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(54) **Electrical assembly with actuating device for a circuit breaker, comprising malfunction signalling means**

Elektrische Anordnung mit Betätigungsvorrichtung für einen Lastschalter, mit
Fehlfunktionanzeigeeinrichtung

Ensemble électrique avec dispositif d'actionnement pour disjoncteur, comprenant des moyens de
signalisation de défaut

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Description

[0001] The present invention relates to an electrical assembly comprising a circuit breaker and a device for actuating the circuit breaker, and in particular to an electrical assembly according to the preamble of Claim 1.

[0002] A circuit breaker is an electrical apparatus which is able to interrupt or establish a flow of current in a circuit by means of special separable contacts; in particular, the contacts are pressed together with a suitable force in a closed circuit breaker condition, while they are separated by an isolating distance in an open circuit breaker condition. These operating conditions are stable, in the sense that the circuit breaker remains in each of them in the absence of external forces.

[0003] Actuating devices (or actuators) are commonly used, for example in control systems for industrial plants, to perform switching operations (opening and closing) of the circuit breaker using energy other than manual energy. Typically, actuating devices use an electric motor to move an operating lever of the circuit breaker from an opening position into a closing position, and vice versa, in response to a suitable external command signal.

[0004] The circuit breaker includes moreover a safety mechanism which allows the circuit breaker to be opened automatically in a situation where there is a malfunction (or fault) of the circuit in which the circuit breaker is arranged.

[0005] Such a circuit breaker is known e.g. from the document US-A-3 806 686.

[0006] A drawback of the known electrical assemblies consists in the fact that the electric circuit breaker opened by this safety mechanism following a malfunction may be closed inadvertently in a manual manner by an operator. The known electrical assemblies in fact do not allow one to distinguish whether the circuit breaker has been opened voluntarily following a normal switching operation (either manually or by means of the actuating device) or whether it has been opened non-voluntarily on account of a malfunction. The closing of the circuit breaker in this situation results in operation of the circuit under incorrect conditions, with a high risk of damage to the circuit breaker and the devices connected.

[0007] The object of the present invention is to overcome the aforementioned drawbacks. In order to achieve this object, an electrical assembly as described in Claim 1 is provided.

[0008] The electrical assembly according to the present invention allows an operator to be warned of the fact that a malfunction situation has occurred. In this way the circuit breaker can be locked in the opening condition, avoiding the danger of incorrect operations; this also prevents the circuit breaker from being accidentally closed by the actuating device owing to a spurious command signal.

[0009] Further characteristic features and advantages of the electrical assembly according to the present invention will emerge from the description, given below, of a

preferred embodiment thereof, provided by way of a non-limiting example, with reference to the accompanying figures, in which:

Fig. 1 is a view, with parts separated, of the electrical assembly according to the present invention; Figs. 2a-2c show a cross-section through the actuating device according to Fig. 1 in different operating conditions.

[0010] With reference in particular to Fig. 1, an electrical assembly 100 comprising an actuating device 103 for a circuit breaker 106 is illustrated. Typically, the actuating device 103 is used as a servomotor in a closed-chain control system, even though its use in different applications is not excluded - for example for simple remote operation of the circuit breaker 106.

[0011] The circuit breaker 106 comprises an insulating body 107 on the side walls of which one or more pairs of terminals 109 for connecting the circuit breaker 106 to corresponding pairs of electric wires of an external circuit (not shown in the figure) are provided. An operating element 110, typically consisting of a lever, is movable rotatably about an axis 112 between a position 110' (shown in continuous lines) and a position 110'' (shown in broken lines) for opening and closing the circuit breaker 106, respectively. The insulating body 107 has, housed inside it, an opening mechanism (not shown in the figure) which, when the operating lever from the closing position 110'' reaches an intermediate release position 110''' (shown in broken lines), triggers movement of the operating lever towards the opening position 110'; this mechanism imparts a sudden acceleration to the operating lever 110, pushing it with force towards the opening position 110', so as to avoid the formation of an electric arc between the contacts of the circuit breaker which are about to separate.

[0012] A slot 113 which allows access to a hole 114 is formed on a front wall of the insulating body 107. The hole 114 is formed (perpendicular to the front wall of the insulating body 107) in an internal element connected to the operating lever 110. When the operating lever is displaced from the opening position 110' into the closing position 110'', the hole 114 moves correspondingly from an opening position 114' (shown in continuous lines) to a closing position 114'' (shown in broken lines); when the operating lever is displaced from the closing position 110'' to the opening position 110', the hole 114 does not move until the operating lever reaches the release position 110''', following which it moves correspondingly from the closing position 114'' to the opening position 114'.

[0013] An additional slot 115 (with a slightly curved shape) is provided on a rear surface of the insulating body 107; this slot 115 allows access to a groove 116 (coaxial with the hole 114) having a shape slightly elongated in the direction of the slot 115. The groove 116 is formed (perpendicular to the rear wall of the insulating body 107) in an additional internal element movable in-

tegrally with the element in which the hole 114 is formed, so as to move the groove 116 between an opening position 116' (shown in continuous lines) and a closing position 116'' (shown in broken lines) in a similar manner to that described above.

[0014] A suitable operating element (not shown in the figure), consisting for example of a pin, is inserted into the hole 114. In the situation where there is a malfunction of the circuit in which the circuit breaker 106 is arranged, a remote protection device (not shown in the figure) acts on this pin so as to displace the hole 114 from the closing position 114'' into the opening position 114'. This displacement causes movement of the operating lever 110 towards the release position 110''', causing opening of the circuit breaker 106. The present invention, however, may also be realized using different equivalent safety elements.

[0015] The actuating device 103 comprises an insulating body 117 which is provided on one of its lateral flanks with a terminal strip 118 for connecting the actuating device 103 to an electrical power supply network. The terminal strip 118 is also used for applying to the actuating device 103 suitable (opening and closing) command signals which are supplied by a remote control device (not shown in the figure).

[0016] The actuating device 103 is provided with a bar 154 (or other equivalent driving means) which is parallel to the axis of rotation 112 and on the bottom surface of which a longitudinal channel 157 is formed, into which channel the operating lever 110 of the circuit breaker 106 is inserted. The operating lever 110 is slidable inside the channel 157 in the direction of the axis 112 so as to allow assembly of the electrical unit 100, while the operating lever 110 and the driving bar 154 move locked together in rotation about the axis 112.

