

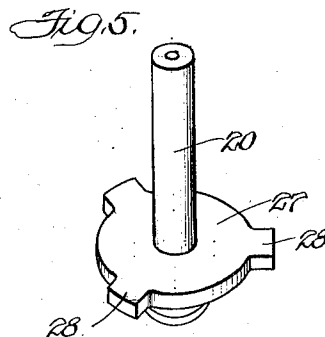
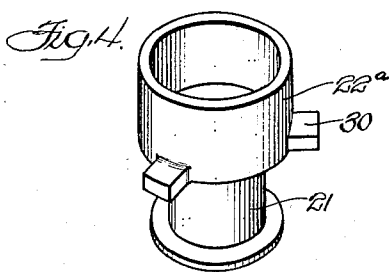
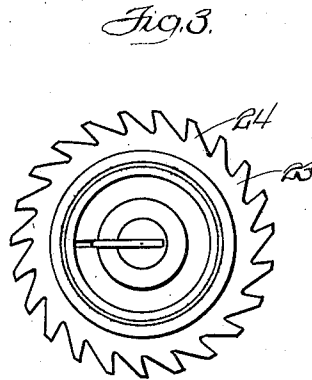
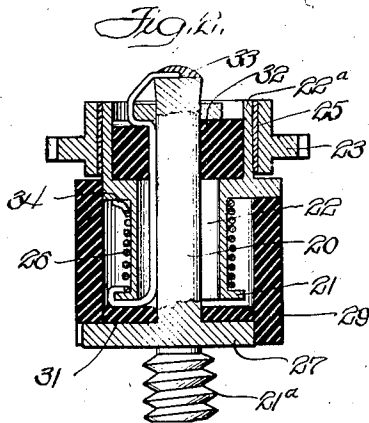
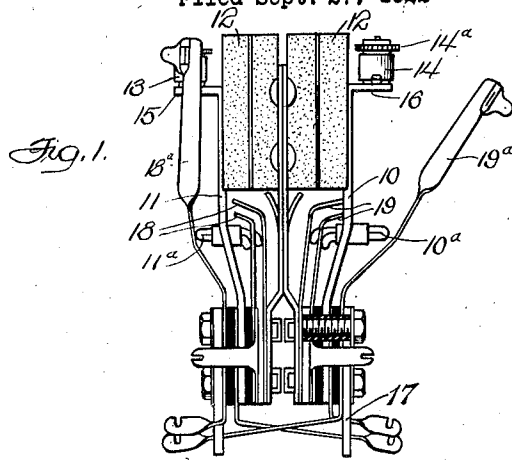
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J. S. BAKER

HEAT COIL

Filed Sept. 27, 1922



WITNESSES

Geo. W. Hansen.

Inventor:
John S. Baker.

By Jones, Addington, Ames & Seibold.
Attorneys

UNITED STATES PATENT OFFICE.

JOHN S. BAKER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE COOK ELECTRIC COMPANY,
OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

HEAT COIL.

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My invention relates to protective devices for electrical circuits and it has special reference to heat coils of the self-soldering type.

Heat coils have heretofore been employed extensively as protective devices against "sneak" currents in electrical circuits, particularly in telephone installations. Heat coils of the self-soldering type heretofore constructed have not been capable of readily responding to excess current conditions because of the poor thermal relations existing between their various elements. For instance, the resistance windings or heat producing means or the heat coils that are capable of generating relatively small amounts of heat are not thermally insulated to a sufficiently high degree from the other metallic parts comprised in the heat coils, as well as the metallic supports upon which the heat coils are mounted and, consequently, the heat so generated has been ineffectively dissipated.

In my present invention, I have produced a heat coil which will be economical and simple to construct and which will respond readily to excess current conditions obtaining in the circuit that the heat coil is adapted to protect.

An object, therefore, of my present invention is to provide a self-soldering heat coil in which substantially all of the heat developed in the heat producing means or resistance winding is effective in acting upon a self-soldering joint or heat responsive element whereby the heat coil will actuate with quick response to protect the associated electrical circuit.

Another object of my invention is to provide a self-soldering heat coil of the character indicated above in which the responsive element, while being in very close thermal relation to the heat producing means or resistance winding, is subject to minimum mechanical stress which insures that the heat coil will remain permanently in operative condition without becoming fatigued.

Other objects of my invention will hereinafter appear and for a better understanding of the nature, scope and characteristic features of my present invention, reference may be had to the following description and the accompanying drawing, in which—

Figure 1 illustrates heat coils forming a

part of my invention positioned in a spring supporting plate of a telephone frame; 55

Fig. 2 is a cross-sectional view showing the detailed construction of a heat coil embodying a form of my invention;

Fig. 3 is a plan view of the device of Fig. 2; 60

Fig. 4 is a perspective view showing the construction of the central supporting member upon which the resistance coil is wound; and

Fig. 5 is a perspective view showing the main central support for the heat coil. 65

