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

(11) EP 1 017 080 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
22.02.2006 Bulletin 2006/08

(51) Int Cl.:
H01H 83/20 *(2006.01)*

(21) Application number: **99204335.6**

(22) Date of filing: **16.12.1999**

(54) **Auxiliary device**

Hilfseinrichtung

Dispositif auxiliaire

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE

(30) Priority: **29.12.1998 IT MI982848**

(43) Date of publication of application:
05.07.2000 Bulletin 2000/27

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EP-A- 0 331 586 **FR-A- 2 567 317**

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EP 1 017 080 B1

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] The present invention relates to an auxiliary actuation device for opening a low-voltage circuit breaker associated therewith following a remotely issued opening command. More particularly, the present invention relates to an auxiliary device known in the art as a shunt tripping relay which has improved shape and characteristics. Document FR 2 567 317 discloses a device according to the preamble of claim 1.

[0002] Conventional magnetothermal or residual-current circuit breakers for low-voltage electrical applications are generally coupled to suitable auxiliary devices.

[0003] These devices are conventionally of two kinds, respectively the actuating type and the actuated type, depending on whether they act on the circuit breaker and actuate an action thereof or perform an action as a consequence of an actuation received from the circuit breaker. For example, an actuating auxiliary device can be constituted by a shunt tripping relay which, following an intervention command received from an operator, mechanically forces the opening of the associated circuit breaker. By virtue of the received actuation, the circuit breaker changes state, changing from a condition in which the contacts are closed to one in which the contacts are open, and by means of appropriate lever systems it triggers a kinematic mechanism inside a device for signaling the state of the circuit breaker associated therewith, which accordingly constitutes an actuated device. In turn, the actuated device provides operators with a signal which corresponds to the current state of the circuit breaker.

[0004] As regards the coupling between the circuit breaker and the auxiliary devices, one of the solutions generally used entails placing all the accessories on a same side of the circuit breaker relative to a front view of said circuit breaker. In this case, the mechanical connection between the circuit breaker and the accessories is achieved by using a shaft which is shaped so as to have multiple protrusions and transmits the movements among the various components, according to a solution which is particularly disadvantageous from the point of view of production as well as from the point of view of functionality. The shaft that is used in fact requires accurate machining in order to form the protrusions and the dimensions required to take into account the different stress levels and the considerable clearances involved. This leads to an increase in production costs and possibly to a reduction in the precision and overall reliability of the assembly constituted by the circuit breakers and the auxiliary devices.

[0005] Another solution that is used for coupling the circuit breaker and the auxiliary device is to distribute the devices on both sides of the circuit breaker; in particular, relative to a front view of the circuit breaker, the actuating auxiliary devices according to the present invention are always fitted on the same side of the circuit breaker, for example on the left, while the actuated ones are fitted on the other side, on the right.

[0006] This coupling solution is particularly advantageous with respect to the one described earlier both because it considerably facilitates users in practical applications and because it allows to use a shaft with a smaller number of protrusions, which is accordingly simpler and cheaper to machine; the mechanical stresses that occur are more balanced and clearance is reduced.

[0007] However, the drawback of this embodiment is that magnetothermal and residual-current low-voltage circuit breakers have moving contacts which are mechanically mutually different and can be arranged differently inside the circuit breakers according to specific applications and/or to the applicable national standards. For example, with specific reference to a magnetothermal circuit breaker of the two-pole type, the moving contacts comprise phase contacts and neutral contacts which are mechanically different from each other and can be located either on the right side or on the left side of said circuit breaker relative to a front view thereof. Accordingly, since the shunt tripping relay is an actuating auxiliary device, it is generally always fitted on the same side of the circuit breaker, for example on the left; in the current state of the art, this leads to the need to produce multiple separate series of auxiliary devices according to the constructive structure of the circuit breaker to which they will be coupled, increasing constructive complexity and production costs. Moreover, when an actuating auxiliary device is coupled to a circuit breaker, the kinematic mechanisms for opening the contacts of the circuit breaker can be affected negatively by the corresponding kinematic systems of the auxiliary device; in particular, the opening speed of the circuit breaker might be reduced, accordingly leading to malfunctions or even to breakage of the circuit breaker.

[0008] A further drawback is that if a remote operator sends a command to open the circuit breaker, in the current state of the art conventional actuating auxiliary devices are not provided with means for local visual indication means which protrude outside the device and allow easy and immediate identification of the tripped circuit breaker; this also prevents resetting the auxiliary device without directly acting on the open circuit breaker.

[0009] The aim of the present invention is to provide an auxiliary device for opening a circuit breaker associated therewith following a remotely issued opening command wherein the coupling to the circuit breaker occurs fully independently of the arrangement of the contacts inside it, with a considerable benefit from the point of view of production.

[0010] Within the scope of this aim, an object of the present invention is to provide an auxiliary device for opening a circuit breaker associated therewith following a remotely issued opening command in which the coupling to the circuit breaker does not affect the kinematic mechanisms of said circuit breaker, thus preserving its design characteristics, particularly in terms of speed of contact opening in case of triggering due for example to

a fault.

[0011] Another object of the present invention is to provide an auxiliary device for opening a circuit breaker associated therewith following a remotely issued opening command in which there is provided a local visual indication of the open state of the circuit breaker due to said remote command.

[0012] Another object of the present invention is to provide an auxiliary device for opening a circuit breaker associated therewith following a remotely issued opening command in which it is possible to reset the auxiliary device without a direct intervention on said circuit breaker.

[0013] Another object of the present invention is to provide an auxiliary device for opening a circuit breaker associated therewith following a remotely issued opening command which is highly reliable, relatively easy to manufacture and at competitive costs.

[0014] This aim, these objects and others which will become apparent hereinafter are achieved by an auxiliary device according to claim 1.

[0015] The device thus conceived ensures a coupling to the circuit breaker associated therewith which is entirely independent of the mechanical structure of the circuit breaker and of the arrangement of the contacts inside it. Moreover, the coupling does not affect at all the performance of the circuit breaker, particularly as regards the opening speed of the contacts during triggering due for example to a fault.

