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(71) Applicant: **ABB Ricerca SpA**
**20099 Sesto San Giovanni (MI) (IT)**

(72) Inventors:
- **Malacalza, Davide**
  **20153 Milano (IT)**
- **Bellini, Luigi**
  **20047 Brugherio (MI) (IT)**

(74) Representative: **Giavarini, Francesco**
**ABB Ricerca S.p.A.**
**Viale Edison, 50**
**20099 Sesto San Giovanni (MI) (IT)**

(54) **Tripping device**

(57) A tripping device for opening the contacts of a circuit breaker associated therewith following the detection of a residual current exceeding a preset limit by a detecting device, comprising an enclosure for containing and supporting a kinematic mechanism which has:

-- an actuation lever and a tripping lever, which are geometrically coupled to each other and are both pivoted on a first pivot of the enclosure, the actuation lever being operatively connected to an actuator which is actuated by the detecting device;
-- an indicator lever, with which an actuation spring is associated, and a transmission lever, said indicator and transmission levers being mutually operatively coupled and being both pivoted on a second pivot of the enclosure, said transmission lever having a coupling pivot for coupling to the kinematic system of the associated circuit breaker;
-- an engagement lever, which is geometrically coupled to the indicator lever and is detachably connected to the tripping lever.

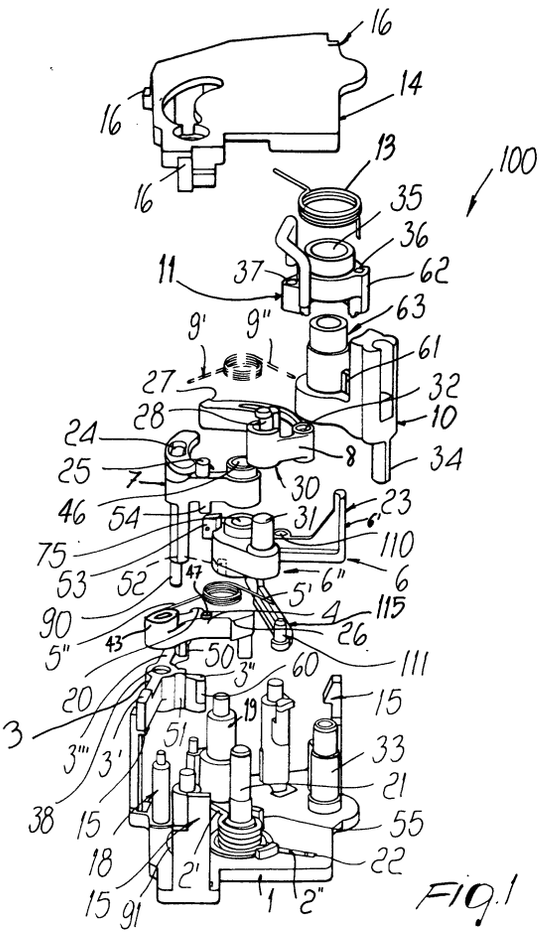


FIG. 1

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## Description

**[0001]** The present invention relates to a tripping device for opening the contacts of a circuit breaker associated therewith when a residual current exceeding a preset limit occurs.

**[0002]** In general, the tripping devices according to the present invention comprise a kinematic mechanism which is operated when a residual current above a preset limit occurs in the electric system in which they are inserted. In particular, the presence of this residual current is detected by a detecting device, typically a magnetically-biased polarized relay, which actuates the kinematic system of the tripping device by means of an actuator. In turn, the tripping device transmits to the associated circuit breaker the force received from the actuator, amplifying it appropriately, and causes the contacts of the circuit breaker to open. Said tripping devices must meet specific requirements which are determined both by applicable statutory provisions and by specific application requirements.

**[0003]** In particular, statutory provisions require the tripping device to be able to operate even when the knob for actuating the circuit breaker associated therewith is blocked ("trip-free mechanism"). Furthermore, when electrical continuity in the circuit is to be restored after an opening of the contacts due to a residual current, the tripping devices must be reset and ready to intervene before the contacts of the circuit breaker are closed again: in this manner they prevent the reoccurrence of the operating conditions if a dangerous condition persists.

**[0004]** In the current state of the art, in order to meet this condition the use of known types of tripping device is not entirely satisfactory, since it forces significant constructive modifications to the kinematic system of the circuit breaker to which the device is coupled. From the point of view of application, tripping devices are generally installed so as to be coupled to a magnetothermal circuit breaker, so as to combine in a single device the functions of protection against short circuits, thermal overloads and residual currents. In turn, the magnetothermal circuit breakers are coupled to appropriate auxiliary devices, which are conventionally of two types, respectively termed active and passive depending on whether they act on the circuit breaker, producing an action thereof, or perform an action according to a command received from said circuit breaker. For example, an active auxiliary device can be constituted by a shunt tripping relay or by an undervoltage relay which senses an electric mains supply voltage which is lower than a limit threshold and causes the circuit breaker to open.

**[0005]** One solution for the coupling of the circuit breaker and the auxiliary devices entails distributing the auxiliary devices on the two sides of the circuit breaker; in particular, with respect to a front view of the circuit breaker, the active auxiliary devices are always installed on the same side of the circuit breaker, for example on the left, while the passive ones are fitted on the other side, on the right. This solution is particularly advantageous both because it is easy to install in practice and because it allows to use an auxiliary device-circuit breaker transmission shaft which is simple and cheap to manufacture mechanically; otherwise there would be considerable constructive complications and there would be a considerable increase in assembly difficulties.

