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H. D. CURRIER

HEAT COIL

Filed April 15, 1920

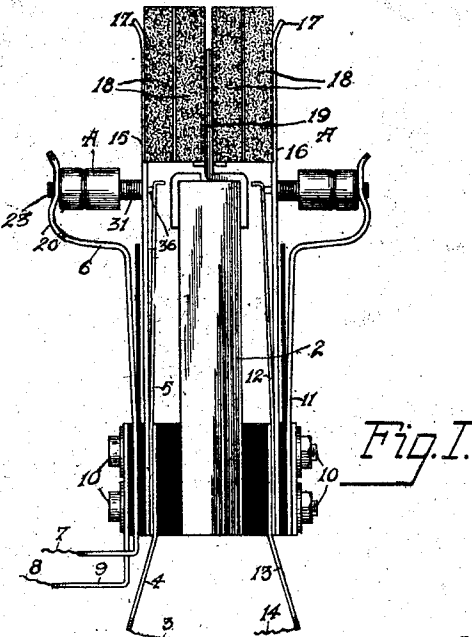


Fig. 1.

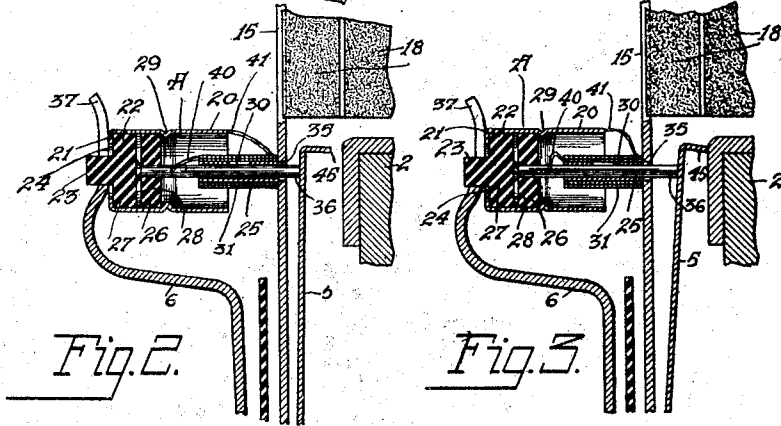
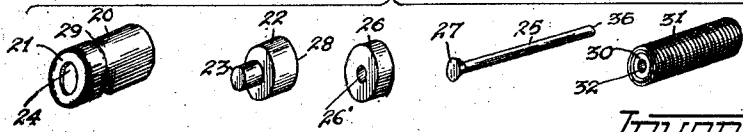


Fig. 2.

Fig. 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

HIRAM D. CURRIER, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

HEAT COIL.

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To all whom it may concern:

Be it known that I, HIRAM D. CURRIER, a citizen of the United States of America, residing in Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Heat Coils, of which the following is a specification.

My invention relates to thermal arresters used for the purpose of guarding against the injurious effects of abnormal currents in electrical circuits, and an object of my invention is the provision of a device of the class described which shall be simple and cheap to manufacture and efficient in operation. My invention relates more particularly to a thermal unit or heat coil and is intended for use in connection with supports under spring pressure or other apparatus, whereby the device or a portion thereof is normally under stress and forms a part of the electrical circuit. The device or heat coil is adapted when operated by an abnormal current passing over the circuit to permit the supports or other apparatus to alter or dis sever the circuit.

The heat coil of my invention comprises a resistance element adapted to be connected in the circuit and protected by a material easily weakened under the influence of heat, but relatively strong under normal conditions. When an abnormal current passes through the resistance element, the said element becomes heated and the protective material weakened which permits the supports or other apparatus to alter or open the circuit.

My invention is capable of use where it is desired to alter the circuit automatically when the passing of the current therethrough is above a predetermined strength, and any material suitable for the particular work in hand may be employed. The resistance element of my invention is in the form of a coil of fine wire wound upon a suitable metal core suitably held in place by an easily weakened material such as any low fusing alloy or solder.

The invention further consists of novel details of construction and combination of

parts hereinafter particularly described and pointed out in the appended specification and claims.

For a better understanding of my invention, reference may be had to the accompanying drawings in which like reference characters in the several views denote like parts, and in which—

Fig. 1 is an elevation of a mounting for the arrester and illustrates the thermal device or heat coil of my invention supported thereby;

Fig. 2 is an enlarged sectional view of the heat coil and showing it resting in its supports and under conditions that are normal;

Fig. 3 is a view similar to that of Fig. 2 but showing the heat coil operated after an abnormal current has affected the low fusing alloy or solder.

Fig. 4 is a disassembled perspective view of the parts of the heat coil of my invention.