[0016] Further characteristics and advantages of the present invention will become apparent from the following detailed description of preferred but not exclusive embodiments of the auxiliary device according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a schematic side view of the auxiliary device according to the present invention in a position which corresponds to the position in which the associated circuit breaker is closed;

Figure 2 is a schematic side view of the auxiliary device in a position which corresponds to the position in which the associated circuit breaker is open due to direct intervention of an operator on said circuit breaker;

Figure 3 is a schematic side view of the auxiliary device in a position which corresponds to the position in which the associated circuit breaker is open due to a remote intervention command issued by a remotely located operator;

Figure 4 is a perspective view of a reset and indication lever used in the device according to the present invention;

Figure 5 is a perspective view of an engagement lever used in the device according to the present invention;

Figure 6 is a perspective view of an actuation lever used in the device according to the present invention.

[0017] With reference to the above figures, the auxiliary actuation device according to the invention comprises an insulating enclosure 1 inside which there are fixed contacts 20 and 20' which operatively couple to a moving contact 29 (changeover contact), for example of the laminar type. Said contacts are electrically connected to connection terminals, respectively an upper terminal 16, a central terminal 17 and a lower terminal 18. For the sake of clarity in illustration, the figures show only one upper terminal 16, but the device according to the present invention actually uses a second upper terminal 16. As a consequence of an opening of the circuit breaker and of the switching of the moving contact 29 between the two fixed contacts 20 and 20', the four-terminal configuration allows, by means of a suitable electric circuit, to visually indicate to a remotely located operator the change of state of the circuit breaker; this indication can be easily achieved by means of two lamps of mutually different colors which indicate an open or closed state of the circuit breaker.

[0018] Inside the enclosure 1 there is also provided an electromagnetic part which comprises a fixed magnet 21 on which a coil 12 is wound and a moving magnet 22 which is pivoted in a point 100 and with which a spring 28 is associated; the coil 12 is operatively associated to a power supply circuit. As shown in Figure 1, in normal operating conditions, i.e., when the associated circuit breaker is closed, the coil 12 is not supplied with electric power and the moving magnet 22 is spaced from the fixed magnet 21. In order to open the circuit breaker due to a remote command, issued for example by an operator who acts on a button, the coil 12 is excited by current pulses which facilitate the generation of a magnetic field of suitable intensity. By means of this magnetic field, the moving magnet 22 is attracted by the fixed magnet 21 and by overcoming the resistance of the spring 28 it performs a movement which is equal to the existing gap, as shown in Figure 3.

[0019] Advantageously, the movement of the moving magnet 22 toward the fixed magnet 21 actuates a suitable kinematic mechanism which opens the circuit breaker in a manner described in detail hereinafter.

[0020] The device according to the invention comprises means for coupling to the circuit breaker which comprise a triggering lever 5, a coupling lever 6 and a transmission lever 10 whose function and connections are described hereinafter.

[0021] Actuation means actuated by the moving magnet comprise an actuation lever 9.

[0022] The device also comprises means for interacting with the moving contact 29, which comprise an interaction lever 13, and a kinematic chain which comprises a second actuation lever 9 and a U-shaped element 32 for the purposes which will be described hereinafter.

[0023] Finally, means are provided for the local visual indication of the open state of the circuit breaker due to a remote opening command; such means comprise a reset and indication lever 7 and an engagement lever 11.

[0024] In particular, the transmission lever 10 is pivoted to a point 101 of the enclosure 1 which is operatively connected to the circuit breaker and with which a return spring 25 is associated; the engagement lever 11 is also arranged on the same pivoting point 101, while the reset and indication lever 7 is pivoted in a point 103 of the enclosure 1.

[0025] The transmission lever 10 is detachably connected, by means of the U-shaped element 32, to the actuation lever 4 and to the tripping lever 5, which are pivoted to a point 102 of the enclosure 1; an actuation spring 26, whose function is described in greater detail hereinafter, acts on the lever 4. As shown in Figure 1, in a position of the device that corresponds to the one in which the circuit breaker is closed, the actuation lever 4 has a raised portion 19 at which one end 13' of the interaction lever 13 is laterally adjacent. The lever 13 is freely pivoted to a point 104 of the enclosure 1 and has an end 13" which abuts against the lamina of the moving contact 29. In this manner, by means of the action applied by the protrusion 19 to the end 13', the lever 13 prevents the movement of the lamina 29.

[0026] As shown in Figure 6, the lamina 4 also has a pivot 30 which can interact with the surface of a slot 31 of the lever 7 and a groove 33 in which the U-shaped element 32 can slide.

[0027] The tripping lever 5 comprises a pivot 14 for coupling to the tripping mechanism of the circuit breaker and has the particularity that it is provided with a toothed sector 2 whose function is described hereinafter.

[0028] As shown in Figure 4, the reset and indication lever 7 has, in addition to the slot 31, a first raised portion 34, on which a first end of a spring 24 acts, and a second raised portion 35, which interacts against a shaped wall 36 of the engagement lever 11. The engagement lever 11, shown in detail in Figure 5, also has a pivot 50 on which the second end of the spring 24 acts. In practice, in the position shown in Figure 1, the spring 24 pushes on one side against the raised portion 34, forcing the lever 7 to turn clockwise, and against the pivot 50 at the other side, forcing the lever 11 to turn counterclockwise. Accordingly, the levers 7 and 11 move against each other, facilitating contact between the raised portion 35 and the shaped wall 36 and remaining engaged in the inactive position shown in Figure 1.

[0029] The lever 9 is pivoted to a point 100 of the enclosure 1 and it is associated with a return spring 28. The lever 9 is composed of two parts: a first part is shaped so as to form a seat 42 for geometric coupling to the moving magnet 22 and a second part protrudes from the first one, two slots 37 and 38 being formed thereon. Moreover, the second part is shaped so as to have an oblique flat portion 39, which can interact with the pivot 14 of the lever 5, and a wing 40 which protrudes substantially perpendicular to the median plane of the lever 9 and is suitable to interact with the pivot 50 of the lever 11.

[0030] Advantageously, the device according to the invention comprises an additional coupling lever 6, pivoted to the point 103, which has a pivot 15 for optional coupling to the kinematic mechanism of the associated circuit breaker, and a toothed sector 3 which is operatively coupled to the toothed sector 2 of the tripping lever 5. In practice, once the kinematic mechanism of the device is actuated, the two toothed sectors 2 and 3 mutually mesh, rotating with respect to each other in opposite directions.

