



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
19.09.2012 Bulletin 2012/38

(51) Int Cl.:
H01H 71/56 (2006.01)

(21) Application number: **11354026.4**

(22) Date of filing: **20.05.2011**

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

(30) Priority: **16.03.2011 IN CH08082011**

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Remarks:

Claims 18, 19 and 20 are deemed to be abandoned due to non-payment of the claims fees (Rule 45(3) EPC).

(54) **Rotary control unit for a modular electric switchgear apparatus**

(57) A rotary control unit (1) designed to be associated with an electric switchgear apparatus (5) provided with an opening (11) arranged in a protuberant part (13) through which a rocking hand lever (15) extends, said control unit comprising rotary drive means (25) designed to be coupled with a rotary operating handle, a reversible operating mechanism to transform an angular movement of said drive means into a pivoting movement of said hand lever, and assembly means comprising at least a first pressing part (31) securedly united to said control unit and at least a second pressing part (32) designed to press respectively on a first and a second surface (21, 22) of said protuberant part parallel to said connection panels, said second pressing part being fitted on flexible means (41).

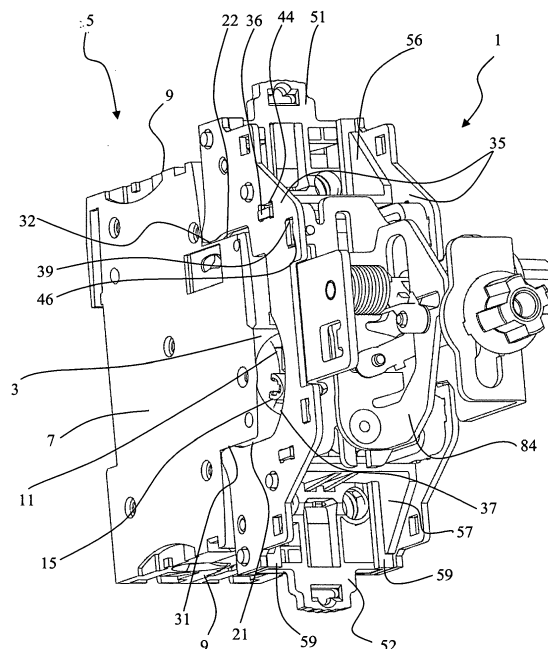


Fig. 1

Description

BACKGROUND OF THE INVENTION

[0001] The invention relates to a rotary control unit designed to be associated with a modular electric switchgear apparatus, generally a low-voltage apparatus, such as a circuit breaker or a differential switch for example.

[0002] The invention relates in particular to a rotary control unit designed to be associated with a modular electric switchgear apparatus housed in an insulating case provided with side main panels, connection panels and a front panel comprising an opening arranged in a protuberant part of said insulating case through which there extends a rocking hand lever able to occupy two stable positions, said control unit comprising:

- rotary drive means designed to be coupled with a rotary operating handle,
- a reversible operating mechanism to transform an angular movement of said drive means into a pivoting movement of said hand lever and vice-versa, and
- assembly means integrated in said control unit to assemble said control unit on said front panel provided with a securing system of said control unit on said insulating case, said assembly means being designed to collaborate with a first surface and a second surface of said protuberant part parallel to said connection panels.

STATE OF THE ART

[0003] French Patent application FR 2 572 579 describes a front or side control unit with a rotary operating handle for equipment with a handle and an insulating case, said control unit being designed to be adjoined to the front panel of said case by means of a clipping system with a self-tightening grip comprising a pair of binding jaws and a tightening device.

[0004] One problem of the control unit of the prior art is that operation of the handle can generate mechanical stresses exerted by said control unit on the case of the equipment unit on which said control unit is fitted, these stresses being liable to cause damage to said equipment unit.

SUMMARY OF THE INVENTION

[0005] The object of the invention is to provide a solution to problems of control units of the prior art by proposing a rotary control unit designed to be associated with a modular electric switchgear apparatus housed in an insulating case provided with side main panels, connection panels and a front panel comprising an opening arranged in a protuberant part of said insulating case through which a rocking hand lever extends able to oc-

cupy two stable positions, said control unit comprising:

- rotary drive means designed to be coupled with a rotary operating handle,
- a reversible operating mechanism to transform an angular movement of said drive means into a pivoting movement of said hand lever and vice-versa, and
- assembly means integrated in said control unit to assemble said control unit on said front panel provided with a system for securing said control unit on said insulating case, said assembly means being designed to collaborate with a first surface and a second surface of said protuberant part parallel to said connection panels,

said unit being **characterized in that** the assembly means comprise at least a first pressing part designed to press on said first surface and at least a second pressing part designed to press on said second surface, said at least a second pressing part being fitted on first flexible means of said control unit.

[0006] The assembly means preferably comprise at least a first stop securedly united to said control unit and designed to press on the second surface to limit any relative movement of said control unit with respect to said electric switchgear apparatus. Advantageously, the assembly means comprise two first pressing parts and two first stops arranged to limit any relative movement of said control unit with respect to said circuit breaker.

[0007] According to one embodiment, the at least a first pressing part is fitted on second flexible means of said control unit. The assembly means preferably comprise at least a second stop securedly united to said control unit and designed to press on the first surface to limit any relative movement of said control unit with respect to said electric switchgear apparatus. The assembly means advantageously comprise two second pressing parts and two second stops arranged to limit any relative movement of said control unit with respect to said circuit breaker.

[0008] According to one embodiment, the control unit comprises an operating mechanism support extending between two parallel mounting plates provided with notches to receive the protuberant part of the insulating case, the first stops and/or the second stops being arranged on said notches. The operating mechanism support is preferably formed in a single mechanical part. In particular, the operating mechanism support can be formed in a cut and folded metal sheet. In particular, at least a part of the first and second pressing parts and the first flexible means can be formed in a part of the support.

[0009] According to one embodiment, the securing system comprises two securing slides to secure said control unit on respectively one and the other of the connection panels of the insulating case, each securing slide being provided with at least one latch designed to be

inserted in an opening arranged on one and the other of said connection panels. The securing system preferably comprises two securing supports on which one and the other of the securing slides are respectively fitted, each securing support being fixed on the two mounting plates. Advantageously, each securing support comprises slide racks to enable translational movement of the securing slide fitted on said securing support and locking means to lock said securing slide in a position in which the latch of said securing slide is inserted in the opening arranged on one or the other of the connection panels.

[0010] According to one embodiment, the operating mechanism comprises a first transmission shaft coupled with the rotary drive means and oriented along a first transmission axis to transmit an angular movement of said rotary drive means, said first transmission shaft being mounted rotating on the support of said operating mechanism, further comprising a first crank securedly united to said first transmission shaft collaborating with a first crank pin borne by a main slide to transform the angular movement of said first transmission shaft into a translational movement of said main slide and vice-versa, said operating mechanism further comprising a drive fork securedly united to said main slide designed to collaborate with the hand lever of the electric switchgear apparatus to transform a translational movement of said main slide into a pivoting movement of said hand lever and vice-versa. The operating mechanism preferably further comprises a second transmission shaft coupled with the rotary drive means and oriented along a second transmission axis perpendicular to the first transmission axis to transmit an angular movement of said rotary drive means, said second transmission shaft being mounted rotating on the support, said operating mechanism further comprising a second crank securedly united to said second transmission shaft collaborating with a second crank pin borne by the main slide to transform the angular movement of said second transmission shaft into a translational movement of said main slide and vice-versa. Advantageously, the support comprises two flat first parts substantially parallel to the front panel of the insulating case, the first transmission shaft being mounted rotating between said first flat parts, and said support comprises two second flat parts substantially parallel to the main panels of said insulating case, the second transmission shaft being mounted rotating between said second flat parts. In particular, the main slide can be mounted sliding in a slide rack of one of the first flat parts of the support. The main slide can in particular be formed from a cut and folded metal sheet comprising a first wing parallel to the first flat part on which said main slide is mounted and a second wing parallel to the main panels of the insulating case, said first and second wing respectively comprising a first and second slide in which the first crank pin and the second crank pin respectively slide.

[0011] The drive means are preferably removable. The drive means preferably comprise a mechanical linking seal allowing a slight clearance between a pivot-pin of

the rotary operating handle to which said drive means are coupled and the first or second transmission axis.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Other advantages and features will become more clearly apparent from the following description of particular embodiments of the invention, given for non-restrictive example purposes only and represented in the appended drawings.

Figure 1 is a perspective view representing a control unit according to the invention fitted on a circuit breaker.

Figure 2 is a side view of the control unit and of the circuit breaker represented in figure 1.

