

J. W. SEAMAN

THERMAL AND MANUAL SNAP-ACTION CIRCUIT BREAKER

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Fig. 1 is a cross-sectional view of a mechanical assembly. It features a central shaft (10) with a pin (38) passing through it. On the right, there is a housing (17) with a plug (18) and a seal (20). Various other components are labeled with numbers: 14, 22, 25, 24, 26, 23, 28, 32, 14, 23, 20, 17, and 44.

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Inventor:
Joseph W. Seaman,
by *Ernest H. Britton*
His Attorney.

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THERMAL AND MANUAL SNAP-ACTION
CIRCUIT BREAKERJoseph W. Seaman, Kennett Square, Pa., assignor
to General Electric Company, a corporation of
New York

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The invention relates to circuit breakers and the principal object is to provide a simplified form of small and inexpensive thermal-trip and manual snap-action on-off type of circuit breaker capable of affording both overload protection and manual control of a circuit.

A further object is to enable the various circuit breaker parts to perform multiple electrical and structural functions and thereby minimize the number of parts required, which is of paramount importance from the cost standpoint.

Another object is to obtain an improved manual snap-action by means of a reversely bowing bimetal strip that also serves as the switch contact pressure spring as well as the automatic thermal overload time-delay trip element.

Other objects are to provide a simplified calibrating means for adjustably mounting the reversely bowing bimetal strip to vary the operating current thereof together with a specially coordinated mounting frame structure that also serves for electrically connecting the strip in the circuit to be controlled automatically and manually by the circuit breaker.

Further objects and advantages of the invention will appear in the following description of the accompanying drawings in which Fig. 1 is a sectional view of the simplified thermal trip and manual snap-action circuit breaker embodying the improvements of the present invention with the parts shown in the circuit-closing position; Fig. 2 is a similar view with the circuit breaker parts shown in the circuit-opening position; and Fig. 3 is a top view of the simplified switch mechanism parts.

As shown in Fig. 1, the simplified circuit breaker is provided with a perforate overhanging multiple function frame 10 of conducting metal adapted to be punched out of sheet stock in tridentate form and bent into channel shape to provide parallel cantilever arms 17 as indicated in Fig. 3 with the central part of the frame 10 punched out so as to form an opening or window 11 through the web of the channel and preferably extending into each channel side as shown. In this way, a pair of forked channel mounting feet 12 and 13 are provided so that the frame 10 may be secured upright by means of the holding screws 14 on the mounting base 15 that is formed of molded insulating material as indicated with suitable holes 16 for recessing the heads of the holding screws 14. The parallel sides of the overhanging channel frame 10 extend to form a pair of cantilever arms 17 for mounting the angular support extension 18 of the molded

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insulating manual operating handle 19 on the pivot pin 20 between the arms 17 as shown more clearly in Fig. 3.

A bimetal snap-action operating strip 22 is secured at one end to the insulating handle pivoted angular support 18 by means of the rivets 23 that also serve to electrically connect one end of the flexible conductors 24 to the one end of the bimetal strip 22. The other end of the flexible conductor 24 is provided with a suitable terminal 25 that is electrically connected to one side of the channel frame 10 by the rivets 26. The web of the channel frame 10 extends from the mounting channel foot 13 so as to form an integral connection terminal 28 projecting beyond the base 15 as shown and provided with a suitable screw 29 to enable the conducting frame 10 of the circuit breaker to be connected to one side of the circuit that is to be controlled by the circuit breaker. In this way, the circuit extends through the frame 10 and the flexible conductor 24 to the one end of the bimetal operating element 22.

