June 4, 1940. J. A. COY 2,203,131

CIRCUIT BREAKER MECHANISM

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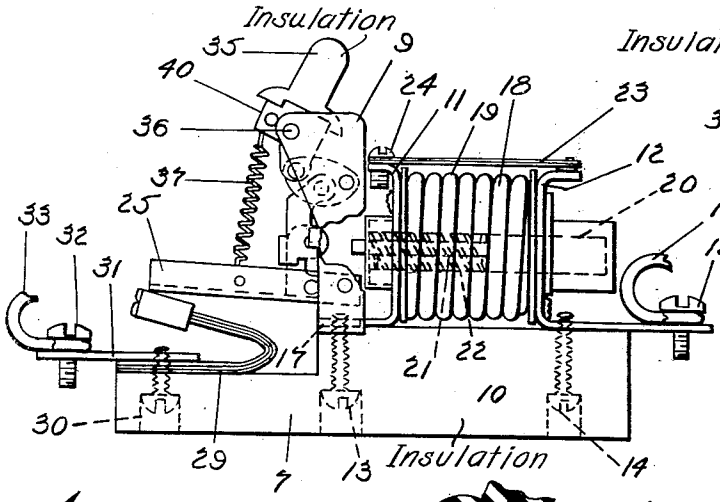


Fig 1

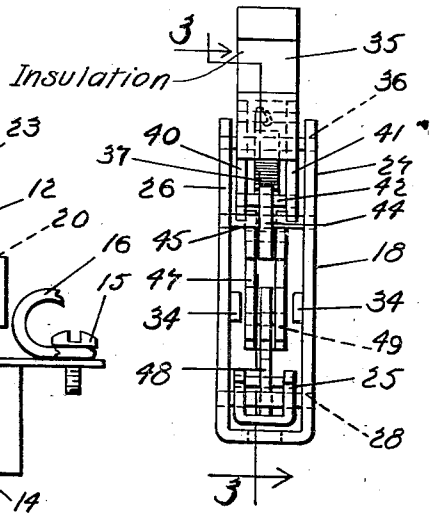


Fig 2

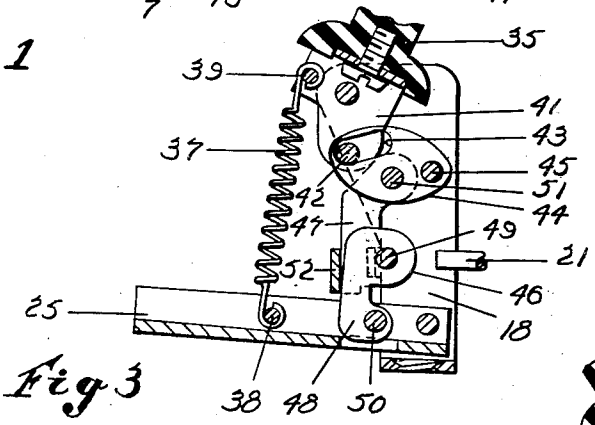


Fig 3

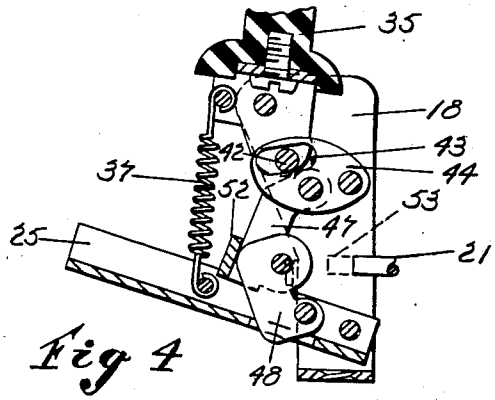


Fig 4

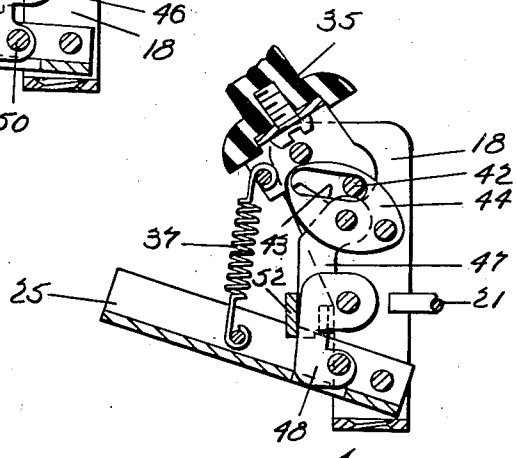


Fig 5

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CIRCUIT BREAKER MECHANISM

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7 Claims. (Cl. 200—89)

The present invention relates to circuit breakers and has specific reference to switch mechanism for circuit breakers adapted to protect electrical equipment used in residences or the like where light capacity circuits are used as the source of power for said equipment.

An object of the invention is to provide a novel and improved switch for circuit breakers which is greatly simplified in structure, may be manufactured at a low cost and which operates efficiently and effectively.

Another object of the invention is to provide a circuit breaker switch which has a single resilient means for actuating and resetting the various parts of said switch.