[0031] This constructive solution allows to provide a coupling of the auxiliary device to the circuit breaker which is fully independent of the arrangement of the contacts inside it. If the position of the poles in the circuit breaker changes, the coupling between the auxiliary device and the circuit breaker can be provided either on the pivot 14 or on the pivot 15; moreover, the change in the direction of rotation of the mechanism of the circuit breaker according to the arrangement of the poles is rendered irrelevant in terms of the functionality of the coupling between the circuit breaker and the device by the presence of the two mutually contrarotating toothed sectors 2 and 3.

[0032] It should be observed that with this solution the movement of the kinematic system inside the device does not affect at all the corresponding movement in the circuit breaker, since the pivot 15 can move without hindrance inside the slot 38; accordingly, if the circuit breaker trips due for example to a fault, the performance of said circuit breaker in terms of opening speed are not altered in any way.

[0033] Another innovative aspect of the actuation device according to the invention is provided by the fact that the lever 7 has a shaped protrusion 60 which, when the circuit breaker opens due to a command issued remotely by a remote operator by means of a pushbutton or a control panel, protrudes from a corresponding opening 61 formed in the enclosure 1 and therefore allows local visual indication of the tripping of the associated circuit breaker.

[0034] Moreover, once the protrusion 60 has protruded from the enclosure, it directly provides a button on which an operator can, for any requirement, act directly and restore the auxiliary device without having to act on the associated circuit breaker, which accordingly remains open. The lever 7 therefore simultaneously provides local indication of an open circuit breaker and resetting of said auxiliary device. In further embodiments, not illustrated by figures, said protrusion might be associated with other levers of the kinematic mechanism of the device.

[0035] The operation of the device according to the invention is now described starting from the operating condition shown in Figure 1, which corresponds to a position in which the associated circuit breaker is closed.

[0036] When the circuit breaker is opened due to manual intervention of an operator who acts directly on its actuation knob, the kinematic mechanism of the circuit breaker transmits the motion to the transmission lever 10, which turns in the direction indicated by the arrow 105, pulling the U-shaped element 32 and reaching, at the end of its motion, the position shown in Figure 2. The

lever 4, under the action of the U-shaped element 32, rotates about its own pivoting axis 102, in the direction indicated by the arrow 106, and reaches the position shown in Figure 2. At the same time, the levers 5 and 6 also rotate in mutually opposite directions, causing the meshing of the two toothed sectors 2 and 3. In turn, the lever 13, once its end 13' has disengaged, releases the lamina 29, which by means of its elastic loading facilitates the switching of the moving contact from the first fixed contact 20 to the second fixed contact 20'.

[0037] The remaining part of the mechanism is substantially not affected by the movement.

[0038] If instead an indirect command is issued remotely by an operator on a pushbutton or on a control panel, the coil 12 is excited by a current pulse which produces a magnetic field whose intensity is adequate to facilitate the attraction of the moving magnet 22 toward the fixed magnet 21. In this situation, the moving magnet 22 is capable of crossing the existing gap and by rotating it couples electromagnetically to the fixed magnet 21. Said movement is transmitted to the lever 9, which also rotates about its pivoting axis 100. Through this rotation, the oblique flat portion 39 pushes against the pivot 14 of the lever 5, forcing it to rotate in the direction indicated by the arrow 107. The toothed sector 2 meshes with the toothed sector 3 of the lever 6, causing the movement of the pivot 15 in the slot 38: in this manner, the circuit breaker receives motion either directly by means of the pivot 14 or indirectly from the lever 6 by means of the pivot 15 and the meshing of the two toothed sectors 2 and 3; moreover, by means of this rotation the tripping lever 5 disengages the U-shaped element 32, which becomes able to slide freely in the groove 33 of the lever 4. Advantageously, the actuation lever 4, no longer locked by the U-shaped element 32, rotates under the action of the thrust of the spring 26 in the direction indicated by the arrow 106 and simultaneously facilitates a faster rotation of the lever 5. This simultaneous rotation is achieved by means of a spring, not shown, which is interposed between the levers 4 and 5 and couples their movement; said spring is conveniently inserted in a seat 80 of the lever 4.

[0039] Therefore, in this manner the potential energy accumulated earlier by the spring 26 is utilized; once said energy has been released, it provides the force required to ensure the prompt movement of the mechanism and the consequent correct intervention of the circuit breaker. This ensures the advantage of being able to minimize the dimensions of the electromagnetic part (moving magnet 22, fixed magnet 21 and coil 12) with a consequent saving in terms of materials, dimensions and costs.

[0040] At the same time, the lever 13, once the end 13' has disengaged, releases the moving contact 29, which moves from the fixed contact 20 to the fixed contact 20'; this changeover deenergizes the coil 12 and prevents its damage due to excessive power supply. The moving contact therefore advantageously acts as a contact for automatically de-energizing the coil; moreover, when the moving contact changes position, the four-terminal configuration allows to visually indicate to a remote operator that the circuit breaker is open, as described earlier.

[0041] Moreover, during rotation the wing 40 of the lever 9 interacts with the pivot 50, pushing it toward the inside of the device and disengaging the shaped wall 36 from the engagement with the raised portion 35. In this manner, the lever 7, pushed by the action of the spring 24 on the raised portion 34, rotates about the pivoting axis 103 and the shaped protrusion 60 protrudes from the enclosure 1 through an opening 61, providing a local visual indication that the circuit breaker has tripped. At the end of the actuation, the transmission lever 10, following the movement of the associated circuit breaker, reaches the position shown in Figure 3, in which the U-shaped element 32 re-engages the levers 4 and 5.

[0042] In this condition, an operator can therefore reset the auxiliary device simply by acting on the protrusion 60, without acting on the circuit breaker, which remains open; by pushing the protrusion 60 downward, the lever 7 in fact rotates and allows reengagement between the raised portion 35 and the shaped wall 36, pushed by the spring 24, which acts on a raised portion 70 of said lever 11. Once the magnetic field generated earlier by the excitation of the coil has ceased, the lever 9 returns to its initial position by virtue of the action of the spring 28.