[0017] On a front wall 158 of the insulating body 117 there is formed a slot 159 facing the slot 115 formed on the rear wall of the circuit breaker 106. A pin 160 which is inserted into the groove 116 projects from the slot 159, perpendicularly with respect to the insulating body 117; the pin 160 is displaced by the groove 116 (as described in detail below) so as to connect the safety mechanism of the circuit breaker 106 to the actuating device 103. The present invention may, however, also be realized using different equivalent connecting means.

[0018] The circuit breaker 106 and the actuating device 103 are connected together, along each side surface of the electrical assembly 100, by means of an L-shaped element 166 (only one of which is shown in the figure). The L-shaped element 166 terminates on the smaller arm of the "L" in a tractional hook 169 which engages in a cavity 172 formed on the rear surface of the circuit breaker 106. The L-shaped element 166 is housed in a matching seat 173 formed in the actuating device 103 along a front vertical edge and is fixed by means of a screw 181 which is screwed into a metal plate (not shown in the figure).

[0019] With reference now to Fig. 2a (the elements al-

ready shown in Fig. 1 are identified by the same reference numbers), a bar 202 parallel to the wall 158 of the actuating device 103 extends perpendicularly from the driving bar 154 of the actuating device 103 (connected in a manner known per se to an electric motor, not shown in the figure). A flange 204 projects upwards from the bar 202; a curved circular-shaped projection 205 with its centre on the axis of rotation 112 extends, in relief, from the rear wall of the bar 202 and the flange 204.

[0020] A substantially triangular-shaped plate 206, parallel to the wall 158, is pivotably mounted on the pin 160 which projects from the slot 159. The plate 206 has, at each of its corners, a tongue 207, 208, 210 which is bent towards the inside of the actuating device 103. An L-shaped element 212 is also pivotably mounted on the pin 160 at a common end of its arms. The bigger arm and the smaller arm of the L-shaped element 212 rest in abutment, respectively, against a rib 213 (formed on the wall 158) and against the tongue 208 of the plate 206; an additional rib 215 is formed on the wall 158 above the rib 213. The free end of the smaller arm of the L-shaped element 212 is provided with a turret piece 214 (parallel to the pin 160) which rests in abutment against a bar 216 pivotably mounted at one of its free ends on the pin 160; the other end of the bar 216 is movable rotatably about a pivot 218 parallel to the pin 160. A flat spring 220 (or other equivalent resilient means) is wound around the pivot 218 and a parallel pin 222; the spring 220 acts with one of its ends against the tongue 210 of the plate 206 and with its other end on the turret piece 214 of the L-shaped element 212 so as to keep the lever mechanism consisting of the elements 206, 212 and 216 in the position shown in the figure.

[0021] A microswitch 224, which is electrically connected to the terminal strip (118 in Fig. 1) by means of one or more suitable wires 226, is arranged in the vicinity of the lever mechanism 206, 212, 216. A flat spring 228 (or other equivalent resilient means) is associated with the microswitch 224 and in the rest condition rests in abutment with one of its free ends against the rib 213, so that the microswitch 224 is open.

[0022] In order to explain operation of the lever mechanism 206, 212, 216, let us assume that the actuating device 103 is in the condition shown in the figure, with the driving bar 154 and the pin 160 in a position, indicated respectively by 154'' and 160'', corresponding to the closing position of the circuit breaker. If the actuating device 103 receives an opening command signal, the driving element 154 starts to rotate in the clockwise direction about the axis 112. As described above, until the driving element 154 reaches a position corresponding to the release position of the operating lever (110''' in Fig. 1), the pin 160 does not move, so that the lever mechanism 206, 212, 216 remains in the position shown in the figure. In this way, the projection 205 comes into contact with the tongue 207 of the plate 206, causing the plate 206 to rotate in an anti-clockwise direction about the pin 160. The tongue 208 of the plate 206 transmits this movement

also to the L-shaped element 212, so that the smaller arm provided with the turret piece 214 moves away from the bar 216 against the action of the spring 220. When the driving element 154 reaches a position corresponding to the release position of the operating lever, the pin 160 starts to move towards the right, causing rotation of the lever mechanism 200,212,216 in a clockwise direction about the pivot 218. In this situation, the free end of the bigger arm of the L-shaped element 212 is located above the rib 215 which acts as a guide, preventing this end from coming into contact with the spring 228. The projection 205 then disengages from the tongue 207 of the plate 206 and the driving element 154 and the pin 160 complete their movement.

[0023] As shown in Fig. 2b (the elements already shown in Fig. 2a are identified by the same reference numbers), the driving element 154 and the pin 160 reach a position, indicated respectively by 154' and 160', corresponding to the opening position of the circuit breaker; it should be noted that the pin 160 does not reach the top end of the slot 159, owing to the elongated shape of the groove 116. If, in the condition shown in the figure, the actuating device 103 receives a closing command signal, the driving element 154 starts to rotate in an anti-clockwise direction about the axis 112; the pin 160 moves correspondingly towards the left, causing rotation of the lever mechanism 206,212,216 in an anti-clockwise direction about the pivot 218. When the projection 205 comes into contact with the tongue 207, the plate 206 is made to rotate in a clockwise direction about the pin 160 in opposition to the spring 220. The tongue 207 then disengages from the projection 205, the free end of the bigger arm of the L-shaped element is freed from the rib 215 and the spring 220 brings the lever mechanism 206,212,216 back into the position illustrated in Fig. 2a.

[0024] With reference to Fig. 2a again, let us now consider the case where, in the condition shown in the figure, a malfunction situation of the circuit containing the circuit breaker arises. In this case, as described above, the safety mechanism of the circuit breaker displaces the pin 160 towards the right, so as to rotate the lever mechanism 206,212,216 in a clockwise direction about the pivot 218. Therefore, when the driving element 154 is triggered so as to move into the opening position, rotating in the clockwise direction about the axis 112, the projection 205 does not come into contact with the tongue 207 of the plate 206. The free end of the bigger arm of the L-shaped element 121 is thus pushed against the spring 228 so that it closes the contact of the microswitch 224, as shown in Fig. 2c. Closing of the microswitch 224 produces a malfunction signal which is transmitted (by means of the wires 226) to a remote location. This signal activates a warning device, for example of the luminous type, so as to inform an operator of the malfunction situation in the circuit in which the electrical assembly is arranged; typically, the operator locks the driving element 154 of the actuating device 103 in the opening position 154', for example by means of a padlock (not shown in the figure),

so as to prevent the circuit breaker from being accidentally closed. The present invention may, however, also be realized using different systems for transmission of the malfunction signal (for example using radio waves), with a luminous signalling device incorporated directly in the actuating device or using other equivalent signalling means. Once any fault in the circuit connected to the circuit breaker has been located and repaired, the driving element 154 is released and a closing command signal is sent to the actuating device 103 (or the driving element 154 is displaced manually towards the closing position 154'').

