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H. K. KRANTZ

THERMAL CUT-OUT

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Fig. 1.

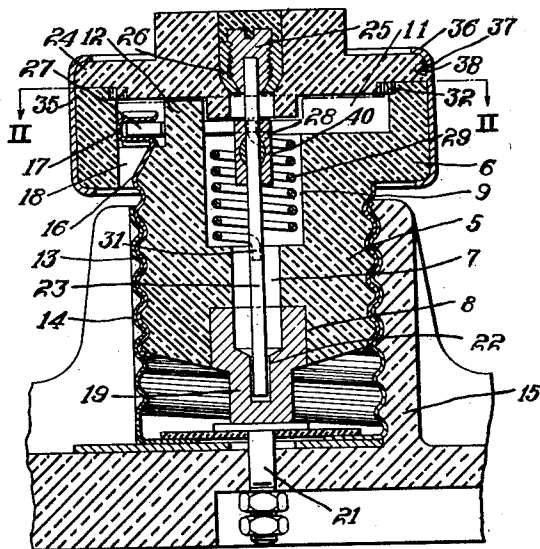


Fig. 2.

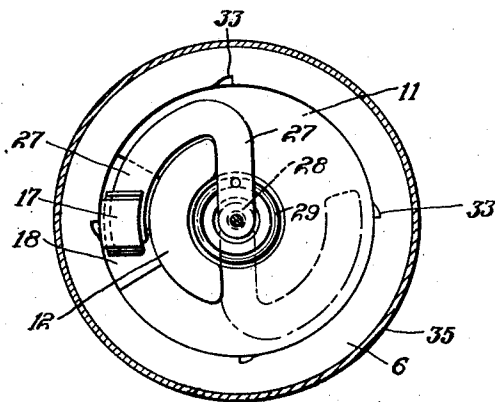
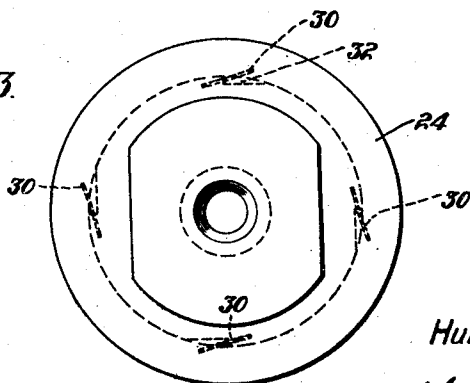


Fig. 3.



WITNESSES:

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THERMAL CUT-OUT.

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To all whom it may concern:

Be it known that I, HUBERT K. KRANTZ, a citizen of the United States, and a resident of Wilkesburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Thermal Cut-Outs, of which the following is a specification.

My invention relates to cutout devices and particularly to thermal cutout mechanism such as is employed to interrupt a circuit when the current therein exceeds a predetermined amount for a predetermined period of time.

One object of my invention is to provide a thermal cutout device that is responsive to heat produced in a conductor or a heating element by an excessive current caused by an overloaded motor or a short circuit.

Another object of my invention is to provide a thermal cutout in the form of a screw plug that may be inserted in a standard receptacle.

Another object of my invention is to provide a thermal cutout that automatically interrupts the circuit in response to action of a thermally responsive element and which may be manually reset for repeated operations.

Another object of my invention is to provide a thermal cutout, having the above-described characteristics, wherein a movable contact is retained closed by means of a fusible element that is adapted to be fused by heat incident to an excess current in a conductor and to release the contact when in a fused state, and which, when solidified, affords a rigid connection between the contact and an operating member by means of which the contact is reset.

A further object of my invention is to provide a simple and compact form of screw-plug thermal cutout device which may be repeatedly reset by the turning of a cap and which is of rugged and durable construction.

These and other objects, that will be made apparent throughout the further description of the invention, are attained in the device hereinafter described, and illustrated in the accompanying drawings, wherein:

Figure 1 is a vertical section through a plug cutout embodying features of my invention and shown mounted in a standard receptacle;

Fig. 2 is a transverse section taken on the

line II—II of Fig. 1, and

Fig. 3 is a plan view of the cap member shown in Figs. 1 and 2.

