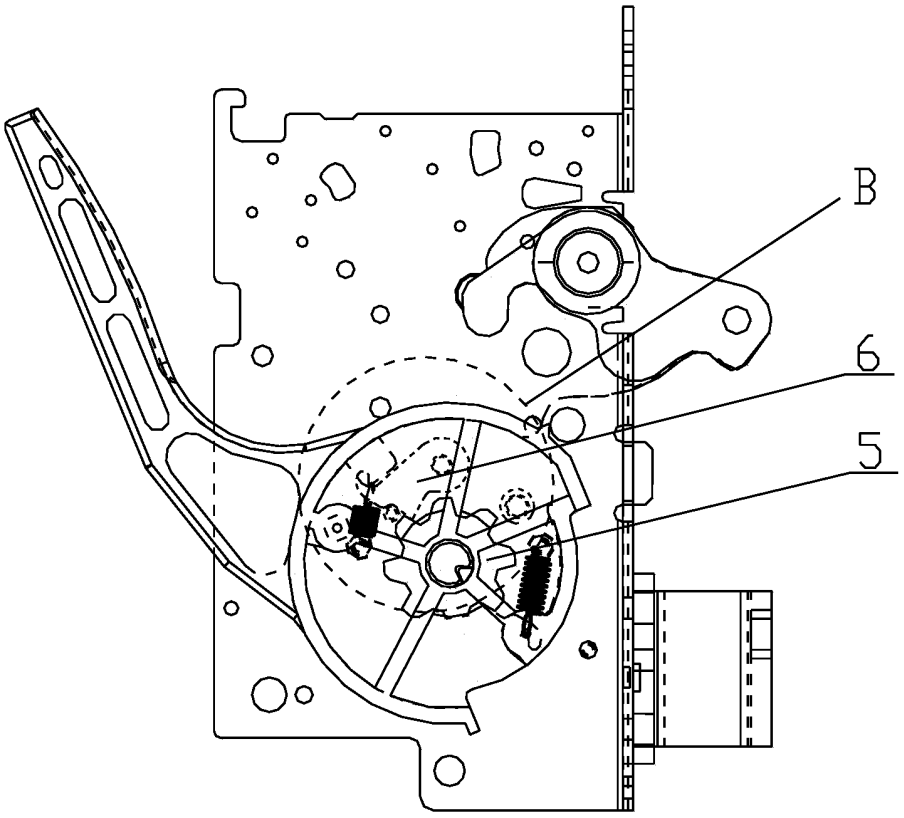


Fig.7

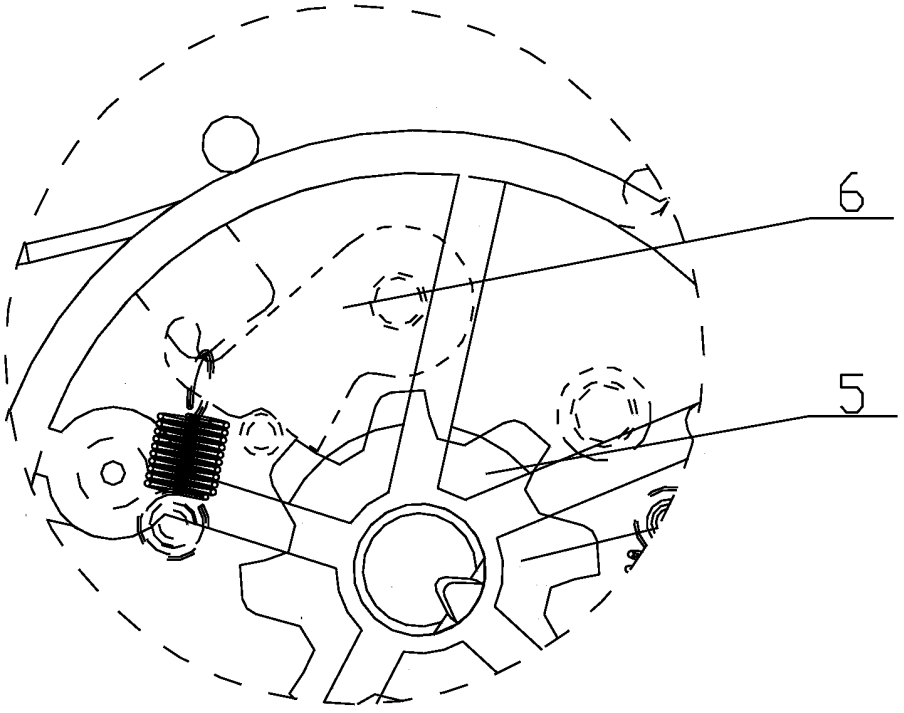


Fig.8

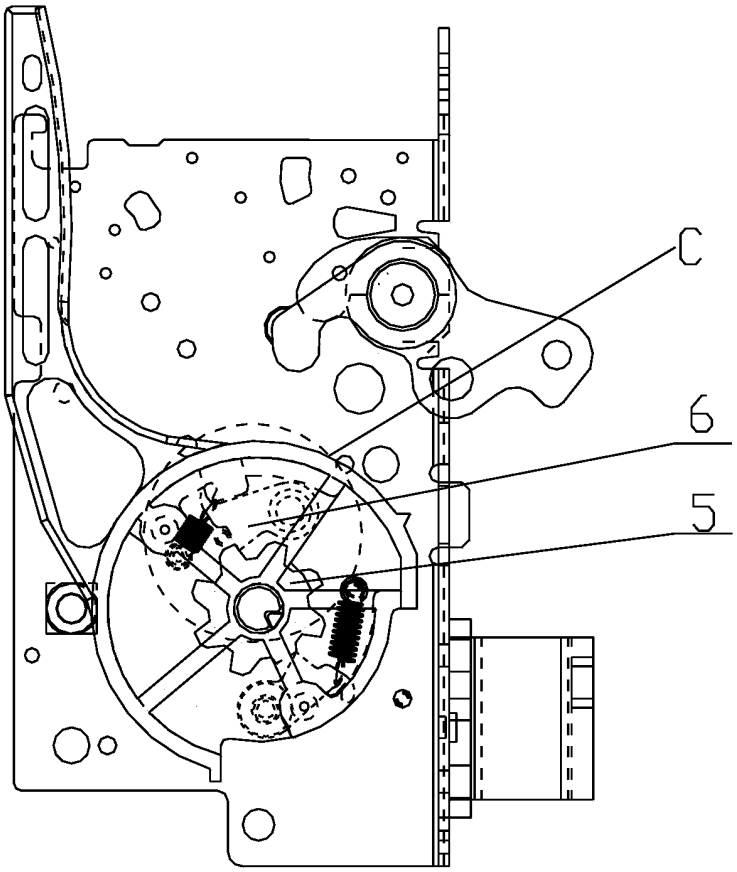