Figure 3 is a perspective view of the control unit represented in figures 1 and 2.

Figure 4 is a perspective view of this same control unit oriented differently.

Figure 5 is an exploded view of most of the elements of the control unit.

Figure 6 is also an exploded view of the control unit after prior assembly of a certain number of elements of said control unit.

Figure 7 is a perspective view of the support of the operating mechanism of the control unit.

Figure 8 is a perspective view of this same support of the operating mechanism oriented differently.

Figure 9 is a perspective view of the support of the operating mechanism of a control unit according to another embodiment.

DETAILED DESCRIPTION OF AN EMBODIMENT

[0013] With reference to figures 1 and 2, the rotary control unit 1 is assembled on the front panel 3 of an insulating case of a circuit breaker 5. The case of the circuit breaker 5 comprises side main panels 7, connection panels 9 and a front panel 3 on which the rotary control unit 1 is assembled. The front panel 3 comprises an opening 11 arranged in a protuberant part 13 of the insulating case through which a rocking hand lever 15 extends able to occupy two stable positions corresponding to closing and opening of contacts of the circuit breaker 5. The protuberant part 13 comprises a first surface 21 and a second surface 22 parallel to the connection panels 9.

[0014] The control unit 1 enables the position of the hand lever 15 of the circuit breaker 5 to be switched by

means of a rotary operating handle, not represented. This operating handle can be fitted on an electric cabinet. For this, the control unit comprises rotary drive means 25 represented in figures 3 and 4. These rotary drive means 25 are designed to be coupled on the one side to a front rotary operating handle. These rotary drive means 25 are coupled on the other side to an operating mechanism or a reversible kinematic drive chain to transform an angular movement of said drive means into a pivoting movement of the hand lever 15 and vice-versa. The operating handle can also be replaced by an electric motor associated with a reduction gear to constitute an electric control unit. As can be seen in figures 3 to 5, most of the elements of this operating mechanism are arranged on a support 27. The rotary drive means 25, the operating mechanism and its support 27 are described in more detailed manner further on in the following.

[0015] As represented in figures 1 and 2, the control unit 1 is assembled on the front panel 3 by means of assembly means integrated in said control unit. The assembly means are designed to collaborate with the first surface 21 and the second surface 22 of the protuberant part 13. More precisely, the assembly means comprise two first pressing parts 31 securedly united to the control unit 1 and designed to press on the first surface 21 of the protuberant part 13. The assembly means further comprise two second pressing parts 32 securedly united to the control unit 1 and designed to press on the second surface 22 of the protuberant part 13. The two first pressing parts 31 and the two second pressing parts 32 can all four be seen in figure 4. In the embodiment represented, the two first pressing parts 31 are fitted substantially facing the respective two second pressing parts 32.

[0016] As can be seen in figures 1 to 6, the support 27 of the operating mechanism extends between two parallel lateral mounting plates 35 provided with notches 37, to accommodate the protuberant part 13 of the insulating case. More precisely, as can be seen in figure 1, the support 27 is fixed on the mounting plates 35 by means of inserts 36, 39 of said support embedded in embedment holes 44, 46 of said mounting plates. These mounting plates 35 can also be qualified as flange-plates. The mounting plates 35 are substantially parallel to the side main panels of the circuit breaker 5. In the embodiment represented, the first pressing parts 31 of the assembly means are arranged on the notches 37. The second pressing elements 32 of the assembly means are for their part formed in a part of the support. The notches 37 of the mounting plates 35 present a shape enabling the protuberant part 13 of the insulating case to be accommodated only when the control unit 1 is fitted the right way on the circuit breaker 5. For this, the mounting plates present a rim 38 which comes up against the stop formed by the hand lever 15 of the circuit breaker 5 if the control unit 1 is not fitted correctly on said circuit breaker, thereby preventing fitting of said control unit. This shape of the notches 37, and in particular the rims 38, acts as error prevention means to help the fitter assemble the control

unit 1 correctly on the circuit breaker 5.

[0017] As can be seen in figures 7 and 8, the operating mechanism support 27 is formed in a single mechanical part, i.e. a cut and folded metal sheet. The second pressing part 32 is mounted on first flexible means. In the embodiment represented, the first flexible means are formed by an ear 41 of said support 27, the free end of said ear supporting the second pressing part. To improve the elastic mobility of the ear 41, the inserts 36 of the support 27 arranged near the ear 41 are embedded in the corresponding embedment holes 44 of the mounting plates 35 with a clearance allowing displacement, whereas the other inserts 39 of said support are fitted with limited clearance in their respective embedment holes 46. These first flexible means 41 enable any relative movement of said control unit 1 with respect to the electric switchgear apparatus 5 to be taken up. Furthermore, when the circuit breaker 5 and its control unit 1 are subjected to shocks or vibrations, the first flexible means 41 prevent nuisance tripping of said circuit breaker which might have been caused in particular by said control unit. They also facilitate assembly or fitting of the control unit 1 on the circuit breaker 5. The material of the support 27 is chosen such as to make the ear 41 sufficiently flexible to absorb any relative movement of the control unit 1 with respect to the circuit breaker 5, in particular when the rotary handle of said control unit 1 is operated. The material of the support 27 is in this case steel. The presence of these first flexible means prevents the circuit breaker from being damaged following operation of the handle of the control unit 1.

[0018] The assembly means of the control unit 1 comprise two first stops 42 securedly united to said control unit and fitted respectively facing said two first pressing parts 31. More precisely, the first stops are arranged on the notches 37 of the mounting plates 35. These first stops 42 are designed to press on the second surface 22 of the protuberant part 13 of the circuit breaker 5 so as to limit any relative movement of said control unit with respect to said circuit breaker when the handle of the control unit is operated. The presence of these first stops 42 enables a relative movement of the control unit 1 with respect to the circuit breaker 5, said control unit being held secure on said circuit breaker by the first and second pressing parts 31, 32.

[0019] As can be seen in figure 2, the second pressing parts 32 press on the second surface 22 of the protuberant part of the circuit breaker 5, whereas the first stops 42 are slightly laid back with respect to said second surface. The extent of this lay-back of the first stops 42 with respect to said second surface 22 is a few tenths of a millimeter and is therefore hardly visible. Operation of the control unit handle can lead to a displacement of the control unit 1 absorbed by the first flexible means 41 until at least one of the first stops 42 comes and presses on the second surface 22 of the protuberant part of the circuit breaker 5.

[0020] As can be seen in figure 4, the two first pressing

parts 31 are fitted respectively facing the two second pressing parts 32 and respectively facing the two first stops 42. In this way, when rotation of the front operating handle takes place in one direction or the other, one or the other of the first stops presses on the second surface 22 of the circuit breaker 5.

[0021] In another embodiment, the control unit comprises another support 28 represented in figure 9 and replacing the support 27. As can be seen in figure 9, the at least a first pressing part 48 is also fitted on second flexible means for example formed by a second ear 50 of the support 28 substantially parallel to the ear 41. In this case, the assembly means comprise two second stops 31 securedly united to the control unit. These second stops 31, like the first stops, are arranged on the notches of the mounting plates and are arranged so as to press on the first surface 21 of the protuberant part 13 of the circuit breaker 5. These second stops 31 in fact correspond to the pressing parts referenced 31 of the embodiment represented in figures 1 to 8. When fitting is performed, the second flexible ear 50 thus prevents the second stops 31 from rubbing on the first surface 21 of the case and from catching on said first surface 21 of the case which is generally made from plastic. This second flexible ear 50 also allows lateral sliding to facilitate positioning of the control unit on the circuit breaker.

[0022] The assembly means of the control unit 1 further comprise a securing system enabling the control unit 1 to be fixed on the insulating case of the circuit breaker 5. This securing system comprises two securing slides 51, 52 to secure the control unit 1 on respectively one and the other of the connection panels 9 of the insulating case. Each securing slide 51, 52 is provided with at least one latch 53, 54 designed to be inserted in a hole arranged on one and the other of the connection panels 9. The part of the latch 53, 54 that is designed to be inserted in the opening of one or the other of the connection panels 9 can present a cross-section that increases between its free end and its base so as to perform securing as said latch progressively enters the opening. As can be seen in figure 4, the securing slide 51 comprises two latches 53, whereas the securing slide 52 only comprises a single latch 54. This single latch 54 enables connection with a differential unit used as an accessory of the circuit breaker 5.

