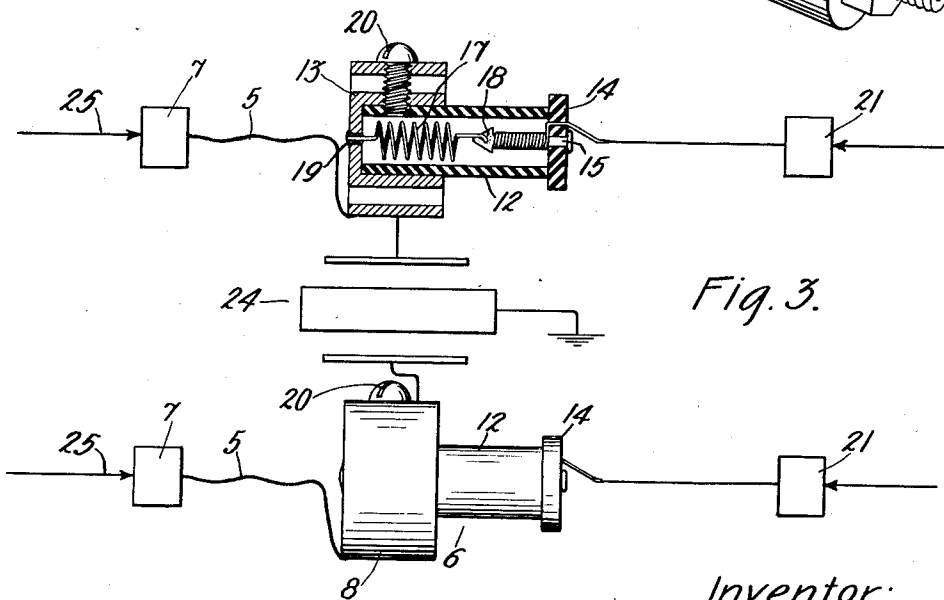
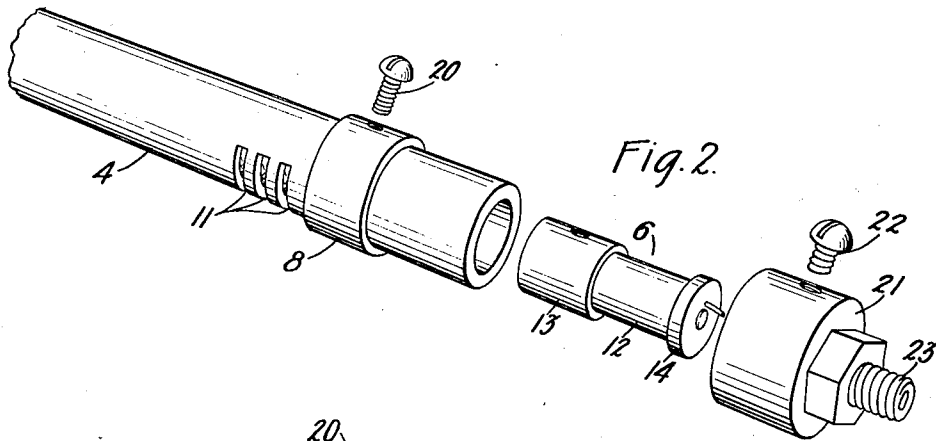
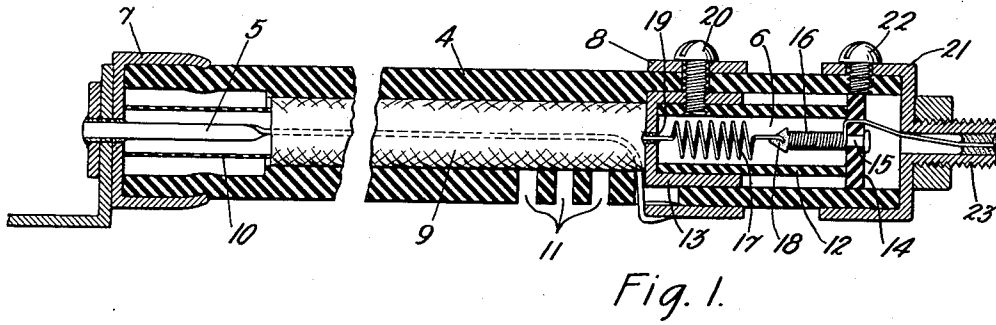


C. S. PRICE.
 PROTECTIVE DEVICE.
 APPLICATION FILED MAR. 16, 1917.

1,276,567.