In this case, the actuating device 103 returns, in a manner similar to that described above, into the condition shown in Fig. 2a.

[0025] The lever mechanism described above is particularly compact, reliable and effective. Moreover, it is extremely simple and may be mass-produced at a low cost, so that it does not increase the final cost of the entire actuating device. The present invention may, however, be constructed also with a driven member different from the lever mechanism described above, with other cam systems, or with equivalent means for activation of the microswitch.

[0026] Obviously a person skilled in the art may make numerous modifications and variations to the electrical assembly described above, in order to satisfy contingent and specific requirements, all of which, however, fall within the scope of protection of the invention, as defined by the claims below.

Claims

1. Electrical assembly (100) comprising a circuit breaker (106) having an operating element (110) movable between an opening position (110') and a closing position (110''), said circuit breaker including a safety mechanism (113-114) adapted to move the operating element (110) from the closing position (110'') into the opening position (110') in response to a malfunction; an actuating device (103) acting on the operating element (110) and adapted to move the operating element (110) between the opening position (110') and the closing position (110''); connecting means (115, 116; 159, 160) adapted to connect the safety mechanism (113-114) to the actuating device (103); signalling means (224,228) and activating means (206,212,216,220) adapted to activate the signalling means (224,228) when there is a non-voluntary movement of the operating element (110) from the closing position (110'') into the opening position (110') caused by the safety mechanism (113-114);

characterized in that said electrical assembly is a modular assembly wherein the circuit breaker (106) includes a first insulating body (107) and said actuating device (103) includes a distinct second insu-

lating body (117) and wherein said actuating device includes in said second body said signalling means (224,228) and said activating means (206,212,216,220) and is such to receive a closing or opening signal for moving said operating element.

2. Electrical assembly (100) according to Claim 1, in which the connecting means (115,116,159,160) include a pin (160) housed in a slot (159) formed in a wall (158) of the body of the actuating device (103) facing the circuit breaker (106), following a voluntary movement of the operating element (110) from the closing position (110'') into the opening position (110') not caused by the safety mechanism (113-114) the pin (160) is adapted to move from a closing position (160'') into an opening position (160') and following said non-voluntary movement of the operation element the pin (160) is adapted not to move when there is a movement from the closing position (110'') into an intermediate release position (110''') of the operating element (110) and the pin is adapted to move from the closing position (160'') into the opening position (160') when there is a movement from the release position (110''') into the opening position (110') of the operating element (110).
3. Electrical assembly (100) according to Claim 1 or 2, in which the signalling means (224, 228) include a microswitch (224) and corresponding resilient means (228), the resilient means (228) in a rest condition keeping the microswitch (224) in a non-active state and in a working condition keeping the microswitch (224) in an active state for generating a malfunction signal.
4. Electrical assembly (100) according to Claim 3, further comprising at least one wire (226) connected to the microswitch (224) for transmitting the malfunction signal externally.
5. Electrical assembly (100) according to Claim 3 or 4, in which the actuating device (103) includes driving means (154,202,204,205) coupled to the operating element (110) and in which the activation means (206,212,216,220) include a lever mechanism (206,212,216) connected to the pin (160), following said non-voluntary movement the driving means (154,202,204,205) not cooperating with the lever mechanism (206,212,216) so that the pin (160) is adapted to move the lever mechanism (206,212,216) into contact with the resilient means (228) so as to bring the resilient means (228) into the working position and following said voluntary movement the driving means (154,202,204,205) co-operating with the lever mechanism (206,212,216) so that the pin (160) is adapted to move the lever mechanism (206,212,216) not in contact with the resilient means (228) so as to keep the resilient means

(228) in the rest condition.

6. Electrical assembly (100) according to Claim 5, in which the lever mechanism (206,212,216) comprises a plate (206) and an L-shaped element (212) pivotably mounted on the pin (160) and a bar (216) movable rotatably about a pivot (218) and pivotably mounted at one of its free ends on the pin (160), following said non-voluntary movement the pin (160) rotating the lever mechanism (206,212,216) about the pivot (218) so that an arm of the L-shaped element (212) makes contact with the resilient means (228) and following said voluntary movement the driving means (154,202,204,205) rotating the plate (206) about the pin (160), the plate (206) rotating correspondingly the L-shaped element (212) about the pin (160) so that the arm of the L-shaped element (212) does not make contact with the resilient means (228).
7. Electrical assembly (100) according to Claim 6, further comprising a rib (215) formed on said wall (158) of the actuating device (103) so as to keep the arm of the L-shaped element (212) not in contact with the resilient means (228) following said voluntary movement.
8. Electrical assembly (100) according to Claims 6 or 7, in which the plate (206) includes a first tongue (208) adapted to co-operate with the L-shaped element (212) and the L-shaped element (212) includes a turret piece (214) adapted to co-operate with the bar (216), the activating means (206,212,216,220) comprising additional resilient means (220) co-operating with a second tongue (210) formed on the plate (206) and with the turret piece (214) so as to keep the first tongue (208) and the turret piece (214) in contact, respectively, with the L-shaped element (212) and the bar (216).
9. Electrical assembly (100) according to Claim 8, in which the driving means (154,202,204,205) include a curved projection (205) adapted to co-operate with a third tongue (207) formed on the plate (206).
10. Electrical assembly (100) according to Claim 9, in which the driving means (154,202,204,205) include a driving bar (154) parallel to an axis of rotation (112) of the driving means, an additional bar (202) perpendicular to the driving bar (154) and a flange (204) parallel to the additional bar (202), the curved projection (205) extending from the additional bar (202) and the flange (204).
11. Electrical assembly (100) according to Claim 10, in which the curved projection (205) has a circular shape with its centre on the axis of rotation (112).

12. Electrical assembly (100) according to any one of Claims 5 to 11, in which the pin (160) is adapted to move from the opening position (160') into the closing position (160'') when there is a closing movement of the operating element (110) from the opening position (110') into the closing position (110''), following said closing movement the pin (160) is adapted to move the lever mechanism (206,212,216) so as to keep the resilient means (228) in or bring them into the rest position.