[0023] The securing system further comprises two securing supports 56, 57 on which one and the other of the securing slides 51, 52 are respectively mounted. Each of these securing supports 56, 57 extends between the two mounting plates 35 on which it is fixed. The securing supports 56, 57 present the form of a bracket and are in this case made from plastic. Each of these securing supports 56, 57 comprises slide racks 59 on which the securing slide 51, 52 mounted on said securing support slides. Each of these securing supports 56, 57 further comprises locking means to lock said securing slide in an inserted position of the latch in the opening arranged on one or the other of the connection panels 9. In this

instance, these locking means comprise clips for locking the securing slides 51, 52 on their respective supports 56, 57. In the securing support 57, the clips enable two different locking positions to be defined to be able to intercalate the connections of a differential unit when the securing support is in an intermediate position.

[0024] As can be seen in figure 4, each securing slide 51, 52 and each securing support 56, 57 respectively comprise two pass-through holes 61, 62 which are arranged in such a way as to be facing one another when said securing slide is locked on its securing support. These pass-through holes 61, 62 are arranged facing the terminal screw heads to enable said terminals to be tightened and loosened.

[0025] The securing system of the control unit 1 enables said control unit to be fitted on and removed from the circuit breaker 5, without damaging the insulating case of said circuit breaker.

[0026] In the following, the elements of the operating mechanism are described. These elements are arranged to transform an angular movement of the rotary drive means 25 into a pivoting movement of the hand lever 15 of the circuit breaker 5, and vice-versa. These elements are for the most part fitted on the fixed support 27 represented in figures 7 and 8. These elements of the operating mechanism can be seen in figures 5 and 6.

[0027] The operating mechanism comprises a first transmission shaft 71 coupled with the rotary drive means 25 visible in figures 3 and 4. The first transmission shaft 71 performs transmission of a frontal command by means of a front operating handle the axis of rotation of which is perpendicular to the front panel 3 of the case of the circuit breaker 5. The transmission shaft 71 is oriented along a first transmission axis that is substantially identical to the axis of rotation of the front operating handle which is coupled with the rotary drive means 25 and which enables frontal command of the circuit breaker 5. The transmission shaft 71 thereby enables an angular movement of the rotary drive means 25 to be transmitted. In the embodiment represented, the first transmission shaft 71 is mounted rotating on the support 27. More precisely, as can be seen in figures 6 to 8, the first transmission shaft 71 is mounted rotating between bearings 74 arranged on two first flat parts 75, 76 of the support 27, said first flat parts being substantially parallel to the front panel 3 of the insulating case of the circuit breaker 5.

[0028] The operating mechanism further comprises a first crank 81 securedly united to the first transmission shaft 71 collaborating with a first crank pin 82 supported by a main slide 84 to transform the angular movement of said first transmission shaft into a translational movement of said main slide, and vice-versa. As can be seen in figures 2 and 3, the main slide 84 is arranged to slide in the direction of movement of the hand lever 15 of the circuit breaker 5 along a slide wall of the support 27 extending transversely between the two mounting plates 35. This slide wall of the support 27 corresponds to one of the two first flat parts 75, 76 between which the first

transmission shaft 71 is mounted rotating, here the first flat part of the support 27 referenced 75. In the embodiment represented, the main slide 84 is formed from a cut and folded metal sheet comprising a first wing 86 which is parallel to the slide wall 75 of the support 27 on which said main slide is mounted. This first wing 86 of the main slide 84 is therefore facing the slide wall 75 of the support 27. The first wing 86 of the main slide 84 bears two guiding fingers 90 able to move in a slide rack 92, in this case a groove, of the slide wall 75 of the support 27. A retaining ring, or a riveting, clipped on the ends of the guiding fingers 90 secures the main slide 84 on the slide wall 75 of the support 27, while at the same time allowing sliding movement with respect to said support.

[0029] As can be seen in figure 2, a drive fork 88, also visible in figures 4 and 5, is supported by the two guiding fingers 90 of the first wing 86 of the main slide 84 and collaborates with the hand lever 15 of the circuit breaker 5 to transform the translational movement of said main slide into a pivoting movement of said hand lever, and vice-versa. When the control unit 1 is fitted on the circuit breaker 5, the hand lever 15 is engaged with a certain clearance in the drive fork 88. The first wing 86 of the main slide 84 also supports the first crank pin 82, the latter being able to slide in a groove or an aperture 94 of said first wing 86. The drive fork 88 comprises a stop 91, visible in figure 4, preventing the control unit 1 from being fitted on the circuit breaker 5 when the hand lever 15 of said circuit breaker is in a closed position of the contacts. This stop 91 also prevents the control unit 1 from being fitted the wrong way round when the hand lever 15 of the circuit breaker 5 is in the closed position of the contacts.

[0030] The kinematic chain formed by the first transmission shaft 71, the first crank 81, the first crank pin 82 and the main slide 84 thereby enables the angular movement of the front operating handle coupled with the rotary drive means 25 to be transformed into an alternating movement of the hand lever 15 of the circuit breaker 5, and vice-versa. The planes of movement of the front operating handle and of the main slide 84 are substantially parallel to the front panel 3 of the insulating case of the circuit breaker 5, whereas the first transmission shaft 71 extends perpendicularly to the slide wall 75 of the support 27 and is fitted between the two first flat parts 75, 76 of said support parallel to said planes of movement. The main slide 84 can thus be guided in translation by the permanent passage of the guiding fingers 90 in the longitudinal slide rack 92 of the slide wall 75 of said support 27 by means of a front operating handle.

[0031] In the embodiment represented, the operating mechanism also comprises a second transmission shaft 101 designed to be coupled with rotary drive means of the same type as those represented in figures 3 and 4 under the reference 25 to perform transmission of a lateral command via a lateral operating handle the axis of rotation of which is perpendicular to the side main panels 7 of the case of the circuit breaker 5. The transmission shaft 101 is oriented along a second transmission axis

that is substantially identical to the axis of rotation of the lateral operating handle and therefore perpendicular to the first transmission axis of the first transmission shaft 71. As can be seen in figures 6 to 8, the second transmission shaft 101 is mounted rotating between bearings 104 arranged on two second flat parts 105, 106 of the support 27, said second flat parts being substantially parallel to the main panels 7 of the insulating case of the circuit breaker 5.

[0032] The operating mechanism also comprises a second crank 111 securedly united to the second transmission shaft 101 collaborating with a second crank pin 112 supported by the main slide 84. The crank 111 and crank pin 112 enable the angular movement of the second transmission shaft 101 to be transformed into a translational movement of the main slide 84 and vice-versa. In the embodiment represented, the main slide 84 which is formed from a cut and folded metal sheet comprises a second wing 118 which is parallel to the main panels 7 of the case of the circuit breaker 5. This second wing 118 of the main slide 84 is therefore perpendicular to the first wing 86. The second wing 118 of the main slide 84 bears the second crank pin 112, the latter being able to slide in a groove or aperture 124 of said second wing 118 of the main slide 84.

[0033] The kinematic chain formed by the second transmission shaft 101, the second crank 111, the second crank pin 112 and the main slide 84 thereby enables the angular movement of the lateral operating handle coupled with the rotary drive means 25 to be transformed into an alternating movement of the hand lever 15 of the circuit breaker 5, and vice-versa. The plane of movement of the lateral operating handle is perpendicular to that of the main slide 84. The second transmission shaft 101 extends perpendicularly to the second flat parts 105, 106 of the support 27 and is fitted between said second flat parts. The main slide 84 can thus be guided in translation by the permanent passage of the guiding fingers 90 in the longitudinal slide rack 92 of the slide wall 75 of said support 27 by means of a lateral operating handle.

[0034] To indicate outside the electric cabinet that the circuit breaker 5 is in a tripped state, for example following an electric fault, the operating mechanism comprises a return spring 95 fitted between the support 27 and the second crank 111. This return spring could also have been fitted between the support and the first crank. In this way, following an electric fault, the second crank 111 drives the rotary operating handle on the front panel of the electric cabinet to a "stop" position. This return spring 95 avoids using the return force of the circuit breaker. The control unit 1 is therefore a control accessory of the type referred to as self-powered to return to the stop position. The return spring 95 also returns the drive fork 88 to the same initial position corresponding to the open position of the contacts of the circuit breaker 5, before the control unit 1 is fitted on the circuit breaker 5. In this way, the initial position of the drive fork 88 prevents the user from fitting the control unit the wrong way round.

[0035] The control unit 1 comprise means for indicating that the contacts of the circuit breaker 5 are welded. These means in this case comprise a stop 100 (figure 4) arranged on the fork 88 so as to press on the arm of the hand lever 15 due to the force exerted by the return spring 95 (figure 3) whatever the position of said hand lever. Due to the reversibility of the operating mechanism, when the hand lever 15 of the circuit breaker 5 is moved to an intermediate position which is characteristic of welding of the contacts of said circuit breaker, the operating handle is also moved to an intermediate position enabling welding of the contacts to be indicated.