**[0006]** If the plant configuration also includes the installation of a pure residual-current circuit breaker, when a residual current occurs the tripping device allows the magnetothermal circuit breaker to open in addition to the residual-current circuit breaker. However, if the contacts of the magnetothermal circuit breaker open due to any other cause, for example due to an intervention actuation imparted by an active auxiliary device or due to a short circuit or to other reasons, the tripping device must act as a transmission bridge between the auxiliary device and the magnetothermal circuit breaker, bypassing in practice the pure residual-current circuit breaker and allowing only the magnetothermal circuit breaker to open. In the current state of the art, no known type of tripping device is capable of meeting this requirement; this in practice prevents the provision of the magnetothermal circuit breaker with auxiliary devices on the residual-current side and accordingly causes the stacking of the auxiliary devices on a single side, causing a consequent technical drawback.

**[0007]** Another disadvantage of known types of tripping device is the fact that they do not have a modular construction structure; they are in fact fitted directly inside the enclosure of the circuit breaker with which they couple. In this manner, the assembly process is complicated, and any interventions for modifying or replacing the components of the kinematic system of the tripping device also affect components that are external to said device.

**[0008]** The aim of the present invention is to provide a tripping device for opening the contacts of a circuit breaker associated therewith following the detection of a residual current exceeding a preset limit by a detecting device, which allows to provide auxiliary devices for the circuit breaker on both sides even in the presence of a residual-current circuit breaker, allowing in particular to bypass the kinematic system of the latter if the opening of the contacts is not due to the detection of said residual current.

**[0009]** Within the scope of this aim, an object of the present invention is to provide a tripping device for opening the contacts of a circuit breaker associated therewith following the detection of a residual current exceeding a preset limit by a detecting device which has a self-supporting modular structure which can be coupled as a separate block to the circuit breaker, so that any interventions on the device itself do not affect in any way components which are external to the device.

**[0010]** Another object of the present invention is to

provide a tripping device for opening the contacts of a circuit breaker associated therewith following the detection of a residual current exceeding a preset limit by a detecting device in which assembly is simpler than in known devices and occurs substantially automatically.

**[0011]** Another object of the present invention is to provide a tripping device for opening the contacts of a circuit breaker associated therewith which is capable of intervening, following an opening of the contacts due to a residual-current condition, before the circuit breaker closes, avoiding the restoring of electric continuity although a residual current higher than a preset limit persists.

**[0012]** Another object of the present invention is to provide a tripping device for opening the contacts of a circuit breaker associated therewith following the detection of a residual current exceeding a preset limit by a detecting device which is capable of operating even when the actuation knob of the associated circuit breaker is blocked.

**[0013]** Another object of the present invention is to provide a tripping device for opening the contacts of a circuit breaker associated therewith following the detection of a residual current exceeding a preset limit by a detecting device 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 a tripping device for opening the contacts of a circuit breaker associated therewith following the detection of a residual current exceeding a preset limit by a detecting device, characterized in that it comprises an enclosure for containing and supporting a kinematic mechanism which comprises:

-- an actuation lever and a tripping lever, which are geometrically coupled to each other and are both pivoted on a first pivot of the enclosure, said actuation lever being operatively connected to an actuator which is actuated by said detecting device;
-- an indicator lever, with which an actuation spring is associated, and a transmission lever, said indicator and transmission levers being mutually operatively coupled and being both pivoted on a second pivot of the enclosure, said transmission lever having a coupling pivot for coupling to the kinematic system of the associated circuit breaker;
-- an engagement lever, which is geometrically coupled to said indicator lever and is detachably connected to said tripping lever; the actuation of said actuator causing the simultaneous mutual rotation of the actuation lever and of the tripping lever so as to disengage the latter from the engagement lever and release the indicator lever, which under the thrust of the actuation spring rotates about said second pivot, moving the transmission lever rigidly with it, at least along part of the rotation, causing the transmission of the motion to the circuit breaker and the opening of its contacts, the transmission lever being free to rotate with respect to the indicator lever upon a command to open the contacts of the circuit breaker which is not due to the detection of a residual current.

**[0015]** The device thus conceived therefore allows to provide the circuit breaker with auxiliary devices on both sides even in the presence of a residual-current circuit breaker, allowing in particular to bypass the mechanical system of the latter if the opening of the contacts is not due to the detection of a residual current.

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

Figure 1 is an exploded view of the tripping device according to the invention;
Figure 2 is a schematic side view of the kinematic mechanism used in the tripping device according to the invention, in an armed position;
Figures 3 to 5 are views of the kinematic mechanism of Figure 2 during intervention for opening the contacts of the associated circuit breaker;
Figure 6 is a side view of the kinematic mechanism of Figure 2 during resetting after intervention for opening the circuit breaker;
Figure 7 is a perspective view of the base of the enclosure used in the device according to the invention.

**[0017]** The tripping device according to the invention is particularly suitable for coupling to a magnetothermal circuit breaker, which is the subject of the European patent application no. 98203874.7, whose description is to be assumed included herein by reference; the device is described with reference to this particular application without intending to limit the scope of its application in any way.

**[0018]** With reference to the above figures, the tripping device according to the invention comprises an insulating enclosure inside which an appropriate kinematic mechanism, generally designated by the reference numeral 100 and described in detail hereinafter, is contained. In particular, as shown in Figure 1. the enclosure is constituted by two parts which can be mutually assembled: a first base part 1, which has a plurality of pivots which are suitable to facilitate the placement and support of the various parts that compose the kinematic mechanism, and a second part 14, which mainly acts as a cover. The connection between the two parts is provided by means of a plurality of vertical teeth 15 which are formed on the base 1 and couple geometrically by snap action with corresponding seats 16 formed on the cover 14; the mutual assembly of the two parts is finally

completed by ultrasonic welding. With this solution, the insulating enclosure has a dual function of containing and supporting the mechanism 100 and allows to have, at the end of assembly, a tripping device which has a self-supporting modular structure and can be coupled as a single block to the circuit breaker associated therewith. This constructive solution furthermore allows to intervene directly on the individual components and to perform any modifications or replacements during the assembly process, without therefore affecting the components that are external to the tripping device; furthermore, the assembly of the various components is simplified and allows to keep in stock only devices suitable for practical use.