Referring to Figure 1, spring supports of a common form of construction are shown which are provided with suitable grounding terminals 10 and 11 and with lightning arresters 12 that constitute carbon blocks spaced from each other by means of a dielectric insulating material. The lightning arresters 12 are of a well-known type of construction. Heat coils 13 and 14 are mounted in brackets 15 and 16 respectively which are secured to a supporting frame 17. The apparatus of Fig. 1 is adapted for use in telephone systems and forms terminals for telephone lines, switchboard and alarm circuits. The heat coil 13 shows its ratchet wheel in normal operating condition whereby a spring member 18 is held in disengagement from the grounding terminal 11. When the heat coil operates, the spring 18 will be released and assume a position corresponding to that shown by a spring member 19 associated with the heat coil 14. The spring member 19 is released when the ratchet wheel 14^a of the heat coil 14 is permitted to rotate, which condition obtains when the heat coil is subjected to an excess temperature arising from the flow of "sneak" currents against which the heat coils 13 and 14 are designed to protect the telephone apparatus. The mechanism of Figure 1, excepting the heat coils, is old in the art and, therefore, further description is not deemed necessary. 95

Referring to Fig. 2 the heat coil embodying a form of my present invention comprises a main central supporting member 20 which is provided with a threaded end 21^a. By means of this threaded end the heat coil is mounted in the support upon the telephone rack of Fig. 1. The main supporting pin or 105

member 20 is encircled by a heat conducting cylindrical member 21 but is thermally insulated therefrom by an interposed dead air space 22. The member 21 is made as light as possible so that its heat absorptive capacity will be very small, and is provided with an extension or sleeve 22^a upon which an actuator or ratchet wheel 23 is mounted. The ratchet wheel 23 is provided on its periphery with teeth 24. Through the medium of these peripheral teeth the spring members 18^a and 19^a of the mechanism of Fig. 1 may be held against the pins 11^a and 10^a. The ratchet wheel 23 is secured to the sleeve 22^a by means of a heat responsive element, such as a fusible joint 25, that is preferably made of solder. The solder joint 25 is adapted to respond in a very short interval of time to any excess current flowing in a current conducting resistance coil 26 that is wound upon the cylindrical member 21.

The main supporting pin 20 is provided adjacent to its threaded end 21^a with a flanged extension 27 such as shown in Figure 5. The flanged extension 27 has three spaced and integrally formed ears 28 which are adapted to be received in notches formed in the lower edge of an insulating bushing 29 that houses the resistance coil 26 and the cylindrical member 21. By means of the ears 28 the insulating casing 29 is held in fixed relation with reference to the main supporting pin 20. Likewise, the cylindrical member 21 is provided with a plurality of integrally formed and spaced ears 30 which engage the insulating sleeve 29 at its upper edge.

A fibre washer 31 may be interposed between the cylindrical member 21 and the metallic flange 27 of the main supporting member 20. Similarly, a fibre washer 32 embraces the upper end of the main supporting pin 20 and holds in spaced relation the sleeve 22^a from the supporting pin 20. One end of the resistance coil 26 is soldered at 33 to the main supporting pin and the other end is soldered at 34 to the cylindrical member 21. In this manner, the ratchet wheel 23 becomes one terminal for the current conducting coil 26 and is insulated from the terminal 33 or the main supporting pin 20 by means of the fibre washer 32 and the dead space 22.

From the foregoing description, it will be observed that the cylindrical member 21 is thermally insulated from the main supporting member 20 and, at the same time, is composed of as small a mass as is consistent with mechanical strength. The fusible connection 25 is in close thermal relation to the resistance coil 26 and, as a consequence, the heat developed by the resistance coil 26 is readily and quickly conducted to the fusible or soldered connection 25. When the fusible connection 25 becomes heated to the point where

it is liquefied, the ratchet wheel 23 may move relative to the sleeve 22. In this circumstance, the spring member 19^a of Fig. 1 is released from the heat coil 14 and the terminal 19 is grounded.

I have discovered that a soldered joint on being subjected to a continuous stress or strain in its cold state becomes fatigued and, in time, will shear thereby releasing any parts that may be connected together thereby. By reducing the unit stress upon a soldered joint, it is relieved of undue mechanical fatigue and, therefore, is not likely to shear. I lower the mechanical stress imposed upon the soldered joint in my present heat coil by disposing the soldered joint 25 at a considerable radius from the main supporting pin 21. This not only gives an increased area for the soldered joint, but also provides a decreased leverage and consequent resisting force for the soldered joint.

The resistance coil 26 is positioned in close thermal relation to the soldered joint 25 and by reason of the small mass of the cylindrical member 21, most of the heat generated by the resistance coil is conducted readily in proximity to the soldered joint 25. The central supporting pin 21, which is of considerable mass and also in close contact with the heavy metallic supporting frames of the telephone rack, is effectively heat insulated from the resistance coil 26 by means of the air space 22. The fibre washer 32 and the fibre cylinder 29 which enclose the heat resistance coil 26 are poor conductors of heat and, therefore, substantially all of the heat generated is permitted to accumulate in the mass of the cylindrical member 21.

When an abnormal current flows through the resistance coil 26, the fusible connection 25, which is preferably made of solder, liquefies and permits relative action between the actuator or ratchet wheel 23 and the cylindrical member 21. When the current reduces to a normal value, the soldered connection 25 will resume its solid state and, consequently, hold in firm position the ratchet wheel 23 precluding it from rotating.