[0036] In the embodiment represented, the drive means 25 are fitted on the first transmission shaft 71 so as to couple a front operating handle with the hand lever 15 of the circuit breaker 5. The same drive means could be used to couple the second transmission shaft 101 with a lateral operating handle. In the case represented, the drive means 25 are removable and can be fitted indifferently on one or the other of the first or second transmission shaft 71, 101 by screw-fastening with a simple screwdriver.

[0037] In the embodiment represented, the drive means 25 comprise a mechanical linking seal allowing a slight clearance between the pivot-pin of the rotary operating handle to which said drive means are coupled and the first or second transmission axis.

[0038] In the embodiment represented, the drive means 25 comprise error prevention means to assemble said drive means on the first or second transmission shaft 71, 101. These error prevention means ensure that the drive means 25 are oriented in the right position. Coupling of the drive means 25 on the first or second transmission shaft 71, 101 is performed by means of a female part of said drive means designed to receive a male part 131 of said first or said second transmission shaft. The male part 131 and the corresponding female part present a cross-section in the form of a cross enabling driving in rotation. The error prevention means can comprise an off-centre groove arranged on one of the crossbars of the cross of the male part and an off-centre pin arranged on the female part to coincide with said groove.

Claims

1. A rotary control unit (1) designed to be associated with a modular electric switchgear apparatus (5) housed in an insulating case provided with side main panels (7), connection panels (9) and a front panel (3) comprising an opening (11) arranged in a protuberant part (13) of said insulating case through which a rocking hand lever (15) extends able to occupy two stable positions, said control unit comprising:

- rotary drive means (25) designed to be coupled with a rotary operating handle,
- a reversible operating mechanism to transform

an angular movement of said drive means into a pivoting movement of said hand lever and vice-versa, and

- assembly means integrated in said control unit to assemble said control unit on said front panel provided with a securing system of said control unit on said insulating case, said assembly means being designed to collaborate with a first surface (21) and a second surface (22) of said protuberant part parallel to said connection panels, **characterized in that** the assembly means comprise at least a first pressing part (31 ; 48) designed to press on said first surface and at least a second pressing part (32) designed to press on said second surface, said at least a second pressing part being fitted on first flexible means (41) of said control unit.

2. The control unit according to claim 1, **characterized in that** the assembly means comprise at least a first stop (42) securedly united to said control unit and designed to press on the second surface (22) to limit any relative movement of said control unit with respect to said electric switchgear apparatus.

3. The control unit according to claim 2, **characterized in that** the assembly means comprise two first pressing parts (31 ; 48) and two first stops (42) arranged to limit any relative movement of said control unit with respect to said modular electric switchgear apparatus (5).

4. The control unit according to any one of claims 1 to 3, **characterized in that** the at least a first pressing part (48) is fitted on second flexible means (50) of said control unit.

5. The control unit according to claim 4, **characterized in that** the assembly means comprise at least a second stop (31) securedly united to said control unit and designed to press on the first surface (21) to limit any relative movement of said control unit with respect to said electric switchgear apparatus.

6. The control unit according to claim 5, **characterized in that** the assembly means comprise two second pressing parts (32) and two second stops (31) arranged to limit any relative movement of said control unit with respect to said modular electric switchgear apparatus (5).

7. The control unit according to any one of claims 2, 3, 5 or 6, **characterized in that** it comprises a support (27 ; 28) of the operating mechanism extending between two parallel mounting plates (35) provided with notches (37) to receive the protuberant part (13) of the insulating case, stops (31 ; 42) being arranged on said notches.

8. The control unit according to claim 7, **characterized in that** the support (27 ; 28) of the operating mechanism is formed in a single mechanical part.
9. The control unit according to claim 8, **characterized in that** the support (27 ; 28) of the operating mechanism is formed from a cut and folded metal sheet.
10. The control unit according to claim 9, **characterized in that** at least a part of the first and second pressing parts (32 ; 48, 32) and the flexible means (41, 50) are formed in a part of the support (27 ; 28).
11. The control unit according to any one of claims 7 to 10, **characterized in that** the securing system comprises two securing slides (51, 52) to secure said control unit on respectively one and the other of the connection panels (9) of the insulating case, each securing slide being provided with at least one latch (53, 54) designed to be inserted in a hole arranged on one and the other of said connection panels.
12. The control unit according to claim 11, **characterized in that** the securing system comprises two securing supports (56, 57) on which one and the other of the securing slides (51, 52) are respectively fitted, each securing support being fixed on the two mounting plates (35).
13. The control unit according to claim 12, **characterized in that** each securing support (56, 57) comprises slide racks (59) to enable translational movement of the securing slide (51, 52) mounted on said securing support and locking means to lock said securing slide in an inserted position of the latch (53, 54) of said securing slide in the opening arranged on one or the other of the connection panels (9).
14. The control unit according to any one of claims 7 to 13, **characterized in that** the operating mechanism comprises a first transmission shaft (71) coupled with the rotary drive means (25) and oriented along a first transmission axis to transmit an angular movement of said rotary drive means, said first transmission shaft being mounted rotating on the support (27), said operating mechanism further comprising a first crank (81) securedly united to said first transmission shaft collaborating with a first crank pin (82) borne by a main slide (84) to transform the angular movement of said first transmission shaft into a translational movement of said main slide and vice-versa, said operating mechanism further comprising a drive fork (88) securedly united to said main slide designed to collaborate with the hand lever (15) of the electric switchgear apparatus to transform a translational movement of said main slide into a pivoting movement of said hand lever and vice-versa.
15. The control unit according to claim 14, **characterized in that** the operating mechanism further comprises a second transmission shaft (101) coupled with the rotary drive means and oriented along a second transmission axis perpendicular to the first transmission axis to transmit an angular movement of said rotary drive means, said second transmission shaft being mounted rotating on the support (27 ; 28), said operating mechanism further comprising a second crank (111) securedly united to said second transmission shaft collaborating with a second crank pin (112) borne by the main slide (84) to transform the angular movement of said second transmission shaft into a translational movement of said main slide and vice-versa.
16. The control unit according to claim 15, **characterized in that** the support (27 ; 28) comprises two first flat parts (75, 76) substantially parallel to the front panel (3) of the insulating case, the first transmission shaft (71) being mounted rotating between said first flat parts, and **in that** said support comprises two second flat parts (105, 106) substantially parallel to the main panels (7) of said insulating case, the second transmission shaft (101) being mounted rotating between said second flat parts.
17. The control unit according to claim 16, **characterized in that** the main slide (84) is mounted sliding in a slide rack (92) of one of the first flat parts (75) of the support (27 ; 28).
18. The control unit according to claim 17, **characterized in that** the main slide (84) is formed from a cut and folded metal sheet comprising a first wing (86) parallel to the first flat part (75) on which said main slide is fitted and a second wing (118) parallel to the main panels (7) of the insulating case, said first and second wing respectively comprising a first and second slide racks (94, 124) in which the first crank pin and second crank pin (82, 112) respectively slide.
19. The control unit according to any one of claims 14 to 18, **characterized in that** the drive means (25) comprise a mechanical linking seal allowing a slight clearance between the pivot-pin of the rotary operating handle to which said drive means are coupled and one of the first or second transmission axes (71, 101).
20. The control unit according to any one of the foregoing claims, **characterized in that** the drive means (25) are removable.

