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(54) **MOVABLE CONTACTOR DEVICE OF CIRCUIT BREAKER**

BEWEGLICHE KONTAKTORVORRICHTUNG EINES UNTERBRECHERSCHALTERS

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Description

Technical Field

[0001] The present invention relates to improvements of a movable contact device in a circuit breaker.

Background Art

[0002] As is known, a circuit breaker such as a molded case circuit breaker or an earth leakage circuit breaker has a power supply side terminal connected to the power supply side of a distribution circuit, a load side terminal connected to the load side of the distribution circuit, a fixed contact point provided in the power supply side terminal, and a movable contact device including movable contacts respectively having movable contact points that are connected to the load side terminal and able to be in contact with or separated from the fixed contact point, an opening and closing mechanism that drives the movable contact device to bring the movable contact points into contact with or separate them from the fixed contact point, an operation handle for manual operation of the opening and closing mechanism, and an automatic tripping device that automatically drives the opening and closing mechanism when a predetermined overcurrent flows or a leakage current flows in the distribution circuit to break the distribution circuit.

[0003] Conventionally, as a movable contact device for the circuit breaker, a configuration including a plurality of movable contacts of conductors with one ends having movable contact points and the other ends penetrated by shaft pins, a crossbar made of an insulating material for holding these shaft pins of the movable contacts and rotatably supporting the respective movable contacts around the shaft pins, a nipping piece of a conductor for nipping the other ends of the movable contacts from both sides in the shaft direction of the shaft pins into sliding contact with the other ends of the movable contacts, a flexible conductor with one end connected to the nipping piece and the other end connected to the load side terminal, and a torsion coil spring that urges the movable contacts in a direction in which predetermined contact pressure is provided to the movable contact points at ON operation of the circuit breaker is proposed (for example, see Patent Document 1).

[0004] In the conventional movable contact device shown in Patent Document 1, a notch part is formed in the above described nipping piece, and the nipping piece is adapted to receive the shaft pins penetrating the other ends of the movable contacts by the notch part.

[0005] Further, the above described torsion coil spring has a pair of coil parts with one ends fixed to the crossbar and the above described shaft pins inserted to serve as compression springs, and a coupling piece integrally coupling the other ends of the coil parts, and the coupling piece comes into pressure contact with the above described movable contacts to constantly urge the movable contacts in ON direction.

[0006] According to the conventional movable contact device described in Patent Document 1, since the notch part formed in the nipping piece is adapted to receive the shaft pins penetrating the other ends of the movable contacts, it may be possible to connect the flexible conductor to the movable contacts via the nipping piece with the movable contacts held by the crossbar using the shaft pins.

[0007] Further, by bringing the nipping piece into pressure contact with the movable contacts by the coil parts of the torsion coil spring, the contact condition between the movable contacts and the nipping piece may be stabilized and the movable contacts and the flexible conductor can be held in an electrically good contact condition while the movable contacts rotate around the shaft pins.

[0008] Patent Document 1: JP-A-2001-68008

[0009] JP 2000-268 697 A is considered as related prior art, and is directed to the provision of a movable contact device for a circuit breaker, not suffering deterioration in the movement of movable contacts if the centre of turning motion of crossbars and the centre of turning motion of the movable contacts are displaced from each other, reduced in the number of component items, and easy in assembling work. This issue is addressed in this document by means of a movable contact device which is equipped with: crossbars interlocking with a switching mechanism, movable-contact bearers fixed to a body case and each having a pair of connecting conductor parts fitted into recesses in the crossbar, movable contacts turnably journalled on and electrically connected to protrusions provided on the connecting conductor parts and engaged with the crossbars, and contact pressure spring having twisted spring parts on both ends thereof fittingly mounted between two outside surface of the connecting conductor parts and the recesses in the crossbars, and intermediate action spring parts engaging with the movable contacts and biasing the movable contacts toward fixed contacts.

Disclosure of the Invention

Problems that the Invention is to Solve

[0010] In the above described conventional movable contact device for circuit breaker shown in Patent Document 1, as one of assembly methods of the movable contact device, there is a method of fixing the shaft pins to the crossbar with the movable contacts, the torsion coil spring, and the shaft pins assembled, and inserting the nipping piece between the torsion coil spring and the movable contacts so that the notch part of the nipping piece connected to the flexible conductor may receive the shaft pins. In the case of the assembly method of the movable contact device, the torsion coil spring is sandwiched between the movable contacts and the crossbar and the coil parts of the torsion coil spring are com-

pressed to generate an urging force as the compression springs.

[0011] Accordingly, to insert the nipping piece between the torsion coil spring and the movable contacts, the nipping piece is slid on the side surfaces of the movable contacts under the condition that the nipping piece is pressed against the side surfaces of the movable contacts by the torsion coil spring. As a result, scratches may be produced on the side surfaces of the movable contacts and the inner surface of the nipping piece.

[0012] On the other hand, as another assembly method of the movable contact device, there is a method of integrally assembling the movable contacts and the nipping piece in advance, and then, attaching the movable contacts and the nipping piece to the crossbar. In the case of the assembly method of the movable contact device, when the movable contacts and the nipping piece integrally assembled in advance are attached to the crossbar, the nipping piece may be dropped from the movable contacts.

[0013] The invention has been achieved to solve the above described problems in the conventional movable contact device for a circuit breaker, and is intended to provide a movable contact device for a circuit breaker, the movable contact device easily assembled with the smaller number of component parts.

Means for Solving the Problems

[0014] A movable contact device for a circuit breaker according to the invention is characterized by the features of claim 1.

Advantages of the Invention

[0015] According to the movable contact device for a circuit breaker according to the invention, since the movable contact has the other end provided between the pair of connecting conductor parts, both side surfaces of the other end are respectively slidably in contact with inner side surfaces of the pair of connecting conductor parts, the contact pressure spring includes a pair of coil spring parts that are fitted between respective outer side surfaces of the pair of connecting conductor parts and side walls of the recess part of the crossbar and urge the pair of connecting conductor parts toward the other end side of the movable contact, an arm-like spring part that couples one ends of the respective pair of coil spring parts to each other, extends to one end side of the movable contact to abut against the movable contact, and urges the movable contact to provide the contact pressure to the movable contact, and a pair of leg parts that extend from the respective other ends of the pair of coil spring parts in a direction opposite to the one end side of the movable contact and abut against wall surfaces of the recess part of the crossbar when the contact pressure spring is fitted, and the recess part of the crossbar includes spring holding walls that abut against at least one parts of outer circumferential parts of the coil spring parts and hold the coil spring parts, the leg parts of the contact pressure spring abut against the wall surfaces of the recess part when the contact pressure spring is fitted in the recess part, the springing operation of the leg parts after fitting of the contact pressure spring becomes unnecessary and the assembly time can be shortened.

[0016] Further, since the contact pressure spring is held by the spring holding walls provided in the recess part of the crossbar, pins for engaging the movable contact and the movable contact supporting member become unnecessary and the number of parts can be reduced.

Brief Description of the Drawings

[0017]

FIG. 1 shows a sectional view of a circuit breaker including a movable contact device according to Embodiment 1 of the invention.

FIG. 2 shows a sectional view showing the movable contact device according to Embodiment 1 of the invention.

FIG. 3 shows an exploded perspective view showing the movable contact device according to Embodiment 1 of the invention with one pole thereof exploded.

FIG. 4 shows an exploded perspective view showing the movable contact device according to Embodiment 1 of the invention with a crossbar broken from break line A in FIG. 3.

FIG. 5 shows an exploded perspective view showing the movable contact device according to Embodiment 1 of the invention with a crossbar broken from break line B in FIG. 3.

