

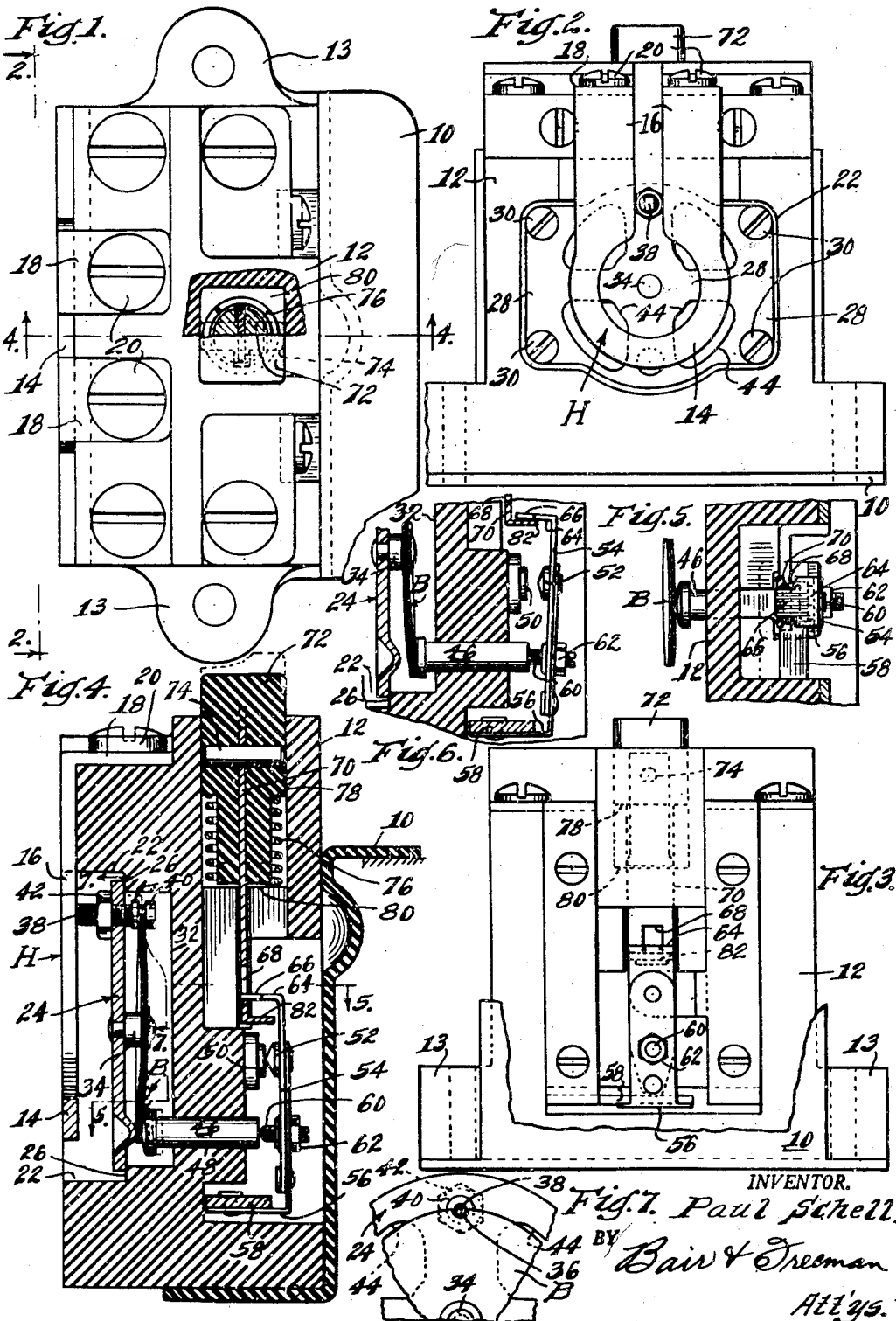
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2,456,153

THERMAL CUTOUT

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INVENTOR.

Fig. 7. Paul Schell.

BY Bain & Freeman

Att'ys.

UNITED STATES PATENT OFFICE

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THERMAL CUTOUT

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7 Claims. (Cl. 200—122)

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My present invention relates to a thermal cutout for protecting motor circuits and the like against overload current conditions.

One object of the invention is to provide a cutout that utilizes a snap-disc type of bimetal element as the actuating means for the cutout, the disc being responsive to heat from a heating element through which the current for the motor or other device being protected flows.

Another object is to provide normally engaged cutout contacts which are opened by snapping of the disc from cold position to hot position and which are then latched in the open position.

Still another object is to provide manual reset means for relatching the contacts in their closed position after the trouble has been remedied, whereupon the cutout is again operative to permit current flow and protect the circuit in the event of an overload.

A further object is to provide the foregoing described parts compactly mounted in a block of insulating material provided with contacts for the various circuit connections, the device being adaptable for mounting particularly on a line starter of the kind shown in my co-pending application, Serial No. 695,336, filed September 6, 1946.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in the accompanying drawings, wherein:

Fig. 1 is a plan view of a thermal cutout embodying my present invention.