Patentansprüche

1. Elektrische Anordnung (100), die einen Schaltungsunterbrecher (106) aufweist, der ein Betriebselement (110) aufweist, das zwischen einer Öffnungsposition (110') und einer Schließposition (110'') bewegbar ist, wobei der Schaltungsunterbrecher einen Sicherheitsmechanismus (113-114), der angepasst ist, um ansprechend auf eine Fehlfunktion das Betriebselement (110) von der Schließposition (110'') zu der Öffnungsposition (110') zu bewegen; eine Betätigungsvorrichtung (103), die an dem Betriebselement (110) wirksam ist und angepasst ist, um das Betriebselement (110) zwischen der Öffnungsposition (110') und der Schließposition (110'') zu bewegen; eine Verbindungseinrichtung (115, 116; 159, 160), die angepasst ist, um den Sicherheitsmechanismus (113-114) mit der Betätigungsvorrichtung (103) zu verbinden; eine Signalisierungseinrichtung (224, 228) und eine Aktivierungseinrichtung (206, 212, 216, 220) umfasst, die angepasst ist, um die Signalisierungseinrichtung (224, 228) zu aktivieren, wenn eine nicht freiwillige Bewegung des Betriebselements (110) von der Schließposition (110'') zu der Öffnungsposition (110') vorliegt, die durch den Sicherheitsmechanismus (113-114) bewirkt wird; **dadurch gekennzeichnet, dass** die elektrische Anordnung eine modulare Anordnung ist, wobei der Schaltungsunterbrecher (106) einen ersten isolierenden Körper (107) umfasst, und die Betätigungsvorrichtung (103) einen separaten zweiten isolierenden Körper (117) umfasst, und wobei die Betätigungsvorrichtung in dem zweiten Körper die Signalisierungseinrichtung (224, 228) und die Aktivierungseinrichtung (206, 212, 216, 220) umfasst und so ein Schließ- oder Öffnungssignal zum Bewegen des Betriebselements empfangen soll.
2. Elektrische Anordnung (100) gemäß Anspruch 1, bei der die Verbindungseinrichtung (115, 116, 159, 160) einen Stift (160) umfasst, der in einem Schlitz (159) untergebracht ist, der in einer Wand (158) des Körpers der Betätigungsvorrichtung (103) gebildet ist, die dem Schaltungsunterbrecher (106) zugewandt ist, wobei nach einer freiwilligen Bewegung des Betriebselements (110) von der Schließposition (110'')

zu der Öffnungsposition (110'), die nicht durch den Sicherheitsmechanismus (113-114) bewirkt wird, der Stift (160) angepasst ist, um sich von einer Schließposition (160'') zu einer Öffnungsposition (160') zu bewegen, und wobei der Stift (160) nach der nicht freiwilligen Bewegung des Betriebselements angepasst ist, sich nicht zu bewegen, wenn eine Bewegung von der Schließposition (110'') zu einer Zwischenfreigabeposition (110''') des Betriebselements (110) vorliegt, und wobei der Stift angepasst ist, um sich von der Schließposition (160'') zu der Öffnungsposition (160') zu bewegen, wenn eine Bewegung von der Freigabeposition (110''') zu der Öffnungsposition (110') des Betriebselements (110) vorliegt.

3. Elektrische Anordnung (100) gemäß Anspruch 1 oder 2, bei der die Signalisierungseinrichtung (224, 228) einen Mikroschalter (224) und eine entsprechende elastische Einrichtung (228) umfasst, wobei die elastische Einrichtung (228) in einem Ruhezustand den Mikroschalter (224) in einem nicht aktiven Zustand hält und in einem Arbeitszustand den Mikroschalter (224) in einem aktiven Zustand zum Erzeugen eines Fehlfunktionssignals hält.
4. Elektrische Anordnung (100) gemäß Anspruch 3, die ferner zumindest einen Draht (226) aufweist, der mit dem Mikroschalter (224) verbunden ist, zum externen Übertragen des Fehlfunktionssignals.
5. Elektrische Anordnung (100) gemäß Anspruch 3 oder 4, bei der die Betätigungsvorrichtung (103) eine Antriebseinrichtung (154, 202, 204, 205) umfasst, die mit dem Betriebselement (110) gekoppelt ist, und bei der die Aktivierungseinrichtung (206, 212, 216, 220) einen Hebelmechanismus (206, 212, 216) umfasst, der mit dem Stift (160) verbunden ist, wobei die Antriebseinrichtung (154, 202, 204, 205) nach der nicht freiwilligen Bewegung nicht mit dem Hebelmechanismus (206, 212, 216) zusammenwirkt, so dass der Stift (160) angepasst ist, um den Hebelmechanismus (206, 212, 216) in Kontakt mit der elastischen Einrichtung (228) zu bewegen, um die elastische Einrichtung (228) in die Arbeitsposition zu bringen, und wobei die Antriebseinrichtung (154, 202, 204, 205) nach der freiwilligen Bewegung mit dem Hebelmechanismus (206, 212, 216) zusammenwirkt, so dass der Stift (160) angepasst ist, um den Hebelmechanismus (206, 212, 216) nicht in Kontakt mit der elastischen Einrichtung (228) zu bewegen, um die elastische Einrichtung (228) in dem Ruhezustand zu halten.
6. Elektrische Anordnung (100) gemäß Anspruch 5, bei der der Hebelmechanismus (206, 212, 216) eine Platte (206) und ein L-förmiges Element (212), die schwenkbar an dem Stift (160) befestigt sind, und

eine Stange (216) aufweist, die drehbar um ein Schwenkelement (218) bewegbar ist und schwenkbar an einem ihrer freien Enden an dem Stift (160) befestigt ist, wobei der Stift (160) nach der nicht freiwilligen Bewegung den Hebelmechanismus (206, 212, 216) um das Schwenkelement (218) dreht, so dass ein Arm des L-förmigen Elements (212) Kontakt mit der elastischen Einrichtung (228) herstellt, und wobei die Antriebseinrichtung (154, 202, 204, 205) nach der freiwilligen Bewegung die Platte (206) um den Stift (160) dreht, wobei die Platte (206) das L-förmige Element (212) entsprechend um den Stift (160) dreht, so dass der Arm des L-förmigen Elements (212) keinen Kontakt mit der elastischen Einrichtung (228) herstellt.