FIG. 6 shows a sectional view showing the crossbar in the movable contact device according to Embodiment 1 of the invention.

FIG. 7 shows a perspective view showing the movable contact device according to Embodiment 1 of the invention with a part thereof broken.

FIG. 8 shows an explanatory view for explanation of a configuration of the movable contact device according to Embodiment 1 of the invention.

Best Mode for Carrying Out the Invention

Embodiment 1

[0018] First, a circuit breaker including a movable contact device according to Embodiment 1 of the invention will be explained. In FIG. 1, a base 1 and a cover 2 formed by a synthetic resin material are integrally assembled by screws (not shown) to form a casing of a circuit breaker 100 for three phases. Inside the base 1, a power supply side terminal 3 connected to the power supply side of a three-phase electric circuit (not shown) opened and

closed by the circuit breaker 100, and a load side terminal 4 connected to the load side of the above described electric circuit are fixed. To the end of the power supply side terminal 3, a fixed contact point 5 is fixed.

[0019] A crossbar 6 formed by a synthetic resin material is supported by the base 1 to be rotatable around its center of axle. A movable contact 8 having a movable contact point 7 at one end has the other end inserted into a recess part, which will be described later, of the crossbar 6 as will be described later. A contact pressure spring 9 is fitted in the above described recess part of the crossbar 6 and urges the movable contact 8 to provide contact pressure to the movable contact point 7 as will be described later.

[0020] A movable contact supporting member 10 has a base part 11 fixed to the base 1 and a pair of connecting conductor parts 101, 102 (only 101 is shown in FIG. 1) rising nearly vertically from the base part 11, and the inner side surfaces of these connecting conductor parts 101, 102 are slidably and electrically connected to the side surfaces of the other end of the movable contact 8 and the pair of connecting conductor parts 101, 102 rotatably support the other end of the movable contact 8.

[0021] The base part 11 of the movable contact supporting member 10 is connected to the load side terminal 4 via a load side connecting conductor 41. The above described crossbar 6, movable contact point 7, movable contact 8, contact pressure spring 9, and movable contact supporting member 10 form a movable contact device 12 according to Embodiment 1 of the invention. The details of the configuration of the movable contact device 12 will be described later.

[0022] A lower link 13 has one end rotatably coupled to the crossbar 6 and the other end rotatably coupled to one end of an upper link 14. An operation mechanism part 15 has one end rotatably supported by the base 1 and the other end to which an operation handle 16 operated by an operator is fixed. The above described upper link 14 has the other end rotatably coupled to the other end of the operation mechanism part 15.

[0023] A toggle spring 17 formed by a tension spring has one end fixed to the coupling part of the lower link 13 and the upper link 14 and the other end fixed to the other end of the operation mechanism part 15,

[0024] The lower link 13, the upper link 14, and the toggle spring 17 form a so-called toggle link mechanism. Now, the operation handle 16 is operated to the left of the drawing by the operator from the state in which the handle 16 is in the closed position at the right of the drawing as shown in the drawing, the operation mechanism part 15 rotates around its one end in a direction of the opened position at the left of the drawing.

[0025] Thereby, the one end of the toggle spring 17 moves to the left of the drawing with the rotation of the operation mechanism part 15, and moves to the left side past the coupling point of the upper link 14 and the operation mechanism part 15.

[0026] Concurrently, the alignment relation between the lower link 13 and the upper link 14 as shown in the drawing is broken down, and the lower link 13 is rapidly raised upward in the drawing by the tension force of the toggle spring 17. In the process of the movement, the crossbar 6 coupled to the one end of the lower link 13 rapidly rotates counter-clockwise, and rotates the movable contact 8 counter-clockwise and separates the movable contact point 7 from the fixed contact point 5. Thereby, the electric circuit is broken.

[0027] On the other hand, if the handle 16 in the opened position is operated to the closed position at the right of the drawing, the operation mechanism part 15 rotates around its one end in a direction of the closed position at the right of the drawing. Thereby, the one end of the toggle spring 17 moves to the right of the drawing with the rotation of the operation mechanism part 15, and moves to the right side past the coupling point of the upper link 14 and the operation mechanism part 15.

[0028] Thereby, the upper link 14 and the lower link 13 have the alignment relation as shown in the drawing by the tension force of the toggle spring 17. In the process of the movement, the lower link 13 rapidly rotates the crossbar 6 clockwise, and rotates the movable contact 8 clockwise and brings the movable contact point 7 into contact with the fixed contact point 5.

[0029] Thereby, the electric circuit is closed. The movable contact 8 is urged by the contact pressure spring 9 and provides predetermined contact pressure to the movable contact point 7 in contact with the fixed contact point 5.

[0030] An automatic tripping device 18 engages with a part of the upper link 14 to latch the counter-clockwise rotation of the upper link 14 around its other end when the operation handle 16 is located in the closed position as shown in the drawing, that is, when the movable contact point 7 is in contact with the fixed contact point 5 and closes the electric circuit. In the automatic tripping device 18, for example, a time-limit tripping mechanism of a bimetal and an instantaneous tripping mechanism of an electromagnet are provided.

[0031] When an overcurrent of a predetermined value or more continuously flows in the electric circuit in a predetermined period or more, the time-limit tripping mechanism of the automatic tripping device 18 operates to release the above described latch. As a result, the upper link 14 rapidly rotates counter-clockwise around its other end by the tension force of the toggle spring 17 and the lower link 13 is rapidly raised upward in the drawing, and, at the same time, the crossbar 6 rotates counter-clockwise.

[0032] Thereby, the movable contact point 7 of the movable contact 8 rapidly separates from the fixed contact point 5 and breaks the electric circuit. When an excessive current such as a short-circuit current flows in the electric circuit, the instantaneous tripping mechanism of the automatic tripping device 18 operates to release the above described latch. Thereby, the electric circuit is instantaneously broken by the same operation as the op-

eration by the above described time-limit tripping mechanism.

[0033] Next, a configuration of the movable contact device 12 according to Embodiment 1 of the invention will be explained in detail. In FIGs. 2 to 7, the crossbar 6 is formed by a synthetic resin material as described above, and both ends in its shaft direction are rotatably supported by the base 1.

[0034] In the crossbar 6, three movable contact attachment parts 60 for respectively attaching the movable contacts 8, the contact pressure springs 9, and the movable contact supporting members 10 corresponding to U-phase, V-phase, and W-phase are provided at equal intervals W.

[0035] The crossbar 6 includes a recess part 600 having an opening part 6001 opening to the circumferential surface of the crossbar in each of the above described movable contact attachment parts 60. The recess part 600 includes a through hole 601 penetrating from the above described opening part 6001 in a direction perpendicular to the shaft direction of the crossbar 6, and a pair of depressed parts 602, 603 having opening parts 6021, 6031 integrated with the opening part 6001 and respectively depressed in the shaft direction from both sides of the through hole 601 in the shaft direction.

[0036] As well shown in FIG. 5, the through hole 601 has an opening part 6012 opening to the circumferential surface of the crossbar 6 opposite to an opening part 6011, and a recessed groove 6013 extending from the middle of the through hole 601 to the above described opening part 6012.

[0037] Further, the pair of depressed parts 602, 603 respectively have U-shaped spring holding walls 6022 that abut against the outer circumferential parts of a pair of coil spring parts 91, 92 of the contact pressure spring 9, which will be described later, and hold the outer diameters of the coil spring parts 91, 92, and flat wall surfaces 6023 continuing to the spring holding walls 6022.

[0038] Note that the spring holding wall and the flat wall surface of the depressed part 603 are not shown in the drawing, however, they are formed similarly to the spring holding wall 6022 and the flat wall surface 6023 of the depressed part 602. Here, the interior spaces of the above described through hole 601 and pair of depressed parts 602, 603 communicate with each other as shown in the drawing.