Fig.9

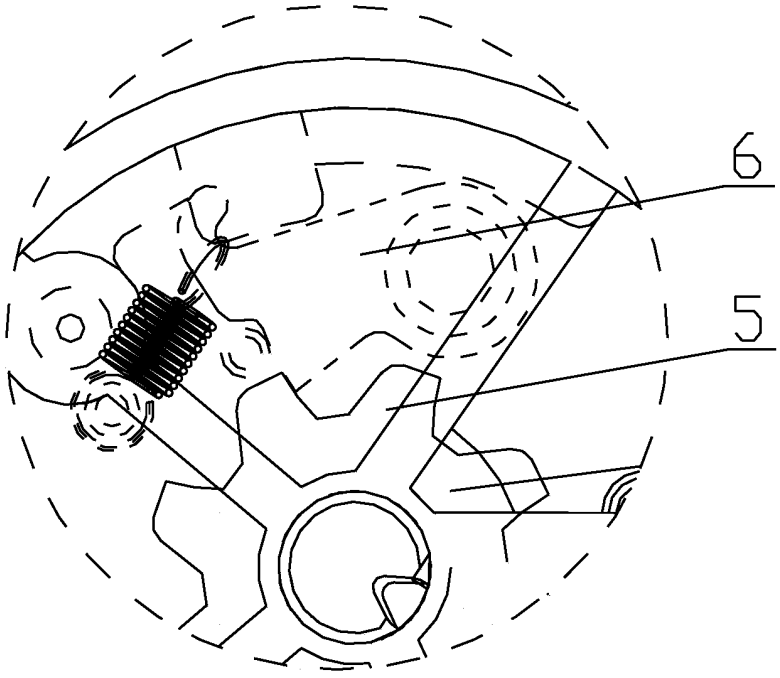


Fig.10

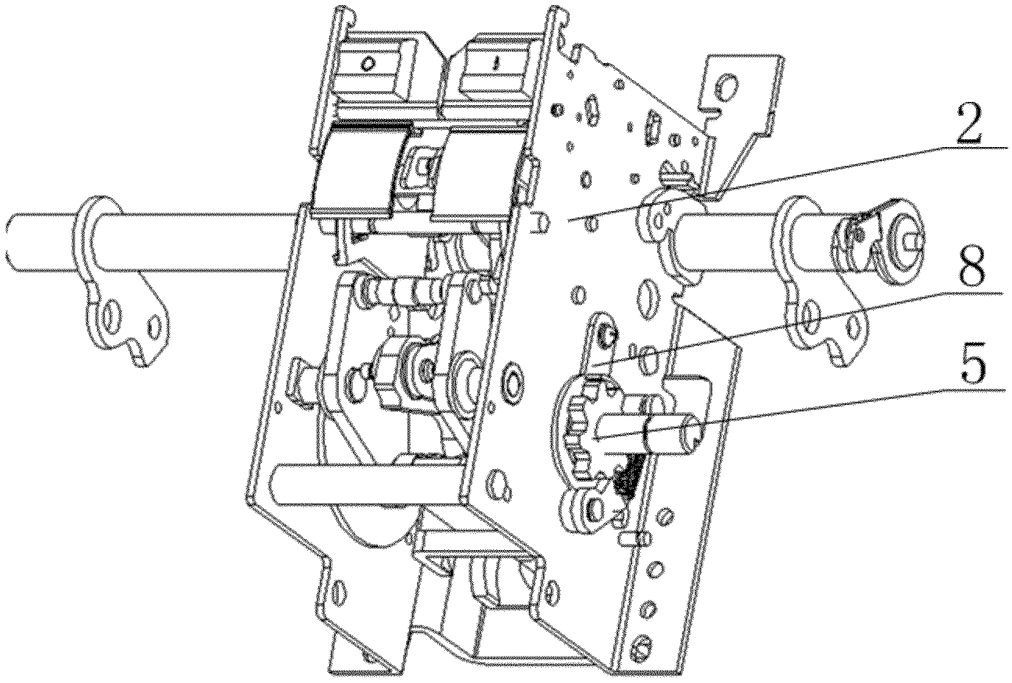


Fig.11

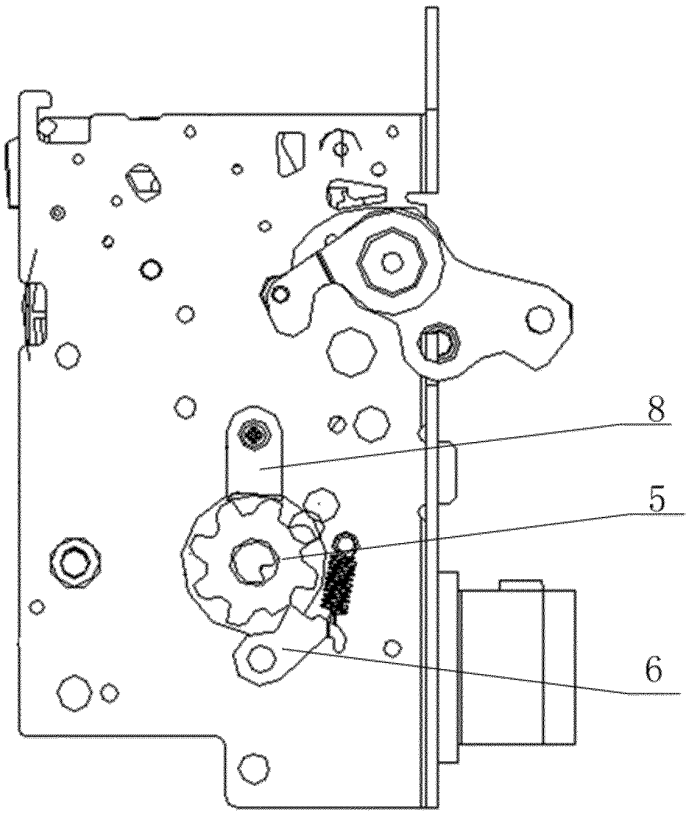