7. Elektrische Anordnung (100) gemäß Anspruch 6, die ferner einen Steg (215) aufweist, der an der Wand (158) der Betätigungsvorrichtung (103) gebildet ist, um den Arm des L-förmigen Elements (212) nach der freiwilligen Bewegung nicht in Kontakt mit der elastischen Einrichtung (228) zu halten.
8. Elektrische Anordnung (100) gemäß Anspruch 6 oder 7, bei der die Platte (206) eine erste Zunge (208) umfasst, die angepasst ist, um mit dem L-förmigen Element (212) zusammenzuwirken, und das L-förmige Element (212) ein Drehturmstück (214) umfasst, das angepasst ist, um mit der Stange (216) zusammenzuwirken, wobei die Aktivierungseinrichtung (206, 212, 216, 220) eine zusätzliche elastische Einrichtung (220) aufweist, die mit einer zweiten Zunge (210), die an der Platte (206) gebildet ist, und mit dem Drehturmstück (214) zusammenwirkt, um die erste Zunge (208) und das Drehturmstück (214) in Kontakt mit dem L-förmigen Element (212) bzw. der Stange (216) zu halten.
9. Elektrische Anordnung (100) gemäß Anspruch 8, bei der die Antriebseinrichtung (154, 202, 204, 205) einen gekrümmten Vorsprung (205) umfasst, der angepasst ist, um mit einer dritten Zunge (207) zusammenzuwirken, die an der Platte (206) gebildet ist.
10. Elektrische Anordnung (100) gemäß Anspruch 9, bei der die Antriebseinrichtung (154, 202, 204, 205) eine Antriebsstange (154) parallel zu einer Drehachse (112) der Antriebseinrichtung, eine zusätzliche Stange (202) senkrecht zu der Antriebsstange (154) und einen Flansch (204) parallel zu der zusätzlichen Stange (202) umfasst, wobei sich der gekrümmte Vorsprung (205) von der zusätzlichen Stange (202) und dem Flansch (204) erstreckt.
11. Elektrische Anordnung (100) gemäß Anspruch 10, bei der der gekrümmte Vorsprung (205) eine kreisförmige Form aufweist, deren Mitte sich auf der Drehachse (112) befindet.

12. Elektrische Anordnung (100) gemäß einem der Ansprüche 5 bis 11, bei der der Stift (160) angepasst ist, um sich von der Öffnungsposition (160') zu der Schließposition (160'') zu bewegen, wenn eine Schließbewegung des Betriebselements (110) von der Öffnungsposition (110') zu der Schließposition (110'') vorliegt, wobei der Stift (160) nach der Schließbewegung angepasst ist, um den Hebelmechanismus (206, 212, 216) zu bewegen, um die elastische Einrichtung (228) in der Ruheposition zu halten oder sie in dieselbe zu bringen.

Revendications

1. Ensemble électrique (100) comportant un disjoncteur (106) ayant un élément de travail (110) mobile entre une position d'ouverture (110') et une position de fermeture (110''), ledit disjoncteur comprenant un mécanisme de sécurité (113-114) conçu pour déplacer l'élément de travail (110) de la position de fermeture (110'') à la position d'ouverture (110') en réponse à un défaut de fonctionnement ; un dispositif d'actionnement (103) agissant sur l'élément de travail (110) et conçu pour déplacer l'élément de travail (110) entre la position d'ouverture (110') et la position de fermeture (110'') ; des moyens de connexion (115, 116 ; 159, 160) conçus pour connecter le mécanisme de sécurité (113-114) au dispositif d'actionnement (103) ; des moyens de signalisation (224, 228) et des moyens d'activation (206, 212, 216, 220) conçus pour activer les moyens de signalisation (224, 228) lorsqu'il y a un mouvement non volontaire de l'élément de travail (110) de la position de fermeture (110'') à la position d'ouverture (110') provoqué par le mécanisme de sécurité (113-114) ;
caractérisé en ce que ledit ensemble électrique est un ensemble modulaire dans lequel le disjoncteur (106) comprend un premier corps isolant (107) et ledit dispositif d'actionnement (103) comprend un second corps isolant distinct (117), et dans lequel ledit dispositif d'actionnement comprend, dans ledit second corps, lesdits moyens de signalisation (224, 228) et lesdits moyens d'activation (206, 212, 216, 220) et est tel qu'il reçoit un signal de fermeture ou d'ouverture pour déplacer ledit élément de travail.
2. Ensemble électrique (100) selon la revendication 1, dans lequel les moyens de connexion (115, 116, 159, 160) comprennent une broche (160) logée dans un trou oblong (159) formé dans une paroi (158) du corps du dispositif d'actionnement (103) faisant face au disjoncteur (106), à la suite d'un mouvement volontaire de l'élément de travail (110) de la position de fermeture (110'') à la position d'ouverture (110'), non provoqué par le mécanisme de sécurité (113-114), la broche (160) est conçue pour se déplacer d'une position de fermeture (160'') à une po-

