

Aug. 13, 1940.

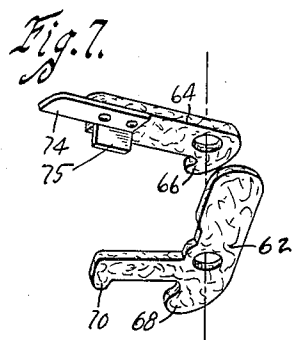
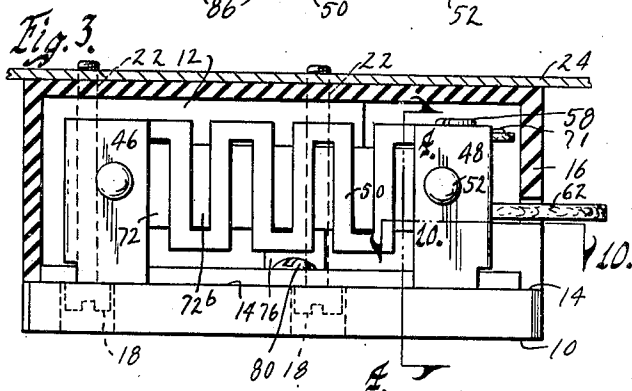
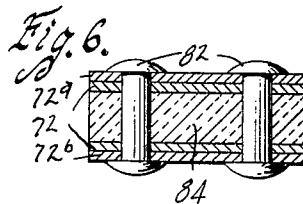
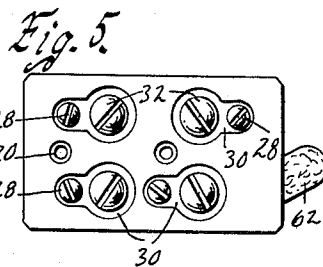
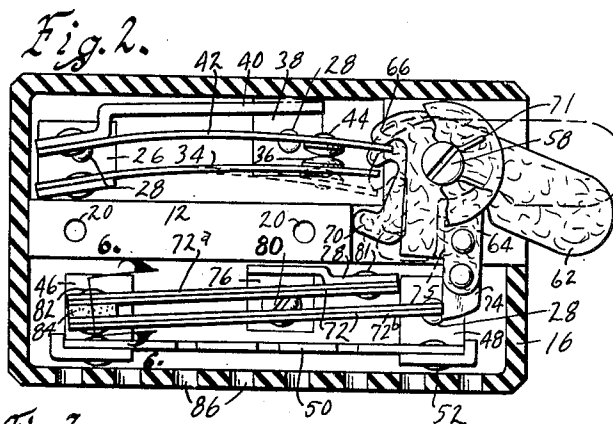
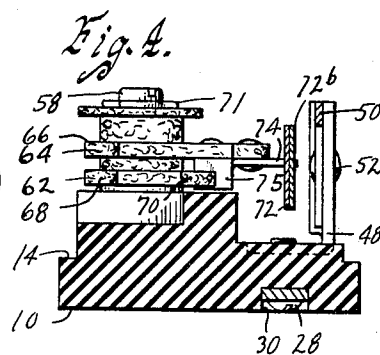
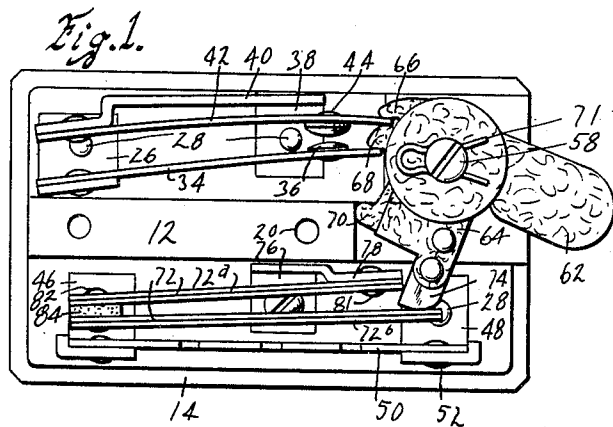
B. E. SHAW

