

June 7, 1949.

F. SHORT
CIRCUIT BREAKER

2,472,233

Filed Nov. 17, 1943

3 Sheets-Sheet 1

Fig. 2.

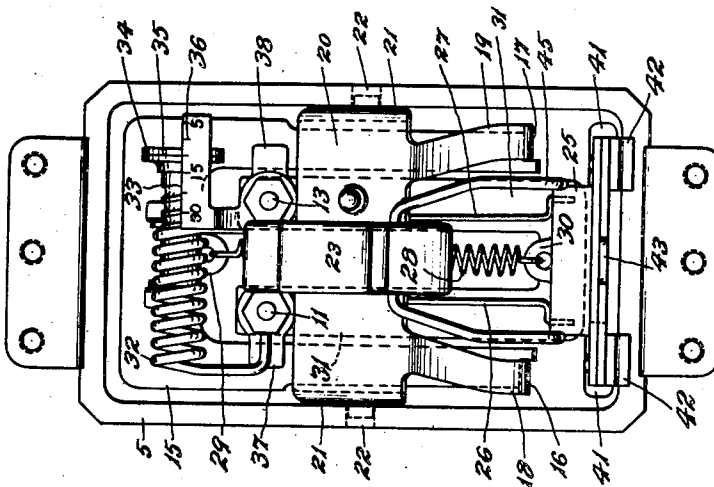
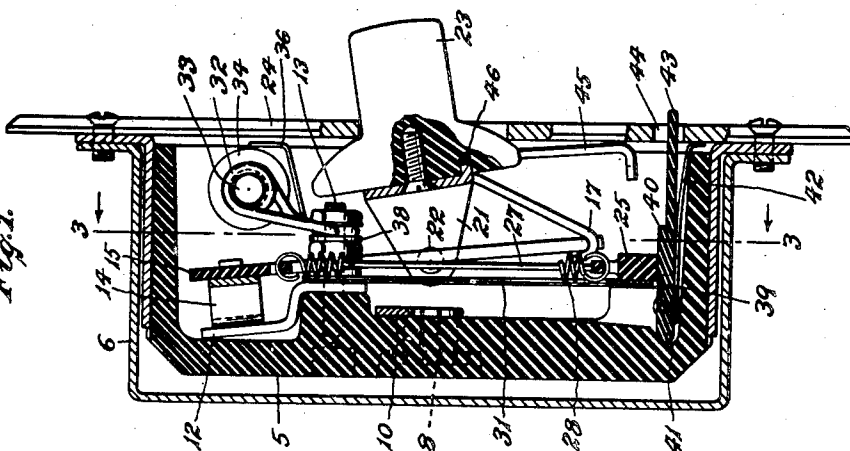


Fig. 1.



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Fig. 5.

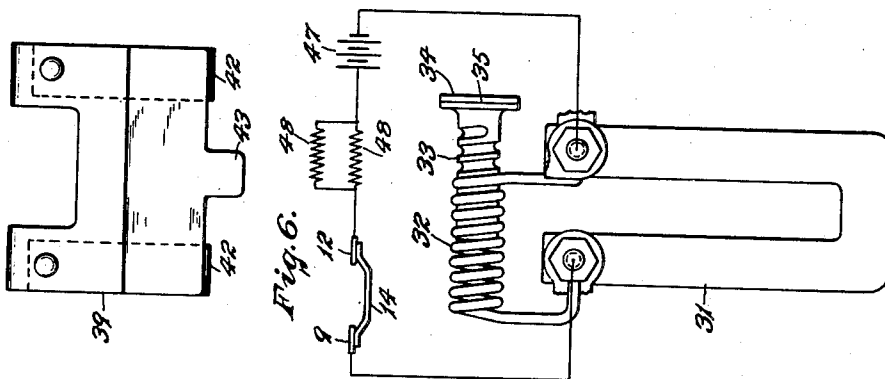


Fig. 4.