- sition d'ouverture (160') et, à la suite dudit mouvement non volontaire de l'élément de travail, la broche (160) est conçue pour ne pas se déplacer lorsqu'il y a un mouvement de la position de fermeture (110'') à une position intermédiaire de libération (110''') de l'élément de travail (110) et la broche est conçue pour se déplacer de la position de fermeture (160'') à la position d'ouverture (160') lorsqu'il y a un mouvement de la position de libération (110''') à la position d'ouverture (110') de l'élément de travail (110).
3. Ensemble électrique (100) selon la revendication 1 ou 2, dans lequel les moyens de signalisation (224, 228) comprennent un microcontact (224) et un moyen élastique correspondant (228), le moyen élastique (228), dans une condition de repos, maintenant le microcontact (224) dans un état non actif et, dans une condition de travail, maintenant le microcontact (224) dans un état actif pour générer un signal de défaut de fonctionnement.
 4. Ensemble électrique (100) selon la revendication 3, comportant en outre au moins un fil (226) connecté au microcontact (224) pour transmettre à l'extérieur le signal de défaut de fonctionnement.
 5. Ensemble électrique (100) selon la revendication 3 ou 4, dans lequel le dispositif d'actionnement (103) comprend des moyens d'entraînement (154, 202, 204, 205) couplés à l'élément de travail (110), et dans lequel les moyens d'activation (206, 212, 216, 220) comprennent un mécanisme à levier (206, 212, 216) relié à la broche (160), à la suite dudit mouvement volontaire, les moyens d'entraînement (154, 202, 204, 205) ne coopérant pas avec le mécanisme à levier (206, 212, 216) afin que la broche (160) soit conçue pour déplacer le mécanisme à levier (206, 212, 216) jusqu'en contact avec le moyen élastique (228) afin d'amener le moyen élastique (228) dans la position de travail et, à la suite dudit mouvement volontaire, les moyens d'entraînement (154, 202, 204, 205) coopérant avec le mécanisme à levier (206, 212, 216) afin que la broche (160) soit conçue pour déplacer le mécanisme à levier (206, 212, 216) non en contact avec le moyen élastique (228) de façon à maintenir le moyen élastique (228) dans la condition de repos.
 6. Ensemble électrique (100) selon la revendication 5, dans lequel le mécanisme à levier (206, 212, 216) comporte une plaque (206) et un élément (212) en forme de L monté de façon de pivotante sur la broche (160), et une barre (216) mobile en rotation autour d'un pivot (218) et montée de façon pivotante, à l'une de ses extrémités libres, sur la broche (160), à la suite dudit mouvement non volontaire, la broche (160) faisant tourner le mécanisme à levier (206, 212, 216) autour du pivot (218) afin qu'un bras de l'élément (212) en forme de L entre en contact avec le moyen élastique (228) et, à la suite dudit mouvement volontaire, les moyens d'entraînement (154, 202, 204, 205) faisant tourner la plaque (206) autour de la broche (160), la plaque (206) faisant tourner de façon correspondante l'élément (212) en forme de L autour de la broche (160) afin que le bras de l'élément (212) en forme de L n'entre pas en contact avec le moyen élastique (228).
 7. Ensemble électrique (100) selon la revendication 6, comportant en outre une nervure (215) formée sur ladite paroi (158) du dispositif d'actionnement (103) afin de maintenir le bras de l'élément (212) en forme de L non en contact avec le moyen élastique (228) à la suite dudit mouvement volontaire.
 8. Ensemble électrique (100) selon la revendication 6 ou 7, dans lequel la plaque (206) comporte une première languette (208) conçue pour coopérer avec l'élément (212) en forme de L et l'élément (212) en forme de L comprend une pièce (214) de tourelle conçue pour coopérer avec la barre (216), les moyens d'activation (206, 212, 216, 220) comportant un moyen élastique supplémentaire (220) coopérant avec une seconde languette (210) formée sur la plaque (206) et avec la pièce de tourelle (214) afin de maintenir la première languette (208) et la pièce de tourelle (214) en contact, respectivement, avec l'élément (212) en forme de L et la barre (216).
 9. Ensemble électrique (100) selon la revendication 8, dans lequel les moyens d'entraînement (154, 202, 204, 205) comprennent une saillie courbée (205) conçue pour coopérer avec une troisième languette (207) formée sur la plaque (206).
 10. Ensemble électrique (100) selon la revendication 9, dans lequel les moyens d'entraînement (154, 202, 204, 205) comprennent une barre d'entraînement (154) parallèle à un axe de rotation (112) des moyens d'entraînement, une barre supplémentaire (202) perpendiculaire à la barre d'entraînement (154) et une aile (204) parallèle à la barre supplémentaire (202), la saillie courbée (205) s'étendant depuis la barre supplémentaire (202) et l'aile (204).
 11. Ensemble électrique (100) selon la revendication 10, dans lequel la saillie courbée (205) a une forme circulaire dont le centre se trouve sur l'axe de rotation (112).
 12. Ensemble électrique (100) selon l'une quelconque des revendications 5 à 11, dans lequel la broche (160) est conçue pour se déplacer de la position d'ouverture (160') à la position de fermeture (160'') lorsqu'il y a un mouvement de fermeture de l'élément de travail (110) de la position d'ouverture (110') à la

position de fermeture (110''), à la suite dudit mouvement de fermeture, la broche (160) est conçue pour déplacer le mécanisme à levier (206, 212, 216) afin de maintenir le moyen élastique (228) ou de l'amener dans la position de repos.

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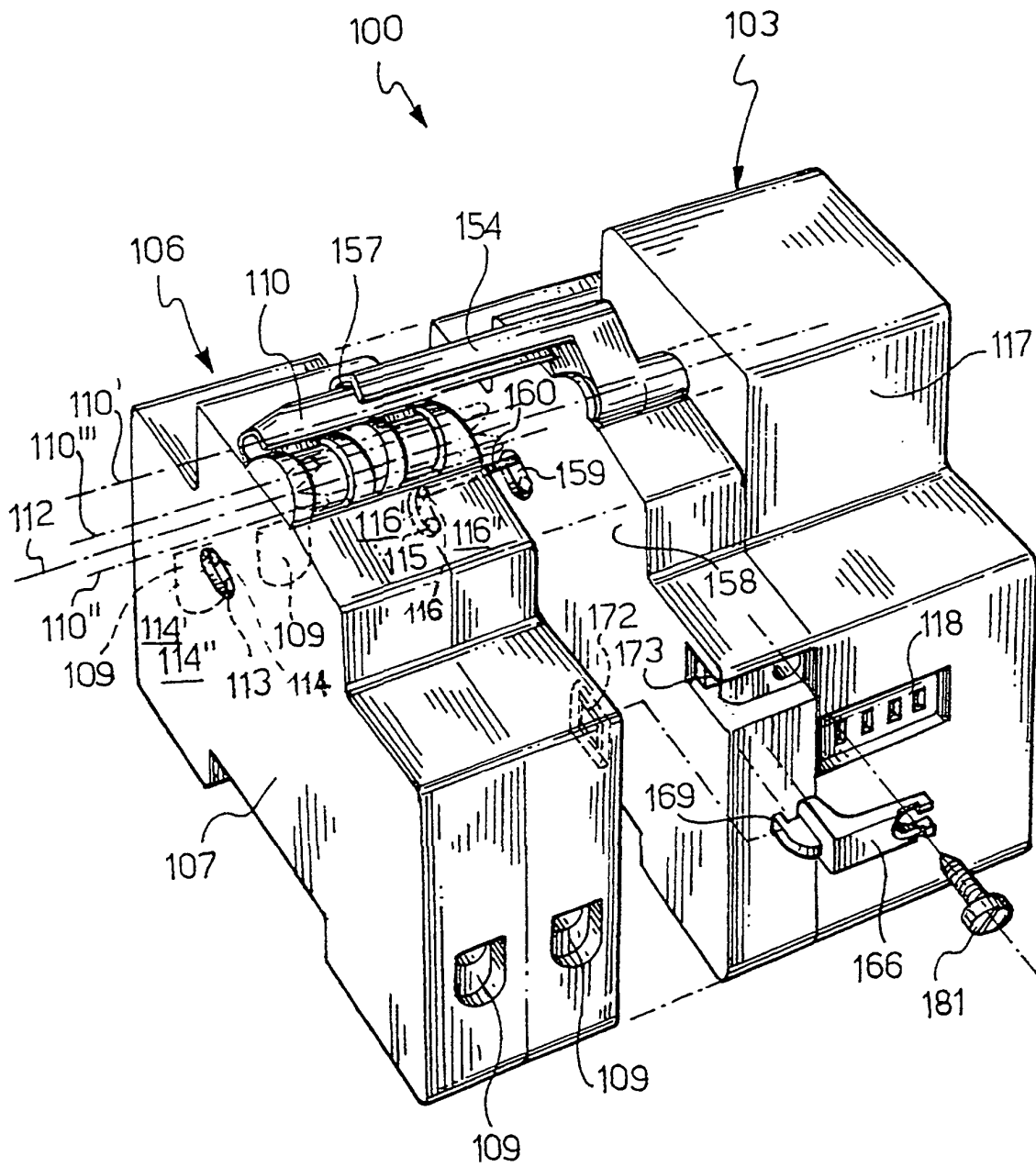