2,211,245

THERMAL CUTOUT UNIT

Filed May 25, 1936

2 Sheets-Sheet 1



Witness
H. S. Munzenmaier

Inventor
~ Burton E. Shaw ~
by Bair, Freeman & Sinclair
Attorneys

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B. E. SHAW

2,211,245

THERMAL CUTOUT UNIT

Filed May 25, 1936

2 Sheets-Sheet 2

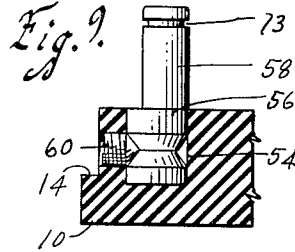
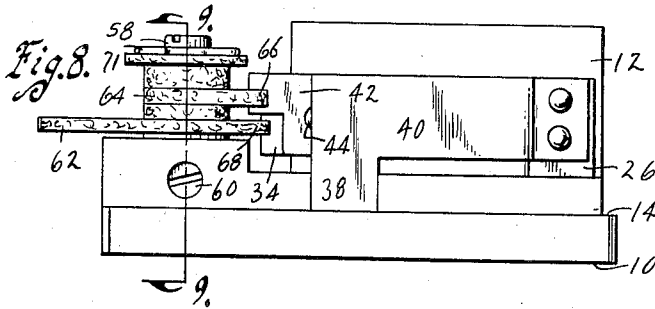


Fig. 10.

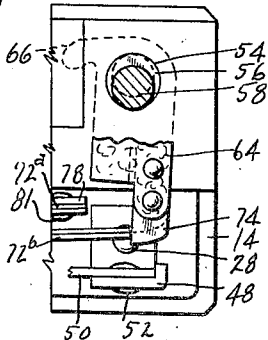


Fig. 11.

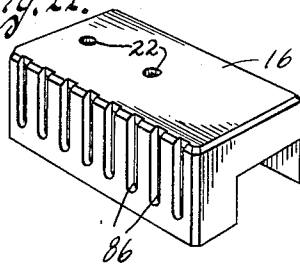


Fig. 12.

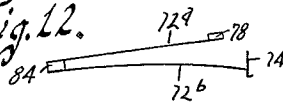


Fig. 13.

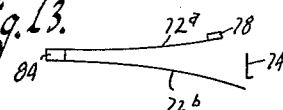


Fig. 14.

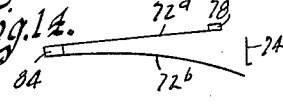
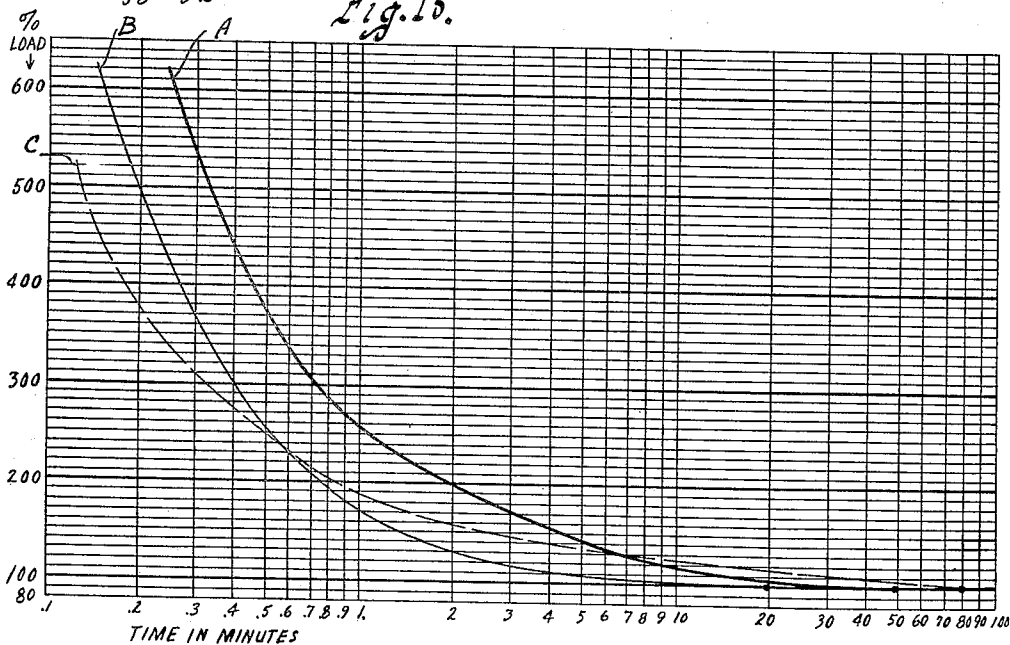


Fig. 15.