[0039] Both side walls of the recessed groove 6013 provided in the above described through hole 601 bulge from both side walls of the through hole 601 toward inside of the through hole 601 via inclined surfaces 6014 (in FIG. 5, only one side wall is shown, however, the other side wall is similarly formed).

[0040] The groove width of the recessed groove 6013 is formed to have dimensions to the degree slightly larger than the plate thickness dimension of the conducting member forming the movable contact 8, and accordingly, the recessed groove 6013 serves to control the movement of the crossbar 6 in the shaft direction in the movable contact 8.

[0041] The movable contact supporting member 10 includes the base part 11 fixed to the base 1 of the circuit breaker 100, the pair of connecting conductor parts 101, 102 raised vertically from the base part 11 with their edge parts opposed in parallel, and a pair of projecting parts 103 provided to respectively project from the wall surfaces opposed to each other of the pair of connecting conductor parts 101, 102 (in FIGs. 3 to 5, only the root part 103 of the projecting part of the connecting conductor part 101 is shown).

[0042] The base part 11 of the movable contact supporting member 10 is electrically connected to the load side connecting conductor 41 when the above described load side connecting conductor 41 is inserted into the raised parts of the connecting conductor parts 101, 102 against the elastic force of the raised parts.

[0043] The movable contact 8 has one end to which the movable contact point 7 is fixed and a through hole 81 at the other end. Into the through hole 81 of the movable contact 8, the above described pair of projecting parts respectively provided in the connecting conductor parts 101, 102 of the movable contact supporting member 10 are inserted from both side parts of the movable contact 8. Thereby, the other end of the movable contact 8 is rotatably supported by the movable contact supporting member 10.

[0044] The inner side surfaces of the connecting conductor parts 101, 102 of the movable contact supporting member 10 are slidably and electrically connected to both side surfaces of the movable contact 8. Accordingly, the configuration eliminates the necessity of connecting a shunt line of a flexible conductor between the movable contact 8 and the load side connecting conductor 41, and forms a so-called shuntless conduction connection structure.

[0045] The contact pressure spring 9 is formed as a double-torsion type torsion coil spring. That is, the contact pressure spring 9 includes the pair of coil spring parts 91, 92 as compression coil springs wound with pitches respectively having predetermined pitch angles, an arm-like spring part 93 that couples the one ends of the respective pairs of coil spring parts 91, 92 to each other, extends to the one end side of the movable contact 8 to abut against a rear surface 82 of the movable contact 8, and urges the movable contact 8 to provide the contact pressure, and a pair of leg parts 911, 921 that extend from the respective other ends of the pair of coil spring parts 91, 92 in a direction opposite to the one end side of the movable contact 8 and abut against the wall surfaces 6023 of the depressed parts 602, 603 when the contact pressure spring 9 is fitted in the depressed parts 602, 603.

[0046] As shown in FIG. 8, under the condition that the coil spring part 91 of the contact pressure spring 9 is fitted in the depressed part 603 of the crossbar 6, its outer circumferential part abuts against the spring holding wall (not shown) of the depressed part 603 (not shown), the

arm-like spring part 93 abuts against the rear surface of the movable contact 8 at point E, and the leg part 911 abuts against the wall surface (not shown) of the depressed part 603 at point F.

[0047] As a result, the coil spring part 91 is pressed against the spring holding wall of the depressed part 603 in H direction and its outer diameter is held at point G. Therefore, without penetration of the shaft pins through the coil spring parts 91, 92 unlike the conventional case, the outer diameters of the coil spring parts 91, 92 can be held and they can be attached to the crossbar 6.

[0048] Next, an assembly method of the movable contact device 12 will be explained. In FIGs. 3 to 6, first, the other end of the movable contact 8 is inserted between the pair of connecting conductor parts 101, 102 of the movable contact supporting member 10, and, into the through hole 81 formed at the other end of the movable contact 8, the pair of projecting parts formed on the inner side surfaces of the pair of connecting conductor parts 101, 102 are inserted and fitted from both side parts of the movable contact 8.

[0049] Then, the arm-like spring part 93 of the contact pressure spring 9 is allowed to abut against the rear surface 82 of the movable contact device 12 and the inner ends of the pair of coil spring parts 91, 92 of the contact pressure spring 9 in the shaft direction are allowed to abut against the outer surfaces of the pair of connecting conductor parts 101, 102 of the movable contact supporting member 10, respectively.

[0050] That is, the contact pressure spring 9 is attached to the other end of the movable contact 8 and the movable contact supporting member 10 while the pair of connecting conductor parts 101, 102 of the movable contact supporting member 10 are sandwiched by the pair of coil spring parts 91, 92.

[0051] Then, the outer ends of the pair of coil spring parts 91, 92 of the contact pressure spring 9 in the shaft direction are grasped and these coil spring parts 91, 92 are compressed against their spring forces, and, with the condition remaining, the movable contact 8 is inserted from the opening part 6001 of the crossbar 6 shown in FIG. 4 into the through hole 601 from its one end and the one end of the movable contact 8 is protruded through the through hole 601 out from the opening part 6012.

[0052] At the same time, the contact pressure spring 9 is inserted from the respective opening parts 6021, 6031 into the pair of depressed parts 602, 603 of the crossbar 6 with the coil spring parts 91, 92 remaining compressed, and parts of the outer circumferential parts of the respective coil spring parts 91, 92 abut against the U-shaped spring holding walls 6022 of the respective depressed parts 602, 603.

[0053] When the contact pressure spring 9 is inserted into the respective depressed parts 602, 603 of the crossbar 6, the pair of leg parts 911, 921 of the contact pressure spring 9 are naturally allowed to abut against the wall surfaces 6023 of the pair of depressed parts 602, 603 in the insertion operation.

[0054] Further, when the coil spring parts 91, 92 of the contact pressure spring 9 are inserted into the depressed parts 602, 603 and released from the above described grasp, they extend in the shaft direction by the spring forces, and the outer ends in their shaft direction abut against the side walls of the respective depressed parts 602, 603. Concurrently, the coil spring parts 91, 92 hold the compressed condition.

[0055] The inner ends of the contact pressure spring 9 in the shaft direction press the connecting conductor parts 101, 102 of the movable contact supporting member 10 toward both side surfaces of the movable contact 8. As a result, the contact pressure as a shuntless contact part is kept between the movable contact 8 and the connecting conductor parts 101, 102 of the movable contact supporting member 10, and they are slidable and the electric connection is kept. This is the end of the assembly operation of the movable contact device 12, and the movable contact device 12 shown in FIGs. 2 to 7 is formed.

[0056] As described above, the movable contact device 12 for a circuit breaker according to Embodiment 1 of the invention can be attached to the crossbar 6 while the movable contact 8 and the movable contact supporting member 10 are connected, and the leg parts 911, 921 of the contact pressure spring 9 engage with the wall surfaces of the recess part only by the operation of compressing and inserting the coil spring parts 91, 92 of the contact pressure spring 9 into the recess part 600 of the crossbar 6, predetermined rotation moment for the movable contact 8 can be obtained, and thereby, the springing operation of the leg parts 911, 921 of the contact pressure spring after insertion of the contact pressure spring 9 becomes unnecessary and the assembly time can be shortened.

[0057] Further, since the outer shapes of the coil spring parts 91, 92 of the contact pressure spring 9 are held by the U-shaped spring holding walls 6022 of the depressed parts 602, 603 forming the recess part 600 of the crossbar 6, shaft pins or the like for holding the contact pressure spring 9 are unnecessary and the number of parts can be reduced.