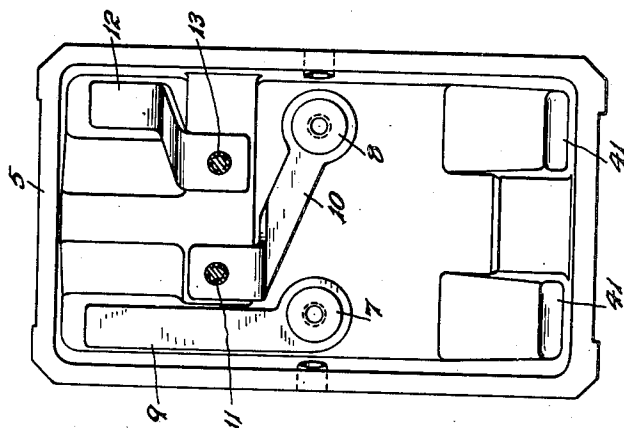
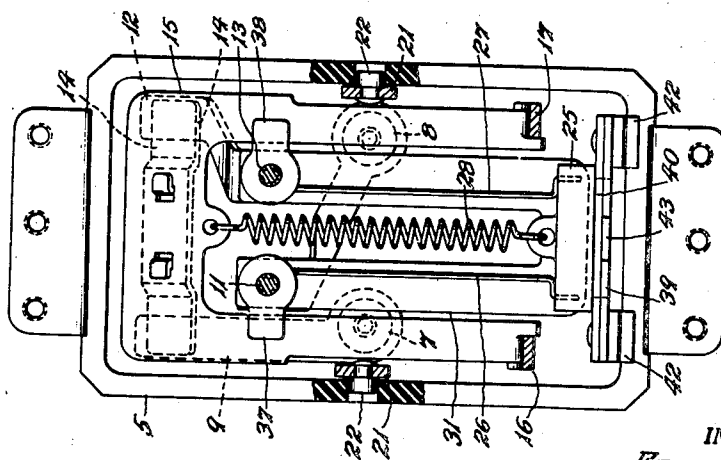


Fig. 3.



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Fig. 9.

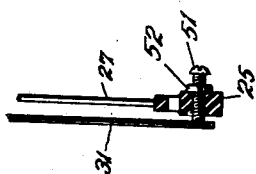


Fig. 8.

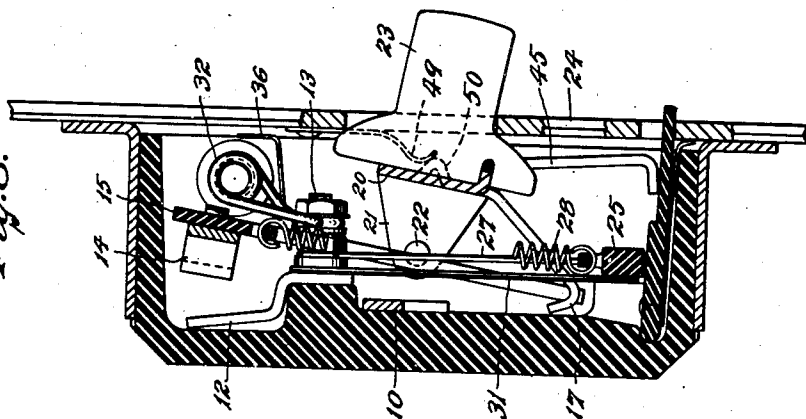
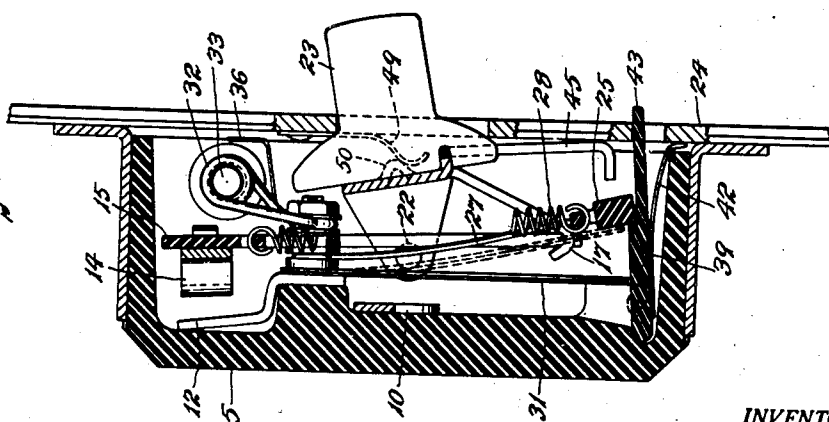


Fig. 7.



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UNITED STATES PATENT OFFICE

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CIRCUIT BREAKER

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Application November 17, 1943, Serial No. 510,635

3 Claims. (Cl. 200-122)

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This invention relates to circuit breakers and more particularly to devices intended for automatically breaking an electric circuit when subjected to an overload.