Witness
H. S. Morganmair

Inventor
~ Burton E. Shaw ~
by Bair, Treiman & Sinclair
Attorneys

UNITED STATES PATENT OFFICE

2,211,245

THERMAL CUTOUT UNIT

Burton E. Shaw, Adel, Iowa, assignor to Penn Electric Switch Co., Des Moines, Iowa, a corporation of Iowa

Application May 25, 1936, Serial No. 81,702

12 Claims. (Cl. 200—122)

An object of my invention is to provide a thermal cutout unit which can be mounted as a unitary structure on control panels or within switch boxes or the like, the unit being comparatively simple and inexpensive to manufacture.

A further object is to provide a thermal cutout unit which is readily disconnectable from its supported position, the arrangement being such that a base and cover enclose the parts of the cutout and are retained assembled while the unit is retained in supported position by a common means.

Still a further object is to provide a thermal cutout unit contained in a housing which includes a base, the base having terminals on the exterior thereof for a heating element and the cutout contacts of the thermal cutout unit.

A further object is to provide a thermal cutout in which the contacts are mounted on leaf springs and one of the leaf springs serves the purpose of moving a retainer which normally retains the contacts in engagement to open circuit position, manual control being provided for resetting the cutout, which control cooperates with one of the leaf springs to keep the contacts separated during resetting operation.

Still another object is to provide a bimetal latch in a thermal cutout having such characteristics that upon a slight overload it will cut out much slower than the usual bimetal type of thermal cutout, yet cut out quicker than the usual solder pot types, whereas upon a high overload it does not cut out so quickly as the solder pot and usual bimetal types of thermal cutouts.

Still a further object is to provide a thermal cutout with a bimetal latch formed of two independent parts, one of which is responsive to heat radiated from a heating element and the other is slowly responsive to such heat by controlled conduction from one of the bimetal elements to the other one.

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

Figure 1 is an enlarged plan view of a thermal cutout unit embodying my invention, the cutout being in released position and the cover being removed.

Figure 2 is a similar view showing the cover in section and the cutout latched, the dotted

position showing one position the latching operation assumes just prior to the full line position.

Figure 3 is a side elevation showing the cover in section and is secured to a panel or wall for supporting purposes.

Figure 4 is a sectional view on the line 4—4 of Figure 3.

Figure 5 is a bottom plan view of my thermal cutout unit showing it full size.

Figure 6 is an enlarged sectional view on the line 6—6 of Figure 2 showing a heat transfer connection.

Figure 7 is an under side perspective view of two of the levers used in my thermal cutout, one being a retainer and the other being a reset lever.

Figure 8 is a side elevation similar to Figure 3, showing the reverse side of the cutout and omitting the cover.

Figure 9 is a sectional view on the line 9—9 of Figure 8, showing an adjuster for a latch in my thermal cutout.

Figure 10 is a plan view of a portion of the cutout unit to illustrate the adjustment secured by the parts illustrated in Figure 9.

Figure 11 is a perspective view of a cover used in connection with my thermal cutout unit.

Figure 12 is a diagrammatical view of a bimetal latch in the cutout showing the first position assumed by the latch upon a slight overload of current flow through the cutout.

Figure 13 is a similar view showing the parts in a different position as caused by continued flow at low overload.

Figure 14 is a similar view showing the position of the parts assumed by a heavy overload; and

Figure 15 is a graph illustrating the relative characteristics of a solder pot type of thermal cutout, the usual bimetal type and my disclosed type for the purpose of comparison.

On the accompanying drawings I have used the reference numeral 10 to indicate a base. The base 10 is preferably made of insulation and has a central barrier 12 and a peripheral shoulder 14. A cover 16 rests on the shoulder 14 and is retained in position by screws 18 having heads countersunk in the base, extending through bores 20 in the base and through perforations 22 in the cover 16. The screws 18 then extend through a panel, switch box wall or other support such as indicated at 24 in Figure 3.

A first L-shaped bracket 26 is mounted on the base 10, preferably countersunk therein. A screw 28 extends through the base for mounting pur-

poses and on the exterior of the base a terminal 30 is connected with the screw 28 and has a terminal screw 32. A first leaf spring 34 is carried by the bracket 26 and is provided with a contact 36. A second bracket 38 is provided having an extension 40 on which a second leaf spring 42 is mounted. The spring 42 carries a second contact 44. Third and fourth brackets 46 and 48 are provided on the base 10 to which opposite ends of a heating element 50 are secured, as by rivets 52. The brackets 38, 46 and 48 are also mounted by screws 28 and have terminals 30 provided with terminal screws 32. The terminal screws it will be noted by referring to Figure 5 are mounted on the exterior of the base 10 so that they are readily accessible without having to extend wiring to a position within the housing. The upper two terminal screws 32 in Figure 5 are provided for the heating element 50 and the lower two for the contacts 36 and 44, whereby independent circuits may be connected with the switch and heating element of the thermal cutout, the barrier 12 separating the two from any chance of short circuit from one circuit to the other.