[0058] Furthermore, scratches are not produced on both side surfaces of the movable contact and the inner side surfaces of the connecting conductor parts at assembly unlike the conventional device, and the life can be extended.

Industrial Applicability

[0059] The invention can be used in a field of a circuit breaker such as a molded case circuit breaker or a molded case earth leakage circuit breaker.

Claims

1. A movable contact device for circuit breaker, comprising:

- a crossbar (6) including a recess part (600) having an opening part (6001) on a circumferential surface and rotatably supported around its center of axle;
- a movable contact supporting member (10) having a pair of connecting conductor parts (101, 102) opposed with a distance in between, at least one parts of the pair of connecting conductor parts (101, 102) are fitted into the recess part (600) of the crossbar (6);
- a movable contact (8) having a movable contact point (7) at one end and the other end rotatably supported by the pair of connecting conductor parts (101, 102); and
- a contact pressure spring (9) that urges the movable contact (8) to provide contact pressure to the movable contact point (7) when the movable contact point (7) comes into contact with a fixed contact point (5) provided in a circuit breaker, wherein the movable contact (8) has the other end provided between the pair of connecting conductor parts (101, 102), both side surfaces of the other end are respectively slidably in contact with inner side surfaces of the pair of connecting conductor parts (101, 102), the contact pressure spring (9) includes a pair of coil spring parts (91, 92) that are fitted between respective outer side surfaces of the pair of connecting conductor parts (101, 102) and side walls of the recess part (600) of the crossbar (6) and urge the pair of connecting conductor parts (101, 102) toward the other end side of the movable contact (8), an arm-like spring part (93) that couples one ends of the respective pair of coil spring parts (91, 92) to each other, extends to one end side of the movable contact (8) to abut against the movable contact (8), and urges the movable contact (8) to provide the contact pressure, and a pair of leg parts (911, 912) that extend from the respective other ends of the pair of coil spring parts (91, 92) in a direction opposite to the one end side of the movable contact (8) and abut against wall surfaces of the recess part (600) of the crossbar (6) when the contact pressure spring (9) is fitted, the recess part (600) of the crossbar (6) includes depressed parts (602, 603) having U-shaped spring holding walls (6022) that abut against at least one parts of outer circumferential parts of the coil spring parts (91, 92) and hold the coil spring parts (91, 92), **characterized in that**, under a condition that the coil spring parts (91, 92) of the contact pressure spring (9) are fitted in the depressed parts (602, 603) of the crossbar (6), the outer circumferential parts of the coil spring parts (91, 92) abut against the U-shaped spring holding walls (6022) of the depressed parts (602, 603), the arm-like spring part (93) abuts against a rear surface (82) of the movable contact (8), the leg parts (911, 912) abut against flat wall surfaces (6023) of the depressed parts (602, 603) which continue to the U-shaped spring holding walls (6022), and the coil spring parts (91, 92) are pressed against the U-shaped spring holding walls (6022) of the depressed parts (602, 603) and outer diameters of the coil spring parts (91, 92) are held.

2. The movable contact device for circuit breaker according to claim 1, wherein the recess part (600) of the crossbar (6) includes a through hole (601) that penetrates the crossbar (6) from the opening part (6001) in a direction perpendicular to the axial direction of the crossbar (6), and a pair of depressed parts (602, 603) that open in the opening part (6001), are respectively depressed from both sides of the through hole (601) in the shaft direction, and have the U-shaped spring holding walls (6022), the movable contact (8) has at least one part of the other end inserted into the through hole (601) and the one end protruding through the through hole (601) from a circumferential surface of the crossbar (6), at least one parts of the pair of connecting conductor parts (101, 102) are fitted in the through hole (601), and the pair of coil spring parts (91, 92) are respectively fitted between outer surfaces of the pair of connecting conductor parts (101,102) and side walls of the pair of depressed parts (602, 603), respectively.

3. The movable contact device for circuit breaker according to claim 1, wherein the recess part (600) of the crossbar (6) is adapted so that the contact pressure spring (9) may be fitted from the opening part (6001) together with the pair of connecting conductor parts (101, 102) under a condition that the pair of coil spring parts (91, 92) are attached to outer side surfaces of the pair of connecting conductor parts (101, 102), and the contact pressure spring (9) is adapted so that the pair of leg parts (911, 921) may abut against the wall surfaces of the recess part (600) upon the fitting.

Patentansprüche

1. Bewegliche Kontaktvorrichtung für Leistungsschalter,
die Folgendes aufweist:

- einen Querträger (6), der einen Aussparungsbereich (600) mit einem Öffnungsbereich (6001) in einer Umfangsoberfläche aufweist und der drehbar um seine Mittelachse gelagert ist;
- eine bewegliche Kontakt-Lagereinheit (10) mit einem Paar von verbindenden Leiterelementen (101, 102), die einander mit einem Abstand da-

zwischen gegenüberliegen, wobei mindestens ein Element des Paars von verbindenden Leiterelementen (101, 102) in den Aussparungsbereich (600) des Querträgers (6) eingepasst ist;

- einen beweglichen Kontakt (8) mit einem beweglichen Kontaktpunkt (7) an dem einen Ende und wobei das andere Ende drehbar gelagert ist in dem Paar von verbindenden Leiterelementen (101, 102); und
- eine Kontaktdruckfeder (9), die den beweglichen Kontakt (8) vorspannt, um einen Kontaktdruck mit dem beweglichen Kontaktpunkt (7) herzustellen, wenn der bewegliche Kontaktpunkt (7) in Kontakt mit einem festen Kontaktpunkt (5) kommt, der in einem Leistungsschalter vorgesehen ist, wobei das andere Ende des beweglichen Kontakts (8) zwischen dem Paar von verbindenden Leiterelementen (101, 102) vorgesehen ist, wobei beide Seitenflächen des anderen Endes jeweils gleitend in Kontakt mit inneren Seitenflächen des Paars von verbindenden Leiterelementen (101, 102) stehen,

wobei die Kontaktdruckfeder (9) ein Paar von Schraubenfederelementen (91, 92) aufweist, die jeweils zwischen äußeren Seitenflächen des Paars von verbindenden Leiterelementen (101, 102) und Seitenwänden des Aussparungsbereichs (600) des Querträgers (6) eingepasst sind, und wobei die Kontaktdruckfeder (9) das Paar von verbindenden Leiterelementen (101, 102) in Richtung des anderen Endes des beweglichen Kontakts (8) vorspannt, wobei ein armförmiges Federelement (93), das jeweils die einen Enden des Paars von Schraubenfederelemente (91, 92) miteinander verbindet, sich in Richtung des einen Endes des beweglichen Kontakts (8) erstreckt, und zwar um gegen den beweglichen Kontakt (8) zur Anlage zu kommen, und das den beweglichen Kontakt (8) vorspannt, um den Kontaktdruck herzustellen, und wobei ein Paar von Schenkelelementen (911, 912), die sich von den jeweils anderen Enden des Paars Schraubenfederelemente (91, 92) in eine Richtung entgegengesetzt zu der Seite des einen Endes des beweglichen Kontakts (8) erstrecken und gegen die Wandoberflächen des Aussparungsbereichs (600) des Querträgers (6) anliegen, wenn die Kontaktdruckfeder (9) eingepasst ist, wobei der Aussparungsbereich (600) des Querträgers (6) ausgesparte Bereiche (602, 603) mit U-förmigen Federhaltewänden (6022) aufweist, die zumindest gegen einen Bereich der äußeren Umfangsbereiche der Schraubenfederelemente (91, 92) anliegen und die Schraubenfederelemente (91, 92) halten, **dadurch gekennzeichnet,**

dass in einem Zustand, in dem die Schraubenfederelemente (91, 92) der Kontaktdruckfeder (9) in die ausgesparten Bereiche (602, 603) des Querträgers (6) eingepasst sind, die äußeren Umfangsbereiche der Schraubenfederelemente (91, 92) gegen die U-förmigen Federhaltewände (6022) der ausgesparten Bereiche (602, 603) anliegen, wobei das armförmige Federelement (93) gegen eine hintere Oberfläche (82) des beweglichen Kontakts (8) anliegt, wobei die Schenkelteile (911, 912) gegen flache Wandoberflächen (6023) der ausgesparten Teile (602, 603) anliegen, die in die U-förmigen Federhaltewände (6022) übergehen, und wobei die Schraubenfederelemente (91, 92) gegen die U-förmigen Federhaltewände (6022) der ausgesparten Bereiche (602, 603) gepresst sind, und wobei die äußeren Durchmesser der Schraubenfederelemente (91, 92) gehalten sind.