The bimetal strip 22 has the element of least expansion located on the lower or outside of the bow as shown in Fig. 1 and the other end of the bimetal 22 extends centrally through the opening or window 11 provided by punching out the central part of the web of the channel frame 10 so as to be mounted in the notched pivotal support 32 that is provided with a threaded shank 33 for adjustably mounting the pivotal support 32 at an acute angle on the base 15. For this purpose, the insulating base is angularly recessed on its opposite sides so as to form an adjusting screw mounting web 34 that is substantially normal to the straight line extending at an acute angle to base 15 between the notch in support 32 and the pivot pin 20. This enables the notched adjustable pivot support 32 for one end of the bimetal strip 22 to be adjustably spaced from the axis 20 of the pivotal support 18 fixed to the other end of the bimetal strip 22 so as to bow the strip on one side of the straight line when the manual operating handle 19 is moved to its left-hand inclined position as shown in Fig. 1 to effect reverse bowing of the strip 22 when it becomes sufficiently heated.

A resilient switch arm 36, together with a suitable reinforcing spring 37, is mechanically secured and electrically connected by means of the rivets 38 to the end of the bimetal strip 22 that is pivotally supported in the notched pivotal support 32. The switch arm 36 diverges from the strip 22 and carries adjacent its free end a switch

contact 39 for engaging with the cooperating switch contact 40 carried adjacent the angularly-bent end 41 of the stationary switch member 42 that is secured to the base 15 by means of the holding screw 43 recessed into hole 16. Thus the diverging switch arm 36 cooperates with the angularly bent conductor end 41 that extends in opposing spaced relation with the bimetal strip 22 to form a magnetic blow-open current loop for exerting substantial force to accelerate the reverse bowing of the bimetal strip 22 under heavy current conditions. The opposite end 44 of the stationary switch member 42 projects beyond the base 15 and is provided with a connector screw 45 to form a terminal for the other side of the circuit that is to be controlled by the circuit breaker.

A removable cover 46 formed of molded insulating material as indicated is provided with a slotted opening 47 for receiving the insulated manual operating handle 19 so that all conducting and operating parts of the improved thermal and manual snap-action switch mechanism may be entirely enclosed except for the circuit terminals 28 and 44.

With the relatively few operating parts of the switch in their position shown in Fig. 1, the circuit is closed from the terminals 44 through the stationary switch member 42, contacts 40 and 39, resilient switch arm 36, rivet 38, bimetal element 22, rivet 23, flexible conductor 24, terminal 25, rivets 26, and the side of channel member 10 to the terminal extension 28. Whenever the current through this circuit exceeds a value predetermined by the adjustment of the notched pivotal support 32, the bowed bimetal strip 22 as shown in Fig. 1 will become heated and cause strains to be set up of sufficient strength to force the bimetal strip 22 to bow in the reverse direction with a snap action and thereby move the switch arm 36 to disengage contact 39 from the contact 40 and open the circuit as shown in Fig. 2. At the same time, the handle 19 is moved in the cover slot 47 to its righthand upright position so as to indicate that the circuit is open. After the bimetal strip 22 has cooled sufficiently to release the strains set up by heating, the handle 19 may be again operated to its lefthand position thereby rotating the pivoted angular support 18 so as to force the bimetal strip 22 to bow into the position in which it is shown in Fig. 1 and at the same time carry the switch arm 36 to reengage contact 39 with contact 40 and thereby reclose the circuit. The circuit may be opened manually at any time irrespective of heating of the bimetal strip 22 by moving the handle 19 from its lefthand position as shown in Fig. 1 to its righthand position as shown in Fig. 2.

Thus, it will be seen that the improvements of the present invention result in a simplified circuit breaker mechanism with relatively few and inexpensive parts that can be readily assembled to afford both overload protection and manual control of the circuit. Furthermore, by simply changing the position of the notched end support 32, the overload current value at which the circuit breaker will trip can be adjusted as desired.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A circuit breaker having in combination, a bimetal strip provided with insulated end supports spaced for bowing the strip into one position on one side of the straight line between the supports to effect snap-action reverse bowing to

the opposite position when the strip is heated, operating means engaging one end of the strip for reversely bowing the strip between said positions, switching means including a conducting switch arm electrically and mechanically connected to the other end of the strip to diverge therefrom on the one side of the straight line between the supports for operation to the circuit-closing position upon bowing of the strip to said one position, and means including a flexible conductor connected with said one end of the strip to complete an electric heating circuit through the strip when said switch arm is in the circuit-closing position.