The base 10 is provided with a socket 54 (see Figure 9), which receives an eccentric portion 56 of a pin 58. The eccentric portion 56 may be rotated relative to the socket 54 and is normally retained against rotation by a set screw 60. Pivoted on the pin 58 is a reset lever 62 and a retainer 64. The retainer 64 has a lug 66 normally engaging the spring 42 to retain the contact 44 engaged with the contact 36 as shown in Figure 2 by solid lines.

The reset lever 62 has a lug 68 which can be engaged with the leaf spring 34, as shown by dotted lines in Figure 2, but which normally is disengaged therefrom. A second lug 70 on the reset lever 62, engages one end of the barrier 12 to act as a stop as shown by solid lines.

I provide a bimetal latch 72 for normally latching the retainer 64 in the position of Figure 2. This retainer and the lever 62 are preferably made of insulation or the like, the retainer being provided with a metal latch lug 74. The latch lug 74 has a portion 75 adapted to be engaged by the back of the lug 70 during the resetting operation, as will be described. The levers 62 and 64 are retained in position with suitable washers interposed between them and a cotter pin 71 located in a groove 73 of the pin 58.

A support is provided for the bimetal latch 72 in the form of a bracket 76 having an extension 78. This bracket is secured on the base 10 by a screw 80. The bimetal latch comprises a first bimetal element 72a and a second bimetal element 72b. One end of the element 72a is anchored as by a rivet 81 to the bracket extension 78, while one end of the bimetal element 72b is anchored to the free end of the element 72a by rivets 82 as shown in Figure 6. A block of insulation 84 is interposed between the two bimetal elements at the rivets 82 to delay heat transmission for a purpose which will hereinafter be made clear.

The cover 16 is provided with a plurality of slot-like perforations 86 adjacent the heating element 50 for the purpose of dissipating heat therefrom after the heating element has been de-energized.

Practical operation

Assuming the thermal cutout unit as being tripped, the position of the parts will be that shown in Figure 1. The contacts 36 and 44 it will be noted are separated. To reset the thermal cutout, the reset lever 62 is swung from the position of Figure 1 to the dotted position of Figure 2.

It first engages the lug 68 with the leaf spring 34 to move the contact 36 in an open circuit direction, and then back of the lug 70 strikes the extension 75 of the latch lug 74 to swing the retainer 64 to the full line position of Figure 2, whereupon the bimetal element 72b, being cooled, will move to the latched position of Figure 2.

Thereupon the reset lever 62 may be released and the leaf spring 34 will move it to the full line position of Figure 2 and engage the contact 36 with the contact 44. Thus during the resetting operation it is impossible to manually retain the contacts engaged, thus preventing manual holding of the switch in engaged position when the heating element 50 is hot enough to unlatch the bimetal latch 72.

Upon a slight overload extended over a relatively short period of time (for instance a 100% overload which is represented by 200 in Figure 15, for a period of one and one-half minutes), the bimetal element 72b receiving heat by radiation from the heating element 50, as illustrated in Figure 2, does not warp sufficiently to unlatch the latch.

The graph line A is charted for the particular bimetal latch I illustrate, while the graph line B is for the ordinary type consisting of a single blade and made longer than the one I illustrate, while the graph line C is for the solder pot type of thermal cutout.

From the graphs it will be obvious that the 100% overload on ordinary bimetal or solder pot constructions will trip out in about eight-tenths of a minute, but it is desirable to have about two minutes before trip out occurs. This is accomplished by using the relatively short bimetal element 72b which in itself cannot unlatch the retainer 62, but which due to the supplemental action of the bimetal element 72a, as shown in Figure 13, will trip out (after a longer period of time).

This supplemental action is secured by heat transfer or conduction from the element 72b to the element 72a through the rivets 82. The insulation 84 substantially reduces the speed of such conduction and likewise the relatively small cross sectional area of the rivets, causes slow heat transfer. The amount of insulation and the size of the rivets can be varied greatly to secure the desired conduction over a wide range of temperature and time to suit the particular installation to be made.

