Aug. 8, 1939. E. L. FISHER 2,168,769

PROTECTOR

Filed Aug. 31, 1937

FIG. 1

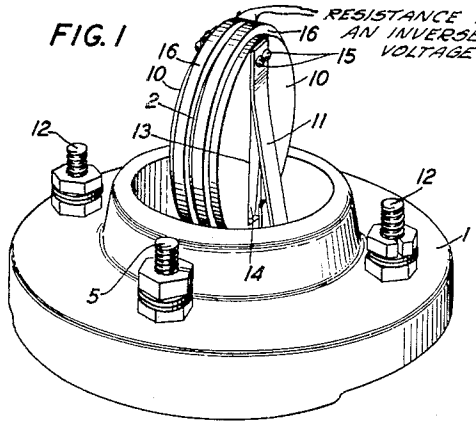


FIG. 2

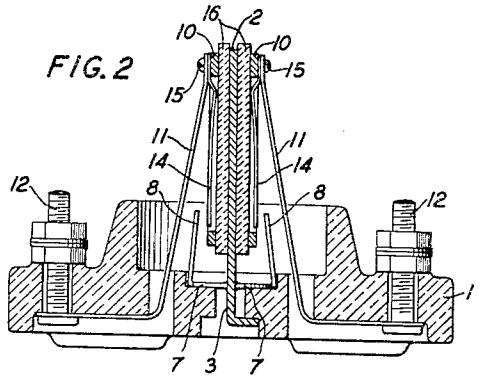
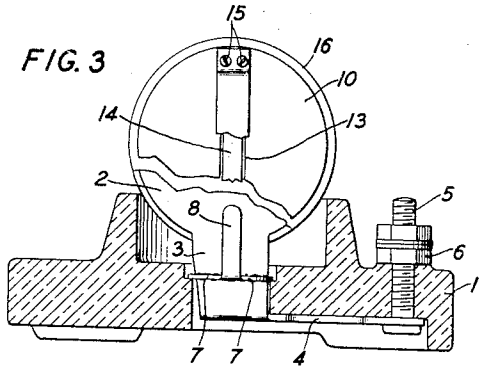


FIG. 3



INVENTOR
E. L. FISHER
BY
H. G. Bandfield
ATTORNEY

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PROTECTOR

Earl L. Fisher, Newark, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

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3 Claims. (Cl. 175—30)

This invention relates to protectors and more specifically to protectors for telephone substation equipment.

Protectors of this type usually comprise a high resistance path from each line conductor to ground. These paths are of such high resistance as to prevent for practical purposes the flow of the low voltage telephone and ringing currents to ground. However, if a high voltage from a power line, lightning or other source is accidentally applied to the line it passes over the high resistance path to ground rather than through the equipment. A common form of protector is an air-gap between line and ground, which air-gap is broken down by the application of a high voltage, allowing current to flow to ground. A more recent development employs in place of the air-gap, a resistance material having a non-linear voltage-current characteristic and commonly referred to as a non-ohmic material. Since with such a material the resistance decreases with increase of applied potential, this material may be defined as one having an inverse resistance-voltage characteristic. Materials which have been found to possess the desired characteristics are "Thyrite", carborundum and certain other refractory materials. The preferred material for this protector is "Thyrite", which has been known in the electrical art for some time. Its physical properties and some of its applications are described by T. Brownlee, General Electric Review, vol. 37, No. 4, April 1934, pages 175 et seq. The advantage of this type of protector is that it is capable of withstanding repeated discharges due to abnormal potentials.

The inherently higher resistance of this type of protector, however, may produce a fire hazard under conditions of long contact with the source of high voltage, such as an adjacent power circuit, unless units of impracticable size are used or unless some special preventive auxiliary device is employed.

An object of this invention is to combine a protector of this type with a thermally responsive means to short-circuit the protector to ground before a dangerously high temperature exists.

A further object is to employ a mounting for the protector in which the generation of excessive heat by the protector will cause a thermostatic metal member to short-circuit the protector.