**[0019]** As shown in detail in Figure 1, the device comprises an actuation lever 3 which has a cylindrical seat 38 which is pivoted to a first pivot 18 provided on the base 1; from the seat 38 three arms 3', 3" and 3"' extend which are angularly spaced apart. The actuation lever 3 is operatively connected to a current sensor which senses any residual current higher than a preset limit and correspondingly actuates an actuator, constituted for example by a magnetically-biased polarized relay. In turn, as shown for example in Figures 2 to 6, the actuator, by means of a release pin 17 (see Figure 2) which strikes a first arm 3' of the actuation lever 3, actuates the kinematic mechanism 100 in the manner explained hereinafter. The second arm 3" of the actuation lever 3 has a shaped end 60 which can interact with a first end 2' of an actuation spring 2 for the functions described in detail hereinafter and an abutment wall 51 which is suitable to geometrically couple to a tooth 50 which is formed on the surface of a tripping lever 4.

**[0020]** Said tripping lever 4, which is also pivoted to the first pivot 18, has a single arm 4' which is provided with a first end which is shaped so as to have a cylindrical seat 43, and with a second end which is shaped so as to have a nose-shaped protrusion 26 which is suitable to geometrically engage a corresponding hook-shaped protrusion 27 formed on the surface of an engagement lever 8; the arm 4' furthermore has, in a substantially median position, a raised wall 47 on which there acts a first end 40' of a first positioning spring 40, and on the opposite side with respect to said nose-shaped protrusion 26, a raised portion 20 on which there acts a first end 5' of a second positioning spring 5. The first positioning spring 40 is positioned around said seat 43 so as to have a second end 40" which pushes against the third arm 3"' of the actuation lever 3. In this manner, the first positioning spring 40 pushes the actuation lever 3 to rotate counterclockwise at one end and pushes the tripping lever 4 so that its rotates clockwise at the other end, ultimately forcing the two levers 3 and 4 to move against each other and thus maintain the bearing coupling between the tooth 50 and the abutment wall 51.

**[0021]** In turn, the second positioning spring 5 is arranged around a third pivot 19 which is fixed to the base 1, so as to have a second end 5" which pushes against a retainer 48 provided on the base 1. In this way, the second positioning spring 5 pushes the tripping lever 4 so that its rotates clockwise and makes it easier to maintain the mutual engagement of the engagement lever 8 and the tripping lever 4.

**[0022]** Another advantage of the device according to the invention is due to the fact that the positioning spring 40 is conceived so as to simultaneously absorb the vibrations to which the device can be subjected. Furthermore, as the dimensions of the actuator that actuates the device vary, the forces involved in the tripping and resetting of said actuator vary accordingly: in the device according to the invention, in order to obviate these changes it is sufficient to use a positioning spring 5 which has a different rigidity, without acting on other components of the kinematic system. This clearly allows to have high flexibility in applications.

**[0023]** The actuation spring 2 is arranged around a second pivot 21, which is fixed to the base 1 of the enclosure, so that a first end 2' is inserted in a slot 52 formed on the surface of an indicator lever 6; a second end 2" of the spring 2 is inserted in a seat 22 formed in the base element 1.

**[0024]** The indicator lever 6 too is pivoted on the second pivot 21 and has, in addition to the slot 52, a substantially cylindrical hollow seat 75 for pivoting on the pivot 21; two angularly spaced arms 6' and 6" protrude from said seat 75. In particular, a first arm 6' of the indicator lever 6 has a shaped end 23 which is suitable for positioning itself, at the end of the rotation imparted by the actuation spring 2, at an opening formed in the enclosure and for visually indicating that the contacts have opened due to a residual current higher than a preset limit; furthermore, on the first arm 6' there is a hole 110 for coupling to a pivot 111 which belongs to a contact lever 115. In turn, the second arm 6" has a pivot 31 for geometric coupling with a corresponding seat 30 which is formed on the engagement lever 8. Furthermore, on the indicator lever 6, at the external surface of the seat 75, there are two protruding blocks: a first block 45 (shown in figure 4) is suitable to abut against a retainer 55 formed on the base 1 of the enclosure in order to stop the rotation of said indicator lever 6, and a second block 53 is provided for coupling to a corresponding tooth 54 formed on a transmission lever 7; in particular, the coupling between the second block 53 and the tooth 54 allows to define a unidirectional constraint between the indicator lever 6 and the transmission lever 7 for the functions explained hereinafter.

**[0025]** The transmission lever 7 has a hollow cylindrical seat 46 for pivoting on the second pivot 21, and a pivot 90 for coupling with the kinematic system of the circuit breaker that is associated with the tripping device.

**[0026]** According to specific applications, for example when the tripping device is used with a differential block, a third positioning spring 9, shown only in figure 1, can be arranged around the external surface of the seat 46 so has to have a first end 9' which acts on a pivot 25

formed on said transmission lever 7 and a second end 9" which acts on a shaped wall 28 of the engagement lever 8; on the surface of the engagement lever 8 there is also a hollow cylindrical wall 30, which geometrically mates with a pivot 31 of the indicator lever 6, and a seat 32 for the insertion of an end of a U-shaped element 12. The U-shaped element 12 can have a curved profile, as shown in figure 1, or a straight profile, as shown in figure 2 to 6. In these cases, advantageously, the second positioning spring 5 and the third positioning spring 9, despite performing mutually different tasks, can be constructively identical, thus allowing to provide advantageous economies of scale and to further simplify the constructive structure of the device.