Fig.12

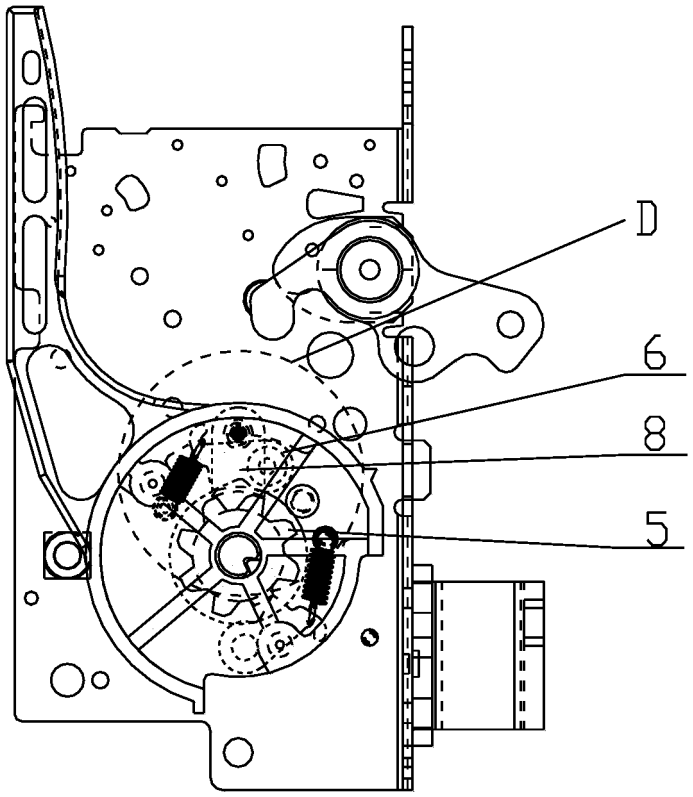


Fig.13

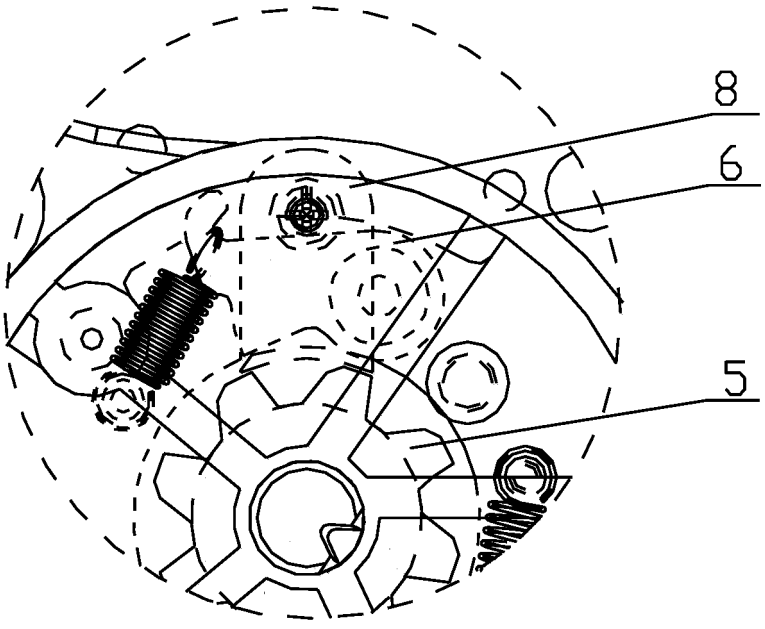


Fig.14