2. Bewegliche Kontaktvorrichtung für Leistungsschalter nach Anspruch 1, wobei der Aussparungsbereich (600) des Querträgers (6) ein Durchgangsloch (601), das den Querträger (6) von dem Öffnungsbereich (6001) aus in einer Richtung senkrecht zu der Axialrichtung des Querträgers (6) durchdringt, und ein Paar von ausgesparten Bereichen (602, 603) aufweist, die sich in den Öffnungsbereich (6001) öffnen, jeweils von beiden Seiten des Durchganglochs (601) in Axialrichtung eingearbeitet sind, und die U-förmigen Federhaltewände (6022) aufweisen, wobei mindestens ein Bereich des anderen Endes des beweglichen Kontakts (8) in das Durchgangsloch (601) eingeführt ist, und das eine Ende durch das Durchgangsloch (601) aus einer Umfangsoberfläche des Querträgers (6) vorsteht, wobei zumindest ein Element des Paars von verbindenden Leiter-elementen (101, 102) in das Durchgangsloch (601) eingepasst ist, und das Paar von Schraubenfederelementen (91, 92) jeweils zwischen äußeren Oberflächen des Paars von verbindenden Leiterelementen (101,102) und Seitenwänden des Paars ausgesparter Bereiche (602, 603) eingepasst ist.

3. Bewegliche Kontaktvorrichtung für Leistungsschalter nach Anspruch 1, wobei der Aussparungsbereich (600) des Querträgers (6) derart ausgelegt ist, dass die Kontaktdruckfeder (9) von dem Öffnungsbereich (6001) aus zusammen mit dem Paar von verbindenden Leiterelementen (101, 102) eingepasst werden kann, unter zwar in einem Zustand, in dem das Paar von Schraubenfederelementen (91, 92) an den äußeren Seitenflächen des Paars von verbindenden Leiterelementen (101, 102) angebracht ist, und dass die Kontaktdruckfeder (9) derart ausgelegt ist, dass das Paar von Schenkelelementen (911, 921) gegen die Wandoberflächen des Aussparungsbereichs (600) beim Einpassen anliegen kann.

Revendications

1. Dispositif contacteur mobile pour un coupe-circuit, comprenant :

- une barre transversale (6) incluant une partie évidée (600) ayant une partie ouverte (6001) sur une surface circonférentielle et supportée en rotation autour de son axe central;
- un élément de support de contact mobile (10) ayant une paire de parties conductrices de connexion (101, 102) opposées avec une distance entre elles, au moins une partie de la paire de parties conductrices de connexion (101, 102) étant logée dans la partie évidée (600) de la barre transversale (6);
- un contact mobile (8) ayant un point de contact mobile (7) à une extrémité et dont l'autre extrémité est supportée en rotation par la paire de parties conductrices de connexion (101, 102); et
- un ressort de pression de contact (9) qui force le contact mobile (8) pour assurer une pression de contact sur le point de contact mobile (7) quand le point de contact mobile (7) vient en contact avec un point de contact fixe (5) prévu dans un coupe-circuit, dans lequel le contact mobile (8) est tel que son autre extrémité est prévue entre la paire de parties conductrices de connexion (101, 102), les deux surfaces latérales de l'autre extrémité sont respectivement capables de coulisser en contact avec des surfaces latérales intérieures de la paire de parties conductrices de connexion (101, 102), le ressort de pression de contact (9) inclut une paire de parties en ressort à boudin (91, 92) qui sont logées entre des surfaces latérales extérieures respectives de la paire de parties conductrices de connexion (101, 102) et des parois latérales de la partie évidée (600) de la barre transversale (6) et forcent la paire de parties conductrices de connexion (101, 102) vers le côté à l'autre extrémité du contact mobile (8), une partie en ressort (93) semblable à un bras qui couple une extrémité de la paire respective de parties en ressort à boudin (91, 92) l'une à l'autre, qui s'étend vers un côté à une extrémité du contact mobile (8) pour venir en butée contre le contact mobile (8), et force le contact mobile (8) pour appliquer la pression de contact, et une paire de parties en forme de patte (911, 912) qui s'étendent depuis les autres extrémités respectives de la paire de parties en ressort à boudin (91, 92) dans une direction opposée au côté à la première extrémité du contact mobile (8) et viennent buter contre des surfaces de paroi de la partie évidée (600) de la barre transversale (6) quand le ressort de pression de contact (9) est logé, la partie évidée (600) de la barre transversale (6) inclut des parties en dépression (602, 603) ayant des parois de maintien (6022) à ressort en forme de U, qui viennent buter contre au moins une partie des parties circonférentielles extérieures des parties en ressort à boudin (91, 92) et maintiennent les parties en ressort à boudin (91, 92),

caractérisé en ce que

sous une condition selon laquelle les parties du ressort à boudin (91, 92) du ressort à pression de contact (9) sont logées dans les parties en dépression (602, 603) de la barre transversale (6), les parties circonférentielles extérieures des parties en ressort à boudin (91, 92) viennent buter contre les parois de maintien de ressort (6022) en forme de U des parties en dépression (602, 603), la partie de ressort semblable un bras (93) vient buter contre une surface arrière (82) du contact mobile (8), les parties en forme de patte (911, 912) viennent buter contre des surfaces de parois planes (6023) des parties évidées (602, 603) qui sont en continuité avec les parois de maintien de ressort en forme de U (6022), et les parties en ressort à boudin (91, 92) sont pressées contre les parois de maintien (6022) du ressort en forme de U des parties en dépression (602, 603) et les diamètres extérieurs des parties en ressort à boudin (91, 92) sont maintenus.

2. Dispositif contacteur mobile pour coupe-circuit selon la revendication 1, dans lequel la partie évidée (600) de la barre transversale (6) inclut un trou traversant (601) qui pénètre la barre transversale (6) depuis la partie ouverte (6001) dans une direction perpendiculaire à la direction axiale de la barre transversale (6), et une paire de parties en dépression (602, 603) qui s'ouvrent dans la partie ouverte (6001), sont respectivement en dépression depuis les deux côtés du trou traversant (601) dans la direction de l'arbre, et comportent les parois de maintien à ressort en forme de U (6022), le contact mobile (8) a au moins une partie de l'autre extrémité insérée dans le trou traversant (601) et la première extrémité en projection à travers le trou traversant (601) depuis une surface circonférentielle de la barre transversale (6), au moins une partie de la paire de parties conductrices de connexion (101, 102) est logée dans le trou traversant (601), et la paire de parties en ressort à boudin (91, 92) sont respectivement logées entre des surfaces extérieures de la paire de parties conductrices de connexion (101, 102) et des parois latérales de la paire de parties en dépression (602, 603), respectivement.