**[0027]** The tripping device according to the invention furthermore comprises a first knob 10 on the surface of which there are, respectively, a hollow cylindrical pivot 63, which is pivoted on a fourth fixing pivot 33 of the base 1, and a pin 34 which is rigidly coupled to a knob for the actuation of the circuit breaker which is associated with said device. A second knob 11 is geometrically coupled, by means of a cylindrical seat 35, on the hollow pivot 63 of the knob 10; around the seat 35 there is a return spring 13 which has an end inserted in a cavity 36 which is formed in said knob 11.

**[0028]** Said second knob 11 furthermore has a hole 37 for coupling to a second end of the U-shaped element 12 and a protruding block 62 which can interact with a corresponding abutment wall 61 formed on the surface of the first knob 10, in order to facilitate the resetting of the device following an intervention for opening the contacts of the associated circuit breaker. At the end of the resetting operation, the block 62 abuts against a retainer 63 formed on the base 1 of the enclosure.

**[0029]** With reference to Figures 2-6, the operation of the device when a residual current exceeding a preset level occurs is now described.

**[0030]** Starting from the operating condition shown in Figure 2, i.e., with the tripping device ready for intervention, when a residual current exceeding a preset level occurs, the pin 17 is actuated and strikes the arm 3' of the actuation lever 3, forcing it to rotate about the pivot 18 in the direction indicated by the reference arrow 101.

**[0031]** As shown in Figure 3, by virtue of the geometric mating between the abutment wall 51 and the tooth 50 the actuation lever 3 simultaneously draws the tripping lever 4 toward itself, making it turn in the same direction and disengaging it from engagement with the engagement lever 8; in this manner, the remaining part of the mechanism 100 can move freely. In particular, the indicator lever 6, under the thrust of the actuation spring 2, turns in the direction indicated by the arrow 102 and, by means of the block 53, which pushes against the tooth 54, couples to the transmission lever 7 and moves it at least along a portion of the rotation. Furthermore, during said rotation the indicator lever 6 pushes the contact lever 115, which by performing a translatory motion acts on a spring which belongs to a test circuit which is external to the tripping device and is not shown. The correct translatory motion of the contact lever 115 is assisted by two guides 116 formed on the base 1.

**[0032]** In turn, the lever 7 transmits the motion to the kinematic system of the associated circuit breaker, causing its contacts to open. As shown in Figure 4, the rotation of the lever 6 ends when the block 45 abuts against the retainer 55. In this position, the shaped end 23 is arranged at an opening of the containment enclosure and visually indicates externally that the circuit breaker has intervened due to a residual current.

**[0033]** Advantageously, the end 2' of the actuation spring 2, during its movement, strikes the shaped end 60, moving the actuation lever 3 and making the arm 3' push against the pin 17, as shown in Figure 4. The lever 3 remains in this position until the device is reset, thus acting as a reset device for the actuation element; furthermore, if said actuation element is a polarized relay, any contamination thereof is avoided. Furthermore, by virtue of the thrust of the positioning springs, in particular of the spring 40, the tooth 50 abuts against the abutment wall 51 and the levers 3 and 4 return into direct mutual contact.

**[0034]** During these steps, if the actuation knob of the associated circuit breaker is blocked, the knob 10, which is rigidly connected thereto by means of the pivot 28, is also blocked; accordingly, the kinematic mechanism 100 remains in the position shown in Figure 4, without the possibility of performing further movements. If instead this situation is not occurring, during the above described operating steps, the knob 10 starts with a certain delay due to its inertia, following the movement of the associated circuit breaker, and turns in the direction indicated by the arrow 103, moving into the position shown in Figure 5. Due to the return spring 13, the knob 11 turns in the direction indicated by the arrow 103 and, by means of the U-shaped element 12, pushes the engagement lever 8; in this manner the hook-shaped protrusion 27 moves past the protrusion 26, reaching the position shown in Figure 5. In this position the device is ready for resetting.

**[0035]** During this rotation, the lever 6 is substantially motionless owing to the rigidity of the actuation spring 2 that is associated therewith.

**[0036]** Resetting is provided by acting directly on the actuation knob of the circuit breaker which transmits motion to the knob 10; as shown in Figure 6, the knob 10 turns in the direction indicated by the arrow 104 so that the abutment wall 61 pushes against the protruding block 62 of the knob 11. In this manner, the knob 11 also turns in the direction of the arrow 104 and, by means of the U-shaped element 12, turns the engagement lever 8 until the hook-shaped protrusion 27 abuts against the protrusion 26. The transmission lever 7, by following the movement of the kinematic system of the associated circuit breaker, turns in the direction indicated by the arrow 105 and, by virtue of the interaction between the tooth 54 and the block 53, moves the indicator lever 6, return-

ing it into the initial position. In turn, the lever 6 moves the contact lever 115 and reloads the spring 2, returning them into their initial positions, and disengages the lever 3, which separates from the pin 17 and also returns exactly into the initial position. At the end of the rotation, the protruding block 62 abuts against the retainer 73, as shown schematically in Figure 2.

**[0037]** Advantageously, the device is shaped so that it is reset and ready for a new intervention before the closure of the contacts of the associated circuit breaker. In this manner it is guaranteed that if a residual current exceeding a preset safety limit persists when the flow of current in the electric circuit is restored, the contacts are reopened immediately.

