

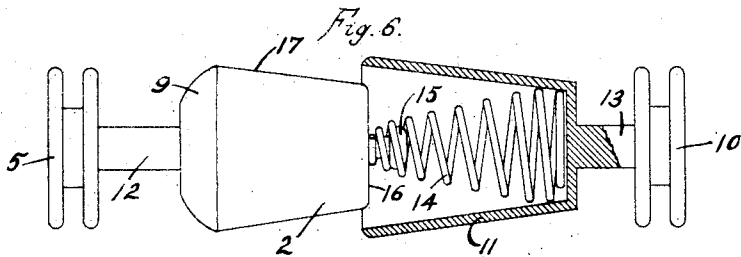
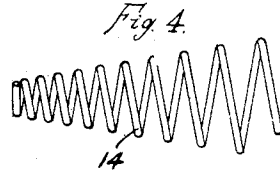
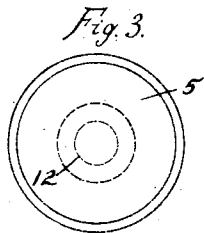
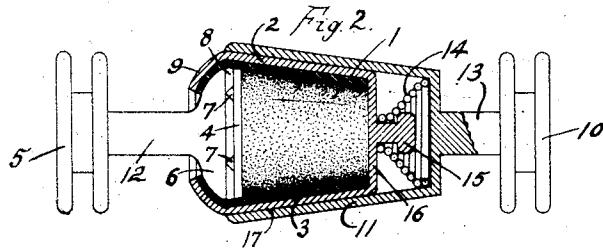
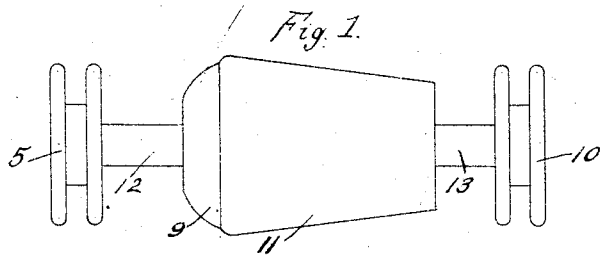
No. 870,714.

PATENTED NOV. 12, 1907.

F. B. COOK.

ELECTROTHERMAL PROTECTOR.

APPLICATION FILED FEB. 15, 1907.



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ELECTROTHERMAL PROTECTOR.

No. 870,714.

Specification of Letters Patent.

Patented Nov. 12, 1907.

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To all whom it may concern:

Be it known that I, FRANK B. COOK, a citizen of the United States of America, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Electrotthermal Protector, of which the following is a specification, reference being had to the accompanying drawings, illustrating same.

My invention relates to electrical protectors used for protecting electrical circuits and apparatus from abnormally large currents of electricity, the form herein illustrated being adapted in particular for telephone systems to protect the lines and delicate apparatus thereof from injurious currents of electricity slightly in excess of the normal, which currents are generally termed "sneak currents."

The principal objects of my invention are to provide a protector of the longitudinally-operable type which is absolutely fire proof; to provide such a protector in which the heating means is in the form of a homogeneous body of resistance material; to provide an electrotthermal protector which is a complete unit in itself and which contains spring operating means for operating same, whereby the protector may be operated without depending upon spring operating means apart from the protector unit; to provide an electro-thermal protector having an openable joint in the circuit normally held against opening by a non-conducting cement applied within the joint in such a manner as to not materially increase the resistance of the joint; to construct such a protector so that it will be very uniform and thoroughly reliable in its operation; and to provide simplicity of construction and durability in such a protector.

Other objects will be apparent from the following specification.