3. Dispositif contacteur mobile pour coupe-circuit selon la revendication 1, dans lequel la partie évidée (600) de la barre transversale (6) est adaptée de telle façon que le ressort de pression de contact (9) peut être

mis en place depuis la partie ouverte (6001) ensemble avec la paire de parties conductrices de connexion (101, 102), sous une condition selon laquelle la paire de parties en ressort à boudin (91, 92) sont attachées sur des surfaces latérales extérieures de la paire de parties conductrices de connexion (101, 102), et le ressort de pression de contact (9) est adapté de telle façon que la paire de parties en forme de patte (911, 921) peuvent venir buter contre les surfaces de paroi de la partie évidée (600) lors de la mise en place.

FIG.1

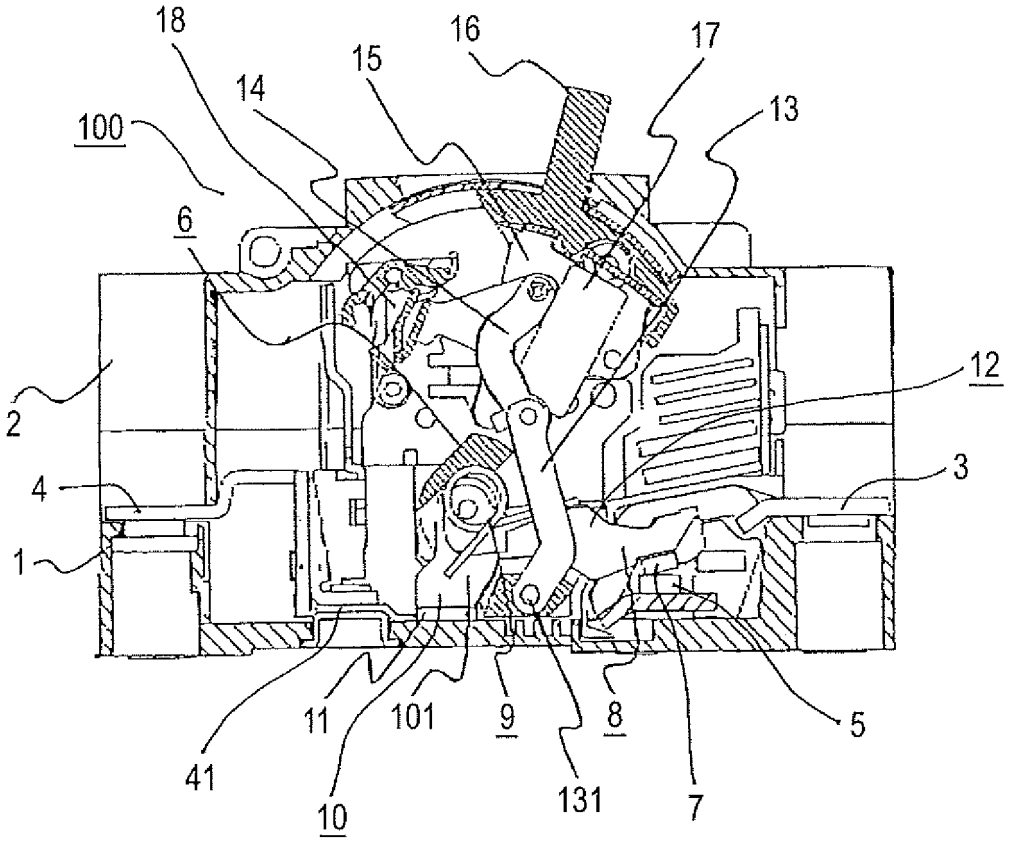


FIG.2

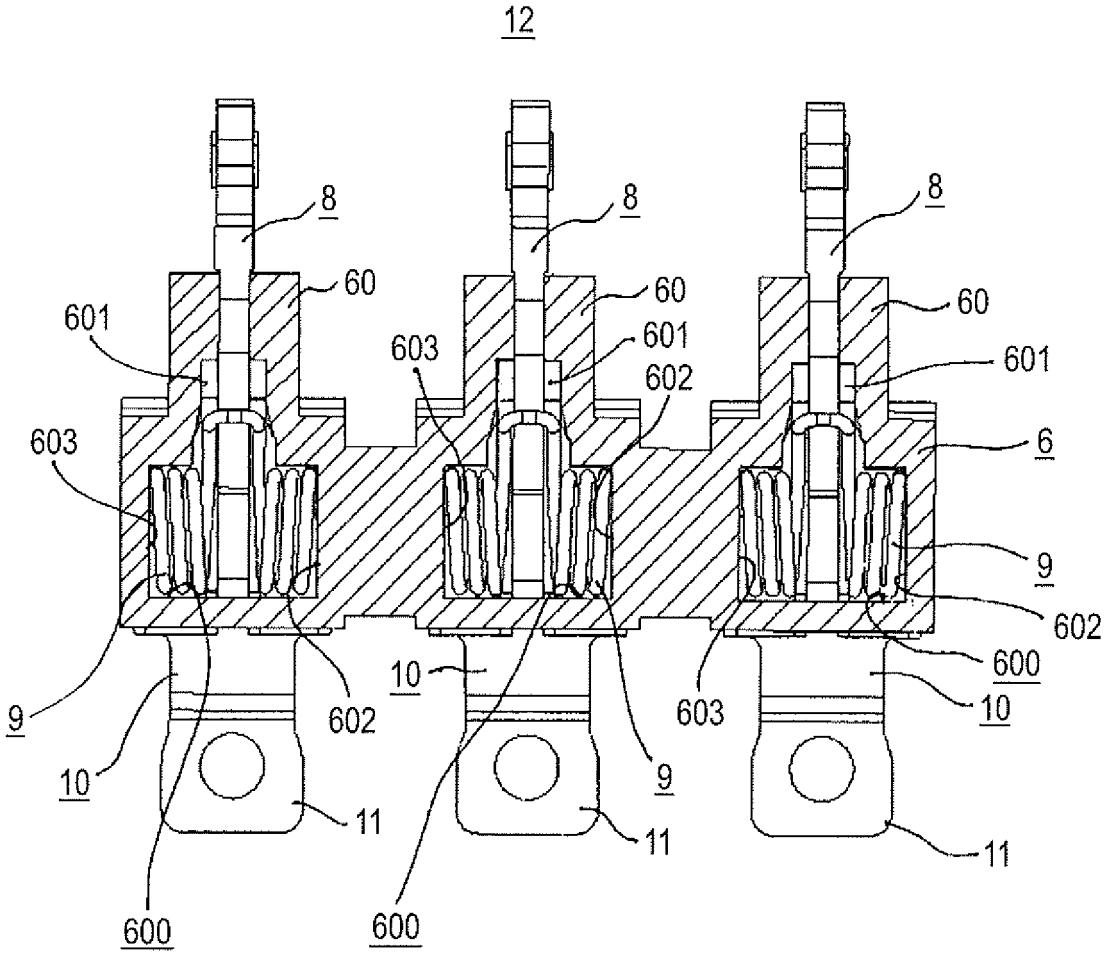

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FIG.3

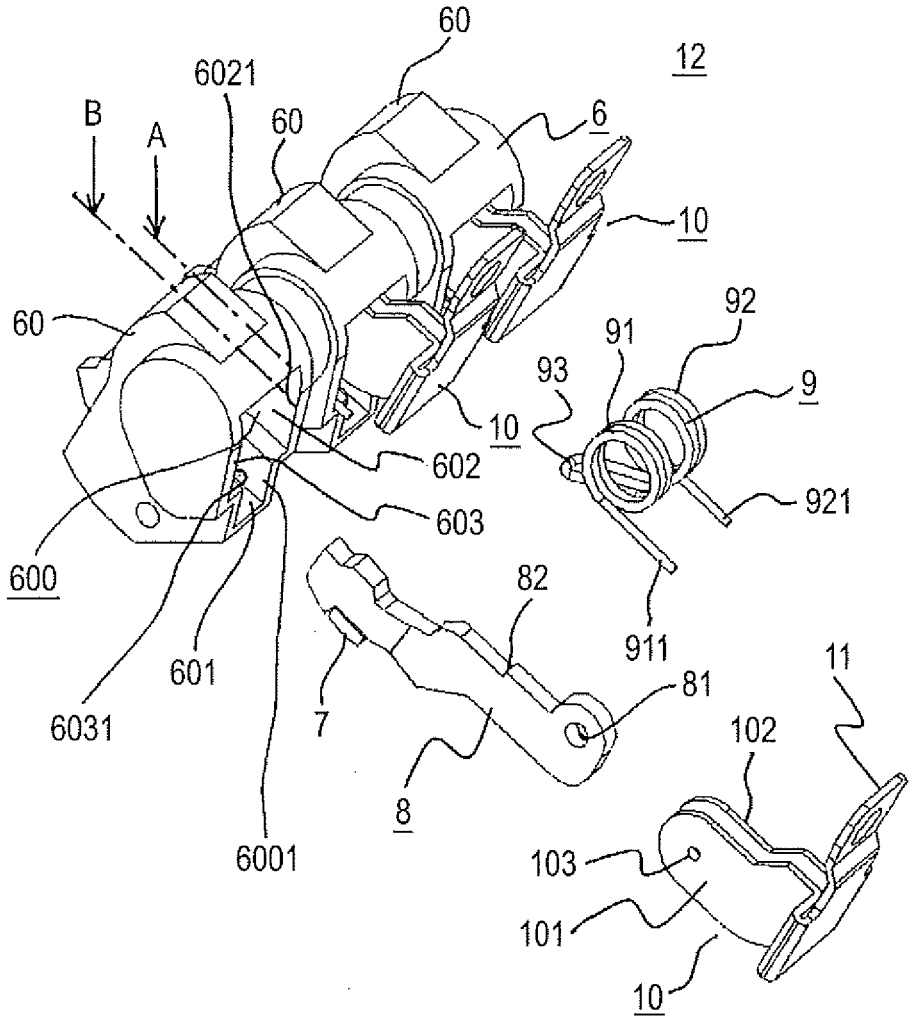

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FIG.4

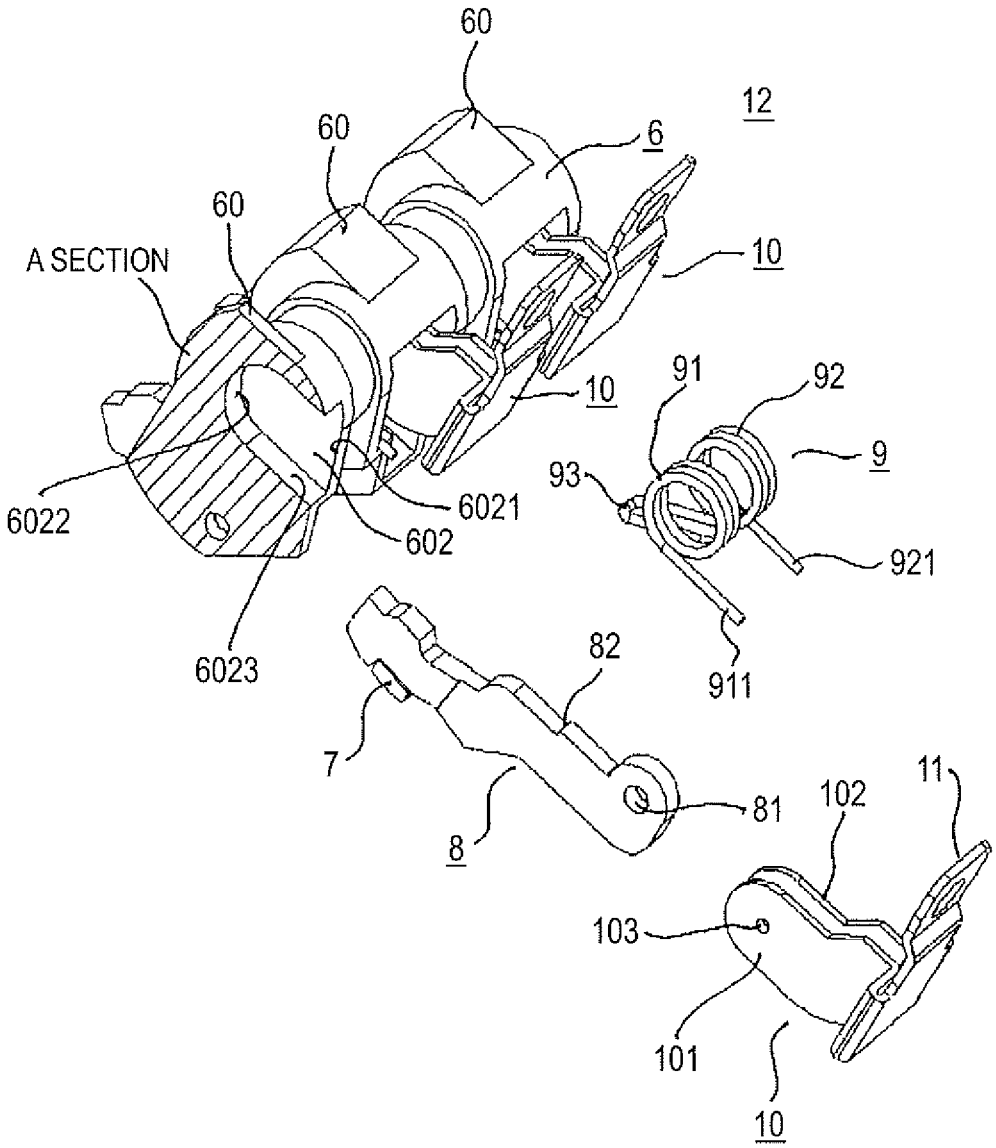

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FIG.5