FIG.1

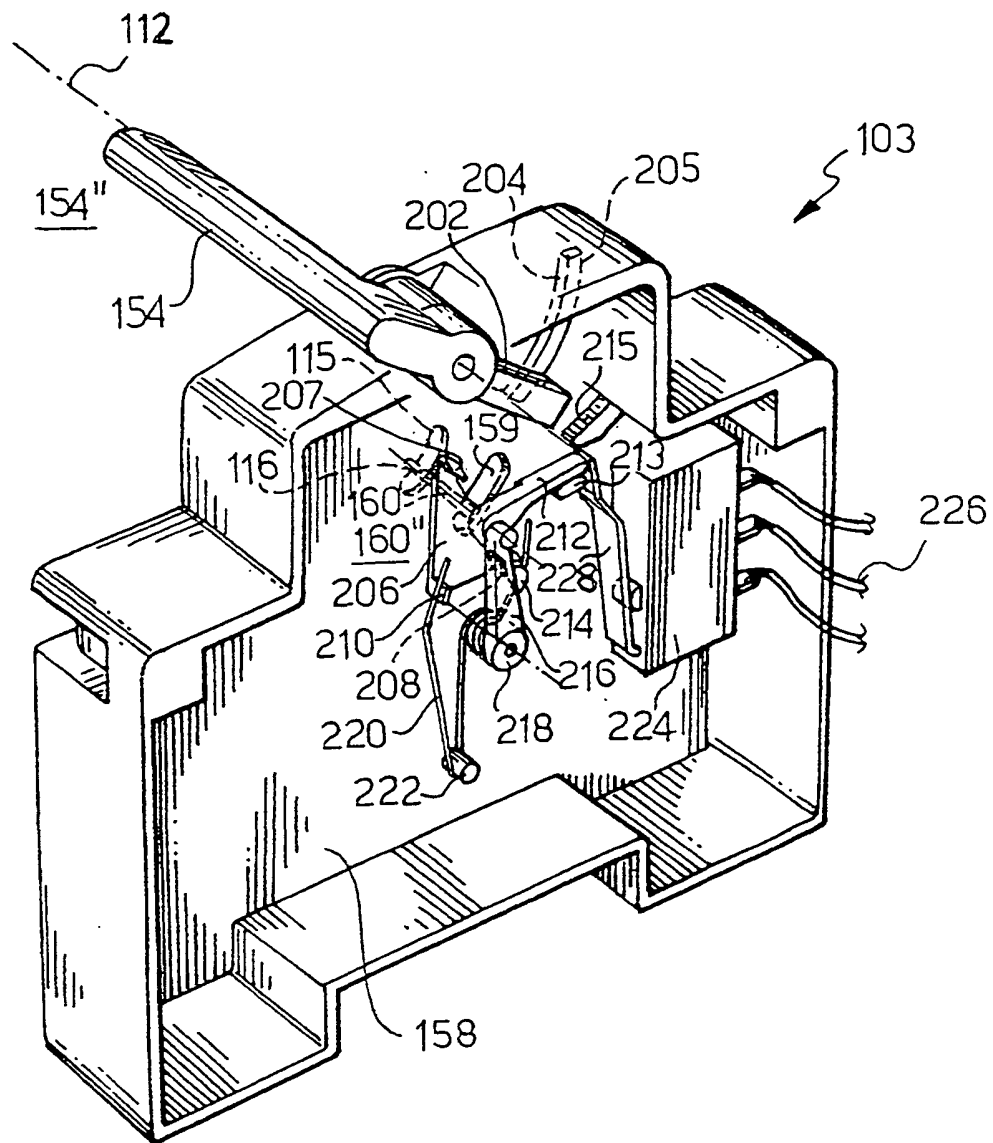


FIG. 2a

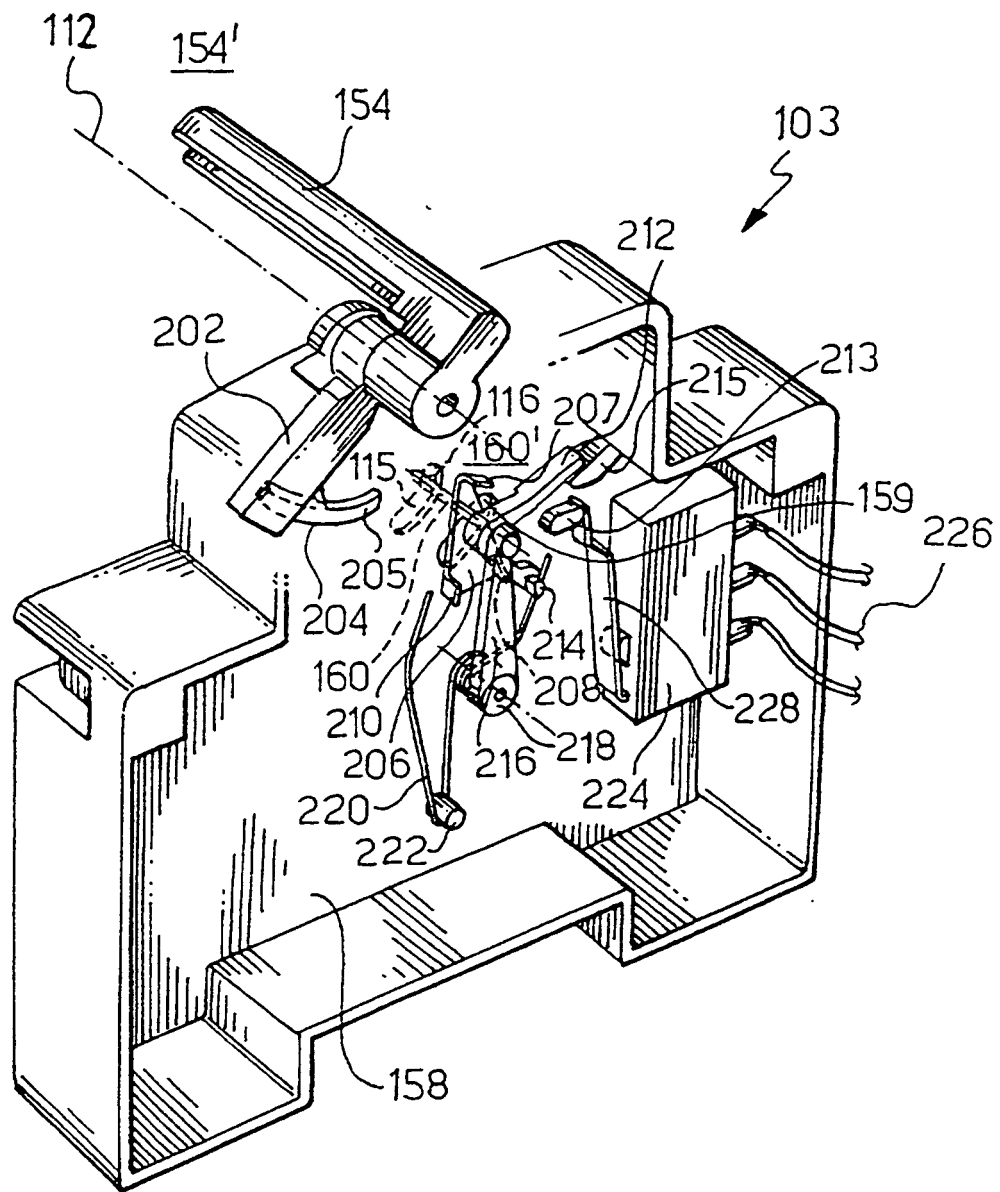