Patented Aug. 20, 1918.



Inventor:
 Charles S. Price.
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UNITED STATES PATENT OFFICE.

CHARLES S. PRICE, OF RUTHERFORD, NEW JERSEY, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

PROTECTIVE DEVICE.

1,276,567.

Specification of Letters Patent.

Patented Aug. 20, 1918.

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To all whom it may concern:

Be it known that I, CHARLES STUART PRICE, a citizen of the United States, residing at Rutherford, in the county of Bergen and State of New Jersey, have invented certain new and useful Improvements in Protective Devices, of which the following is a full, clear, concise, and exact description.

This invention relates to a protective device for electric circuits and comprises a fuse element for protection against abnormal currents and a heat coil element for protection against currents of lower value. The fuse element consists of a fusible conductor which is ruptured by the heating effect of the current passing through it whenever such current exceeds a predetermined value. The heat coil element is adapted for protection against foreign currents, which, although not strong enough to operate the fuse element would, if allowed to continue to flow, cause damage to the apparatus associated with the line.

The object of this invention is to provide a combined heat coil and fuse which will be efficient and accurate in operation, cheap to manufacture and the elements of which will not only be easily replaceable but will each be unaffected by the operation of the other. A further object is to provide a construction in which it is possible to utilize the advantages of a predetermined rupture point of the fusible conductor as referred to in my co-pending application, filed August 3, 1916, Serial No. 112,989.

A still further object is to provide a heat coil construction which is self-contained and therefore can be easily tested without assembling the complete device.

The several features of this invention may be more readily understood by reference to the accompanying drawings, wherein Figure 1 is a longitudinal sectional view of a protective device embodying this invention; Fig. 2 is an expanded view showing the various parts of the heat coil element in position for assembling; and Fig. 3 is a circuit diagram showing a standard method of connecting these protective devices in telephone line circuit.

In the tubular sheath 4 of fiber or similar material are mounted the fusible conductor 5 and the heat coil element 6. One end of the fusible conductor is connected to a metal end piece 7, the other end being brought out

through an opening in the side of the sheath and soldered to the metal band 8. The fusible conductor 5 is preferably surrounded for a portion of its length by means of a porous non-conducting, non-combustible material 9, asbestos sleeving having been found a very efficient material for this use. The remaining portion of the fusible conductor is surrounded by a tube 10 of insulating material such as paper, and so arranged as to provide an air space about the conductor at this point. The sleeving of insulating material 9 is so located as to come in direct contact with the fusible conductor and therefore conducts away a part of the heat generated, thereby allowing that portion of the conductor passing through the tube 10 to attain a higher temperature and determine the point of rupture. Suitable vents 11 in the tubular sheath 4 are so located that the heated gases generated at the rupture of the fusible conductor are required to pass through practically the entire length of the asbestos sleeving before being expelled, thereby causing the metal vapors to be absorbed and chilled and the arc to be broken up.

The heat coil element 6 consists of a self-contained unit, the operating members being assembled within the insulating tube 12, which is closed at one end by means of the cap 13 and at the other end by means of an insulating disk 14. Securely fastened to this disk is the metal spindle or core 15, upon which is placed the heating winding 16. One end of this winding is connected directly to the core, the other end being led through a perforation in the insulating disk as shown. A spring member 17 is fastened at one end of the core 15 by means of a low melting-point solder 18. In assembling this element the wound core, to which is soldered the helical spring, is first placed within the tube 12, the free end of the spring 17 being threaded through a perforation 19 in the metal cap 13. The proper degree of tension is then put upon the spring drawing the insulating disk against the tube, after which the spring is soldered to the metal cap 13, closing up the perforation 19. The assembled unit is next placed within the tubular sheath 4 and is secured in place by means of the screw 20, passing through the metal band 8, the tubular sheath 4 and engaging a threaded hole in the metal cap 13. The

end of the tubular sheath containing the heat coil is closed by means of a metal end cap 21 which is secured to the sheath by means of the screw 22. This metal end cap is provided with a hollow stud 23 through which is threaded the free end of the heat coil winding and to which this winding is soldered.