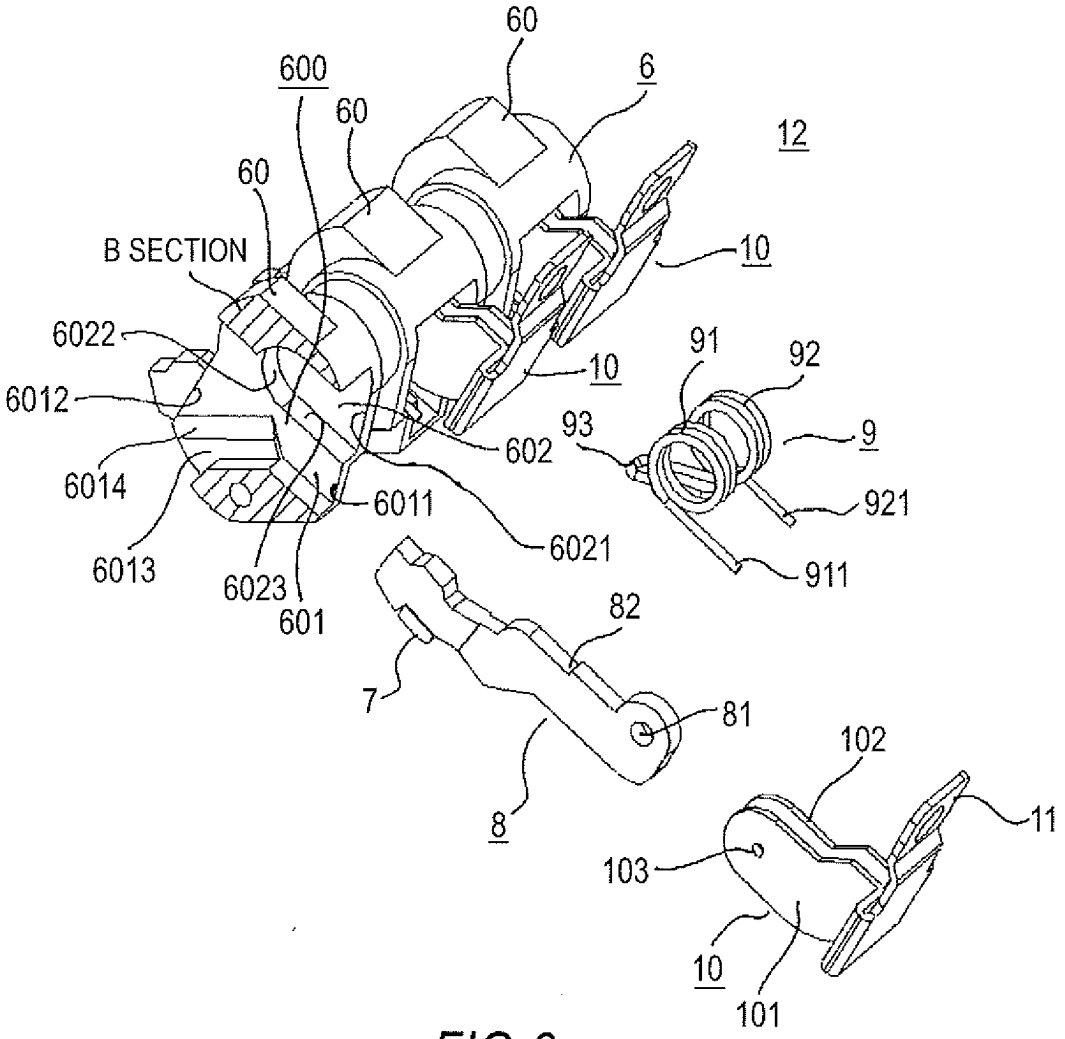

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B SECTION
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FIG.6

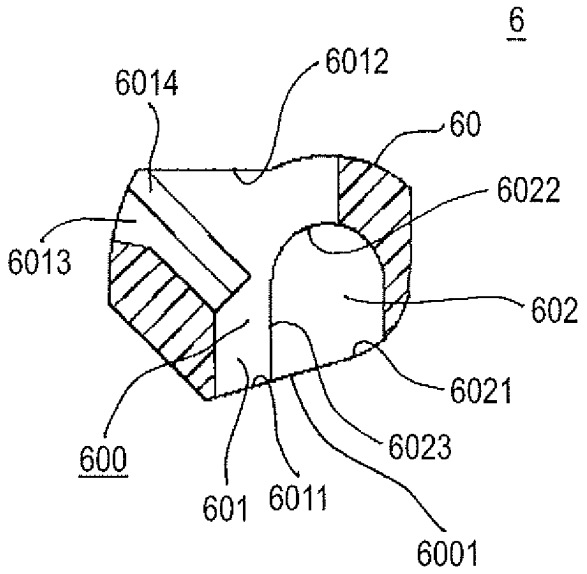

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FIG.7

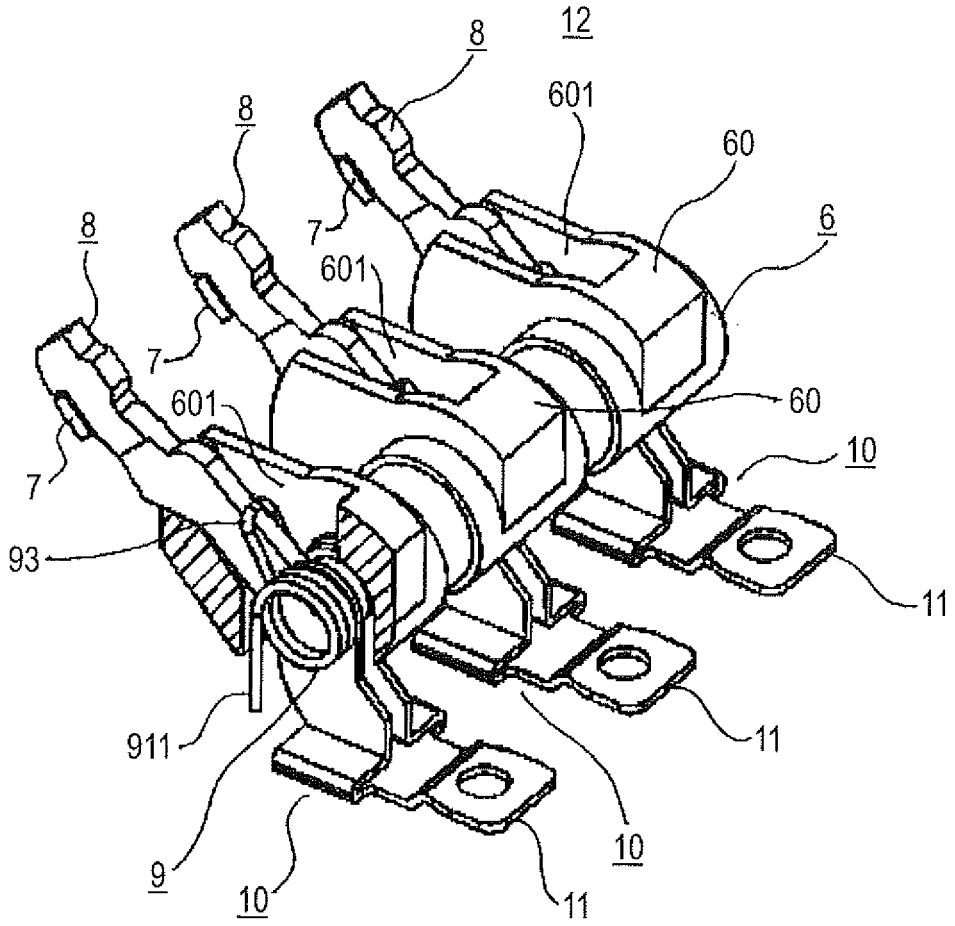
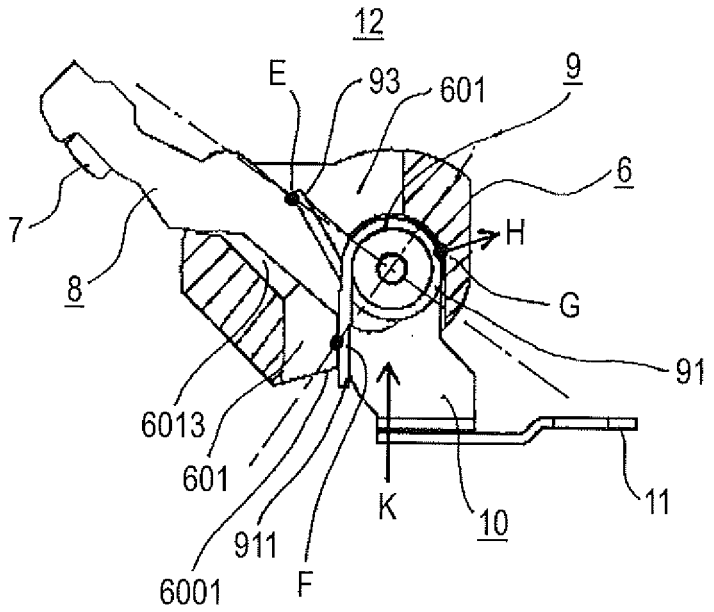

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FIG.8


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REFERENCES CITED IN THE DESCRIPTION

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