2. A circuit breaker having in combination, a bimetal strip provided with insulated pivotal end supports spaced for bowing the strip into one position on one side of the straight line between the supports to effect snap-action reverse bowing to the opposite position when the strip is heated, operating means including the pivotal support at one end of the strip for reversely bowing the strip between said positions, switching means including a conducting switch arm electrically and mechanically connected to and diverging from the other end of the strip to be operated to the circuit-closing position upon bowing of the strip to said one position, means including a flexible conductor connected with said one end of the strip to complete an electric heating circuit through the strip when said arm is in the circuit-closing position, and means for adjusting the pivotal support at the other end of the strip to vary the heating current required to effect snap action reverse bowing of the strip.

3. A circuit breaker having in combination, a bimetal strip having a pivoted operating member secured to one end thereof and a notched support for the other end thereof spaced from the pivoted member to bow the strip on one side of the straight line therebetween for snap-action movement to reversely bow the strip on the other side of the line when the strip is heated, a circuit conductor extending in opposing spaced relation with the one side of the strip and having a stationary switch contact carried thereby, a resilient conducting member secured to the other end of the reversely bowing bimetal strip to diverge from the one side thereof and having a movable switch contact carried thereby into engagement with the stationary switch contact for cooperating with the stationary conductor to form a magnetic blow-open current loop to accelerate the reverse bowing of the strip, and a circuit conductor electrically connected with the one end of the strip to complete an electric heating circuit there-through upon pivotal movement of the operating member to bow the strip to said one side of the line to engage said contacts.

4. A circuit breaker having in combination an electrically heated snap-action reverse bowing bimetal strip having a pivoted manual operating and insulating member secured to one end thereof, a conducting frame for pivotally mounting said operating member and provided with a circuit terminal, an adjustable insulated support for the other end of the strip to vary the heating current required to effect bowing of the strip, switching means electrically connected to the other end of the strip and mechanically connected to be operated upon bowing of the strip, and current-conducting means including a flexible conductor interconnecting said frame with said one end of the strip to complete an electric heating circuit therethrough.

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5. A circuit breaker having in combination an insulating base, a perforated cantilever frame mounted on the base, a stationary switch member mounted on the base, an electrically heated snap-action reversed bowing bimetal strip having a manual operating and insulating handle secured to one end thereof and pivotally mounted on the cantilever end of the frame to extend the strip through a perforation in the frame, a flexible conductor electrically interconnecting the one end of the strip with the frame, a support for the other end of the strip adjustably mounted on the base, and a conducting switch arm connected to the other end of the strip to be operated into circuit closing engagement with the stationary switch member upon bowing of the strip into one position for completing an electric heating circuit through the strip to effect reverse bowing of the strip.

6. A circuit breaker having in combination an insulating base, a cantilever channel frame having the web thereof mounted on the base and provided with an integral circuit terminal and an opening through the web of the channel, an electrically heated snap-action reverse bowing bimetal strip having a manual operating and insulating handle secured to one end thereof and pivotally mounted between the sides of the chan-

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nel at the cantilever end of the frame to extend the strip through the opening in the web of the channel, a support for the other end of the strip adjustably mounted on the base to vary the heating current required to effect bowing of the strip, a stationary switch member mounted on the base and provided with a circuit terminal, a conducting switch arm connected to the other end of the strip to be operated into circuit closing engagement with the stationary switch member upon bowing of the strip by said operating handle, and a flexible conductor for interconnecting the other end of the strip to the frame to complete an electric heating circuit for reversely bowing the strip.

JOSEPH W. SEAMAN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,694,569	Walsh -----	Dec. 11, 1928
1,809,305	Matthews -----	June 9, 1931
2,395,698	Tiffany -----	Feb. 26, 1946
2,399,406	Toth -----	Apr. 30, 1946
2,462,244	Wise -----	Feb. 22, 1949