**[0038]** Advantageously, if the intervention of the circuit breaker is not due to the presence of a residual current but to any other operating condition, for example due to a command sent by an auxiliary device, the transmission lever 7 can rotate freely with respect to the indicator lever 6. In this case, the lever 7 receives the movement from the auxiliary device by means of a coupling pin which passes through a slot a slot 91 formed on the base 1, and is inserted in a slot 24 provided on the lever 7 itself. In this situation, the transmission lever 7 moves in the direction indicated in Figure 2 by the arrow 106 and transmits the movement to the associated circuit breaker without the remaining part of the kinematic mechanism being affected by the movement in any way. In this manner, the residual-current circuit breaker, if provided, is configured as an actual auxiliary device and its kinematic system is bypassed entirely.

**[0039]** Yet another advantage of the tripping device according to the invention is given by the fact that it can be coupled to a multiple-pole magnetothermal circuit breaker, regardless of the arrangement of the poles, for example with the neutral pole on the right or on the left. In this case it is in fact sufficient to assemble the kinematic system by turning it through 180°, without performing constructive modifications of the components.

**[0040]** In practice it has been found that the tripping device according to the invention fully achieves the intended aim and objects, since it allows to provide the circuit breaker associated therewith with auxiliary devices on both sides even in the presence of a pure residual-current circuit breaker. The device furthermore has a self-supporting modular structure which can be coupled as a separate block to the circuit breaker and whose assembly is simple and substantially automatic.

**[0041]** Advantageously, the tripping device thus conceived, in addition to being particularly suitable for direct coupling to a magnetothermal circuit breaker, can also be used effectively in residual-current blocks and in pure residual-current circuit breakers which are commonly used. It should also be noted that all the innovative functions and the inventive aspects of the device may be achieved by using commonly commercially available elements and materials with extremely low costs.

**[0042]** The tripping device thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the inventive concept; all the details may furthermore be replaced with other technically equivalent elements.

**[0043]** In practice, the materials used, as well as the dimensions, may be any according to the requirements and the state of the art.

## Claims

1. A tripping device for opening the contacts of a circuit breaker associated therewith following the detection of a residual current exceeding a preset limit by a detecting device, characterized in that it comprises an enclosure for containing and supporting a kinematic mechanism which comprises:

   -- an actuation lever and a tripping lever, which are geometrically coupled to each other and are both pivoted on a first pivot of the enclosure, said actuation lever being operatively connected to an actuator which is actuated by said detecting device;
   -- an indicator lever, with which an actuation spring is associated, and a transmission lever, said indicator and transmission levers being mutually operatively coupled and being both pivoted on a second pivot of the enclosure, said transmission lever having a coupling pivot for coupling to the kinematic system of the associated circuit breaker;
   -- an engagement lever, which is geometrically coupled to said indicator lever and is detachably connected to said tripping lever;

   the actuation of said actuator causing the simultaneous mutual rotation of the actuation lever and of the tripping lever so as to disengage the latter from the engagement lever and release the indicator lever, which under the thrust of the actuation spring rotates about said second pivot, moving the transmission lever rigidly with it, at least along part of the rotation, causing the transmission of the motion to the circuit breaker and the opening of its contacts, the transmission lever being free to rotate with respect to the indicator lever upon a command to open the contacts of the circuit breaker which is not due to the detection of a residual current.

2. The tripping device according to claim 1, characterized in that said containment and support enclosure comprises two parts, a base and a cover respectively, the two parts being suitable for mutually assembling so as to form a self-supporting modular structure which can be coupled as a single block to the circuit breaker.

3. The tripping device according to claim 1, characterized in that the actuation lever has a cylindrical seat for pivoting on said first pivots from which three angularly mutually spaced arms protrude, of which:

   -- a first arm, which is suitable to operatively interact with said actuator;
   -- a second arm, which respectively has a shaped end which can interact with said actuation spring and an abutment wall for geometric coupling with a corresponding tooth formed on the surface of the tripping lever;
   -- a third arm, on which an end of a first positioning spring arranged around a seat of said tripping lever acts.

4. The tripping device according to claim 1, characterized in that the tripping lever has an arm which has an end shaped so as to have a nose-shaped protrusion, said nose-shaped protrusion being suitable for engagement with a corresponding hook-shaped protrusion formed on the surface of the engagement lever.

5. The tripping device according to claim 4, characterized in that the arm of the tripping lever has, in a substantially median position, a raised wall on which a second end of said first positioning spring acts, said first positioning spring being suitable for facilitating the geometric coupling between the abutment wall and the tooth and for maintaining the mutual engagement of the engagement lever and of the tripping lever.

6. The tripping device according to claim 4 or 5, characterized in that the arm of the tripping lever has, in a substantially median position and on the opposite side with respect to said nose-shaped protrusion, a raised portion on which a first end of a second positioning spring acts, said second positioning spring being pivoted on a third pivot provided on said base, the second end of said second positioning spring acting on a retainer provided on the base itself.

7. The tripping device according to claim 1, characterized in that the indicator lever has a hollow substantially cylindrical seat for pivoting on said second pivot, from which two angularly mutually spaced arms protrude, of which:

   -- a first arm, which has a shaped end which is suitable to arrange itself, at the end of the rotation imparted by the actuation spring, at an opening formed in the enclosure, in order to visually indicate that the contacts have opened due to said residual current, said first arm comprising a hole for coupling to a fourth pivot provided on a contact lever;
   -- a second arm, on the surface of which there is a fifth pivot for coupling to a corresponding seat of the engagement lever.

8. The tripping device according to claim 7, characterized in that two protruding blocks are formed on the indicator lever at the external surface of said substantially cylindrical seat, a first block being suitable to abut against a retainer formed on the base in order to stop the rotation of said indicator lever, and a second block being suitable for coupling to a corresponding tooth formed on the transmission lever, the coupling between said second block and said tooth forming a unidirectional coupling between the indicator lever and the transmission lever.