When there is a high overload, for instance a 500% overload as represented by 600 in Figure 15, the trip out time for my latch as compared with those represented by the graph line B is greater, because trip out occurs before any substantial amount of conduction across the rivets 82 occurs, and consequently the short bimetal element 72b in itself, as a result of radiation from the heater 50, unlatches as in Figure 14, whereas in Figure 12 the overload has not been sufficient to heat it to a trip out position.

Thus by the particular arrangement of the two elements 72a and 72b, as disclosed, a thermal cutout having the characteristics of the curve A is obtained, whereas the characteristics of the curves B and C, which are ordinary bimetal latches and solder pots, are not as desirable.

Upon trip out occurring, the leaf spring 42 serves as the actuating means for the retainer 64 to swing it to the position of Figure 1, while the lugs 68 and 70 serve as stops, the lug 70 against the barrier 12 and the lug 68 for the

spring 34, so that the contact 36 does not engage the contact 44 when the cutout is unlatched and the latch lug 74 engages the right hand end of the bimetal element 72a in Figure 1, which acts as a stop for it.

Referring to Figure 10 it is obvious that the latch lug 74 overlaps the right hand end of the bimetal element 72b to considerable extent so as to provide a relatively long predetermined trip out period.

It is obvious, however, that if the lug 74 is moved upwardly to the dotted position, the period will be shortened. The pin 58 may be rotated for securing such adjustment, since the pin is off center relative to the eccentric portion 56 thereof. The adjustment can be retained by the set screw 60. Thus I have provided a simple and effective means for adjusting the speed of operation of the switch.

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 unit, a support contacts supported thereby, a retainer for normally retaining said contacts engaged, a bimetal latch for latching said retainer in normal position and a heating element for warping said bimetal latch to unlatched position, said bimetal latch comprising a first bimetal element having one end anchored which upon being heated warps in an unlatching direction and a second bimetal element which upon being heated warps in an unlatching direction, said second bimetal element having one end anchored to the free end of said first bimetal element.

2. In a thermal cutout unit, a housing comprising a base and a cover for cooperation therewith, means extending through said base and cover to retain them assembled relative to each other and to mount them on a support, contacts within said housing, terminals on the exterior of said base for said contacts, a retainer for normally retaining said contacts engaged, a bimetal latch for latching said retainer in normal position, a heating element within said housing for warping said bimetal latch to unlatched position and terminals on the exterior of said base for said heating element, said bimetal latch comprising a first bimetal element having one end anchored which upon being heated warps in an unlatching direction and a second bimetal element which upon being heated warps in an unlatching direction, said second bimetal element having one end anchored to the free end of said first bimetal element, the means for anchoring said second element to said first element comprising a heat transfer element of small cross sectional area to substantially delay heat transmission from the second element to the first element.

3. In a thermal cutout unit, a housing comprising a base and a cover for cooperation therewith, means extending through said base and cover to retain them assembled relative to each other and to mount them on a support, contacts within said housing, terminals on the exterior of said base for said contacts, a retainer for normally retaining said contacts engaged, a bimetal latch for latching said retainer in normal position, a heating element within said housing for warping said bimetal latch to unlatched position

and terminals on the exterior of said base for said heating element, said bimetal latch comprising a first bimetal element having one end anchored which upon being heated warps in an unlatching direction and a second bimetal element which upon being heated warps in an unlatching direction, said second bimetal element having one end anchored to the free end of said first bimetal element, the means for anchoring said second element to said first element comprising a spacer of insulating material between the elements and a rivet extending through the elements and spacer for transferring heat from the second element to said first element.

4. In a thermal cutout unit, a housing comprising a base and a cover for cooperation therewith, means extending through said base and cover to retain them assembled relative to each other and to mount them on a support, contacts within said housing, terminals on the exterior of said base for said contacts, a retainer for normally retaining said contacts engaged, a bimetal latch for latching said retainer in normal position, a heating element within said housing for warping said bimetal latch to unlatched position and terminals on the exterior of said base for said heating element, said bimetal latch comprising a first bimetal element having one end anchored which upon being heated warps in an unlatching direction and a second bimetal element which upon being heated warps in an unlatching direction, said second bimetal element having one end anchored to the free end of said first bimetal element, said second bimetal element being interposed between said heating element and said first bimetal element.