An object of this invention is to provide a circuit breaker having a current responsive element which is in series with an electric circuit controlled thereby.

A further object is to provide a circuit breaker wherein said element is selectively adjustable to automatically operate the circuit breaker in response to resistance of different amperages in the circuit.

A still further object of the invention is to provide such a circuit breaker having a current responsive element which is adapted to be connected in series with an electric circuit controlled by said breaker and which is selectively adjustable to provide different resistances in the circuit for operating the breaker when under loads of different amperages.

A further object of the invention is to provide an automatic circuit breaker having thermal responsive means acting as a conductor in the electric circuit and operable to actuate said breaker when subjected to pre-determined current loads.

A still further object is to provide such a circuit breaker which can be installed in conventional types of wall switch boxes.

Further objects of the invention will be more clearly understood from the following description and from the accompanying drawings in which—

Fig. 1 is a side view in central vertical section of a circuit breaker embodying my invention.

Fig. 2 is a front plan view of the same removed from the wall box.

Fig. 3 is a front view in vertical section on line 3-3 of Fig. 1 with the latch member and parts of the casing being shown in elevation.

Fig. 4 is a front view in elevation of the casing with some of the current conducting parts mounted therein.

Fig. 5 is an elevational plan view of the latch member.

Fig. 6 is a front view in elevation of the operating member and adjusting means as connected in an electrical circuit; the said circuit being indicated diagrammatically.

Fig. 7 is a view similar to Fig. 1 but showing

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the position of the switch when automatically moved to open position by the current responsive operating member as indicated in dotted lines.

Fig. 8 is a similar view showing the switch when moved to open position by the operation of the manually operable member.

Fig. 9 is a fragmental view, in central vertical section, showing a modified form of adjusting means.

As shown in the drawings, my improved circuit breaker comprises a casing 5 of insulating material which may be mounted in any suitable manner within a conventional wall switch box such as indicated at 6. The said casing has mounted therein terminals 7 and 8 which extend through the rear wall of the casing and have threaded openings therein to receive binder screws for connecting thereto the ends of conductor wires of an electrical circuit. The terminal 7 is electrically connected with a contact member 9 and the terminal 8 is similarly connected to a conductor bar 10 which extends to a post 11. Another contact member 12 extends to a post 13.

A switch mechanism is provided which consists of a switch bar 14 that is adapted to bridge across and contact the contact members 9 and 12. The said switch bar is carried on an inverted U-shaped rocker bar 15 of insulating material and which is pivotally supported with its bottom extensions mounted in hook-shaped portions 16 and 17 in the spaced arms 18 and 19 of a cradle 20 having side extensions 21-21 with trunnions by which the said cradle is journaled in the casing 5 at the pivotal points indicated at 22-22.

The said cradle is provided with an operating handle 23 which extends through a cover plate 24.

A spring anchoring bar 25 of insulating material is carried at the ends of resilient supporting members 26 and 27 which are preferably made of spring wire and anchored respectively on the posts 11 and 13. A switch operating spring 28 is secured at one end thereof to a loop portion 29 on the carrier 15 and at the other end to a loop 30 on the said anchoring bar 25.

A bi-metallic U-shaped operating member 31 is mounted on the posts 11 and 13 and is disposed in back of the switch anchoring bar 25 for the purpose to be hereinafter described. Also mounted on said posts, and electrically connected

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in parallel with said bi-metallic operating member, I provide a resistance in the form of a helical coil 32 having an adjusting screw 33 which is threaded thereto and has a disk-shaped head portion 34 whereby it may be rotated. The rim of said portion 34 may be provided with an indicating line 35 which cooperates, as will be hereinafter described, with indicia on a scale 36 that is carried on the post 13. Stop members 37 and 38 may also be mounted on said posts 11 and 13 for limiting the movement of the carrier 15.

A latch member 39, preferably also of insulating material and having a detent 40, is pivoted within recesses 41—41 in the casing 5. Spaced spring members 42—42 are secured to the said latch member, underlie the same and engage the front plate 24 to retain the latch within said recesses and urge it towards its operating position with relation to the anchor bar 25.

The said latch member 39 is provided with an extension 43 which projects through an opening 44 in the front plate 24 to serve as an indicator, and it may also be used as a re-setting handle as will be hereinafter described.