9. The tripping device according to claim 1, characterized in that it comprises a first knob which has a pin for coupling to a knob for actuating the associated circuit breaker and a hollow cylindrical pivot for pivoting on a sixth pivot formed on said base.

10. The tripping device according to claim 9, characterized in that it comprises a second knob which is coupled to the outer surface of said hollow cylindrical pivot and is operatively connected to the engagement lever by means of a U-shaped element, a return spring being associated with said second knob.

11. The tripping device according to claim 10, characterized in that said second knob has a protruding block which can interact with a corresponding abutment wall formed on the surface of the first knob, in order to facilitate the resetting of the device after an intervention for opening the contacts of the circuit breaker due to said residual current, and to abut against a retainer formed on the base at the end of the resetting of the device.

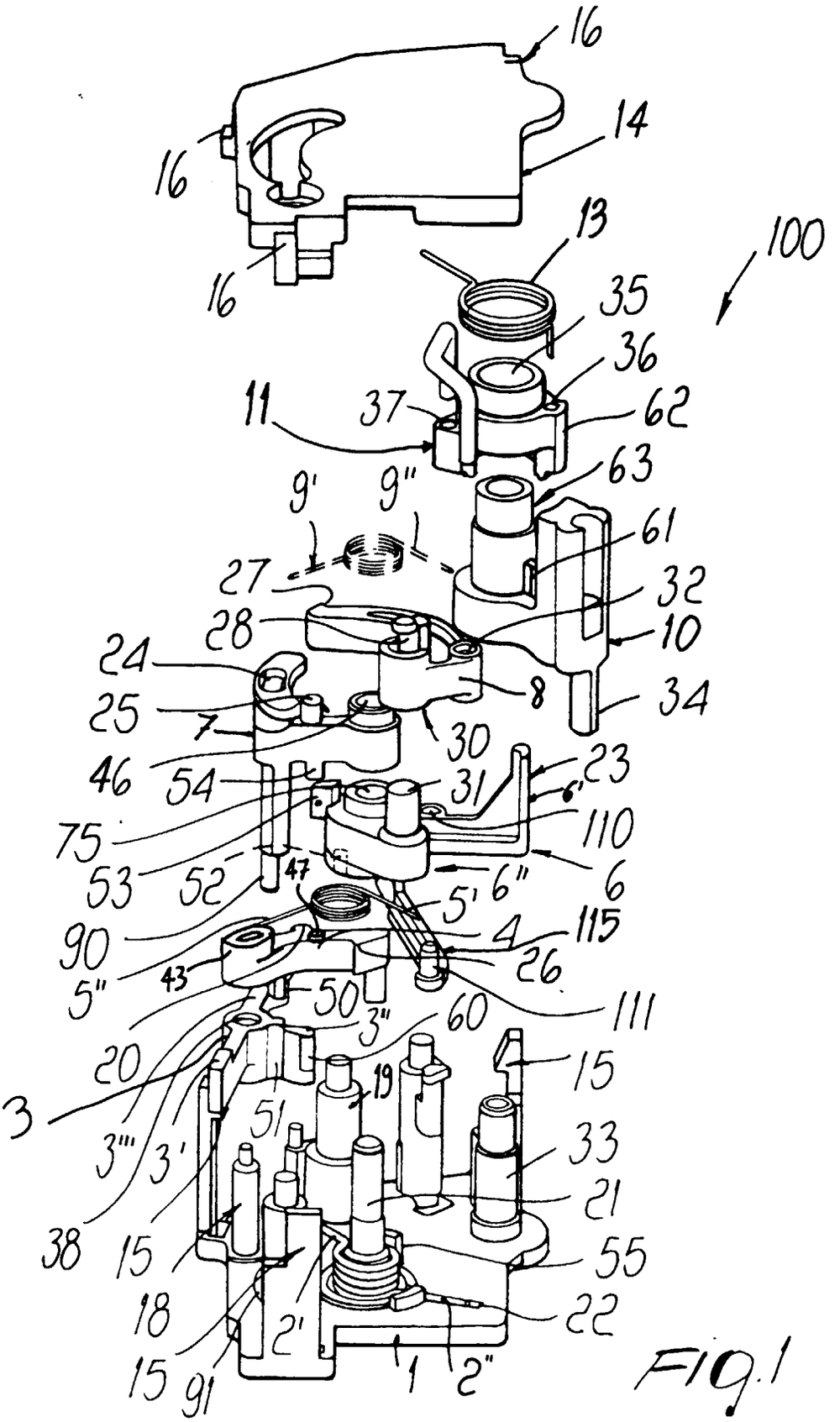
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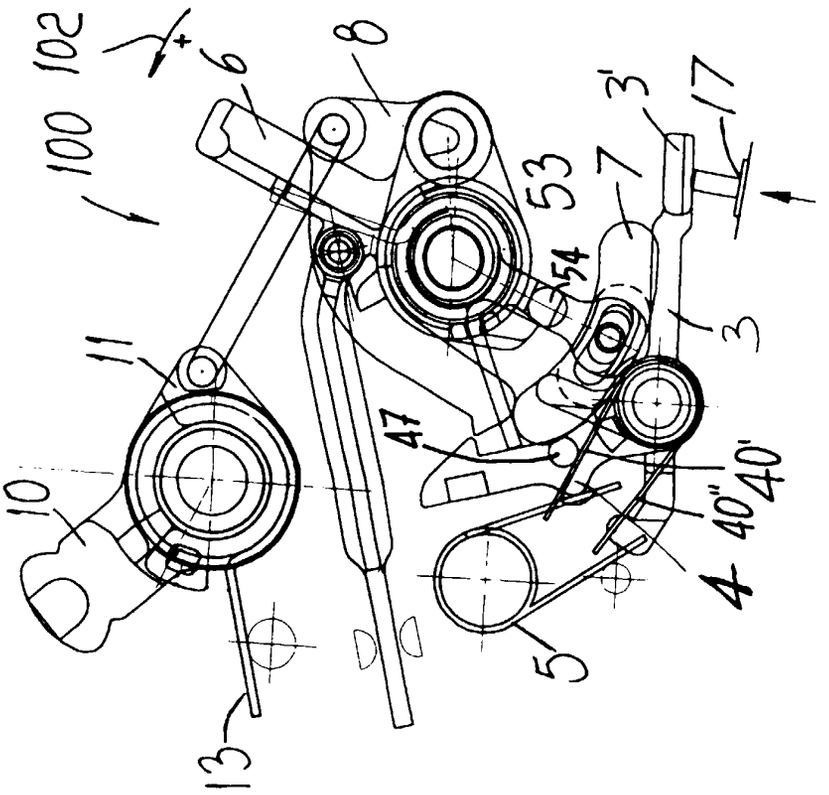
FIG. 1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40'
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13