While I have shown and described one embodiment of my invention, it is to be understood that many modifications may be made therein without departing from the spirit and scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the U. S. is:

1. A heat coil comprising a main supporting member, a second member surrounding said main member and thermally insulated therefrom, heat producing means upon said second member, an actuator, a fusible material securing said actuator to said second member whereby, when the fusible material is softened, the said actuator may move relatively to said second member.

2. A heat coil comprising a main sup-

porting member, a second member surrounding said main member and thermally insulated therefrom, a resistance coil wound upon said second member, an actuator, a fusible material in close thermal relation to said resistance coil and securing said actuator to said second member whereby, when the fusible material is softened, the said actuator may move relatively to said second member.

3. A heat coil comprising a main supporting member, a second member surrounding said main member and thermally insulated therefrom, heat producing means upon said second member, a ratchet wheel mounted upon said second member, a fusible material securing said ratchet wheel to said second member whereby, when the fusible material is softened, the said ratchet wheel may move relatively to said second member.

4. A heat coil comprising a main supporting pin, a second member surrounding said pin but thermally insulated therefrom, a resistance coil wound upon said second member, a ratchet wheel mounted upon said second member, a fusible connection between said ratchet wheel and said second member whereby, when the fusible material is softened, the said ratchet wheel may rotate upon said second member.

5. A heat coil comprising a main supporting member extending centrally therethrough, a second member mounted about and thermally insulated from said supporting member, a resistance coil wound upon said second member, an actuator, and heat responsive means in close thermal relation to said resistance coil whereby, when the heat responsive means becomes excessively heated, the said actuator may move freely.

6. A heat coil comprising a main supporting member, a concentrically disposed second member thermally insulated therefrom, heat producing means upon said second member, an actuator in close thermal relation to said heat producing means, and heat responsive means normally securing said actuator to said second member whereby, when the heat responsive means becomes excessively heated, the said actuator may move relatively to said second member, said heat responsive means automatically securing together said actuator and said second member when the excess heat in the heat responsive means is dissipated.

7. A heat coil comprising a central supporting member, a heat conducting cylindrical member thermally insulated from said supporting member, a resistance coil wound upon said cylindrical member, a ratchet wheel in close thermal connection with said cylindrical member, and a fusible material mechanically connecting said ratchet wheel to said cylindrical member.

8. A heat coil comprising a main support-

ing pin, a cylindrical member encircling said pin and thermally insulated therefrom, a current carrying coil mounted upon said cylindrical member, a ratchet wheel mounted on said cylindrical member, a fusible connection between said ratchet wheel and said cylindrical member in close thermal relation to said coil, and a casing of low heat conductivity for said coil.

9. A heat coil comprising a central supporting pin, a heat insulated casing mounted thereupon, a heat conducting member positioned interiorly of said casing and exteriorly of said supporting pin and thermally insulated therefrom, a resistance coil wound upon said heat conducting member, a ratchet wheel mounted upon said conducting member and exteriorly of said casing, and a fusible connection between said ratchet wheel and said heat conducting member and in close thermal relation to said resistance coil.

10. A heat coil comprising a supporting member, a substantially hollow cylindrical member of small mass thermally insulated therefrom, heat producing means upon said hollow cylindrical member, an actuator in close thermal relation to said heat producing means, and heat responsive means normally securing said actuator to said hollow cylindrical member whereby, when the heat responsive means becomes excessively heated, the said actuator may move relatively to said hollow cylindrical member, said heat responsive means automatically securing together said actuator and said hollow cylindrical member when the excess heat in the heat responsive means is dissipated.

11. A heat coil comprising a main supporting member, a second member thermally insulated therefrom, a resistance coil wound upon said second member, an actuator, and heat responsive means in close thermal relation to said resistance coil whereby, when the heat responsive means becomes excessively heated, then only may the said actuator move.

12. A heat coil comprising a supporting pin, an actuator, a mounting for said actuator, and thermal insulating means for interlocking said pin and said mounting together, said means, pin and mounting being arranged in concentric relation with respect to each other.

13. A heat coil comprising a central supporting pin, an actuator, a mounting for said actuator spaced in concentric relation to said pin, and thermal insulating means for interlocking said pin and said mounting together.

14. A heat coil comprising a central supporting pin, an actuator, a mounting for said actuator spaced in concentric relation to said pin, a heat responsive connection be-

tween said mounting and said actuator, and thermal insulating means for interlocking said pin and said mounting together.

15. A heat coil comprising a central supporting pin, an actuator, a mounting for said actuator spaced in concentric relation to said pin, and means for interlocking said pin and said mounting together, said means comprising an insulating sleeve disposed exteriorly of said mounting.

16. A heat coil comprising a central sup-

porting pin, an actuator, a mounting for said actuator spaced in concentric relation to said pin, said pin and said mounting being provided with spaced lateral extensions, and a notched sleeve engaging said extensions for interlocking said pin and said mounting together.

In witness whereof, I have hereunto subscribed my name.

JOHN S. BAKER.