[0043] The device can also be reset by acting on the control knob of the circuit breaker. In this case, the movement is transmitted from the circuit breaker to the transmission lever 10 which pushes the lever 4 by means of the U-shaped element 32; the pivot 30, during the movement of the lever 4, acts against the surface of the slot 31 of the lever 7 and pulls it downward, causing it to rotate. By virtue of this rotation, the raised portion 35 couples to the shaped wall 36, as described earlier. Moreover, the protrusion 19 engages the end 13' of the lever 13 which, by rotating about its pivoting axis 104, acts on the lamina of the moving contact 29 and returns it onto the fixed contact 20.

[0044] In practice it has been found that the auxiliary actuation device according to the invention fully achieves the intended aim, since it allows to provide a coupling with the circuit breaker independently of the mechanical structure of the circuit breaker and of the arrangement of the contacts inside it without affecting its performance in any way; moreover, thanks to the adoption of the above-described particular constructive refinements, it is possible to locally and directly identify the opening of the circuit breaker, with consequent reset of said device without acting on the circuit breaker.

[0045] It should also be observed that all the innovative functions and the inventive aspects of the device can be achieved by using commonly commercially available elements and materials with extremely modest costs; the mechanism thus conceived allows also to optimize the dimensions of the electromagnetic part constituted by the magnets and by the coil, providing a further economic benefit.

Claims

1. An auxiliary device for opening a circuit breaker associated therewith following a remote opening command, comprising an insulating enclosure (1) which contains fixed contacts (20, 20') and a corresponding moving contact (29), connection terminals, a fixed magnet (21) on which a coil (12) is wound and a moving magnet (22) which is coupled electromagnetically to said fixed magnet, comprising:

   - actuation means (9) which are operatively connected to and actuated by the moving magnet;
   - means (14) for coupling to the circuit breaker which are operatively associated to said actuation means;
   - a kinematic chain (5, 6, 10) operatively connected to said means for coupling to the circuit breaker;
   - means (13) for interacting with the moving contact, which are operatively connected to said kinematic chain; **characterised by**
   - means (7, 11) for providing a local visual indication of the open state of the circuit breaker following said remote opening command, actuated by said actuation means,

   said means for coupling to the circuit breaker comprising a coupling lever and a tripping lever which are operatively connected to each other, each lever comprising a pivot for coupling to the circuit breaker, the coupling and tripping levers being mutually operatively connected by means of two toothed sectors (2, 3) which are associated therewith and mutually mesh, rotating with respect to each other in mutually opposite directions.

2. The auxiliary device according to claim 1, **characterized in that** said means for coupling to the circuit breaker further comprise a transmission lever which is operatively connected to the circuit breaker and with which a return spring is associated..

3. The auxiliary device according to claim 1, **characterized in that** said actuation means comprise a first actuation lever which has a seat for geometric coupling to the moving magnet, a return spring being associated with said first actuation lever.

4. The auxiliary device according to claim 3, **characterized in that** said first actuation lever has a shaped edge which forms at least one surface which is suitable to interact with the pivot of said tripping lever, and a slot in which the pivot of said coupling lever slides freely.

5. The auxiliary device according to claim 1, **characterized in that** said means for interacting with the moving contact comprise an interaction lever which is freely pivoted to the enclosure and is provided with a first end which can interact directly with the moving contact.

6. The auxiliary device according to one or more of the preceding claims, **characterized in that** said kinematic chain comprises a second actuation lever provided with a protrusion which can interact with a second end of the interaction lever, a spring being associated with said second actuation lever and being suitable to provide an amount of energy for the opening of the circuit breaker.

7. The auxiliary device according to claim 6, **characterized in that** the second actuation lever has a seat in which a spring is inserted, said spring being suitable to operatively couple the tripping lever and said second actuation lever.

8. The auxiliary device according to claim 6, **characterized in that** the second actuation lever has a groove in which a U-shaped element slides, said U-shaped element being suitable to detachably connect said second actuation lever and said tripping lever to the transmission lever.

9. The auxiliary device according to one or more of the preceding claims, **characterized in that** said means for the local visual indication of the open state of the circuit breaker due to a remote opening command comprise a reset and indication lever and an engagement lever which respectively have a first raised portion and a shaped wall which can be geometrically coupled to each other.

10. The auxiliary device according to claim 9, **characterized in that** the reset and indication lever has a protrusion which can protrude from an opening of the enclosure following the opening of the circuit breaker due to a remote opening command.

11. The auxiliary device according to claim 9, **characterized in that** said reset and indication lever has a second raised portion on which a first end of a spring acts and a slot which can interact with a pivot which is formed on the surface of the second actuation lever.

12. The auxiliary device according to claim 9, **characterized in that** the engagement lever has a pivot and a seat which are suitable to interact with the second end of the spring which is connected to said second raised portion, a wing also acting on said pivot, said wing being formed on the surface of the first actuation lever.

13. The auxiliary device according to one or more of the

preceding claims, **characterized in that** it comprises four connection terminals.

Patentansprüche

1. Hilfsvorrichtung zur Öffnung eines Leistungsschalters, der ihr zugeordnet ist, infolge eines entfernten Öffnungsbefehls, der ein isolierendes Gehäuse (1) enthält, welches feste Kontakte (20, 20') enthält und einen entsprechenden beweglichen Kontakt (29), Verbindungsanschlüsse, einen festen Magneten (21), auf welchen eine Spule (12) gewickelt ist, und einen beweglichen Magneten (22), welcher elektromagnetisch mit dem festen Magneten gekoppelt ist, aufweisend:

   - Betätigungsmittel (9), welche betreibbar verbunden sind mit und betätigt werden durch den beweglichen Magneten;
   - Mittel (14) zur Kopplung an den Leistungsschalter, welche operativ den Betätigungsmitteln zugeordnet sind;
   - eine kinematische Kette (5, 6, 10), die betreibbar mit den Mitteln zur Kopplung an den Leistungsschalter gekoppelt ist;
   - Mittel (13) zur Wechselwirkung mit dem beweglichen Kontakt, welche betreibbar mit der kinematischen Kette verbunden sind; **dadurch gekennzeichnet, dass**
   - Mittel (7, 11) zur Bereitstellung einer lokalen, visuellen Anzeige des Offen Zustands des Leistungsschalters als Folge des entfernten Öffnungsbefehls bereitgestellt werden, die durch die Betätigungsmittel betätigt werden, wobei die Mittel zur Kopplung an den Leistungsschalter einen Kopplungshebel aufweisen und einen Auslösehebel, welche operativ miteinander verbunden sind, wobei jeder Hebel einen Drehpunkt zur Kopplung an den Leistungsschalter aufweist, wobei die Kopplungs- und Leistungsschalter miteinander betreibbar mittels zweier gezahnter Abschnitte (2, 3) verbunden sind, welche ihnen zugeordnet sind und die sich miteinander verzahnen und sich in Bezug aufeinander in zueinander entgegengesetzte Richtungen drehen.

2. Hilfsvorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Mittel zur Kopplung an den Leistungsschalter ferner einen Übertragungshebel umfassen, welcher betreibbar mit dem Leistungsschalter gekoppelt ist und dem eine Rückholfeder zugeordnet ist.

3. Hilfsvorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** das Betätigungsmittel einen ersten Betätigungshebel aufweist, der einen Sitz zur geometrischen Kopplung mit dem beweglichen Magneten hat, wobei dem ersten Betätigungshebel eine Rückholfeder zugeordnet ist.

4. Hilfsvorrichtung nach Anspruch 3, **dadurch gekennzeichnet, dass** der erste Betätigungshebel eine geformte Kante hat, welche wenigstens eine Oberfläche bildet, die geeignet ist, mit einem Drehpunkt des Auslösehebels wechselzuwirken, und einen Schlitz, in welchem der Drehpunkt des Kopplungshebels frei gleitet.

5. Hilfsvorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Mittel zur Wechselwirkung mit dem beweglichen Kontakt einen Wechselwirkungshebel aufweisen, welcher frei gegenüber dem Gehäuse drehbar ist und der mit einem ersten Ende ausgestattet ist, welches direkt mit dem beweglichen Kontakt wechselwirken kann.

6. Hilfsvorrichtung nach einem oder mehreren der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die kinematische Kette einen zweiten Betätigungshebel umfasst, der mit einem Vorsprung ausgestattet ist, welcher mit einem zweiten Ende des Wechselwirkungshebels wechselwirken kann, wobei dem zweiten Betätigungshebel eine Feder zugeordnet ist und die geeignet ist, eine Menge von Energie zur Öffnung des Leistungsschalters bereitzustellen.

7. Hilfsvorrichtung nach Anspruch 6, **dadurch gekennzeichnet, dass** der Betätigungshebel einen Sitz hat, in welchen eine Feder eingeführt ist, wobei die Feder geeignet ist, den Auslösehebel und den zweiten Betätigungshebel betreibbar zu koppeln.

8. Hilfsvorrichtung nach Anspruch 6, **dadurch gekennzeichnet, dass** der zweite Betätigungshebel eine Rille hat, in welcher ein U-förmiges Element gleitet, wobei das U-förmige Elemente geeignet ist, lösbar den zweiten Betätigungshebel und den Auslösehebel mit dem Übertragungshebel zu verbinden.

9. Hilfsvorrichtung nach einem oder mehreren der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Mittel zur lokalen, visuellen Anzeige des Offenzustandes des Leistungsschalters aufgrund eines entfernten Öffnungsbefehls einen Rücksetz- und Anzeigehebel und einen Erfassungshebel umfassen, welche jeweils einen ersten erhabenen Teil und eine geformt Wand haben, welche geometrisch miteinander gekoppelt werden können.

10. Hilfsvorrichtung nach Anspruch 9, **dadurch gekennzeichnet, dass** der Rücksetz- und Anzeigehebel einen Vorsprung hat, welcher aus einer Öffnung des Gehäuses vorspringen kann als Folge der Öff-

nung des Leistungsschalters aufgrund eines entfernten Öffnungsbefehls.

11. Hilfsvorrichtung nach Anspruch 9, **dadurch gekennzeichnet, dass** der Rücksetz- und Anzeigehebel einen zweiten erhabenen Teil hat, auf welchen eine Feder wirkt, und einen Schlitz, welcher mit einem Drehpunkt wechselwirken kann, welcher auf der Oberfläche des zweiten Betätigungshebels gebildet wird.

12. Hilfsvorrichtung nach Anspruch 9, **dadurch gekennzeichnet, dass** der Erfassungshebel einen Drehpunkt hat und einen Sitz, welche geeignet sind, mit dem zweiten Ende der Feder wechselzuwirken, welche mit dem zweiten erhabenen Abschnitt verbunden ist, einen Flügel, der ebenso auf den Drehpunkt einwirkt, wobei der Flügel auf der Oberfläche des ersten Betätigungshebels gebildet wird.

13. Hilfsvorrichtung nach einem oder mehren der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** sie vier Verbindungsanschlüsse aufweist.

Revendications

1. Dispositif auxiliaire pour ouvrir un disjoncteur associé à celui-ci à la suite d'un ordre d'ouverture à distance, comprenant une enveloppe de protection électrique isolante (1) qui contient des contacts stationnaires (20, 20') et un contact mobile correspondant (29) des terminaux de connexion, un aimant stationnaire (21) sur lequel une bobine (12) est enroulée et un aimant mobile (22) qui est couplé électromagnétiquement audit aimant stationnaire, comprenant :

- des moyens actionneurs (9) qui sont connectés de manière fonctionnelle à et actionnés par l'aimant mobile ;
- des moyens (14) pour un couplage au disjoncteur qui sont associés de manière fonctionnelle audit moyen actionneur ;
- une chaîne cinématique (5, 6, 10) connectée de manière fonctionnelle audit moyen pour un couplage au disjoncteur ;
- des moyens (13) pour interagir avec le contact mobile, qui sont connectés de manière fonctionnelle à ladite chaîne cinématique ; **caractérisé par**
- des moyens (7, 11) pour fournir une indication visuelle locale de l'état ouvert du disjoncteur à la suite dudit ordre d'ouverture à distance, actionnés par lesdits moyen actionneurs,

lesdits moyens pour le couplage au disjoncteur comprenant un levier de couplage et un levier de déclenchement qui sont connectés de manière fonctionnelle l'un à l'autre, chaque levier comprenant un pivot pour le couplage au disjoncteur,
les leviers de couplage et de déclenchement étant mutuellement connectés de manière fonctionnelle au moyen de deux secteurs dentés (2, 3) qui sont associés en ceci et qui s'engrènent mutuellement, effectuant une rotation l'un par rapport à l'autre dans des directions mutuellement opposées.