A feature of the invention is the production of a substation protector unit which includes a conductor element having an inverse resistance-voltage characteristic as the high resistance path and a mounting in which is incorporated a thermally responsive means for short-circuiting the high resistance only during the persistence of an abnormally high temperature in the unit.

An exemplary embodiment of the invention is illustrated in the accompanying drawing in which:

Fig. 1 is a perspective view of the protector device mounted on a suitable base;

Fig. 2 is a central section taken at right angles to the plane of the protector disc; and

Fig. 3 is a partial section taken on a plane parallel to the protector disc.

The protector is mounted on a perforated base member 1 of ceramic or other suitable material. The ground contact element 2 is in the form of a disc with a reduced portion 3, which has a right angle projection 4 which comprises a combined support and connecting means. The part 4 is mounted on the base 1 by means of the terminal bolt 5 and nut 6. Projected from either side of the portion 3 and firmly attached thereto are flange members 7. These members provide additional support for the ground contact element 2 and also carry the auxiliary ground contact member 8, the function of which will be described in due course.

On either side of the ground contact 2 are the line contacts 10. These are in the form of discs of the same size as the ground contact discs. These contacts are supported on the base by resilient bracket members 11 which also serve as electrical connectors between the contacts 10 and the terminals 12. The terminals 12 are in the form of bolts by means of which the brackets are attached to the base. The contact discs 10 are slotted part way through the vertical diameter as at 13. Within the vertical slots are located thermally warpable strips 14. The contacts 10, brackets 11 and strips 14 of each group are secured together by the fastening means 15 which may be screws or rivets. Between the ground contact 2 and each line contact 10 is mounted a disc 16 of "Thyrite" or other material having the desired resistance-voltage characteristic. These discs 16 are frictionally held in place due to the pressure applied by the resilient bracket members 11.

In practice, connection is made from terminal 5 to ground and from each of terminals 12 to a line conductor.

The operation of the device is as follows:

Under conditions of normal voltage the very high resistance of the conductors 16 prevents for all practical purposes, the flow of current from the line wire to ground. However, upon the

application of abnormally high potentials the resistance of members 16 goes down and current flows to ground. If this flow is sustained for a predetermined period sufficient heat may be generated to cause the thermally responsive members 14 to deflect. These members are arranged to warp outwardly from the slot 13 into contact with the auxiliary ground contacts 8. This provides a low resistance shunt around the disc 16. The generation of heat to a dangerous degree is thus prevented. Upon reduction of temperature the thermal elements 14 recede, opening the shunt path. If the high voltage persists the cycle is repeated. However, if the high voltage has been removed the protector assumes normal effective condition. By means of this invention continuous protection is achieved without the disadvantages attendant upon use of other protectors of this general type.

Although the invention has been described with relation to the particular embodiment illustrated in the drawing, it is understood that it is not limited thereby but only by the scope of the appended claims.

What is claimed is:

1. A protective device comprising a pair of electrodes separated by a member of high resistance material having a non-linear variation of resistance with applied voltage, a bimetallic element mounted in a slot in one electrode, an auxiliary contact connected to the other electrode and located adjacent said slot in a position to be contacted by the bimetallic element when a dangerously high temperature exists in the device.

2. A protective device comprising a pair of electrodes separated by a member of high resistance material having an inverse resistance-voltage characteristic, a bimetallic element mounted in a slot in one of said electrodes and having one end in contact with said high resistance material, and an auxiliary contact connected to the other electrode and located adjacent said slot in a position to be contacted by the bimetallic element upon a predetermined increase in temperature of said device.

3. A protective device comprising a pair of electrodes separated by a member of high resistance material having an inverse resistance-voltage characteristic, a bimetallic element mounted in and substantially closing a slot in one of said electrodes and having one end in contact with said high resistance material, and an auxiliary contact connected to the other electrode and located adjacent said slot in a position to be contacted by the bimetallic element upon a predetermined increase in temperature of said device.

EARL L. FISHER.