Fig. 2 is a front elevation thereof looking at the left end of Fig. 1.

Fig. 3 is a rear elevation thereof with a portion of an insulating cover omitted.

Fig. 4 is a vertical sectional view on the line 4—4 of Fig. 1.

Fig. 5 is a detail sectional view on the line 5—5 of Fig. 4.

Fig. 6 is a sectional view similar to a portion of the lower part of Fig. 4 showing the cutout in tripped position, and

Fig. 7 is a vertical sectional view on the line 7—7 of Fig. 4 showing the manner of anchoring an edge of a thermostat disc.

On the accompanying drawing, I have used the reference numeral 10 to indicate an insulating cover in the form of a Z-shaped plate and 12 a cutout body of insulating material having perforated ears 13 for mounting. The drawing is

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somewhat enlarged in relation to the full size cutout in order to show the parts more clearly, although of course the cutout can be made in various sizes.

A heating element H of strip type is mounted on the front of the block 12 and is in the form of a semi-circular portion 14 having upstanding arms 16 bent to provide mounting flanges 18. Terminal screws 20 are mounted in the flanges 18 with which circuit connections may be made.

In a recess 22 in the front of the body 12, I mount a plate 24 against a shoulder 26. The plate 24 is circular with two side flanges 28 as shown in Figure 2, and each side flange is mounted in the recess 22 by means of screws 30.

Inward of the shoulder 26 is a second and smaller recess 32 in which a bimetal element B is mounted, the element B being in the form of a disc having its center loosely riveted to a stud 34 which in turn is rigidly riveted to the plate 24. The upper edge of the disc B is notched as at 36 (see Fig. 7) to engage a stud 38 between flanges 40 of the stud. The stud is rigidly secured in the plate 24 by being threaded therein for adjustment, a lock nut 42 being provided to retain the adjustment.

Heat is adapted to be radiated from the heater H to the bimetal disc B through openings 44 in the plate 24. The bimetal element is adapted to slide a pin 46 through an opening 48 of the body member 12 from the position of Figure 4 to the position of Figure 6 when the bimetal element responds to a predetermined degree of heat and snaps from the concave position of Figure 4 to a reversed concave position as in Figure 6.

Thermal cutout contacts are provided at 50 and 52, the contact 50 being stationary and the contact 52 movable by being mounted on an arm 54 pivoted by means of a leaf spring 56 connected to it and to a stationary cross bar 58 imbedded in the body 12. The arm 54 carries a set screw 60 for adjustment purposes and for being engaged by the pin 46 to separate the contacts, a lock nut 62 being provided for retaining the adjustment.

The upper end of the arm 54 is bent at right angles as indicated at 64 and provided with a reduced portion 66 that normally enters an opening 68 of a vertical plate 70. The plate 70 is vertically slidable and has its upper end imbedded in a push button 72 of insulating material and pinned in relation thereto by a pin 74. The push button 72 is normally biased in an upward direction by a spring 76 interposed between a shoulder 78 of the push button 72 and a shoulder 80 of the body member 12. The lower end of the plate 70 is

provided with a flange 82, the purpose of which will hereinafter appear.

Practical operation

In the operation of my thermal cutout, normal current flow through the heater H, while generating heat therein, is insufficient to trip the cutout. The cutout of course is set at the set screws 38 and 60 for the desired cutout temperature. When the current becomes excessive or an overload is thrown on the line, the excess current flowing through the reduced width portion 14 of the heater H will cause it to heat sufficiently that radiation therefrom through the openings 44 in the plate 24 will warp the bimetal disc B until it snaps from a position of concavity as shown in Figure 4 to one of opposite concavity as shown in Figure 6. This will result in the pin 46 being slid toward the right in the opening 48 to the position of Figure 6 thereby effecting separation of the contact 52 from the contact 50 for breaking the circuit.

At the same time the reduced portion 66 of the bend 64 on the upper end of the arm 54 will be retracted from the opening 68 of the plate 70 so that the spring 76 can elevate this plate to the position of Figure 6. The flange 82 at that time acts as a stop to limit the elevating movement.

When the bimetal disc B snaps back to the position of Figure 4 due to cooling of the heater H as a result of cessation of current flow, the contacts 50 and 52 will still be locked out by reason of the reduced end 66 of the arm 54 engaging the plate 70 when the disc snaps to its original position and the spring 56 tends to return the contact 52 to engagement with the contact 50.

After the trouble that caused the cutout operation is remedied, the thermal cutout can be reset by depressing the button 72 from the dotted line to the full line position of Figure 4 thereby bringing the opening 68 down to a position where it registers with the reduced end 66 so that the spring 56 can force this end back into the opening 68 (the original position of Figure 4). The thermal cutout will now remain closed until heat from the heater H again snaps the disc B to the position of Figure 6.