A further object of the invention is to provide a means for opening the breaker contacts upon the occurrence of an overload, said means also serving to reset the switch for manual closing of the breaker contacts.

Other objects will be apparent from the following specification and drawing, in which:

Fig. 1 is a side elevational view of my circuit breaker with the casing removed.

Fig. 2 is an end elevational view of the switch mechanism of the breaker shown in Fig. 1.

Fig. 3 is a cross-sectional view taken on line 3—3 of Fig. 2, the switch being shown in contact engaging position.

Fig. 4 is a cross-sectional view similar to that of Fig. 3 showing the switch in an intermediate position.

Fig. 5 is a cross-sectional view similar to that of Fig. 3 showing the switch in contact disengaged position.

My invention comprises a circuit breaker 7 having a means responsive to current conditions such as a solenoid 8 and the switch mechanism 9 mounted on a non-conductive base 10. The solenoid has two vertical metal plates 11 and 12 fastened to the base by means of screws 13 and 14, respectively, the lower end of plate 12 being flanged to form with screw 15 a contact for load wire 16 of the circuit to be protected. This wire is led to an electrical translating device while the other remaining circuit wire of said device is connected with the service circuit in the conventional manner. An extension 17 formed on the flange of the vertical plate 11 overlies the horizontal portion of a U-shaped support 18 of the switch mechanism, screw 13 serving to clamp the horizontal portion of the U-shaped support between the base and the extension 17.

The solenoid has a wire coil 19 supported on a conventional core between the vertical plates 11 and 12, said core being disposed centrally of said coil and having located therein a plunger 20 connected to a plunger rod 21 resiliently held in a retracted position within the core by means of a spring 22. The upper ends of the vertical supports may be provided with a compound or bi-metallic element 23, one end thereof being rigidly fastened by means of screw 24 to the plate 11, whilst the other end freely engages the plate 12. One end of the coil is adapted to electrically contact the plate 11 whilst the other end of the coil is connected to plate 12.

A movable contact 25, preferably U-shaped in cross-section is rotatably mounted between the side members 26 and 27 of the U-shaped support by means of a pin 28, the outer end thereof being adapted to engage or disengage a resilient stationary contact 29. The stationary contact is fastened to the base 10 by a screw 30, which is threaded to a plate 31, and in tightened condition clamps said resilient member between the base and said plate. The outer end of the plate is provided with a screw 32 for binding the end of line wire 33 to the plate 31. The electrical circuit passing through the breaker when the movable contact is in engagement with the stationary contact is as follows: The load wire 16, screw 15, vertical plate 12, coil 19, vertical plate 11, part of the current being shunted about the coil through bi-metallic element 23, extension 17, U-shaped support 18, pin 28, movable contact 25, stationary contact 29, plate 31, and line wire 33.

It will be understood from the foregoing that when a temporary overload occurs in the protected circuit, the bi-metallic element shunted across the coil terminals will be opened, thereby allowing the full current to pass through the solenoid to actuate the plunger against the spring 22. The rod 21 will then engage the switch mechanism as hereinafter set forth. Upon the occurrence of a dangerous overload, the solenoid will be actuated in the above manner without the assistance of the bi-metallic element.

The switch mechanism as shown in Fig. 2, is mounted as a unit between the side members 26 and 27 of the support 18. The movable contact 25 adapted for movement into and out of engagement with the stationary contact, has for its lower limit of motion said stationary contact, while its upper limit of motion is determined by two stops 34 formed on the side members of the support which engage said contact when it moves upwardly. A manually operated switch lever 35 is positioned adjacent the top of the support 18, and is rotatably mounted on pin 36 held in the

side members of the support. A tension spring 37 has its lower end in engagement with a pin 38 fastened to the movable contact 25, whilst its upper end is hooked about a pin 39 held between the two spaced extensions 40 and 41 forming the lower portion of the manually operated lever. The spring therefore tends to at all times urge the movable contact in a clockwise direction on its shaft 26, and to urge the manually operated lever 35 in a counter-clockwise direction toward the movable contact. The lower end of the lever is provided with a cross-pin 42 which is received in an elongated slot 43 formed in a link 44, the latter being freely mounted to a pin 45 supported at its ends on the side members 26 and 27 of the support 16.

A toggle element 46 comprising an upper member 47 and a lower member 48 fastened together by a joint pin 49 is connected to the movable contact by a cross-shaft 50 positioned between the pin 25 and the spring engaged pin 36. The upper member 47 is freely fastened to the link by means of a cross-pin 51. The upper member comprises two spaced portions joined together at their lower ends by means of a horizontal stop portion 52 which engages the lower member 48 when the toggle element is in operative position with the pins 51, 49, and 50 past their dead-center position.