A latch operating member 45 is pivotally mounted at 46 to the handle 23 and provides fingers which swing freely from said handle for operating the latch 39 as will be also hereinafter described.

When the above described circuit breaker is connected to an electrical circuit, the bi-metallic operating member 31, together with the resistance 32, are connected in series in said circuit and, as illustrated in Fig. 6 of the drawings, the said circuit includes the switch 14, the contact members 9 and 12, a source of energy 47 and resistances 48—48 which represent different appliances that may be connected to said circuit.

The operation of my improved circuit breaker will now be described.

When the circuit breaker is in its closed position, as illustrated in Fig. 1, the electric current may flow from the terminal 7 to the contact 9, through the switch bar 14 to the contact 12 and to the post 13, through the U-shaped bi-metallic member 31 and the resistance coil 32 to the post 11, and through the conductor 10 to the binding post 8. The said bi-metallic member 31 and resistance 32 are connected in parallel and constructed to carry current up to a certain predetermined amount of amperage through the circuit. Therefore, should an overload above such amperage occur in the circuit, the resistance in the said bi-metallic member 31 will cause it to heat and warp in the direction of the spring anchoring bar 25, as indicated in dotted lines in Fig. 7, and force the said anchoring bar outwardly until the anchoring point of the spring 28 has been moved past the pivotal point of the switch carrier 15 in the hook portions 17. At this time, the said carrier will be rocked on its pivots and moved to the position shown in Fig. 7 wherein the switch bar 14 is spaced from the contacts 9 and 12 and thereby breaking the electrical circuit. As the switch mechanism is moved to the open position by the above operation, the bar 25 will move past the detent 40 and the latch 39 will be forced upwardly, by the springs 42—42, moving said detent in the path of the return movement of said bar. After the circuit has been broken, the bi-metallic member 31 will cool and return to its normal position, leaving the said anchoring bar 25 in engagement with the detent 40 against the tension of the spring members 26—27. It will be noted that the extension 43 on the latch 39

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is now in its up position. This will indicate, from the exterior of the plate 24, that the switch is open and that the circuit has been broken due to the occurrence of an overload.

The above described circuit breaker may be re-set by simply moving the handle 23 downwardly to the position illustrated in Fig. 8. The downward movement of the handle 23 will cause the fingers 45 to move the latch 39 downwardly and disengage the detent 40 from the bar 25; thus allowing the said bar to be returned, by the spring members 26—27, to its re-set position which is also the normal "off" position of the circuit breaker.

After the circuit breaker has been re-set, the switch mechanism may be moved to its closed or "on" position by moving the handle 23 to the position shown in Fig. 1. This will carry the hook portions 17—17 to the position wherein the pivotal points of the carrier 15 are at the opposite side of the axis or center of the spring 28 and thus causing the said spring to urge the carrier into switch closing position.

It will be noted that, while the anchoring bar 25 is in its normal position, the circuit breaker may be operated to the "on" or "off" positions in the same manner as any ordinary switch. However, when the said anchor bar has been forced to the position illustrated in Fig. 7 by an overload in the circuit, the switch cannot be closed until the lever 23 is first moved downwardly to the re-set position and then upwardly to the position shown in Fig. 1.

My improved circuit breaker may also be re-set by simply forcing the extension 43 downwardly since this will disengage the bar 25 from the detent 40, cause the said bar to move to its normal position and carry the axis of the spring 28 past the pivotal point of the carrier 15. This, however, will also cause the said spring 28 to swing the said carrier and move the switch bar 14 to the circuit closing or "on" position.

It will be noted that the switch mechanism of my improved circuit breaker cannot be moved to its circuit closing position until the circuit breaker has first been "re-set" by the downward movement of either the lever 23 or the extension 43. This will assure an indication that the circuit has been broken through the automatic operation of the circuit breaker on account of an overload in the circuit. Indication, of the automatic operation of the circuit breaker due to an overload, is also provided, while the circuit is "dead," when the operating handle 23 is in its "on" position and also when the extension 43 is in its raised position, as illustrated in Fig. 7.

Adjustability of the above described circuit breaker is obtained by means of the resistance coil 32 and the screw 33 which may be turned in said coil until the indicating line 35 thereon is in register with the figure on the scale 36 that corresponds to the amperage at which it is desired to have the circuit breaker operate for automatically breaking the electric circuit.