The cutout disclosed is effective to cause a cutout operation at a predetermined temperature within close limits. The use of a snap disc insures these close limits as the disc snaps at a critical temperature, which temperature is substantially unvarying. At the time of snap, the accumulated energy is considerable and effects rapid and positive opening of the cutout as distinguished from other types of cutouts having non-snapping thermal elements. In such devices the cutout point varies with a variation in friction and other factors. Thus a positive-point cutout is possible when constructed in accordance with the foregoing specification.

The parts of the cutout are so designed and so related to each other that a very compact structure results. The operation is simple and the various parts are readily accessible for repair or replacement.

The heater H can be readily changed for one of different capacity by removal of the screws 20. By varying the thickness and width of the circular portion 14 of the heater, different current capacity can be had as desired or required.

Some changes may be made in the construction and arrangement of the parts of my device without departing from the real spirit and purpose of my invention, and it is my intention to

cover by my claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim as my invention:

1. In a thermal cutout, a body member having a recess, a mounting plate therein, a snap-disc bimetal element centrally supported on said mounting plate and confined at one point around its edge, said mounting plate having openings therein, a heating element mounted on said body member for radiating heat through said openings to said bimetal element, cutout contacts normally engaged and adapted to be separated, a slidable pin to effect such separation, said slidable pin being engageable by a portion of said disc opposite said confined portion thereof, and means to latch said contacts in the open position, said last means being manually operable to effect subsequent closure of said contacts.

2. In a thermal cutout, a body member, a snap disc bimetal element centrally supported thereon and confined at one point around its edge, a heating element mounted on said body member for radiating heat to said bimetal element, cutout contacts normally engaged and adapted to be separated by a portion of said disc opposite said confined portion thereof, a leaf spring on which one of said contacts is mounted, and slidable means having an opening normally receiving an end of said leaf spring to latch said contacts in the open position by engagement of said end with said slidable means beyond the edge of said opening when said bimetal element re-cools, said slidable means being manually movable to a position permitting re-entry of said leaf spring and in said opening for effecting subsequent closure of said contacts.

3. In a thermal cutout, a body member having a recess, a mounting plate on a shoulder in said recess, a snap-disc bimetal element mounted in said recess on one side of said mounting plate, thermal cutout contacts opened by said disc element when it is heated to a predetermined degree, an electrical heater for said disc element comprising a semi-circular flat portion extending circumferentially in relation to said disc element and located on the opposite side of said mounting plate, said mounting plate being perforated to permit the radiation of heat from said electrical heater to said disc element, and means to latch said contacts open.

4. In a thermal cutout, a body member having a stepped recess, a mounting plate and a bimetal disc mounted in different portions of said recess on opposite sides of the step, said mounting plate being secured to said step, a heater for said bimetal element, said mounting plate having openings for radiated heat from the heating element to pass through to said bimetal element, normally engaged contacts operable by said bimetal element to be separated thereby when the bimetal element is heated to a predetermined degree by said heating element, said contacts carrying a latch lug, a movable plate biased in one direction and having an opening to receive said latch lug whereby heating of said bimetal element to said predetermined degree removes said latch lug therefrom permitting the bias of the plate to effect movement thereof to a latched-out position for said contacts, and manual means to depress said plate against its bias to permit re-entry of said lug into said opening for effecting reclosure of said contacts.

5. In a thermal cutout, a body member having a stepped recess, a mounting plate and a bi-metal

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disc mounted in different portions of said recess on opposite sides of the step, said mounting plate being secured to said step, a heater for said bimetal element, said mounting plate having openings for radiated heat from said heating element to pass through to said bimetal element, normally engaged contacts separable by said bimetal element when it is heated to a predetermined degree by said heating element, latching means to thereupon retain said contacts separated, and manual means to reclose said contacts.

6. In a cutout, a body member, a bimetal disc mounted at its center in said body member and anchored at one edge thereto, a heater for said bimetal element, normally engaged contacts operable by the opposite edge of said bimetal element to be separated thereby when the bimetal element is heated to a predetermined degree by said heating element, said contacts carrying a latch lug, a movable reset element biased in one direction and having an opening to receive said latch lug whereby heating of said bimetal element to said predetermined degree removes said latch lug therefrom permitting the bias of the reset element to effect movement thereof to a latched-out position for said contacts, and manual means to depress said reset element against its bias to permit re-entry of said lug into said opening.

7. In a thermal cutout, a body member having a recess, a mounting plate on a shoulder of said recess, a snap disc bimetal element mounted in said recess on one side of said mounting plate,

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thermal cutout contacts opened by said disc element when it is heated to a predetermined degree, an electrical heater for said disc element comprising a semi-circular flat portion extending circumferentially in relation to said disc element and located on the opposite side of said mounting plate, said mounting plate being perforated to permit the radiation of heat from said electrical heater to said disc element, a leaf spring on which one of said thermal cutout contacts is mounted, and slidable means having an opening normally receiving an end of said leaf spring to latch said contacts in the open position by engagement of said end with said slidable means beyond the edge of said opening when said disc element re-cools, said slidable means being manually movable to a position permitting re-entry of said leaf spring end in said opening for effecting subsequent closure of said thermal cutout contacts.

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