Referring to the drawings, the device includes a base or plug 5 of insulating material having an enlarged flange portion 6 and a centrally disposed bore 7 extending longitudinally of the base and terminating in enlarged bores 8 and 9. The bore 9 opens into a shallow chamber 11 in which an arcuate ridge 12 is disposed.

The smaller portion of the base 5 is provided with a threaded metallic sleeve 13 adapted to fit a similar sleeve 14 in the receptacle 15. The sleeve 13 is provided with a terminal extension 16 that may be formed integral with the sleeve or riveted thereto, as preferred. The extension terminates in a jaw member 17 of U-shape that extends into the chamber 11 through an opening 18.

A terminal member 19 is secured to the base within the bore 8 and is adapted to conductively engage the terminal 21 of the receptacle 15. The terminal 19 is provided with a bore 22 having two portions of different diameters, the larger portion being equal in diameter to the diameter of the reduced portion of the bore 7, while the smaller portion is adapted to receive the inner end of a conductor 23, of slightly less diameter than that of the bore, in such manner that it conductively engages the terminal and may be rotated with respect thereto.

The conductor or heating element 23 is rigidly clamped, at one end, to an insulating cap 24 by means of a split screw 25 that is threaded into a tapered sleeve 26. The sleeve is embedded or molded in the insulating material of the cap and serves to securely clamp the conductor to the screw in such manner that the conductor turns with the cap when the latter is rotated.

An arcuate switch arm or contact member 27 having a metal hub portion 28 is rigidly secured to the arm and is mounted for rotation upon the conductor 23, and the bore of the hub 28 is provided with molten solder which, when solidified, releasably secures the contact arm to the conductor. A helical spring 29, having one end 31 embedded in the base adjacent the inner end of the bore 9 and its outer end attached to the contact arm, serves to rotate the arm in a clockwise direction out of contact with the

jaw member 17 into the position indicated in dot-and-dash lines in Fig. 2, wherein one end of the arcuate extension serves as a stop therefor.

5 When the cap is rotated counter-clockwise with respect to the base 5, the contact arm is moved into conductive engagement with the jaw member 17. Reverse movement of the cap is prevented by the ratchet device which
10 comprises a plurality of yielding wire pins 30 embedded in the offset cylindrical section 32 of the cap 24 and which snap outwardly into notches 33 disposed at intervals of 90° upon the inner surface of the annular ridge
15 34 on the base 5.

The cap 24 and the base 5 are held in assembled relation by means of a ferrule 35 that is rigidly secured to the cap by means of a flange 36 and indentations 37
20 in the ferrule which project into notches 38 in the outer surface of the cap. The other end of the ferrule is crimped loosely under the flange of the base member and permits free relative rotary movement of
25 the cap and base but prevents longitudinal separation thereof. The ferrule may be knurled on the outer surface in order to provide a roughened grip for the fingers.

The operation of the device is as follows:
30 the plug is first inserted in the receptacle 15 to a position wherein the terminal member 19 engages the conductor 21 of the receptacle. The threads of the threaded terminal sleeve 13 are right-hand and, there-
35 fore, the plug is secured into the receptacle by a clockwise rotary movement. The latch mechanism for preventing relative rotary movement of the cap and base in one direction is so disposed that there is no relative
40 movement between the cap and base while the plug is being inserted in the receptacle.

After the plug is inserted in the receptacle by clockwise turning movement, the cap is
45 turned in the reverse direction which causes the contact arm 27 to be so turned that the free end thereof is moved between the contact surfaces of the terminal jaw 17. The circuit through the device is then closed and current flows from the threaded sleeve termi-
50 nal 14 of the receptacle, the threaded sleeve 13 of the plug, the terminal jaw 17, the contact arm 27, the hub 28, solder 40, conductor rod 23 and the terminal 19 to the conductor terminal 21 disposed centrally
55 of the receptacle.

When an excessive amount of current flows through the cutout device, such as is incident to the overload of a motor or a short-circuit in the system, the solder 40
60 between the conductor 23 and the hub 28 is fused by the heat incident to the excess current. The spring 29 then snaps the contact arm 27 into the open position indicated by the dot-and-dash lines in Fig. 2.