Referring more in detail to my invention as illustrated, and particularly to Fig. 1, I show a vertical iron plate 2 which represents that part of the distributing frame to which the circuits entering a telephone exchange are connected before they terminate at the exchange switchboard. A thermal unit or heat coil A is mounted and held in position on each side of the plate 2 and directly opposite each other by springs 5, 6 and 15, and springs 11, 12 and 16, respectively, which are secured to the plate 2 by the clamping screws 10. The incoming conductor 3 connects with the terminal 4 which is conductively connected to the spring 5, the spring 5 being connected to conductor 7 through the heat coil A and spring 6, and thence to the switchboard connections and apparatus, from whence the circuit returns by way of the conductor 8, terminal 9, clamping screws 10, which are conductively connected to the terminal 9, and through spring 11 which is conductively connected to the clamping screws 10, through the heat coil A, spring 12 and terminal 13 which terminal 13 is conductively connected with the spring 12, to external conductor 14. The conductors

3 and 14 are therefore the two ends of the external or main circuit and the conductors 7 and 8 are the ends of the switchboard continuation. The springs 15, 6, 11 and 16 are provided with openings or slots to receive the ends of the heat coils A and the springs 15 and 16 are extended or prolonged and terminate into ends 17 to hold the carbon plate protectors in position upon the ground plate extension 19. The springs 6 and 15 are separated by means of insulation to insulate them from each other and are also insulated from the plate 2 and clamping screws 10. The springs 11 and 12 are also suitably insulated in a manner just described, and the clamping screws 10 support the springs and insulating strips firmly in place upon the mounting plate 2.

The thermal unit or heat coil A of my invention comprises a metal sleeve tube 20 having its end portion 21 turned over by means of a spinning operation. A button 22 of suitable insulation material is provided and is of a size to fit in the tube 20 and when in place the said button 22 abuts against the turned over portion 21 of the sleeve 20 which portion 21 serves as a shoulder against which the button 22 rests. A stud 23 integrally formed with the button 22 protrudes through the opening 24 formed by the turned portion 21 of the sleeve 20 for purposes as will presently be described. A pin 25 of suitable conducting material is provided and a plug 26 of suitable insulation material is provided with a central orifice 26' extending therethrough, and is of a size to receive the pin 25. The plug 26 when in position rests against the head 27 of the pin 25 and is of a size to fit in the sleeve 20 so that when the plug 26 is in position in the sleeve 20, the head 27 of the pin 25 abuts against the face 28 of the button 22. To hold the button 22, pin 25 and plug 26 in position in the tube 20 against movement, the sleeve surface just forward of the plug 26 when in the position just described is formed into a rib 29 by means of a spinning operation thus maintaining the parts just described in position in the sleeve 20 against movement. A sleeve 30 of suitable conducting material is provided and upon which resistance unit 31 is wound, and consists of a plurality of turns of fine insulated wire such as German silver. The sleeve 30 is provided with an orifice 32 of a size to permit it being slipped over the pin 25 and is attached to the forward end of the pin 25 by means of a soft solder or similar easily fusible alloy or metal. One end of the unit is soldered to the pin 25, while the other end of the unit is soldered to the sleeve 20. The solder used in making the connection between the pin 25 and sleeve 30 may be any soft alloy melting at about 160° and the solder used in soldering

the terminals of the unit 31 to the pin 25 and sleeve 20 respectively is comparatively hard.

Fig. 2 represents an enlarged partial view showing the heat coil A in supported inoperative position between the springs 5 and 6. The spring 15 is provided with an orifice 35 through which the end 36 of the pin 25 extends, and the stud 23 of the button 22 rests in the slot 37 in the tip 17 of the spring 6. The spring 6 is under tension and when the heat coil A is in position as just described, the sleeve 30 upon which the unit 31 is wound abuts against the face of the spring 15 and the end 36 of the pin 25 engages the spring 5. The circuit extends from the spring 5, through the pin 25 to the terminal 40 of the unit 31, the winding of the unit 31, the terminal 41 of the unit 31, the sleeve 20, spring 6 to the conductor 7. When a dangerous current of the character described traverses the line for a sufficient length of time, the resistance of the coil or unit 31, causes the development of heat, which is communicated to the sleeve 30 and acts upon the soft solder which holds the sleeve 30 in place upon the pin 25 under normal conditions. In a short time this solder becomes softened and yields to the force exerted by the spring 6 which forces the sleeve 20 to the right and the pin 25 is also moved, the said pin 25 sliding through the sleeve 30. The end 36 of the pin 25 being in engagement with the spring 5 forces its angular portion 45 into engagement with the plate 2 thereby grounding the incoming line conductor and the conductor extending to the switchboard.

While I have illustrated the heat coil of my invention in association with a specific form of apparatus, I wish it understood that it is adapted to be used in connection with other apparatus, and I also do not wish to be limited to the exact structure as shown, as changes may readily suggest themselves to those skilled in the art, but aim to cover all such changes and modifications as come within the spirit and scope of the appended claims.