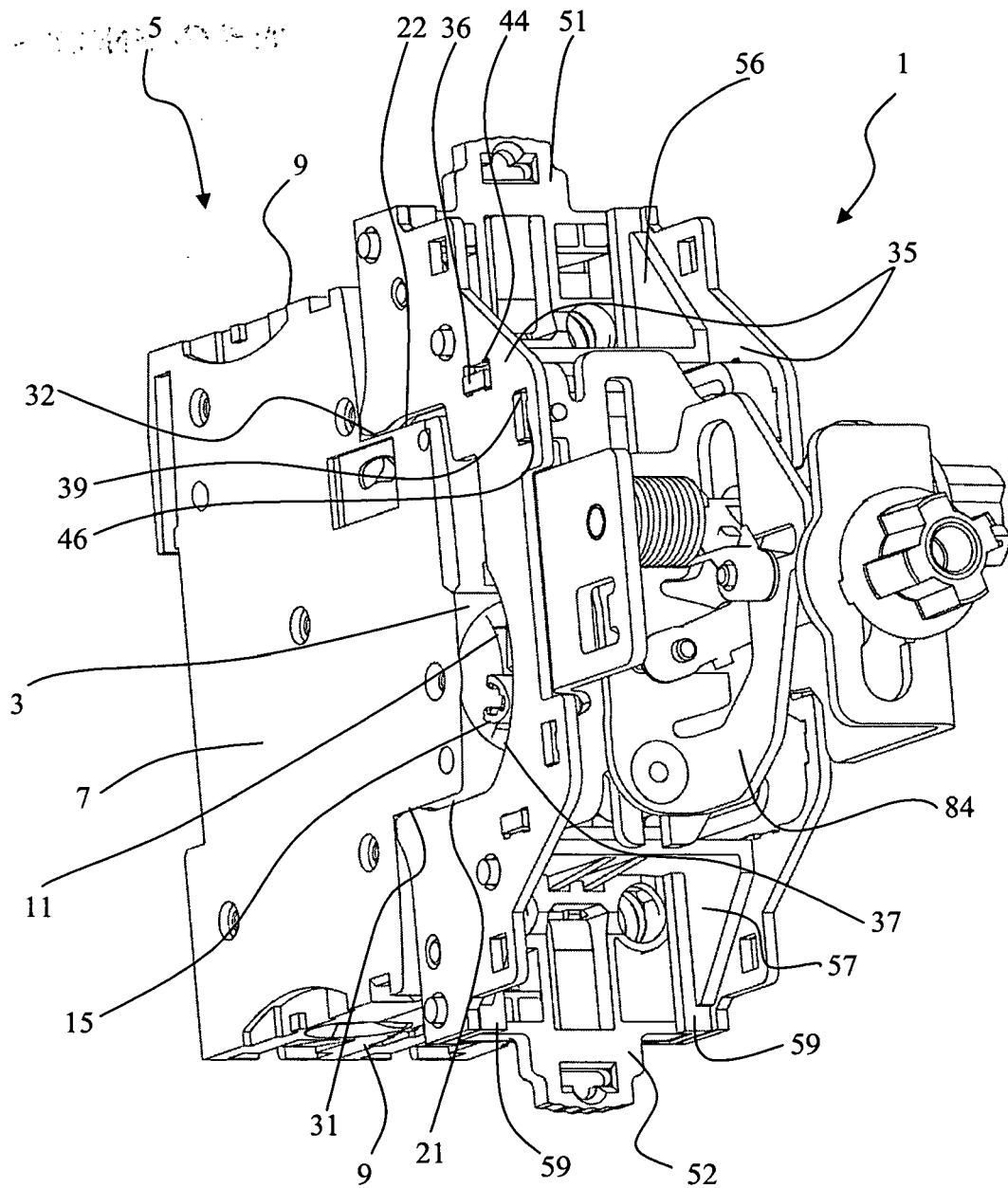


Fig. 1

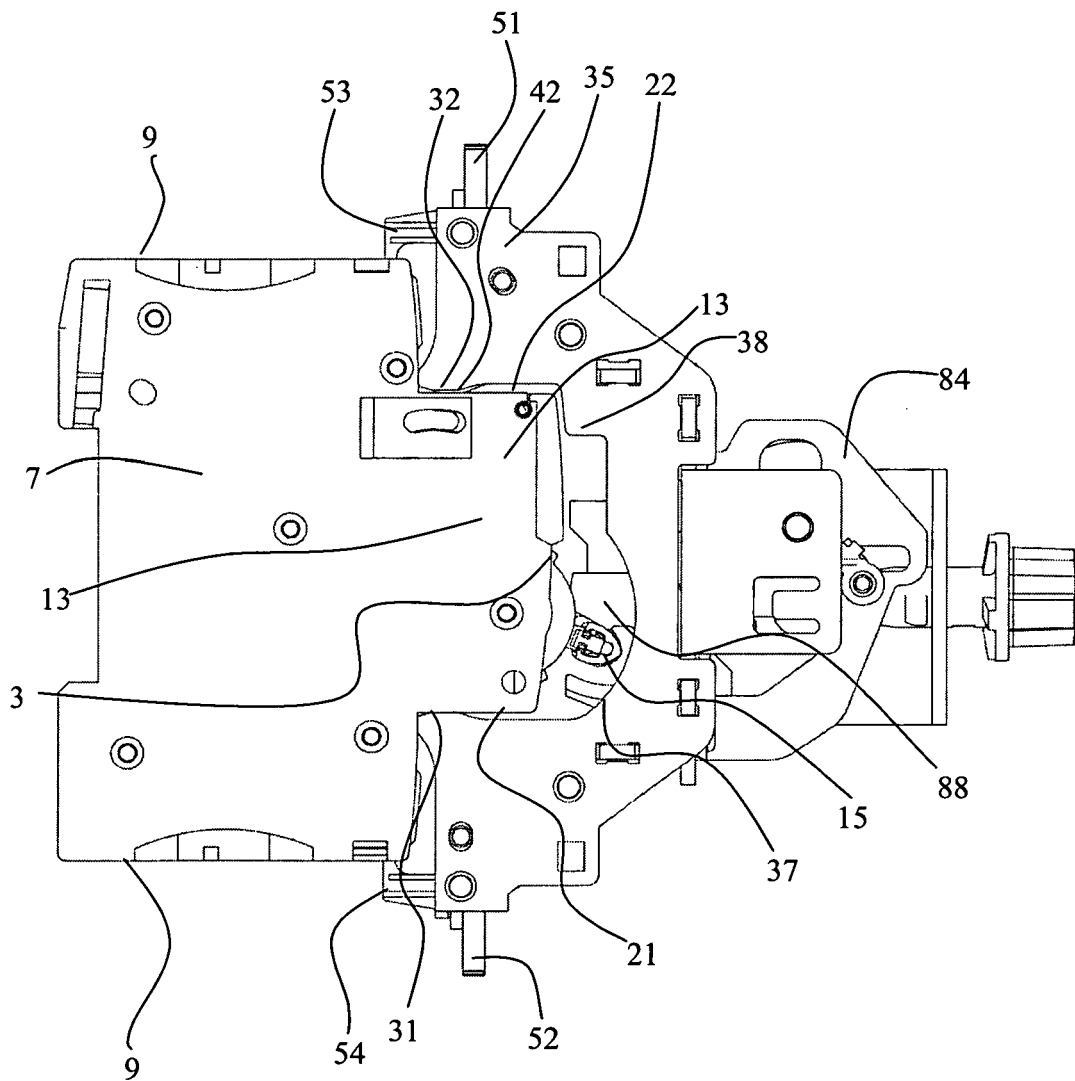


Fig. 2

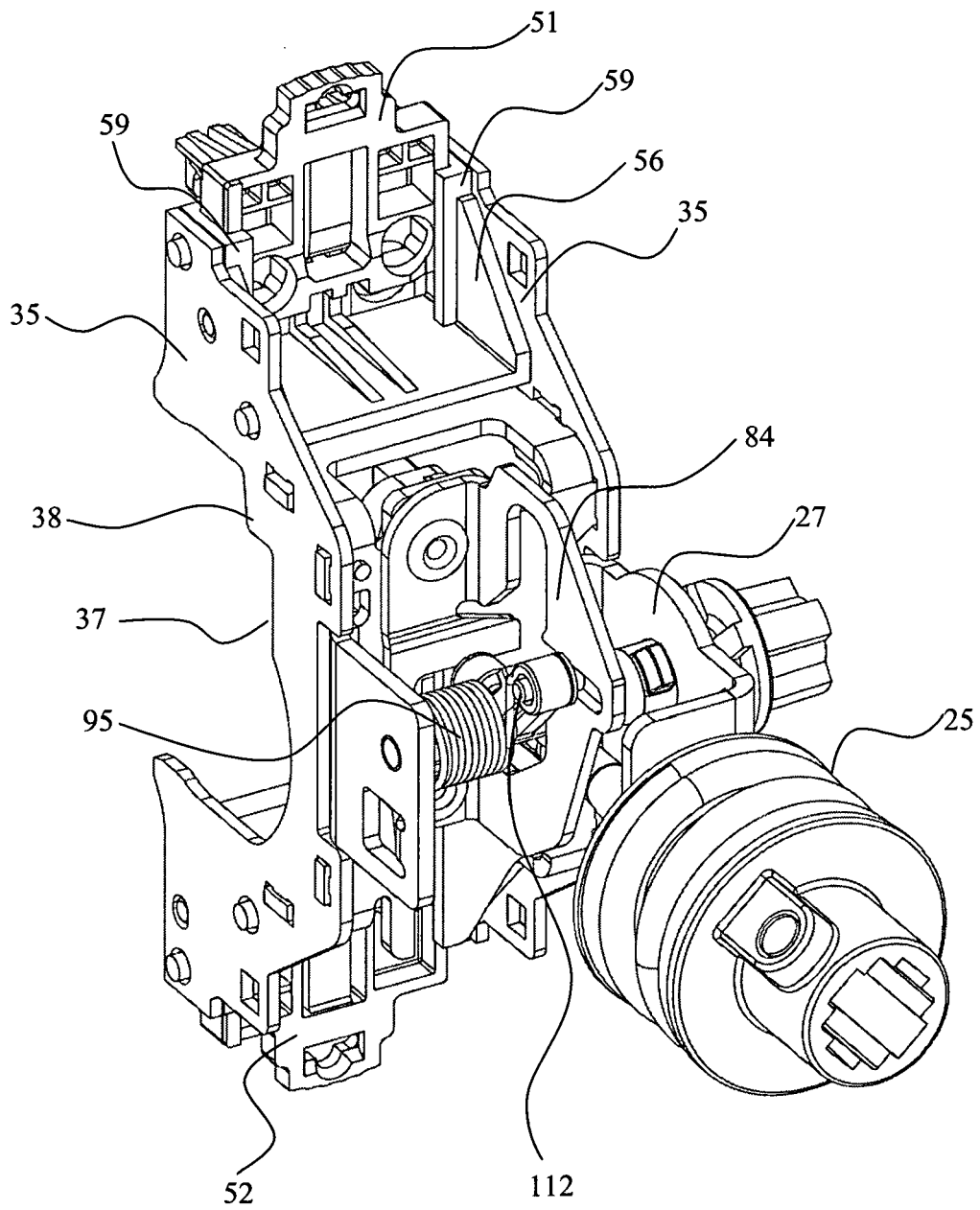


Fig. 3

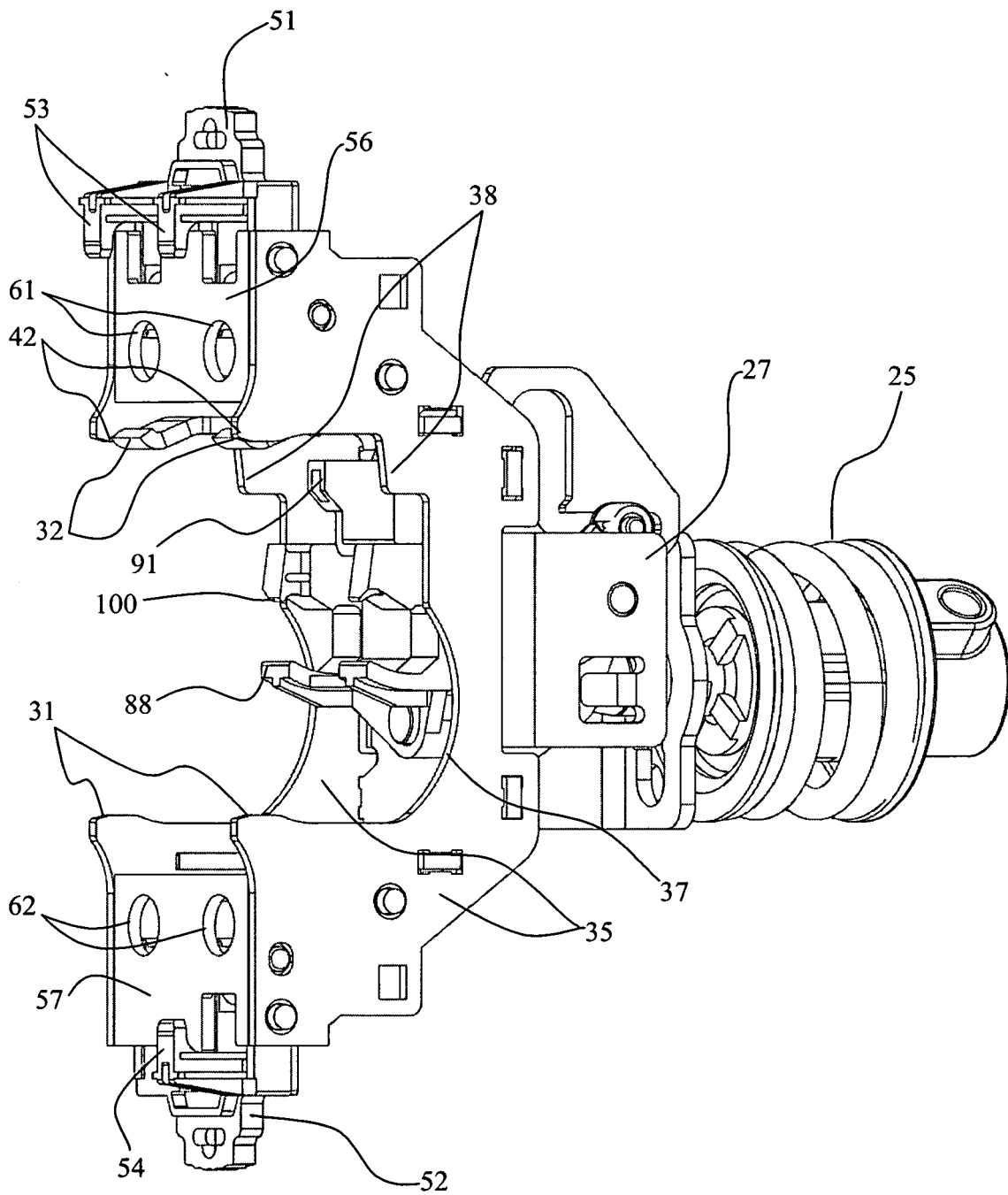


Fig. 4

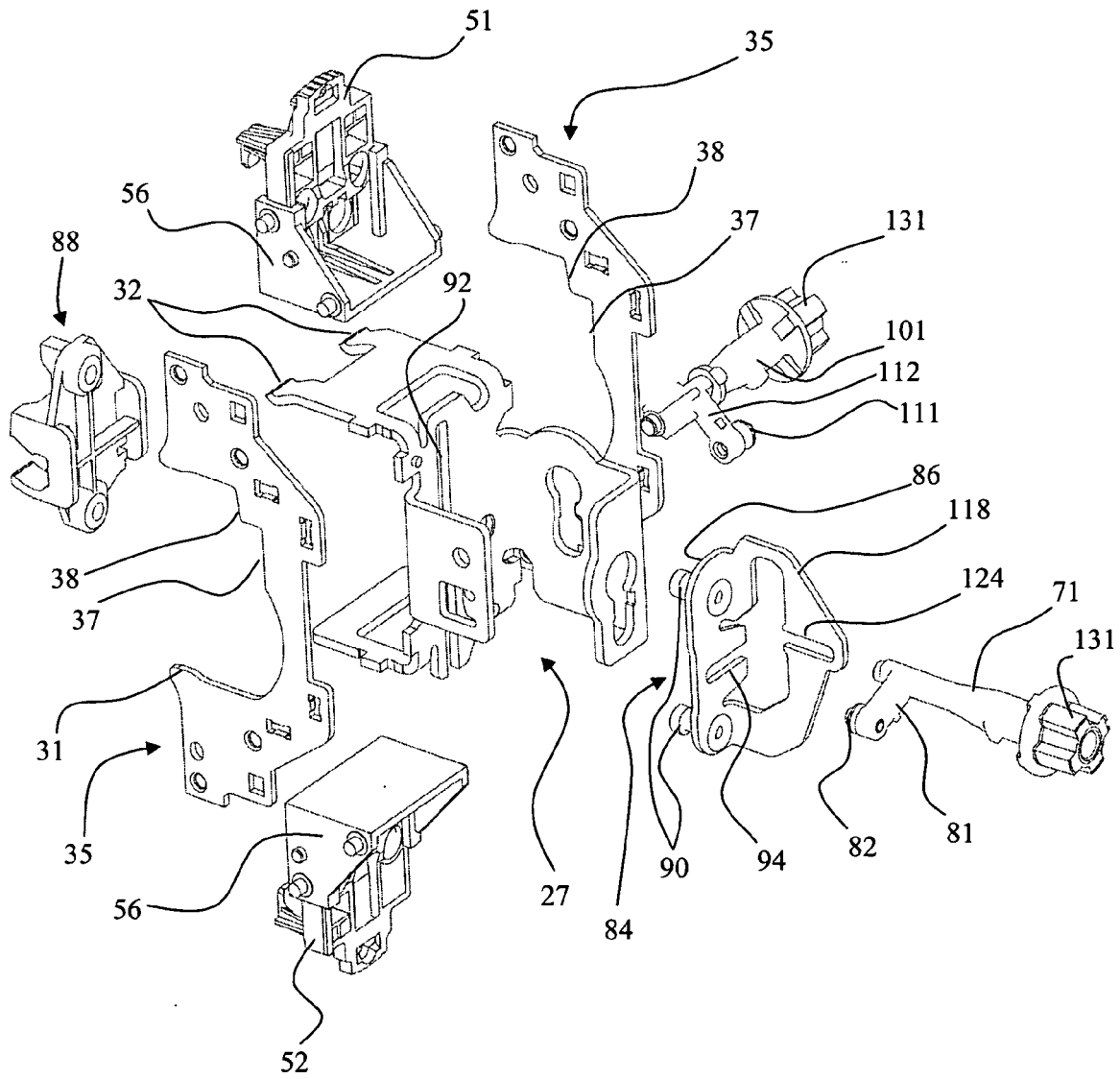


Fig. 5

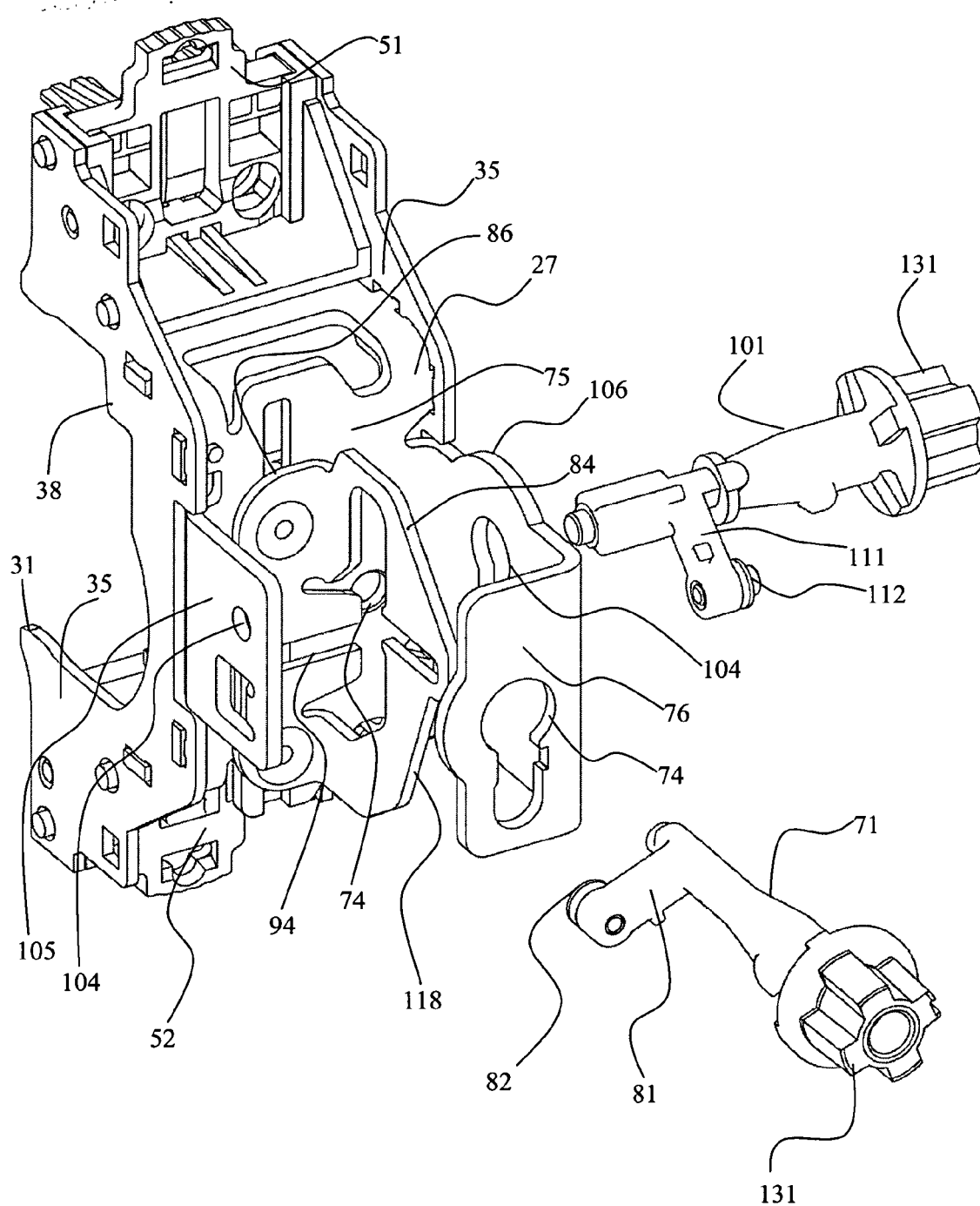


Fig. 6

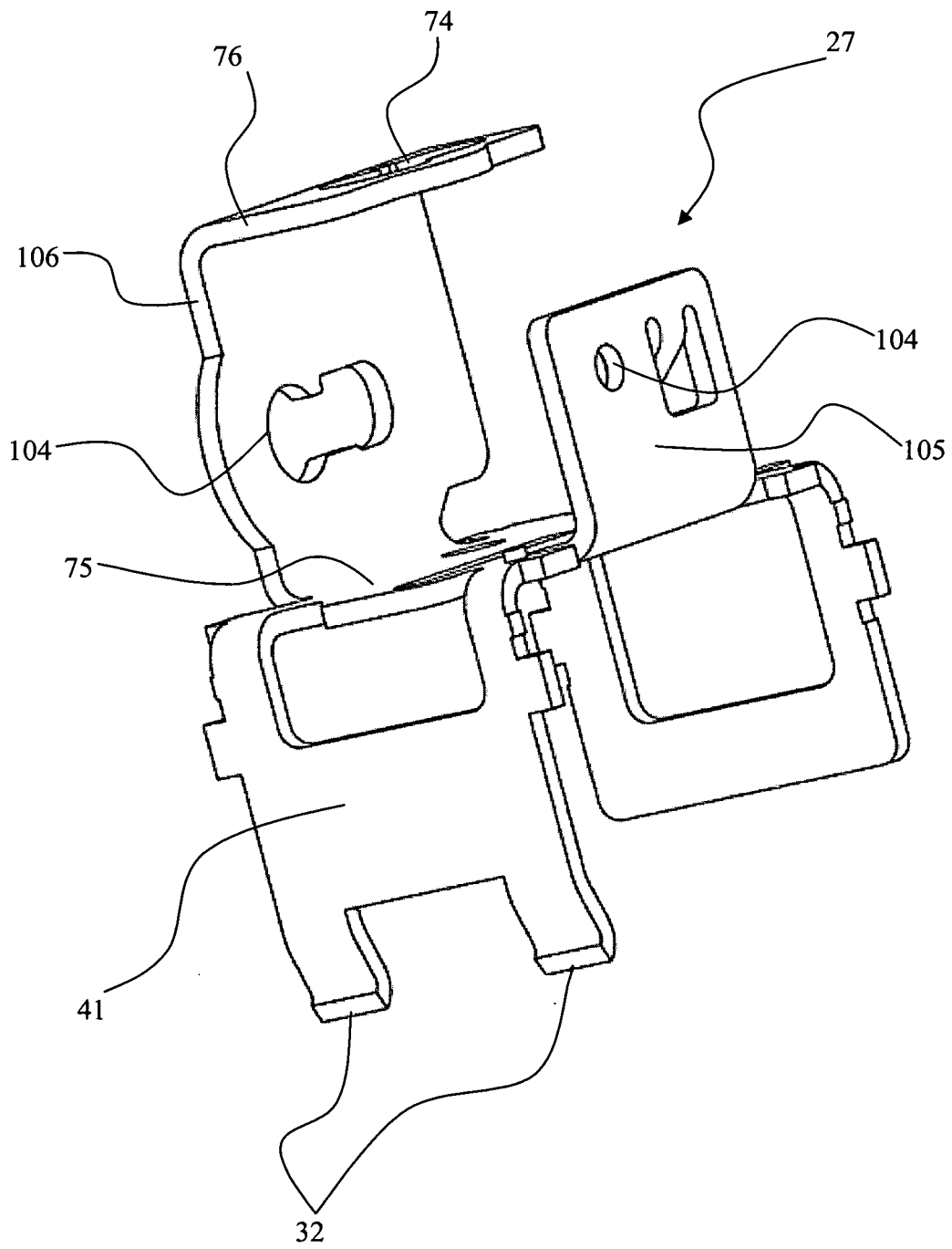


Fig. 7