65 Rotary movement of the switch arm is

limited by engagement thereof with the arcuate extension 12 on the base. A few seconds after the current has been interrupted, the solder solidifies and again releasably
70 connects the contact arm to the conductor 23. The circuit may then again be closed or the device reset to operative conducting position by turning the cap 24 in a counter-
75 clockwise direction until the ratchet wires 30 snap into the notches 33 in the base. The spring 29 is thus re-wound and is so biased that the instant another excessive current is imposed on the circuit it will again snap
80 the contact arm to open position.

It has been found that the device may operate repeatedly a great number of times
85 without any appreciable deterioration in the ability of the solder to reset and, therefore, the device is durable and can be used in a great variety of applications. The device
90 is relatively inexpensive and efficient and may be used wherever threaded receptacles are employed in the place of the usual fuse elements.

While the device illustrated is of the screw-plug type, it is apparent that it may be designed for application in fuse clips adapted to receive standard cartridge fuses. The device is, therefore, not limited to its
95 application to threaded fuse receptacles.

While I have described and illustrated but one embodiment of my invention, it will be apparent to those skilled in the art that various changes, modifications, substitutions, additions and omissions may be made in the apparatus illustrated without departing from the spirit and scope of the invention, as set forth in the appended claims.

I claim as my invention:—

1. A cutout comprising a terminal member, a movable contact member for engaging the terminal member, fusible means for releasably retaining the contact member in engagement with the terminal member, operating means relatively movable with respect to the contact member and means for moving the contact member out of engagement with the terminal member when the fusible means has released the contact member.
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2. A cutout comprising a terminal member, a movable contact member for engaging the terminal member, thermally-responsive operating means for the contact member for releasably retaining the contact member in engagement with the terminal member and relatively movable with respect to the contact member and means for moving the contact member out of engagement with the terminal member when the thermally-responsive means releases the contact member.
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3. A cutout comprising a terminal member, a movable contact member for engaging the terminal member, means for
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moving the contact member out of engagement with the terminal member, operating means for the contact member for holding the contact member in engagement with the terminal member and relatively movable with respect thereto, and a thermally-responsive element permitting relative movement of the holding means and the said contact member at a predetermined temperature.

4. A cutout comprising a base member, a cap member mounted thereon for relative rotary movement, a terminal member mounted on the base member, a contact member carried by the cap member and movable thereby into engagement with the contact member, yielding means for moving the contact member out of engagement with the terminal member, and a thermally-responsive element releasably connecting the contact member to the cap member.

5. A cutout comprising a base member, a cap member mounted thereon for relative rotary movement, a pair of separate terminal members mounted on the base member, a movable contact member for releasably connecting the said terminal members, means for actuating the contact member and a thermally-responsive releasable means for releasably connecting the contact member and the cap member.

6. A cutout comprising a pair of relatively movable members, a pair of separate terminal members mounted on one of the said members, a movable contact member for releasably connecting the said terminal members, means for actuating the contact member and a thermally-responsive releasable means for releasably connecting the contact member to the said means.

7. A cutout comprising a base member, a cap member mounted for relative rotary movement thereon in one direction, a pair of separate terminal members mounted on the base member, a conductor secured to the cap member, and engaging one of the terminal members, and a contact member releasably secured to the conductor and movable by rotary movement of the cap member into engagement with the other terminal member, means for moving the contact member out of engagement with the terminal member, and a thermally-responsive element for releasably connecting the contact member to the conductor.

8. A cutout comprising a terminal member, a contact member movable into engagement with the terminal member, a fusible element for releasably retaining the contact member in engagement with the terminal member, means for moving the contact member out of engagement with the terminal member when the fusible member releases the contact member, and means relatively

movable with respect to the contact member and associated with the fusible means for resetting the contact member in operative engagement with the terminal member.

9. A cutout comprising a terminal member, a contact member movable into and out of engagement with the terminal member, an operating member relatively movable with respect thereto, a thermally-responsive means for releasably retaining the contact member in engagement with the terminal member, means for moving the contact member out of engagement with the terminal member when the thermally-responsive means releases the contact member and means for moving the contact member into engagement with the terminal member.

10. A cutout comprising a base member, a cap member rotatably mounted thereon, a contact member for engaging the terminal member, a thermally-responsive element for releasably connecting the contact member to the cap member whereby rotation of the cap member in one direction moves the contact member into engagement with the contact member, and means for moving the contact member relative to the cap member in a reverse direction, and out of engagement with the terminal member when the thermally-responsive element releases the contact member.