Electrical protectors of the type comprising an openable cemented joint, openable upon an excess of current in the protector, are generally constructed so as to open the circuit through the protector, when same operates. Such a protector is also generally constructed with some form of an insulating inclosing shell which is inflammable. These features in such a protector are objectionable under certain circumstances, especially when the lines equipped with the protectors become crossed with high-voltage wires of other systems, in that when the thermal protector operates and opens the circuit, the high-voltage current will form an arc at the protector, where the circuit is opened only a slight distance, and the current will thus continue to flow through the protector. The arc thus established in the protector will set fire to the inflammable inclosing shell, which will in turn set fire to other protectors directly above this protector, and thereby sometimes burn out or injure a whole strip of protectors and thus throw a number of lines out of service and also cause considerable damage by fire.

In my present invention I have provided an electro-

thermal protector which operates upon excessive heating to allow circuit-controlling means to control suitable circuits, but which does not open the circuit at the protector, thus doing away with the formation of an arc at the protector. In this protector I also do away with the coil of fine wire generally provided as heating means in such protectors, and employ herein a body of powdered resistance material suitably held in shape and which is capable of standing a considerable increase in current above the normal. Then I construct this protector with a metallic casing inclosing same and thereby do away with the ordinary inflammable inclosing shell usually employed.

I will now more particularly describe my invention by reference to the accompanying drawings in which,—

Figure 1 is a side elevation of the complete protector unit; Fig. 2 is a longitudinal cross-sectional view of the protector shown in Fig. 1, with portions shown in elevation; Fig. 3 is an end elevation of Fig. 1; Fig. 4 is a side elevation of the coil spring preferably employed in the protector of Figs. 1 and 2 for keeping the circuit through the protector closed when same operates; Fig. 5 is a side elevation of the coil spring of Fig. 4, compressed as in the protector of Fig. 2 when same is set for operation; and Fig. 6 is a side elevation of the protector of Figs. 1 and 2, showing the protector after same has operated, a portion of the exterior metallic shell being shown in cross-section to show the position of the coil spring when the protector is operated.

Like characters refer to like parts in the several figures.

The heating element 1, preferably comprising a suitable powdered resistance material pressed into a pill, is inclosed in the metallic shell or cup 2 and insulated from the sides thereof by a thin piece of insulating material 3. The heating element 1 is shown, described and claimed in my copending application for Letters Patent on electro-thermal protector, Serial No. 316,153, filed May 10, 1906. Against the outer end of the heating element 1 is placed a disk 4 to make electrical connection with the element 1. A terminal portion 5, provided with a large end portion 6, is placed against contacts 7 7 on the disk 4 so as to make good electrical connection therewith and at the same time provide an air space 8 which keeps the heat produced in the protector from being conducted to the terminal 5. The end portion 9 of the metallic cup 2 is formed over around the end portion 6 of terminal 5, preferably as shown in Fig. 2, and is insulated therefrom by the sheet of insulation 3. The end portion 9 is formed over until the resistance element 1 is compressed sufficiently to adjust the resistance thereof to the proper amount, the resistance being measured during the operation of forming over the portion 9. The terminal 10 is provided with a cup-shaped portion 11 adapted to fit over the metallic cup 2 and make good