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

1. A protective appliance of the character described including a cylindrical tube of conducting material having an internal ridge, a pair of discs engaging said tube and secured therein by said internal ridge, a pin of conducting material insulantly fastened within said tube by said pair of discs and extending therefrom, a member integrally formed with one of said disks and adapted to protrude through an opening in said tube, a fixed member and a flexible member for supporting said protective appliance, said flexible member adapted to receive one

end of said pin to support said protective appliance in position and a coil of wire mounted upon said pin having its one end electrically connected to said pin and its other end electrically connected to said tube, said pin being included in circuit with said tube and said coil of wire in series.

2. A protective appliance of the character described including a cylindrical tube of conducting material having an internal ridge, a pair of discs engaging said tube and secured therein by said internal ridge, a pin of conducting material insulatingly fastened within said tube by said pair of discs and extending therefrom, a sleeve slipped over said pin and secured thereto by a soft alloy, and a coil wound upon said sleeve having its one end attached to said pin and its other end secured to said tube, said pin being included in circuit with said coil and said tube in series said coil being adapted when an abnormal current passes therethrough to melt said alloy thereby permitting said sleeve to slide along said pin.

3. A protective appliance of the character described including a tube of conducting material, an internal ridge integrally formed in said tube, a disc of insulating material having an orifice and adapted to fit into said tube in juxtaposition to said ridge, a pin of conducting material provided with an enlarged end portion and adapted to extend through the orifice in said disc, a second disc of insulating material adapted to be placed in said tube to abut against the head of said pin to hold the same in position, said disks and said pin being held in position in said tube against displacement by said internal ridge, a member integrally formed with said second disk and adapted to protrude through an opening in said tube, and means for engaging said protruding end and the other end of said pin for operatively supporting said protective appliance in position.

4. A protective appliance of the character described, including a cylindrical tube having a portion of one end turned over, a disc of insulating material adapted to fit into said tube and abut against said turned over end portion, a second disc having an orifice and adapted to fit into said tube, a pin provided with an enlarged end portion and extending through the orifice in said second disc and having its enlarged end portion abutting against said first disc, means including an internal ridge formed integrally with said tube for securing said second disc in position whereby said discs and pin are firmly secured in said tube against displacement, a member integrally formed with said first disk and adapted to protrude through an opening in the turned over end of said tube, and means for engaging the protruding end of said member and the other end

of said pin for operatively supporting said protective appliance in position.

5. A protective appliance of the character described including a cylindrical tube having a portion of one end turned over, a disc of insulating material having an orifice and adapted to fit into said tube and abut against means including an internally raised portion formed integrally with said tube, a pin provided with an enlarged end portion and extending through the orifice in said disc, a second disc adapted to fit into said tube and abut against the enlarged end portion of said pin and also to abut against the said turned over end portion of said tube whereby said discs and pin are firmly supported in said tube against forward movement by said means, a coil secured to said pin having its one end electrically connected with the pin and its other end electrically connected with said tube, and a projecting portion for said last disc for use in securing the protective appliance in position.

6. A protective appliance of the character described including a cylindrical tube, a disc of insulating material having an orifice and adapted to fit into said tube and abut against means consisting of a ridge formed integrally with said tube, a pin provided with an enlarged end portion and extending through the orifice in said disc, a second disc adapted to fit into said tube and abut against the enlarged end portion of said pin, means including a circumferential shoulder formed integrally with said tube for securing said second disc in position whereby said discs and pin are firmly supported in said tube by both of said means, a sleeve of conducting material adapted to be slipped over said pin and means consisting of a soft alloy securing said sleeve to said pin, a coil mounted upon said sleeve having its one end electrically connected to said pin and its other end electrically connected to said tube, and an integrally formed projecting stud for said second disc for use in securing the protective device in position.

7. A protective appliance of the character described including a cylindrical tube, a disc of insulating material having an orifice and adapted to fit into said tube and abut against means including a ridge formed integrally with said tube, a pin provided with an enlarged end portion and extending through the orifice in said disc, a second disc adapted to fit into said tube and abut against the enlarged end portion of said pin, means including a turned over end portion formed integrally with said tube for securing said second disc in position whereby said discs and pin are firmly supported in said tube against movement by both of said means, a sleeve of conducting material adapted to be slipped over said pin and means including a soft alloy securing said sleeve on said pin,

a coil mounted upon said sleeve having its one end electrically connected to said pin and its other end electrically connected to said tube, and an integrally formed projecting stud for said second disc for use in securing the protective device in position, said device when in position adapted to be yieldingly held under spring tension so that when the said soft alloy is fused the said sleeve slides along said pin, thereby permitting a change in the circuit in which said appliance is connected. 10

Signed by me at Chicago, county of Cook and State of Illinois, this 12 day of April, 1920.

HIRAM D. CURRIER.