11. A cutout comprising a pair of members relatively rotatable in one direction only, a terminal carried by one of the members, a contact member movable by one of the members into engagement with the terminal members when the members are rotated relatively and a thermal-responsive device for controlling the movement of the said contact member.

12. A cutout comprising a terminal member, a movable contact member, yielding means for moving the contact member in one direction out of engagement with the terminal member, operating means relatively movable with respect to the contact member for resetting the contact member in engagement with the terminal member, and a thermal-responsive element adapted to connect the contact member to the operating means when the temperature thereof is below a predetermined point whereby the contact member may be reset by the operating means, and to release the contact member to permit circuit opening movement thereof by the yielding means when the temperature of the thermal-responsive element is above a predetermined point.

13. A cutout comprising a terminal member, a movable contact member, yielding means for moving the contact member in one direction out of engagement with the terminal member, operating means relatively movable with respect to the contact mem-

ber for resetting the contact member in engagement with the terminal member, and a fusible element adapted to connect the contact member to the operating means when the temperature thereof is below a predetermined point whereby the contact member may be reset by the operating means and to release the contact member to permit circuit opening movement thereof by the yielding means when the fusible member is in a fused state.

14. A cutout comprising a plug member having a terminal member terminating in a threaded portion adapted to engage the threaded conductor of a standard receptacle, a centrally disposed terminal member thereon for engaging a conductor in the receptacle, a movable contact member within the plug member for connecting the said terminal members on the plug member, yielding means for moving the contact member out of operative engagement with the said terminal members, a cap rotatably mounted on the plug for resetting the contact member in operative engagement with the terminal members and a thermally-responsive device for controlling the operation of the contact member.

15. A cutout comprising a plug member adapted to fit a receptacle, a pair of terminal members on the plug member adapted to engage the terminals of the receptacle, a movable contact member within the plug member for connecting the said terminal members on the plug member, yielding means for moving the contact member out of operative engagement with the said terminal members, a cap rotatably mounted on the plug for resetting the contact member in operative engagement with the terminal members, and a thermally-responsive device for controlling the operation of the contact member.

16. In combination, in a plug cutout having a pair of conductors for connecting terminals of a receptacle and releasably maintained in engagement by a thermally-responsive element, means for separating the conductors when the thermally-responsive element releases the conductors and movable means on the plug for resetting the conductors in operative engagement.

17. In combination, in a plug cutout having a pair of conductors for connecting terminals of a receptacle and releasably maintained in engagement by a fusible element, means for separating the conductors when the fusible element releases the conductors and movable means on the plug for

resetting the conductors in operative engagement.

18. A cutout comprising a base, a movable cap member therefor, a pair of separate terminal members, a conductor secured to the cap member and engaging one of the terminal members and adapted to be moved by the cap member, a contact member releasably secured to the conductor by a thermally-responsive element and movable by the cap member into engagement with the other terminal member, ratchet means for retaining the cap and contact member in set or operative conductive position with respect to the last-mentioned terminal member, and a yielding means for moving the contact member out of set position independently of the cap member when the thermally-responsive element releases the contact member.

19. A cutout comprising a plug member having a threaded terminal member disposed exteriorly thereof and adapted to fit a standard receptacle, a centrally disposed terminal thereon for engaging a conductor in the receptacle, a cap member rotatably mounted upon the plug member, a spring-actuated contact member within the plug member adapted to be moved out of engagement with the threaded terminal member by the spring and to be re-set in engagement with the threaded terminal member by the cap member, and a thermally-responsive device for controlling the movement of the contact member.

20. A cutout comprising a pair of relatively movable supporting members, a pair of separate terminal members mounted on one of the supporting members, a conductor secured to one of the supporting members and engaging one of the terminal members, a contact member, a fusible element for releasably securing the contact member to the conductor adapted to be heated by current in the conductor and to release the contact member when fused and to rigidly secure the contact member to the conductor when solidified, whereby relative movement of the movable member causes relative movement of the contact member and the other terminal member, and means for moving the contact member relative to both movable members when the fusible element is fused.

In testimony whereof, I have hereunto subscribed my name this 29th day of October 1921.

HUBERT K. KRANTZ.