FIG.2b

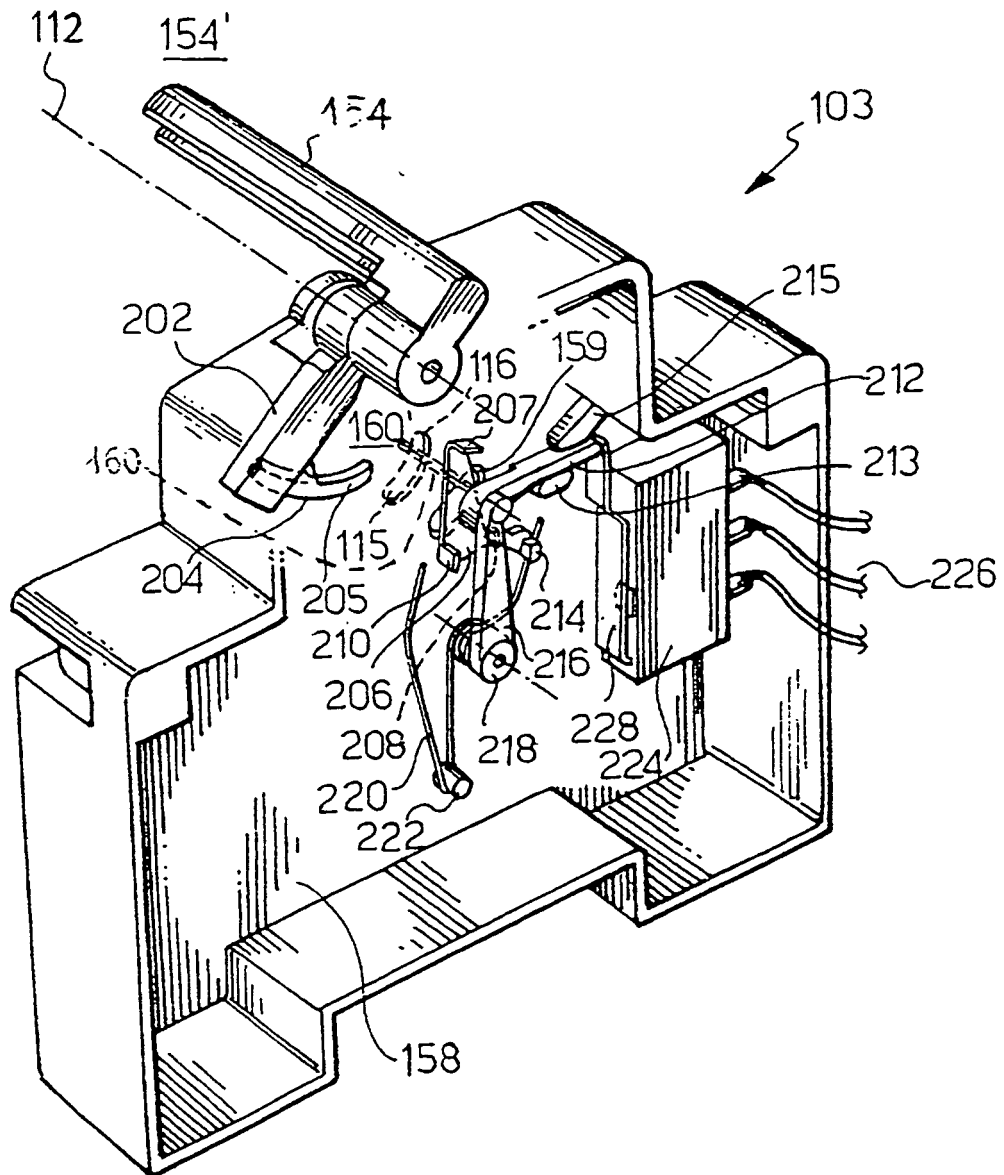


FIG. 2c