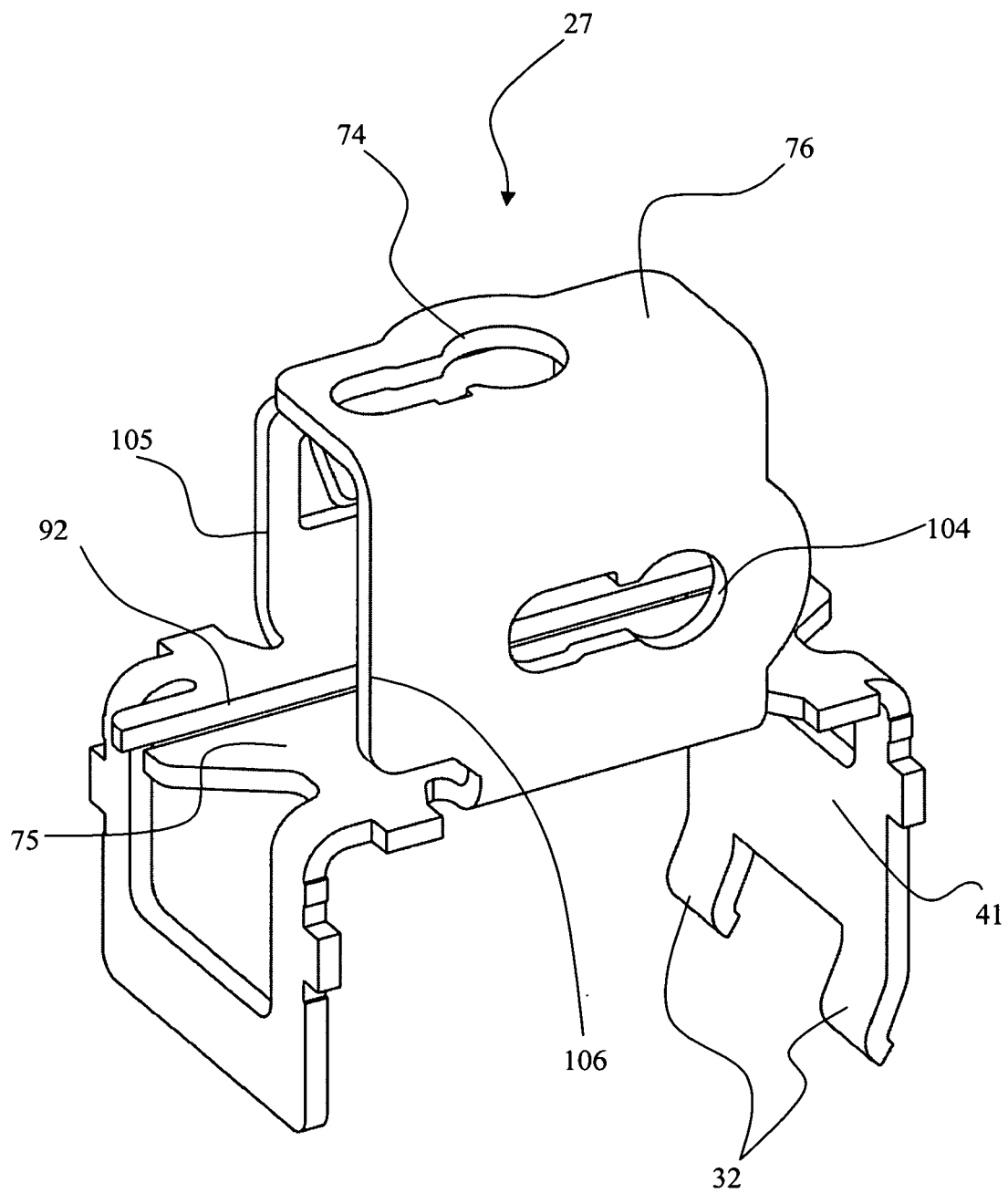


Fig. 8

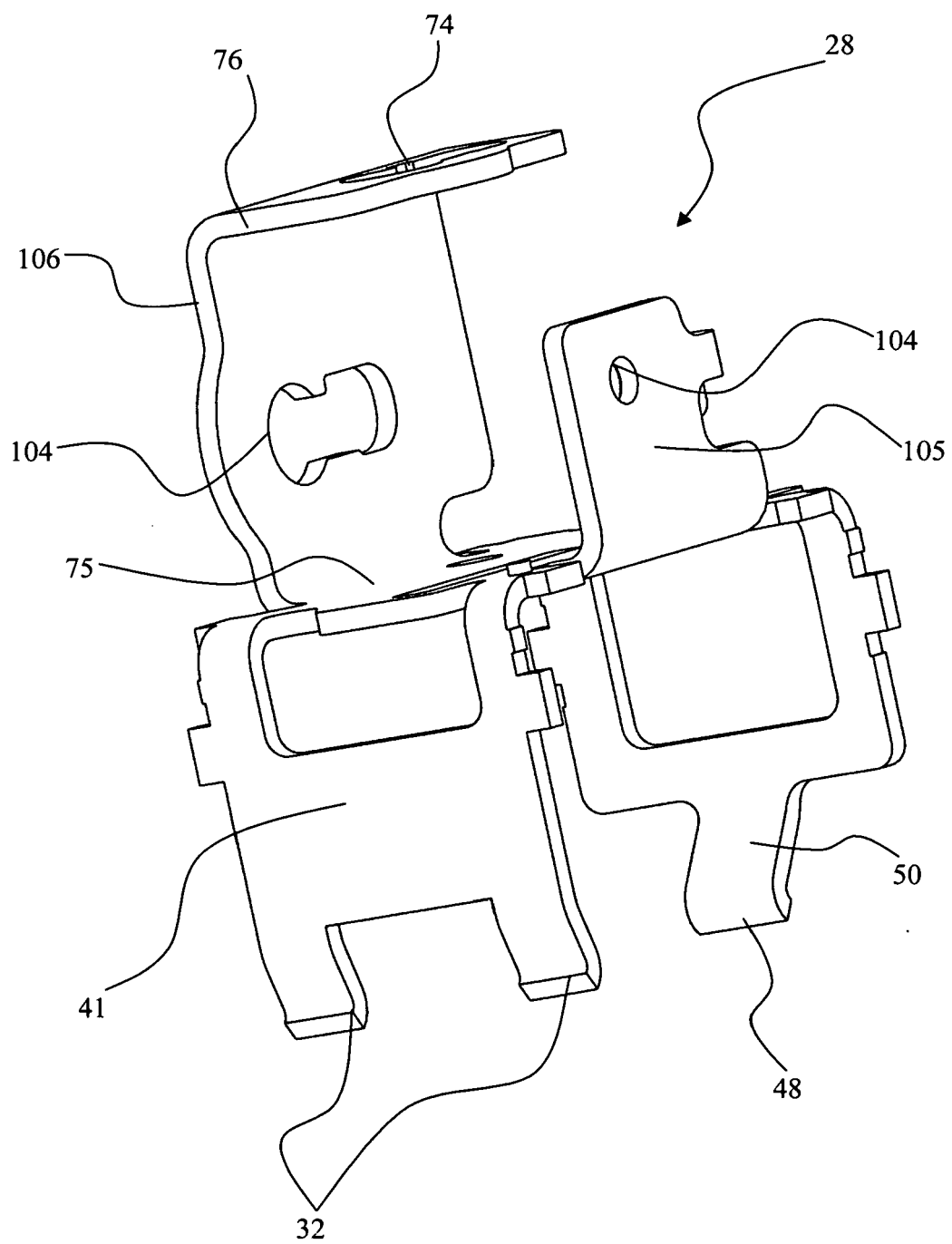


Fig. 9



EUROPEAN SEARCH REPORT

Application Number
EP 11 35 4026

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A	Anonymous "Product Catalog": "ABB: S800PV - The High Performance MCB", ABB Switzerland Ltd, CMC Low Voltage Products, Fulachstr. 150, CH-8201 Schaffhausen 13 November 2008 (2008-11-13), XP002603278, Retrieved from the Internet: URL:www05.abb.com/global/scot/scot209.nsf/veritydisplay/87291f85795c7423c12575010058file2/\$File/2CCC413002C0202_S800PV_Englisch.pdf [retrieved on 2010-10-01] * Rotary drive S800-RD; page 2/5, paragraph Ordering details * * Rotary drive S800-RD + S800RHE / S800-SOR; page 5/4, paragraph Dimensional drawings *	1-16	TECHNICAL FIELDS SEARCHED (IPC) H01H
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Place of search Munich		Date of completion of the search 15 June 2012	Examiner Ernst, Uwe
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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15-06-2012

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