electrical connection therewith. Between the cup-shaped portions 2 and 11, and preferably extending all over the contact surface therebetween, is placed a thin film 17 of heat-susceptible, non-conducting, cementing material, preferably a compound of Venice turpentine and gum shellac, to cement the two cup-shaped portions 2 and 11 together. The film of cementing material between the portions 2 and 11 is thin enough so as not to materially interfere with the metallic contact between these two parts. In practice it has been demonstrated that the resistance through this cemented joint is only a very small fraction of an ohm, and that the joint so made, in the type of protector illustrated, will normally stand a pull of 100 pounds or more. The compound of Venice turpentine and gum shellac used, softens at about 150 degrees F. and allows the cups 2 and 11 to be readily separated. The cup-shaped portions 2 and 11 are preferably conically shaped so that they will tightly fit each other and so that the joint between same will readily open when sufficiently heated, whether the pull on the terminals 5 and 10 is along the longitudinal axis of the protector or at an angle with the said axis so as to place the protector under a buckling stress. The terminals 5 and 10 are provided with small neck portions 12 and 13 which prevent any considerable conduction of heat to the said terminals. The terminals 5 and 10 are preferably provided with the usual annular recesses therein to fit suitable spring members in the ordinary telephone protective apparatus. The coil spring 14 of Fig. 4 is placed within the cup portion 11, preferably as shown in Fig. 2, the smaller end of spring 14 grasping the knob 15 on the end of cup 2, and the larger end of spring 14 being forced down into the smaller portion of cup 11 and being somewhat compressed thereby. The coil spring 14 makes electrical connection between the metallic cups 2 and 11 and thereby prevents the circuit through the protector from being opened when the protector is operated as shown in Fig. 6. This coil spring 14 is compressed as shown in Fig. 5, when the protector is set for operation as shown in Fig. 2, and is preferably strong enough to operate the parts of the protector from the position shown in Fig. 2 to the position shown in Fig. 6, without any other spring means to assist it. Thus in addition to keeping the circuit through the protector closed, the coil spring 14 also tends to operate the protector when same is sufficiently heated.

The circuit through the protector is from terminal 5, through neck portion 12, contacts 7 7, disk 4, heating element 1, end 16 of cup 2, the conical portion of cup 2, the cementing material between portions 2 and 11, the conical portion of cup 11, and neck portion 13; to terminal 10. An abnormally large current traversing this circuit heats the resistance element 1. The heat thus produced in the device is conducted by the metallic cup 2 to the cemented joint between the cups 2 and 11 where it softens the cementing material and allows the cups 2 and 11 to separate as shown in Fig. 6. The spring 14, or springs connected with terminals 5 and 10, or both, now operate the protector from the position shown in Fig. 2 to the position shown in Fig. 6, and thereby allow suitable circuits to be controlled in any suitable manner. It is not thought to be necessary to herein describe how these circuits may be con-

trolled, as this is well known to those familiar with apparatus of this character.

If it is desired to reset the protector for another operation, the same may be heated in any suitable manner and the parts pressed together again as shown in Fig. 2, and allowed to cool, whereupon the cementing material 17 will recement the cups 2 and 11 together and thereby hold the parts of the protector in set position for another operation.

The protector may be operated and reset as above described, as many times as desired. If the protector is operated a great number of times it may be necessary to apply fresh cementing material to the exterior surface of the cup 2, but this may be readily done in any suitable manner.

I do not wish to limit this invention to the particular details of construction as herein shown, as many modifications may be made therein without departing from the scope of the invention.

What I claim as my invention and desire to secure by Letters Patent is,—

1. An electro-thermal protector comprising a metallic cup, heating means contained within the cup, another metallic cup in which the first mentioned cup is inserted and secured therein by heat-susceptible cementing material, and a coil spring placed within the second mentioned cup and making electrical connection with both of the said cups whereby the circuit through the protector is kept closed when the cemented joint opens.

2. An electro-thermal protector comprising two metallic cup-shaped portions, one within the other, heat-susceptible cementing material holding the cups together, heat-producing means within the inner cup for softening the said cementing material, and means making electrical connection with both of the said cups whereby the circuit through the protector is maintained closed when the cups are separated.

3. An electro-thermal protector comprising two conically shaped metallic cups, one placed within the other so that the conical surfaces fit each other and make electrical connection with each other, heat-susceptible cementing material securing the said cups together, heating means within the interior cup for softening the cementing material upon abnormal current conditions, and a coil spring placed within the exterior cup whereby electrical connection between the said cups is maintained after the protector has operated.

4. In an electrical protector of the character described, two metallic surfaces bearing against each other, a thin film of heat-susceptible non-conducting cementing material placed between the said metallic surfaces and cementing same together without materially affecting the electrical contact between the two surfaces, and means for heating the said cementing material upon abnormal current conditions to allow the said metallic surfaces to separate.