From the foregoing it will be understood that the movable contact 25 and the manually operated switch lever 35 are rotated in counter-clockwise directions; that is, they are movable toward each other when the contact is moved to disengaged position and the lever to an "off" position or away from each other when the contact is moved to engaged position and the lever to an "on" position. Further, the spring 37 which connects the movable contact and the lever constantly biases them to contact disengaged position, the link and toggle arrangement serving to resist the action of the spring and retain the movable contact and lever in closed contact position. With the toggle members in operative position as indicated in Figs. 1, 2 and 3, the engagement and disengagement of the movable contact can be controlled through the manual lever 35, it being only necessary to rotate the lever counter-clockwise from its position in Fig. 3 to the position indicated in Fig. 5. During this action the pin 42 on the lever moves in the slot 43 formed in the link 44, from its position on the left side to the right side thereof, the spring 37 being collapsed and providing constant resilient tension for the toggle member to retain it in operative substantially longitudinal condition. To move the movable contact to engaged position, the manual lever is rotated clockwise from its position in Fig. 5 to the position of Fig. 3, a similar but opposite action being performed by the parts, from that described in opening the contacts.

In the event an overload condition occurs in the protected circuit, the solenoid is operated as previously described, to thus move the solenoid plunger rod 21 to a position indicated by dotted lines 53 (Fig. 4). In this relative position the plunger rod strikes the toggle member at its jointed portion thus collapsing it and permitting the spring 37 to rotate the movable contact and lever toward one another. This action disengages the contact to break the circuit, allowing the plunger rod 21 to instantly return to the position shown in Fig. 1, under action of the spring 22. The rotation of the lever acts to move the pin 42 toward the right-hand-side of the slot 43 in the link, and as these parts assume the positions indicated in Fig. 5, said pin rotates the link clockwise to straighten the collapsed toggle members and return them to operative longitudinal relationship beyond dead-center. The spring 37 is under tension in Fig. 5 so that the operative position of the toggle members cannot be disturbed either by jars or the like, or the sudden action of the various parts of the switch mechanism, other than by the plunger rod 21.

What is claimed is:

1. A circuit breaker comprising in combination; a stationary contact; a contact movable to engage and disengage the stationary contact; a manually reciprocated member having a portion thereof movable toward and away from the movable contact as said contact moves to its disengaged and engaged positions respectively; a spring for biasing the movable contact and the reciprocated element to disengaged contact position; a link associated with the reciprocated element; a toggle element pivoted to the link and the movable contact and normally held in operative position; and an element movable in response to overload conditions in the circuit for breaking the toggle when said element is actuated.

2. A circuit breaker comprising in combination; a stationary contact; a contact movable into or out of engagement with the stationary contact; a manually operated means movable toward and away from the movable contact as said contact moves out of or into engagement respectively; a spring for biasing the movable contact and the manually operated means toward one another; jointed means for operatively associating the manually operated means and the movable contact; and means responsive to current conditions in the circuit for actuating the jointed means.

3. A circuit breaker comprising in combination; a stationary contact; a contact movable to engage or disengage the stationary contact; a manually operated means movable to an "off" and "on" position corresponding to the disengaged and engaged positions respectively of the movable contact; a spring connected to the manually operated means and the movable contact for biasing them to contact disengaged positions; and jointed means associated with the movable contact and the manually operated means, and adapted, in operative position, to resist the action of the spring; an element responsive to current conditions in the circuit to throw the jointed means into inoperative position; and means associated with the spring for automatically returning the jointed means to operative position, after said jointed means has been made inoperative.

4. A circuit breaker comprising in combination; a stationary contact; a contact movable to engage and disengage the stationary contact; a manually operated means; a spring connected to the movable contact and the manually operated means; a jointed member associated with the manually operated means and the movable contact and adapted, in operative position, to resist the action of the spring; means responsive to current conditions in the circuit for throwing the jointed member into inoperative position; and means controlled by the spring for automatically returning the jointed member to operative position.

5. A circuit breaker comprising in combination; a stationary contact; a pivoted contact

adapted to engage and disengage the stationary contact; a manually operated switch lever; a spring connected to the lever and the movable contact at points removed from their axes; a rotatable link associated with the lever; a toggle element connected to the link and fastened to the pivoted contact intermediate its pivot point and the point where the spring engages said contact; and a means responsive to overload conditions in the circuit for actuating the toggle member.

6. A circuit breaker comprising in combination; a stationary contact; a pivoted contact adapted to engage and disengage the stationary contact; a manually operated switch lever; a pin on the lever; a spring connected to the lever and the movable contact; a rotatable link having a slot therein for receiving the pin; toggle members pivoted to the movable contact and to the link; a stop formed on one of the toggle members for holding said members in normal, operative position whereby the movable contact is controlled by the lever; means responsive to current conditions in the circuit for collapsing the toggle members to an inoperative position to move the movable contact to disengaged position; and means for automatically returning the toggle to operative position after it has been collapsed.

7. A circuit breaker comprising in combination; a stationary contact; a pivoted contact adapted to engage and disengage the stationary contact; a manually operated switch lever rotatable to and from predetermined "off" and "on" positions; a link and toggle mechanism connected to the link and the movable contact, and in operative position adapted to permit actuation of said contact by the lever; a spring connected to the lever and the movable contact and biasing said contact and lever to disengaged and "off" positions, respectively, against the action of the link and toggle mechanism; an element responsive to circuit conditions for throwing the toggle into an inoperative position; and means associated with the link and the spring for automatically placing the link and toggle in operative position.

JOSEPH A. COY.