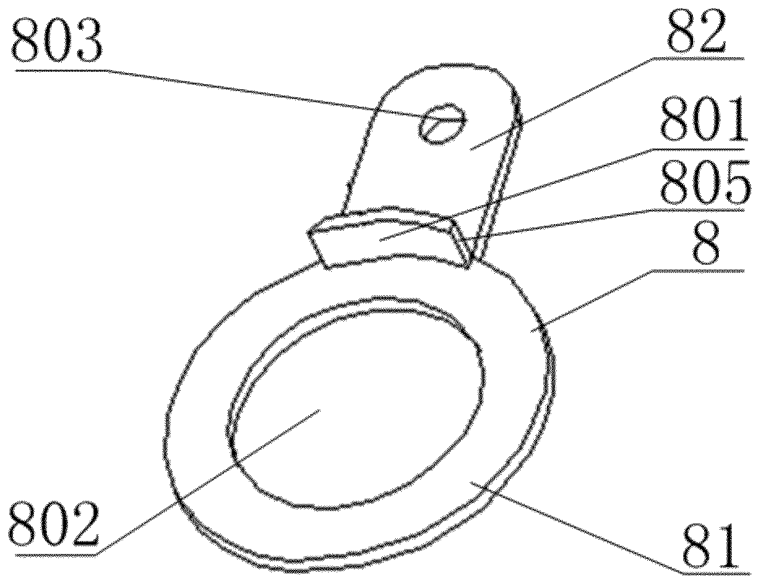


Fig.15

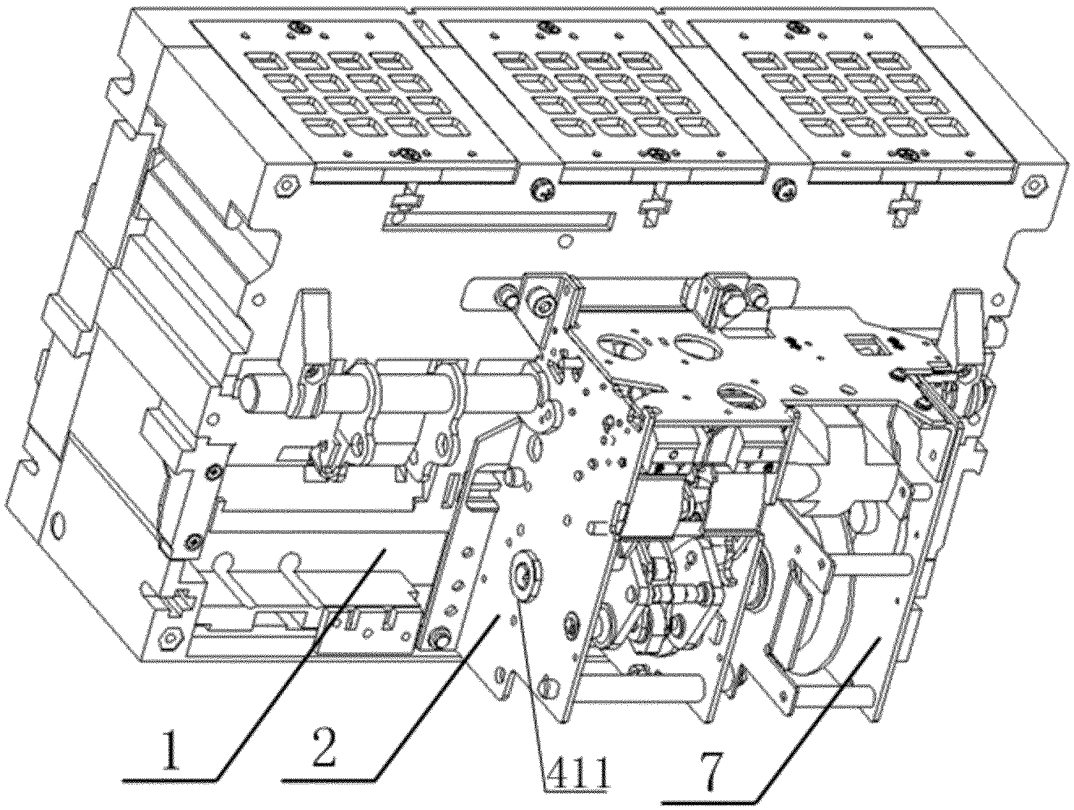


Fig.16

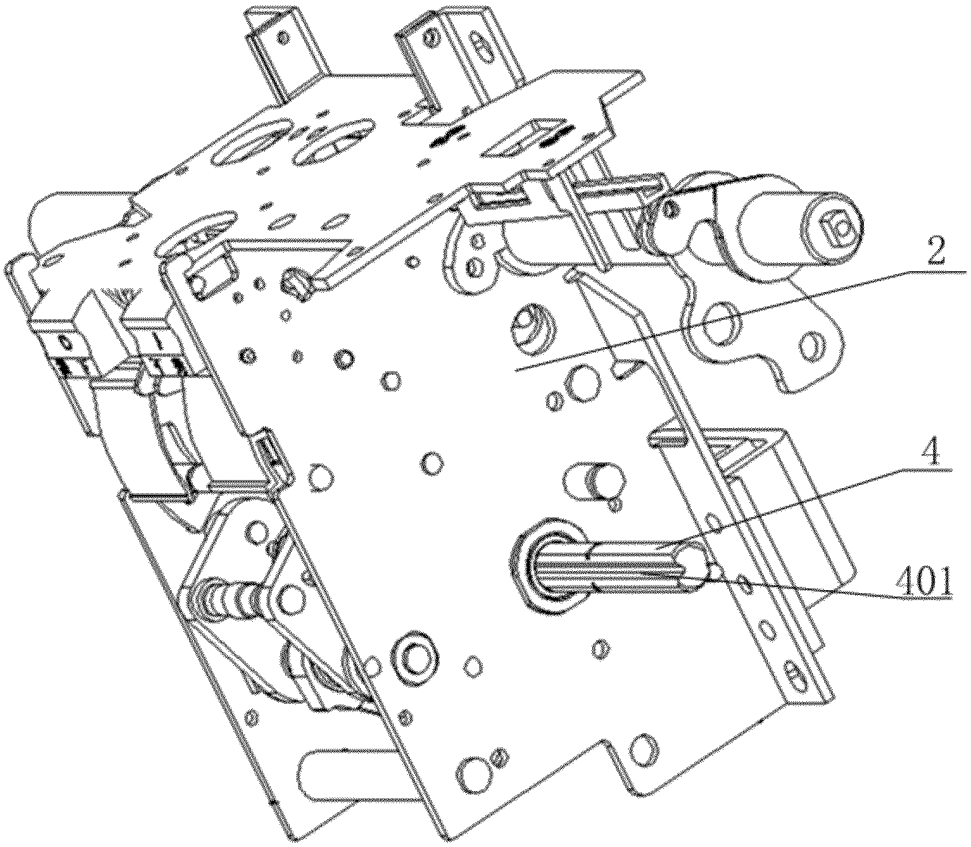


Fig.17