FIG. 3

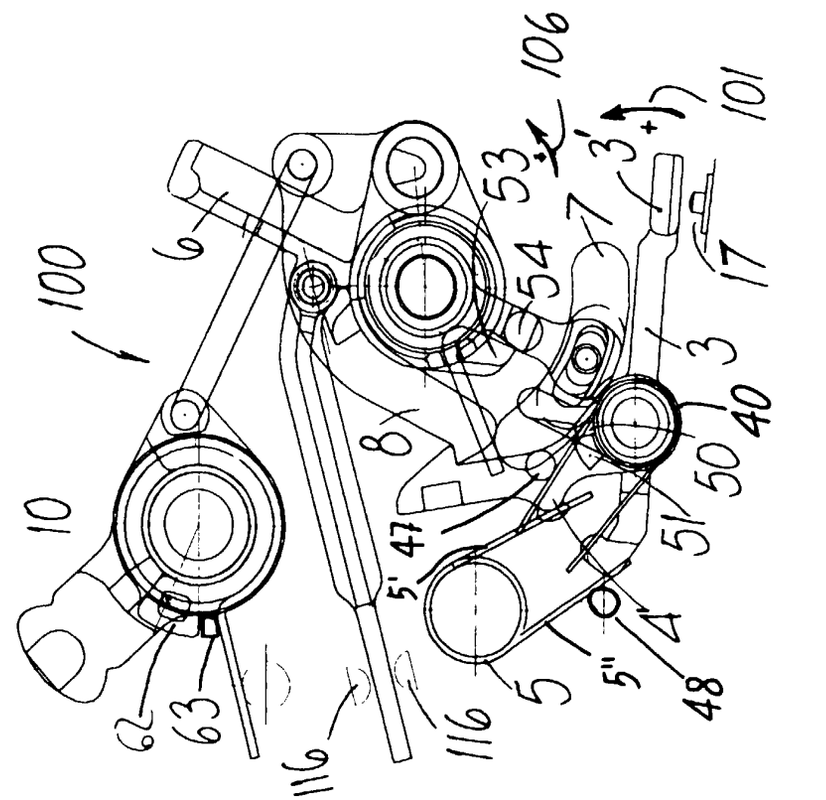
106
101
100
6
53
54
7
3'
17
3
8
40
50
10
47
51
5'
4'
5"
48
5
62
63
116
116