5. In a thermal cutout, circuit opening means comprising a heating element, a retainer and a bimetal latch for said retainer, said latch when warped due to a predetermined heat from said heating element unlatching said retainer to open the circuit through said cutout, said bimetal latch comprising a first bimetal element having one end anchored which upon being heated warps in an unlatching direction and a second bimetal element which upon being heated warps in an unlatching direction, said second bimetal element having one end anchored to the free end of said first bimetal element.

6. In a thermal cutout, circuit opening means comprising a heating element, a retainer and a bimetal latch for said retainer, said latch when warped due to a predetermined heat from said heating element unlatching said retainer to open the circuit through said cutout, said bimetal latch comprising a first bimetal element having one end anchored which upon being heated warps in an unlatching direction and a second bimetal element which upon being heated warps in an unlatching direction, said second bimetal element having one end anchored to the free end of said first bimetal element, the means for anchoring said second element to said first element comprising a heat transfer element of small cross sectional area to substantially delay heat transmission from the second element to the first element.

7. In a thermal cutout, circuit opening means comprising a heating element, a retainer and a bimetal latch for said retainer, said latch when warped due to a predetermined heat from said heating element unlatching said retainer to open the circuit through said cutout, said bimetal latch comprising a first bimetal element having one end anchored which upon being heated warps in

an unlatching direction and a second bimetal element which upon being heated warps in an unlatching direction, said second bimetal element having one end anchored to the free end of said first bimetal element, the means for anchoring said second element to said first element comprising a spacer of insulating material between the elements and a rivet extending through the elements and spacer for transferring heat from the second element to the first element.

8. In a thermal cutout, circuit opening means comprising a heating element, a retainer and a bimetal latch for said retainer, said latch when warped due to a predetermined heat from said heating element unlatching said retainer to open the circuit through said cut-out, said bimetal latch comprising a first bimetal element having one end anchored which upon being heated warps in an unlatching direction and a second bimetal element which upon being heated warps in an unlatching direction, said second bimetal element having one end anchored to the free end of said first bimetal element, said second bimetal element being interposed between said heating element and said first bimetal element.

9. A thermal cutout comprising a pair of leaf springs, a contact carried by each, a retainer for biasing one of said springs to position with its contact engaging the other contact, a bimetal latch for said retainer, said latch upon releasing said retainer permitting one of said leaf springs to move to a position with the contact carried thereby out of engagement with the other contact and a heating element for so unlatching said latch upon predetermined current flow through said heating element, said bimetal latch comprising a first bimetal element having one end anchored which upon being heated warps in an unlatching direction and a second bimetal element which upon being heated warps in an unlatching direction, said second bimetal element having one end anchored to the free end of said first bimetal element.

10. A thermal cutout comprising a pair of leaf springs, a contact carried by each, a retainer for biasing one of said springs to position with its contact engaging the other contact, a bimetal latch for said retainer, said latch upon releasing

said retainer permitting one of said leaf springs to move to a position with the contact carried thereby out of engagement with the other contact and a heating element for so unlatching said latch upon predetermined current flow through said heating element, said bimetal latch comprising a first bimetal element having one end anchored and a second bimetal element having one end anchored to the free end of said first bimetal element, the means for anchoring said second element to said first element comprising a heat transferring element of small cross sectional area to substantially delay heat transmission from the second element to the first element.

11. In a thermal cutout unit, a support, contacts supported thereby, a retainer for normally retaining said contacts engaged, a bimetal latch for latching said retainer in normal position, a heating element for warping said bimetal latch to unlatched position, said bimetal latch comprising a first bimetal element having one end anchored which upon being heated warps in an unlatching direction and a second bimetal element which upon being heated warps in an unlatching direction, said second bimetal element having one end anchored to the free end of said first bimetal element, the means for anchoring said second element to said first element comprising a heat transfer element of small cross sectional area to substantially delay heat transmission from the second element to the first element.

12. In a thermal cutout unit, a support, contacts supported thereby, a retainer for normally retaining said contacts engaged, a bimetal latch for latching said retainer in normal position, a heating element for warping said bimetal latch to unlatched position, said bimetal latch comprising a first bimetal element having one end anchored and a second bimetal element having one end anchored to the free end of said first bimetal element, the means for anchoring said second element to said first element comprising a spacer of insulating material between the elements and a rivet extending through the elements and spacer for transferring heat from said second element to said first element.

BURTON E. SHAW.