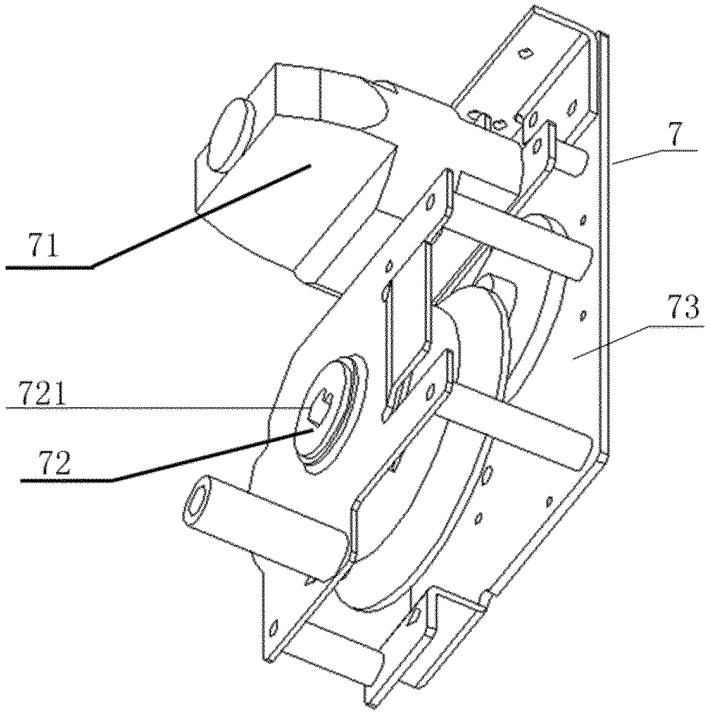


Fig.18

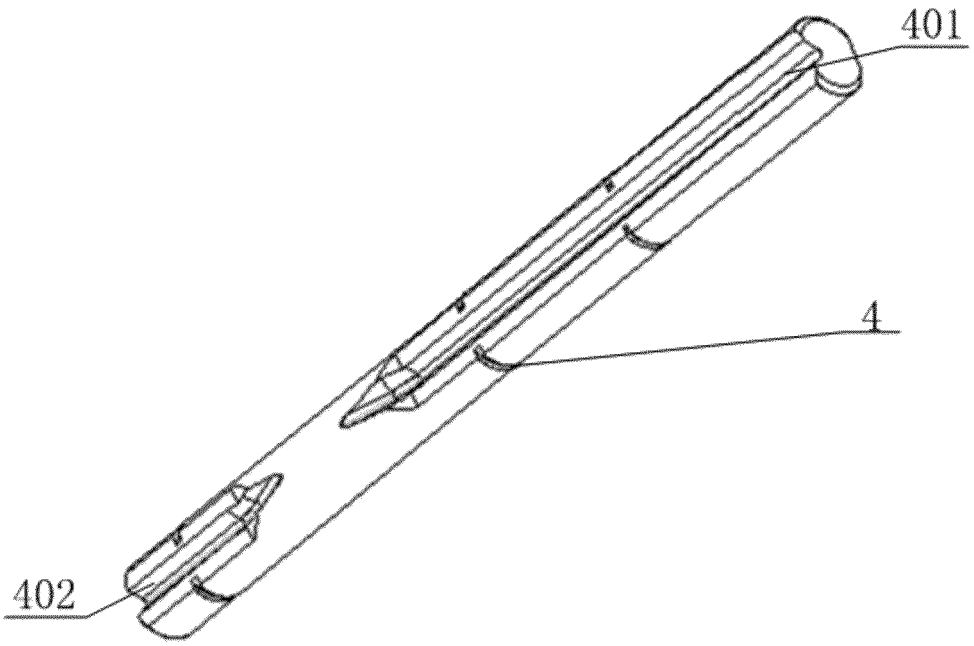


Fig.19

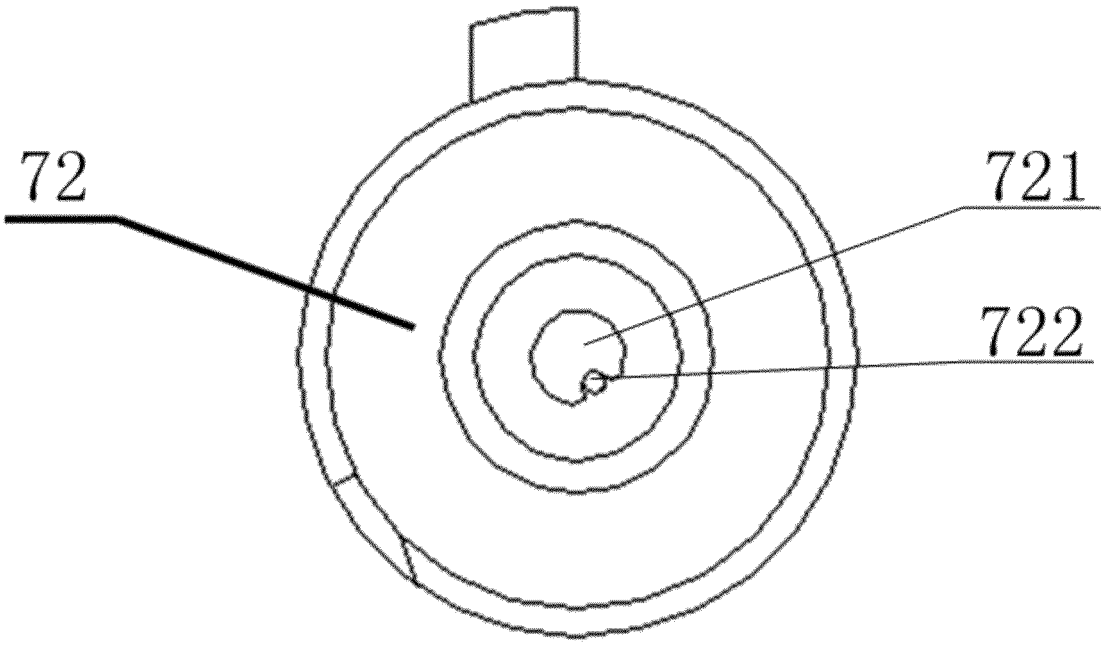