2. Dispositif auxiliaire selon la revendication 1, **caractérisé en ce que** lesdits moyens pour le couplage au disjoncteur comprennent en outre un levier de transmission qui est connecté de manière fonctionnelle au disjoncteur et avec lequel un ressort de rappel est associé.

3. Dispositif auxiliaire selon la revendication 1, **caractérisé en ce que** lesdits moyens d'actionnement comprennent un premier levier actionneur qui a un support pour un couplage géométrique à l'aimant mobile, un ressort de rappel étant associé audit premier levier actionneur.

4. Dispositif auxiliaire selon la revendication 3, **caractérisé en ce que** ledit premier levier actionneur a un côté façonné qui forme au moins une surface qui est appropriée pour interagir avec le pivot dudit levier déclencheur, et une fente dans laquelle le pivot dudit levier de couplage glisse librement.

5. Dispositif auxiliaire selon la revendication 1, **caractérisé en ce que** lesdits moyens pour interagir avec le contact mobile comprennent un levier d'interaction qui pivote librement vers l'enveloppe de protection électrique et qui est doté d'une première extrémité qui peut interagir directement avec le contact mobile.

6. Dispositif auxiliaire selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** ladite chaîne cinématique comprend un second levier actionneur doté d'une protubérance qui peut interagir avec une seconde extrémité du levier d'interaction, un ressort étant associé avec ledit second levier actionneur et étant approprié pour fournir une quantité d'énergie pour l'ouverture du disjoncteur.

7. Dispositif auxiliaire selon la revendication 6, **caractérisé en ce que** le second levier actionneur a un support dans lequel un ressort est inséré, ledit ressort étant approprié pour coupler de manière fonctionnelle le levier de déclenchement et ledit second levier actionneur.

8. Dispositif auxiliaire selon la revendication 6, **caractérisé en ce que** le second levier actionneur a une rainure dans laquelle un élément en forme de U glisse, ledit élément en forme U étant approprié pour

connecter de manière détachable ledit second levier actionneur et ledit levier de déclenchement au levier de transmission.

9. Dispositif auxiliaire selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** lesdits moyens pour une indication visuelle locale de l'état ouvert du disjoncteur en réponse à un ordre d'ouverture à distance comprend un levier d'armement et d'indication et un levier d'accouplement qui ont respectivement une première partie surélevée et une paroi façonnée qui peuvent être couplées de manière géométrique l'une à l'autre.

10. Dispositif auxiliaire selon la revendication 9, **caractérisé en ce que** le levier d'armement et d'indication a une protubérance qui peut faire saillie depuis une ouverture de l'enveloppe de protection électrique à la suite de l'ouverture du disjoncteur en réponse à un ordre d'ouverture à distance.

11. Dispositif auxiliaire selon la revendication 9, **caractérisé en ce que** ledit levier d'armement et d'indication a une seconde partie surélevée sur laquelle une première extrémité d'un ressort agit et une fente qui peut interagir avec un pivot qui est formé sur la surface du second levier actionneur.

12. Dispositif auxiliaire selon la revendication 9, **caractérisé en ce que** le levier d'accouplement a un pivot et un support qui sont appropriés pour interagir avec la seconde extrémité du ressort qui est reliée à ladite seconde partie surélevée, un bras agissant également sur ledit pivot, ledit bras étant formé sur la surface du premier levier actionneur.

13. Dispositif auxiliaire selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce qu'**il comprend quatre terminaux de connexion.