5. An electrical protector comprising metallic cup-shaped portions, one placed within the other and normally held together by heat-susceptible cementing material, means for heating the cementing material upon abnormal current conditions; and a spring within the external cup, placed under tension whereby the said cups are separated when the said cementing material is softened.

6. An electrical protector comprising metallic cup-shaped portions one placed within the other and normally held together by heat-susceptible cementing material, means for heating the cementing material upon abnormal current conditions, and means within the external cup whereby electrical connection is maintained between the said cups after the cemented joint is opened.

7. An electro-thermal protector comprising heat-producing means, an openable metallic joint, and heat-susceptible non-conducting cementing material within the joint, all in series in the circuit, the said cementing material being applied within the joint in a film so thin as to not materially affect the conductivity of the said circuit.

8. In an electrical protector of the character described, a conically shaped metallic cup, a heat-producing element of homogeneous resistance material placed within the cup under pressure and insulated from the sides thereof, a second cup within which the first is placed and normally cemented therein, a knob on the inner end of the first mentioned cup, and a coil spring within the second mentioned cup, one end of which is squeezed into the second mentioned cup and the other end of which is secured to the said knob, whereby the circuit through the protector is maintained after the cups have separated upon the operation of the device.

9. In a protector of the character described, a conically shaped metallic cup portion, an insulating shell within the cup portion, a homogeneous resistance body, a contact plate, and a terminal member all in series within the said insulating shell, the said resistance body making electrical connection with the inner end of the said cup, the larger end of the said cup being formed over to securely hold the portions therein in position under pressure, a second conically shaped metallic cup portion placed over the first said cup portion and cemented thereto by heat-susceptible cementing material, suitable terminals for the device for connecting same in the circuit to be protected, and a coil spring placed within the said exterior cup between the end portions of the said cups whereby the circuit through the protector is maintained closed after the protector operates.

10. A self-contained electrical protector unit of the character described, comprising heating means and an openable metallic joint normally held against opening by heat-susceptible non-conducting cementing material, all in series in the circuit, and means within the device whereby the circuit through the protector is maintained after the said cemented joint has opened.

11. An electrical protector of the character described, comprising an openable joint normally held against opening by heat-susceptible non-conducting cementing material, means for softening the said cementing material upon abnormal current conditions in the device, and means within the device adapted to maintain a circuit through the protector after same has operated.

12. An electrical protector of the character described, comprising an openable joint in series in the circuit, normally held against opening by a film of heat-susceptible non-conducting cementing material which is also in series in the circuit, means for heating the said cementing material upon abnormal electrical conditions, and a coil spring in the device placed under tension whereby the said cemented joint is opened upon abnormal heating.

13. An electrical protector of the character described, comprising heat-producing means and an openable joint normally held against opening by heat-susceptible non-conducting cementing material, which is included in series in the circuit, and means for opening the said joint when same is heated, for purposes substantially as described.

14. A heat-cartridge of the longitudinally operable type comprising two metallic shell portions fitted one within the other and normally held against separation by heat-susceptible non-conducting cementing material, heating means within the device for heating the said cementing material upon abnormal current conditions in the device, and means for pulling the said shell portions apart when the cementing material is heated.

15. A heat-cartridge of the longitudinally operable type comprising two metallic shell portions fitted one within the other and normally held against separation by heat-susceptible non-conducting cementing material, heating means within the device for heating the said cementing material upon abnormal current conditions in the device, means for pulling the said shell portions apart when the cementing material is heated, and means within the protector for maintaining a closed circuit through the protector after same has operated.

As inventor of the foregoing, I hereunto subscribe my name in the presence of two subscribing witnesses, this 12th day of February, 1907.

FRANK B. COOK.

Witnesses:

FREDERICK R. PARKER,
JNO. F. TOMPKINS.