FIG. 2

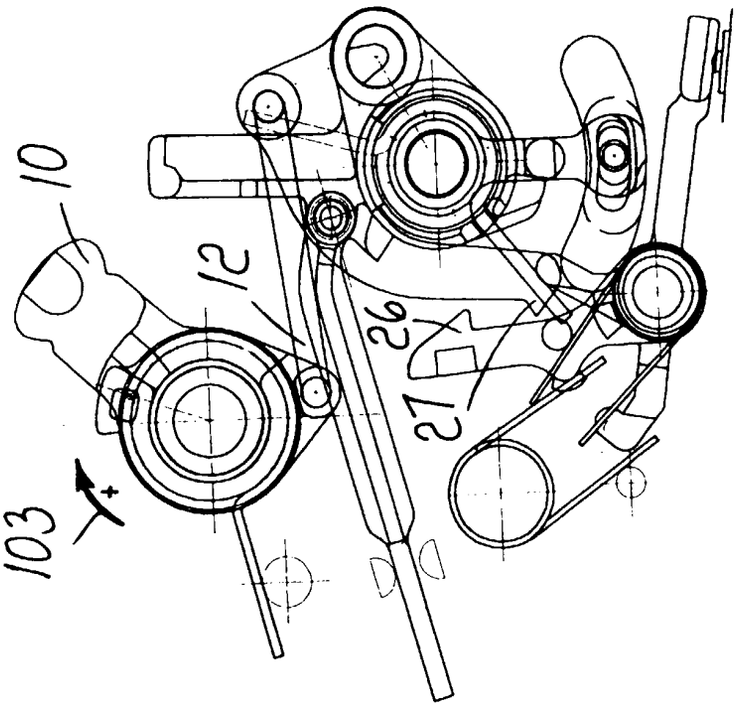


FIG. 5

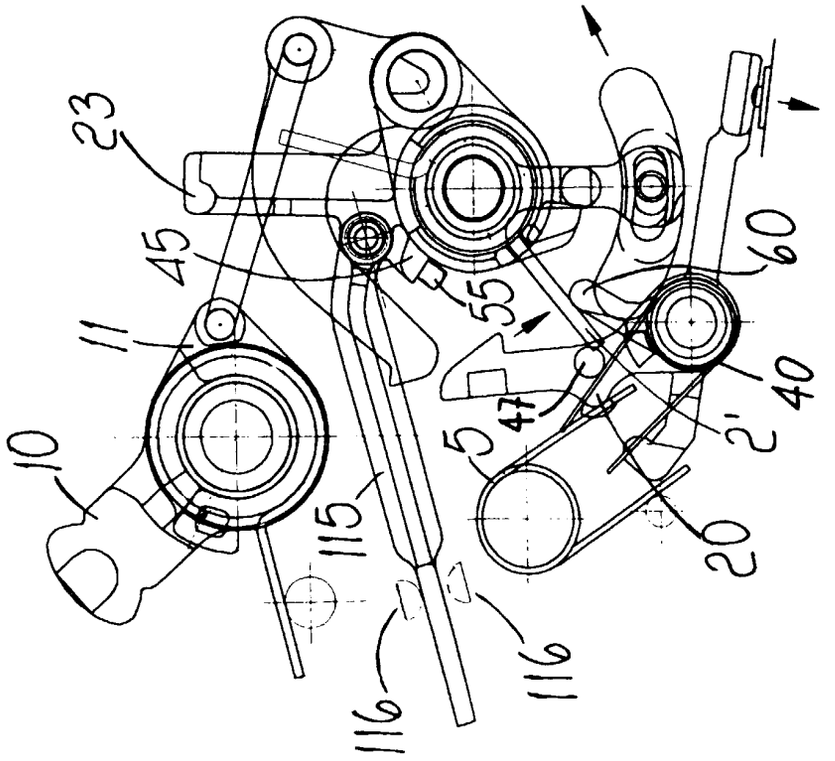


FIG. 4

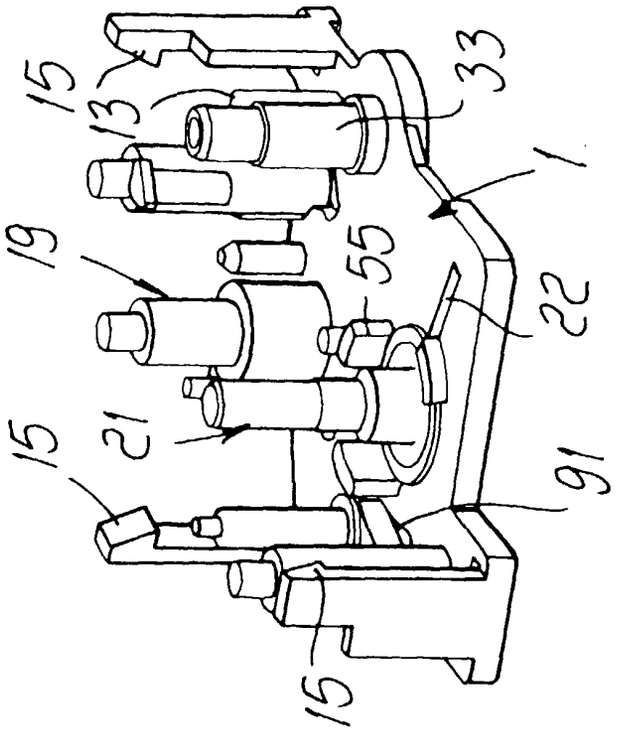


FIG. 7

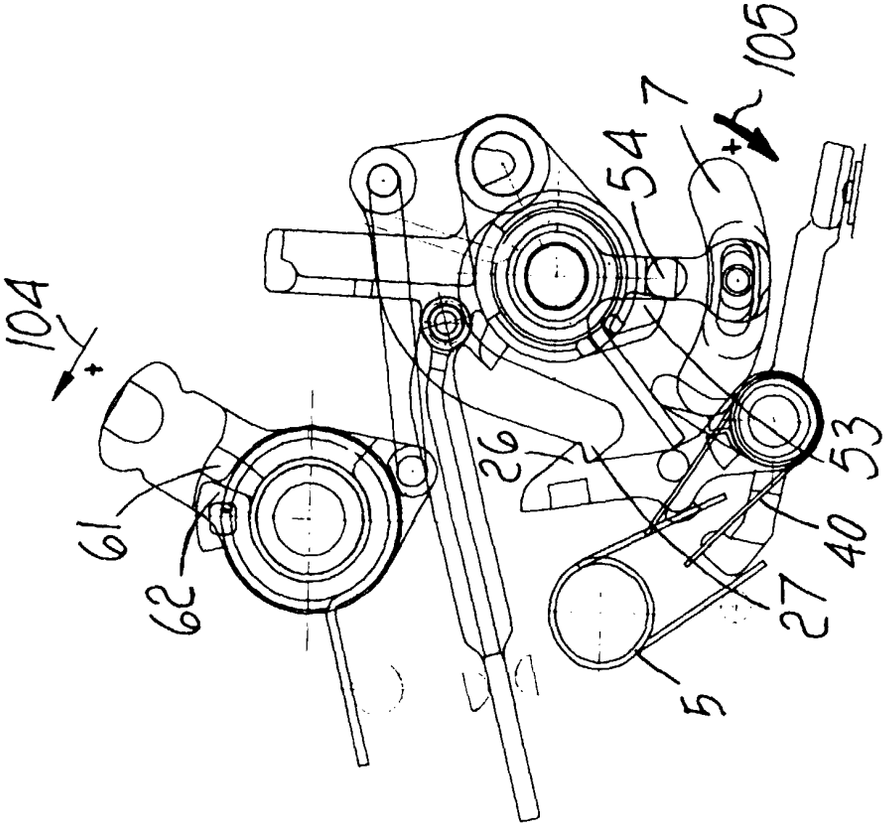


FIG. 6

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Application Number
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| MUNICH | 15 May 2000 | Mausser, T |

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