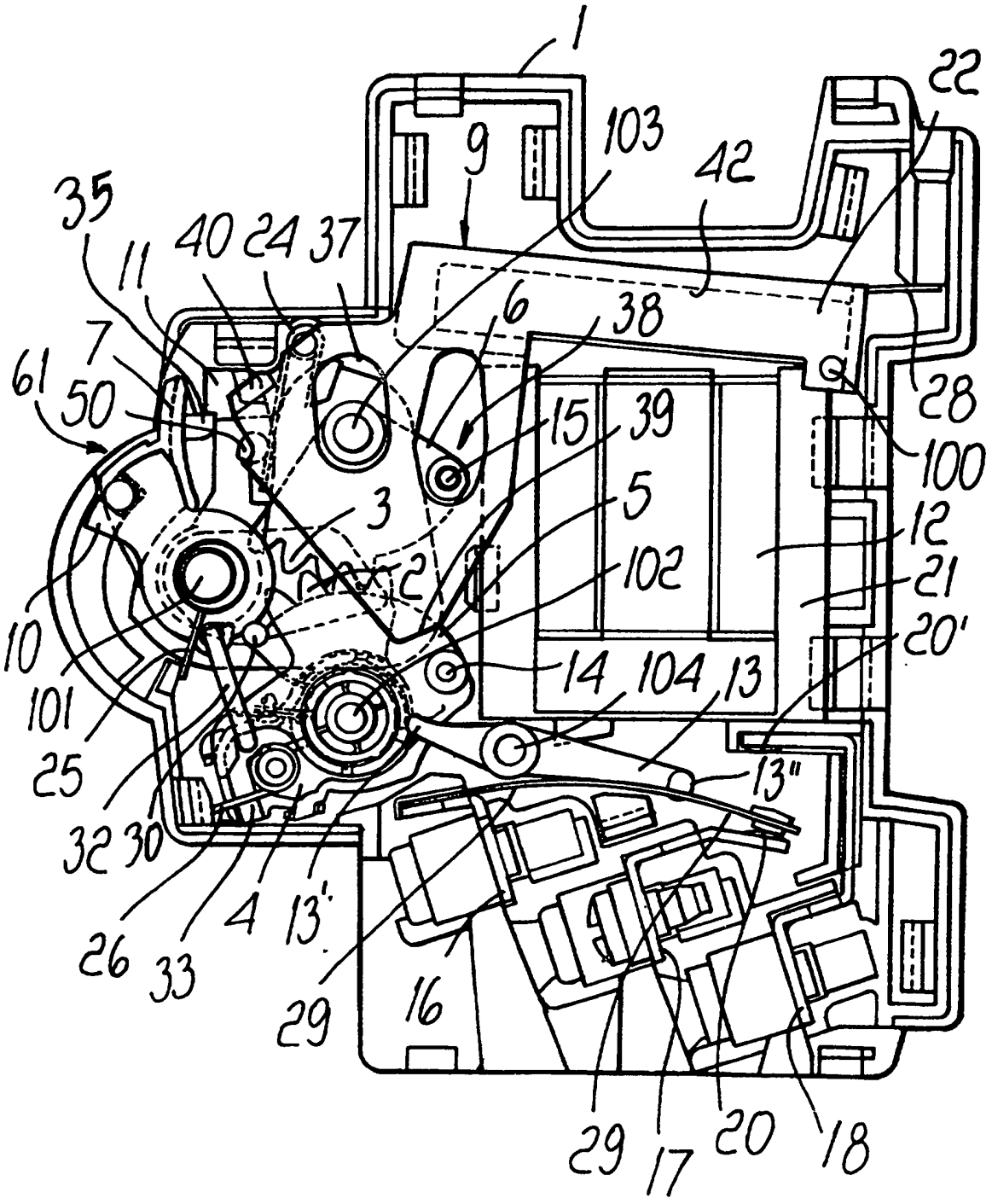

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Fig. 1

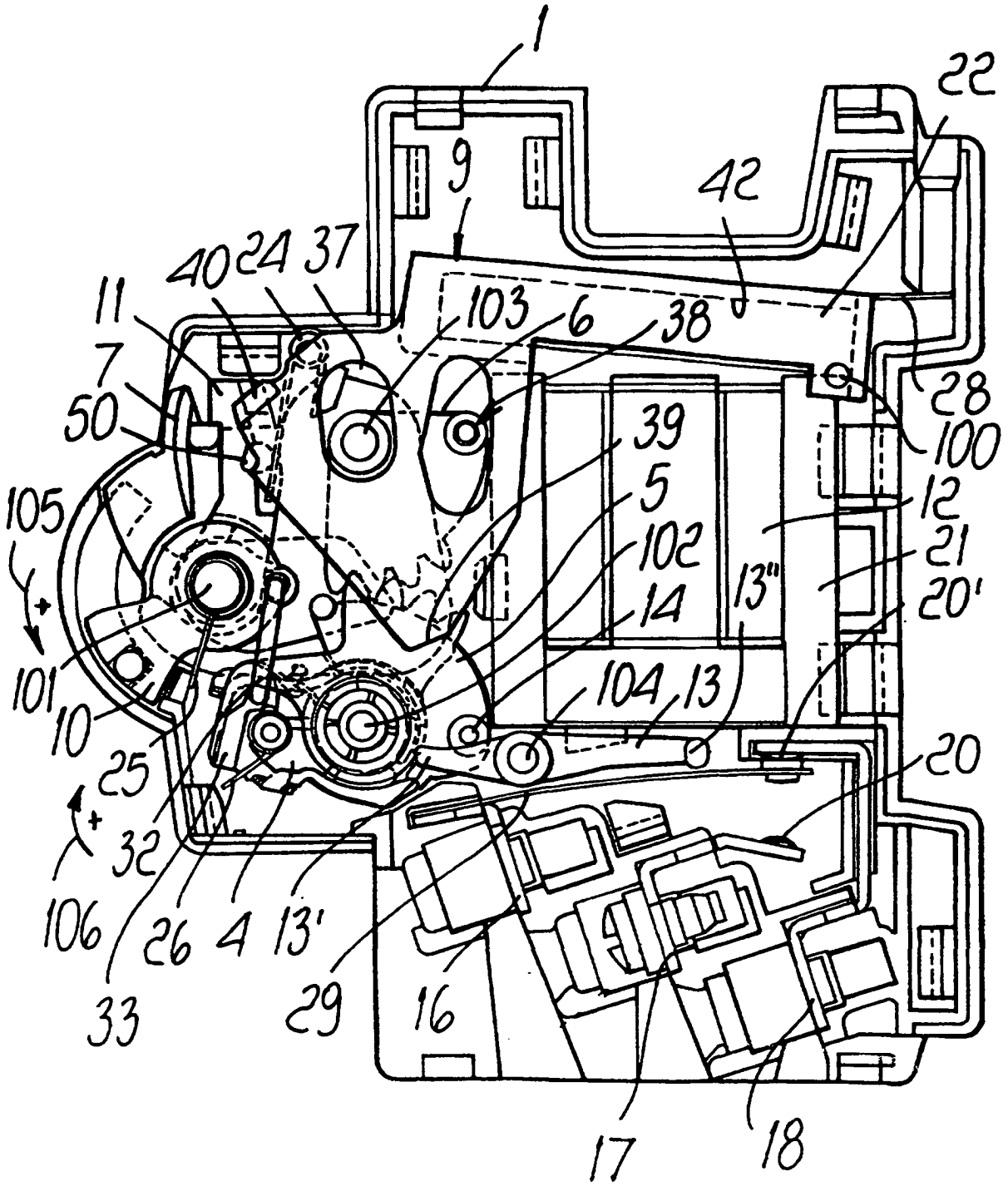

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Fig. 2

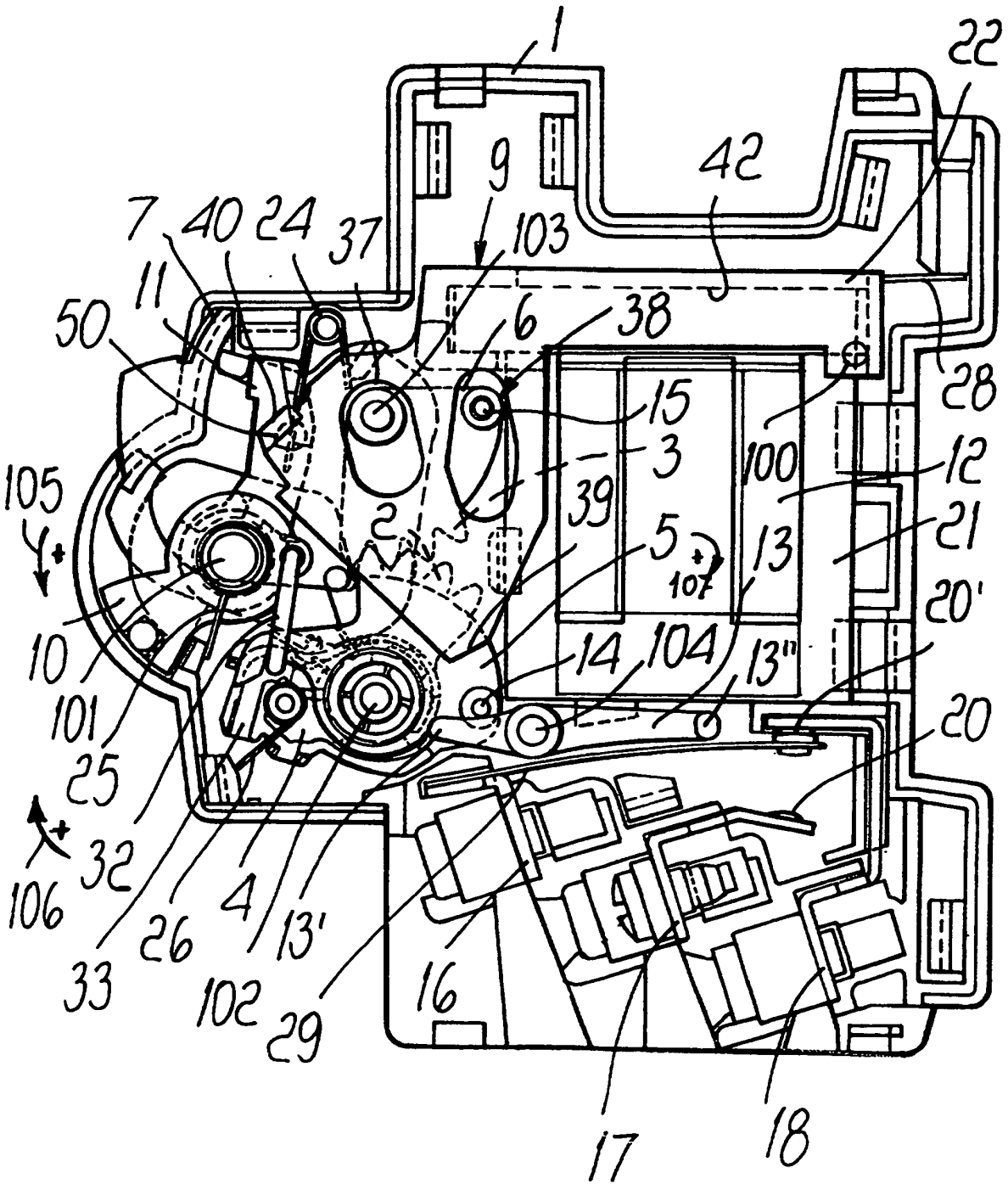