Fig.20

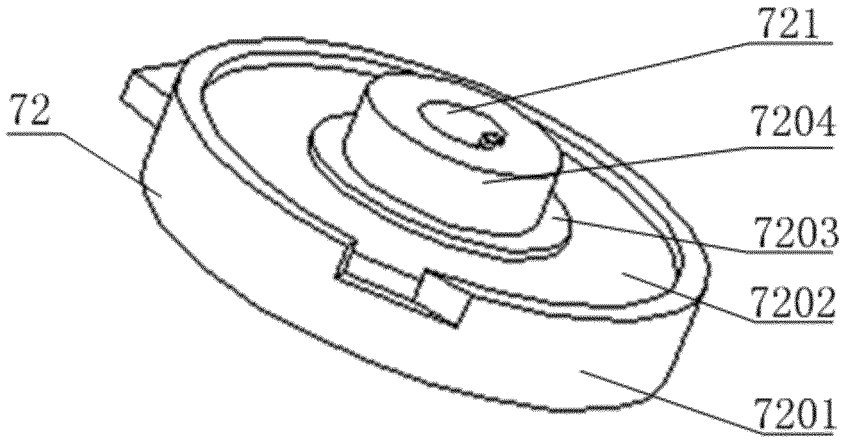


Fig.21

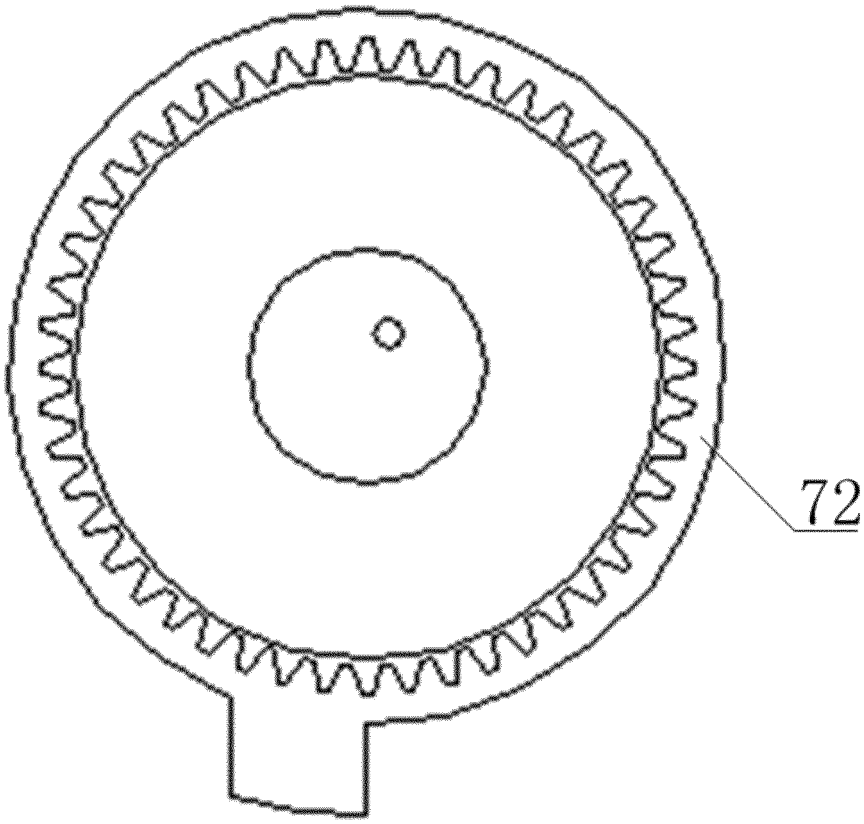
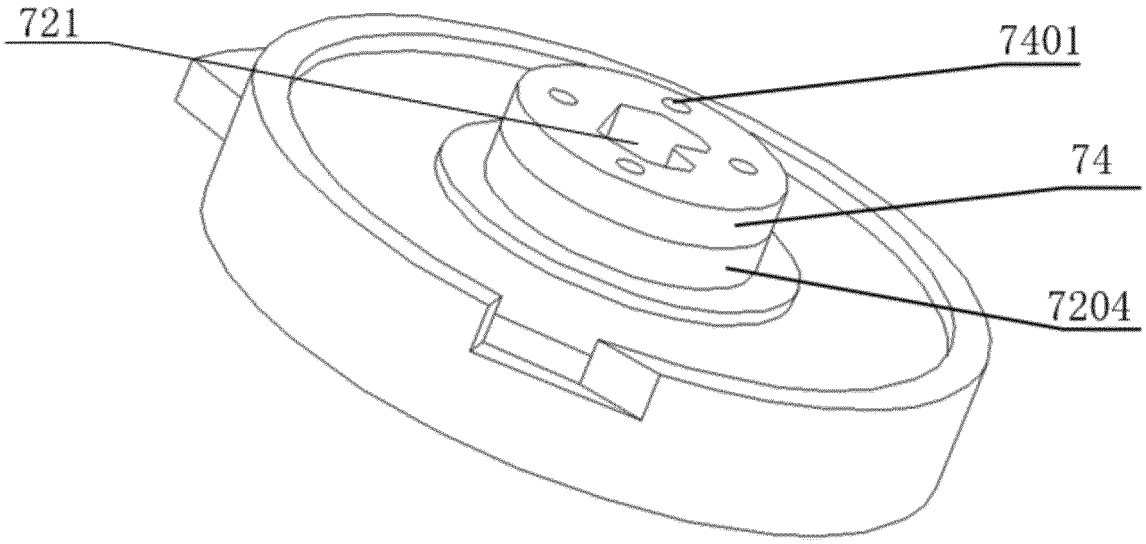