Referring more particularly to Fig. 3, in which is shown a method for protecting a telephone line with devices of the type described, it will be noted that the metal band 8 is connected to ground by means of a lightning arrester 24 which may be of any of the well-known types. The fusible conductor 5 is connected to the line wire 25 and is adapted to open the circuit in case of abnormal current flow. In the event of a cross with a power line permitting the flow of current which although not of sufficient value to melt the fusible conductor would in time cause damage to the apparatus, the circuit to the instrument is opened by the heat coil element without affecting the rest of the circuit. This arrangement leaves the lightning arrester together with the fusible conductor connected directly to the line, thereby affording protection against the effect of lightning discharges.

In the operation of the heat coil element, the foreign current enters along the line wire 25 and flows in series through the fusible conductor 5, metal band 8, screw 20, metal cap 13, spring 17, core 15, winding 16, metal end cap 21 and thence to the instrument being protected. Upon sufficient heat being generated in the winding 16, the fusible solder 18 becomes plastic, freeing the spring 17, which is under tension, allowing it to move rapidly away from the core, thereby positively breaking the circuit to the instrument.

It will be noted that with the construction shown, the operation of the fuse element does not affect the heat coil element, since the latter is protected from the arc by means of the metal cap 13 and a new fusible conductor may be placed within the sheath without disturbing the heat coil. Moreover, the operation of the heat coil does not in any way affect the fusible conductor and a new heat coil can be easily placed within the sheath. Since the heat coil element is a self-contained unit, it may be tested entirely independent of the fuses with which it is later associated. Another decided advantage resulting from the unit type construction is the double air space provided about the heat coil element. This not only results in a more efficient coil, but also in one in

which the operation is affected only to a slight degree by outside temperatures.

What is claimed is:

1. A protective device having in combination a tubular sheath, a fusible conductor inclosed within and extending along the greater portion of said sheath and a self-contained heat coil inclosed within the remaining portion of said sheath and mounted independent of said fusible conductor, said heat coil element comprising a tubular container providing an inner air chamber, a circuit controlling device and a heating winding inclosed within said chamber, and an outer air space between said sheath and said tubular container.

2. A protective device having in combination a tubular sheath, a metal band secured thereto, metallic end pieces for said sheath, a fusible conductor electrically connected between one end piece and the metal band, and a self-contained heat coil element inclosed in said sheath and connected between the other end piece and the metal band, said element comprising a tubular container, a circuit controlling device, a heating winding located within said container, and a metal cap closing one end of said container.

3. A protective device comprising a tubular sheath, a metal band secured thereto, vents in said sheath adjacent to said band, a fusible conductor connected at one end to said band, a porous non-conducting material surrounding said conductor, means for determining the rupture point of said conductor at or near the non-vented end of said sheath, and a heat coil element in said sheath, said element being provided with a metal cap closing the bore of said sheath, whereby the heated vapors generated at the rupture of said conductor are expelled through the vents without damaging said heat coil element.

4. In a protective device, a self-contained heat coil comprising a tubular container, a circuit controlling device mounted under tension therein, a metal cap to which said circuit controlling device is connected, inclosing one end of said container, a heating element for operating said circuit controlling device, and an insulating disk to which said heating element is secured closing the other end of said container, said disk being held against said container by the tension of said circuit controlling device.

In witness whereof, I hereunto subscribe my name this 15th day of March A. D., 1917.

CHARLES S. PRICE.