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Fig. 3

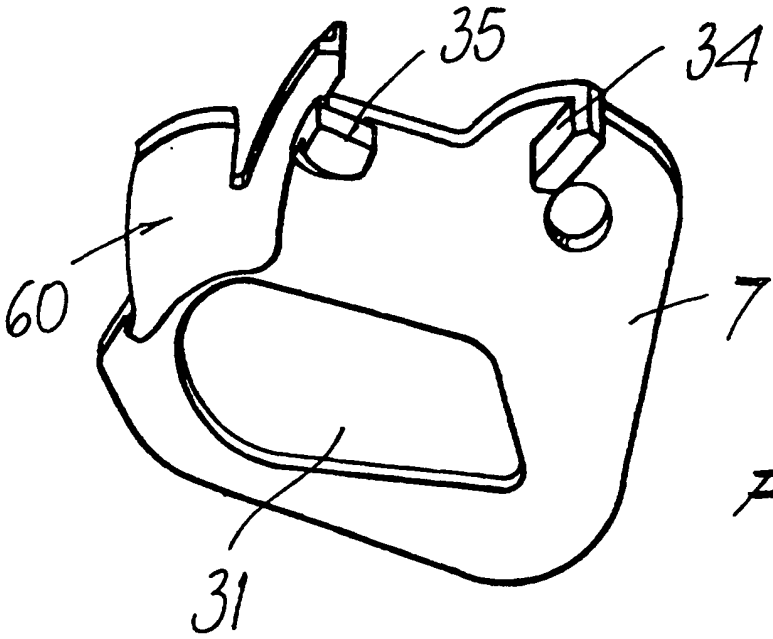


Fig. 4

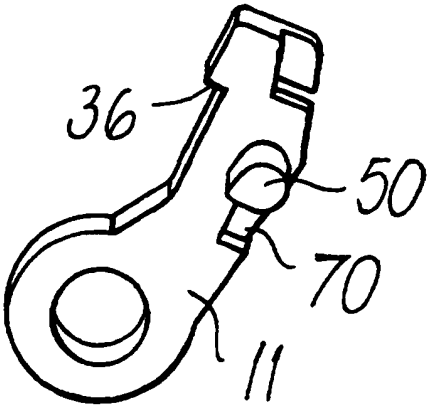


Fig. 5

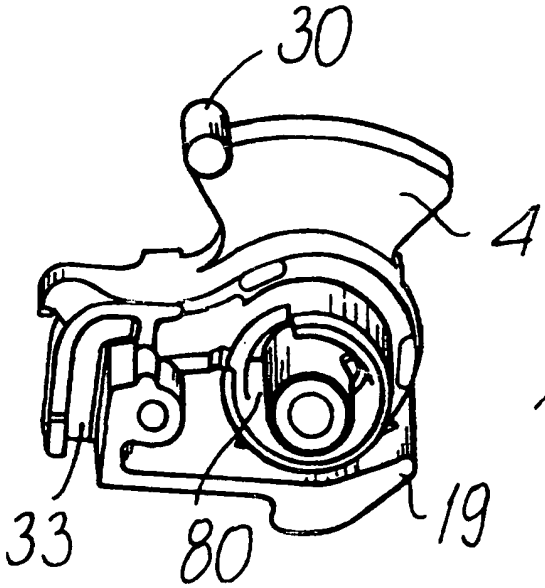


Fig. 6