Fig.22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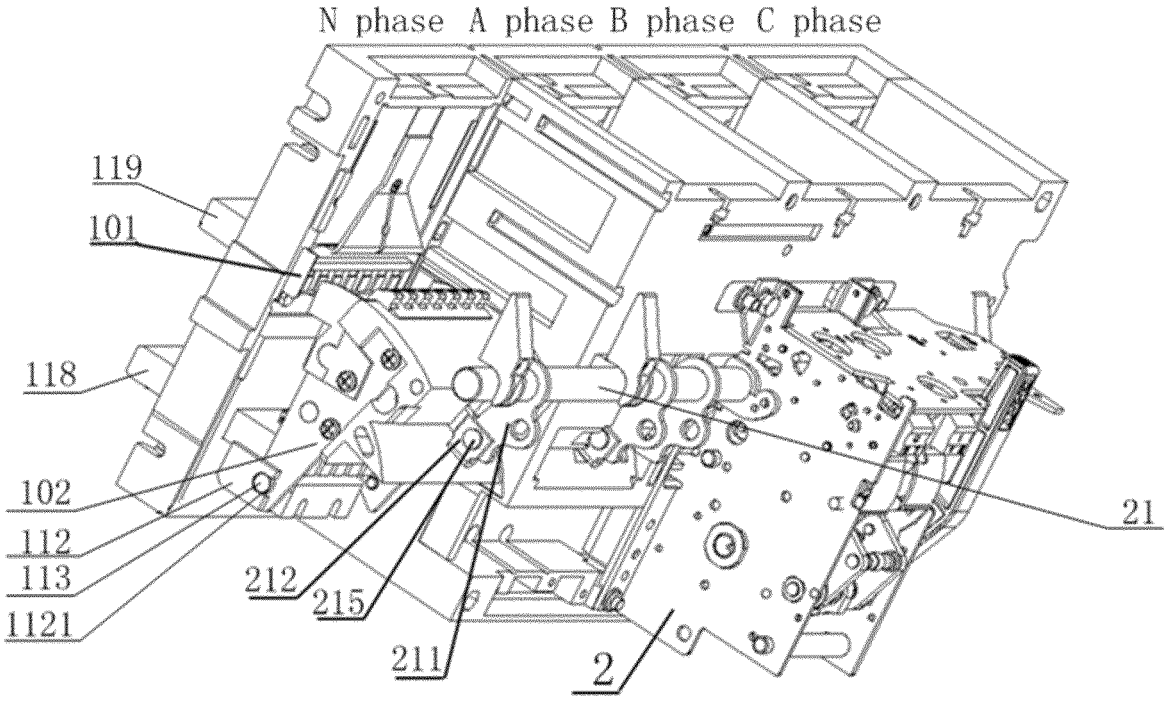
7204

Fig.23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B phase
C phase
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118
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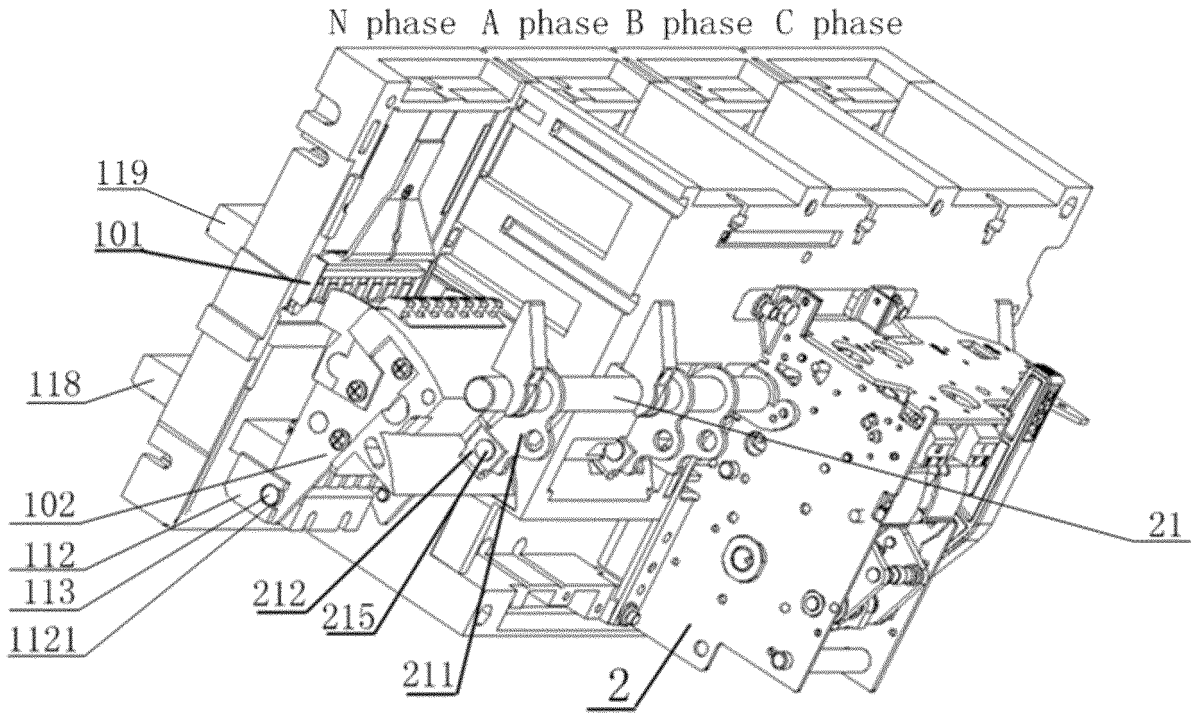
215
211
2
21

Fig.24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21

Fig.25

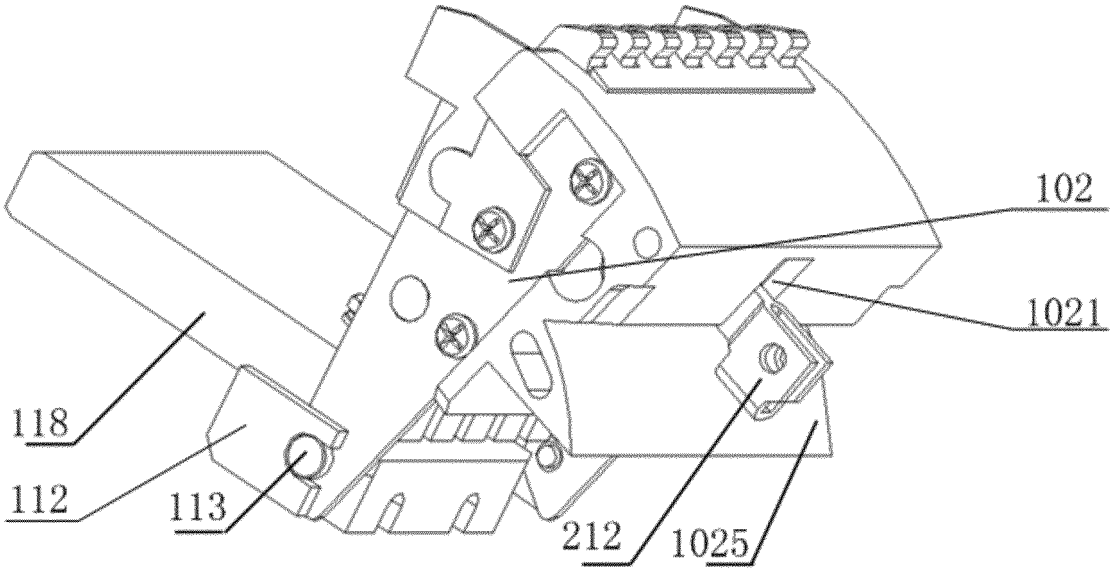
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Fig.26