Assuming that the resistance of the bi-metallic member 31 is such that it takes a current flow of three amperes before it will heat to a temperature which will cause it to operate the bar 25, it will be readily understood that, when the screw 33 is positioned in the coil 32 so that the indicating line 35 registers with "5" on the scale 36, the effective length of the said coil will be such that it will have a current carrying capacity of two amperes; thus a total of five amperes flowing through the circuit will cause the bi-metallic bar

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31 to flex and operate to break the circuit as above described and illustrated in Fig. 7. When the screw 33 is set so that the line 35 is in register with the figure "30" on the scale 36, the coil 33 will have a lesser effective length which will decrease its resistance to the current so that it will have a current carrying capacity of twenty-seven amperes and thereby raise to thirty amperes the amount of current required in the circuit in order to heat the member 31 sufficiently to cause it to operate. It is pointed out that since the coil 32 and the member 31 are connected in parallel, the amount of current flowing through the bi-metallic member 31 is in direct proportion to the resistance in the coil 32, which is controlled by the effective length thereof. Therefore, any change in the resistance of the coil 32 will also proportionately change the amount of current flowing through the member 31 and thereby render the said member operable under overloads of different intensities.

It will be understood, from the foregoing description, that I have provided simple and highly effective means whereby a circuit breaker, such as above described, may be selectively adjusted to operate under overloads of different pre-determined intensities. This is of particular advantage since it provides for accurate and speedy calibration during the production of circuit breakers.

As shown in Figs. 7 and 8, means are provided for retaining the cradle 21 in the "on" and "off" positions. Such means may comprise a spring 49 which is suitably mounted, such as on the cover 24, and is adapted to engage a boss 50 on the said cradle with an over-center action and exert a tension on said boss urging the cradle 21 to the opposite limits of its movement.

My invention may also include adjusting means, such as shown in Fig. 9, wherein an adjusting screw 51, having a lock nut 52, is threaded to the bar 25 and engages the bi-metallic member 31; thus providing a calibrating adjustment which, if desired, may be used in conjunction with or in lieu of the resistance adjustment which includes the coil 32.

My improved circuit breaker is highly desirable as a protection for the regular fuses in an electric circuit since it can be installed in the circuit with said fuses and, by adjusting the circuit breaker so that it will automatically operate at just below the amperage of the regular fuses, an overload in the circuit will cause it to be broken before the said fuses are blown and thus provide an opportunity to repair the defect or remove the overload from the circuit before damage has been caused to the regular fuses.

I claim:

1. A circuit breaker including a casing, electric contact members mounted in said casing, a switch bar cooperating with said contact members, a carrier for said bar, a carriage pivotally supporting said carrier, a spring member connected at one end of said carrier and at the opposite end to an anchoring member movable to carry the axis of said spring across the pivotal axis of said carrier, a current carrying member responsive to an overload in said circuit for operating said anchoring means to cause said spring member to move said switch mechanism to open circuit position, a latch member having a detent for engaging said an-

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choring means to retain said switch mechanism in open position, means for manually operating said carriage to move the pivotal point of said carrier to the opposite side of said spring member, means operable with said carriage for moving said latch to release said anchoring means, and means urging said anchoring means toward their normal position.

2. An electric circuit breaker including a casing, contact members mounted in said casing, a switch bar cooperating with said contact members, a carrier for said switch bar pivotally supported at one end thereof within a movable seat, a spring member secured to said carrier, anchoring means for said spring member, manually operable means for moving said seat to cause movement of said carrier by said spring into circuit closing or breaking position, current carrying means in series with said switch and responsive to overloads in said circuit for moving said anchoring means to cause operation of said switch to open circuit position, a detent for retaining said anchoring means against movement to normal position, and means on said manually operable member for causing said detent to release said anchoring means and thereby re-set said switch.

3. An electric circuit breaker of the character described comprising a casing having a front plate a switch mechanism mounted in said casing, said mechanism including a switch bar, a carrier for said bar, a spring for operating said carrier, anchoring means for said spring, means for pivotally supporting said carrier by one end thereof and adapted to move the pivoted end across the axis of said spring to cause operation of said carrier into circuit closing and opening positions, said anchoring means being movable from a normal position at one side of the pivotal point of said carrier to a position at the opposite side thereof, a detent for preventing return of said anchoring means to said normal position, and an extension on said detent projecting through said front plate for indicating the condition of said breaker and operable to release said anchoring means and permit return thereof to normal position.

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