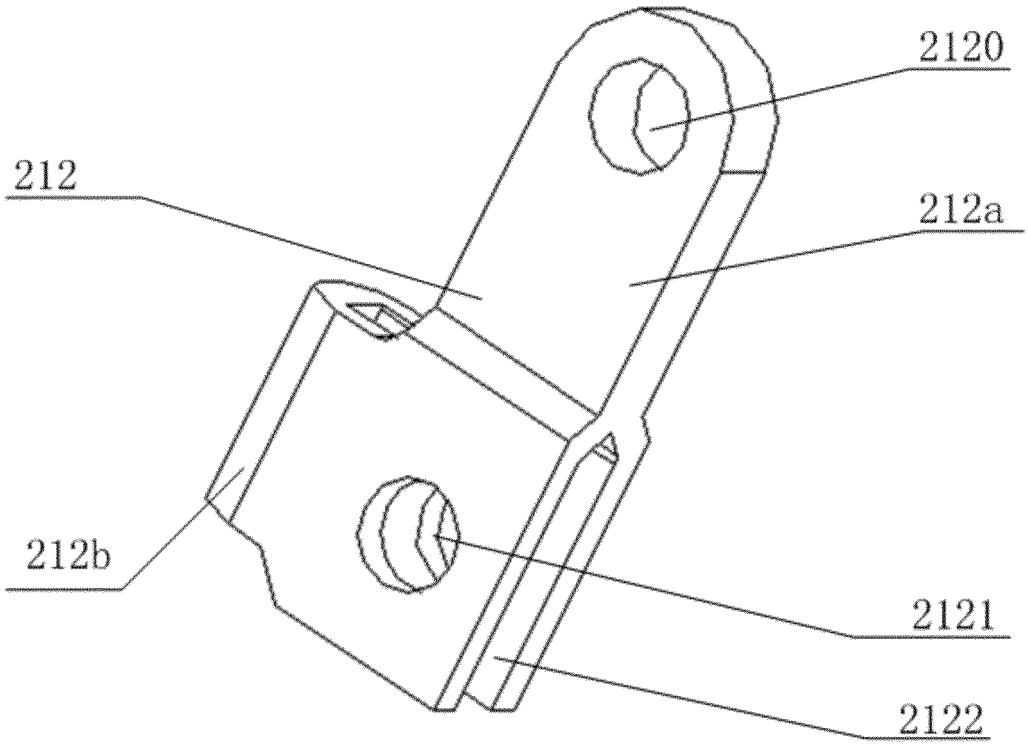

Fig.27

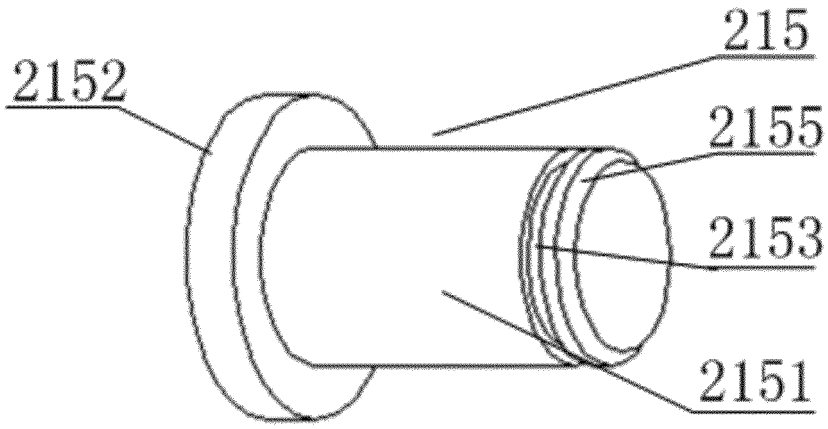

Fig.28

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2016/106610

A. CLASSIFICATION OF SUBJECT MATTER

H01H 71/10(2006.01)i

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

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)

WPI, EPODOC, CNPAT, CNKI: 断路器, 储能, 手柄, 防卡滞, 转轴, 掣子, 棘轮, CIRCUIT, BREAKER, ENERGY, STORAGE, SHAFT, HANDLE, ANTI, SEIZE, STAGNANT, PREVENT, DETENT, RATCHET, PAWL, WHEEL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E	CN 206116320 U (ZHEJIANG CHINT ELECTRICS CO., LTD.) 19 April 2017 (2017-04-19) claims 1-10	1-10
X	CN 103681022 A (ZHJIANG ELECTRIC APPLIANCE AND SWITCHGEAR CO., LTD. ET AL.) 26 March 2014 (2014-03-26) description, paragraphs [0003]-[0019], and figures 1-4	1, 4, 6, 7
A	CN 102543501 A (WECOME GROUP CO., LTD.) 04 July 2012 (2012-07-04) entire document	1-10
A	JP H10199376 A (NISSIN ELECTRIC CO., LTD.) 31 July 1998 (1998-07-31) entire document	1-10
A	GB 434282 A (SPRIGG, H.H.) 29 August 1935 (1935-08-29) entire document	1-10

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"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)

"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

"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

"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

"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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 July 2017	**27 July 2017**
Name and mailing address of the ISA/CN **State Intellectual Property Office of the P. R. China** **No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088** **China** Facsimile No. **(86-10) 62019451**	Authorized officer TANG, Hexiang Telephone No. (86-10)61648434

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2016/106610

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	206116320	U	19 April 2017	None			
CN	103681022	A	26 March 2014	CN	103681022	B	27 January 2016
CN	102543501	A	04 July 2012	CN	102543501	B	06 February 2013
JP	H10199376	A	31 July 1998	None			
GB	434282	A	29 August 1935	None			

Form PCT/ISA/210 (patent family annex) (July 2009)