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IMPULSE LIGHTNING ARRESTER

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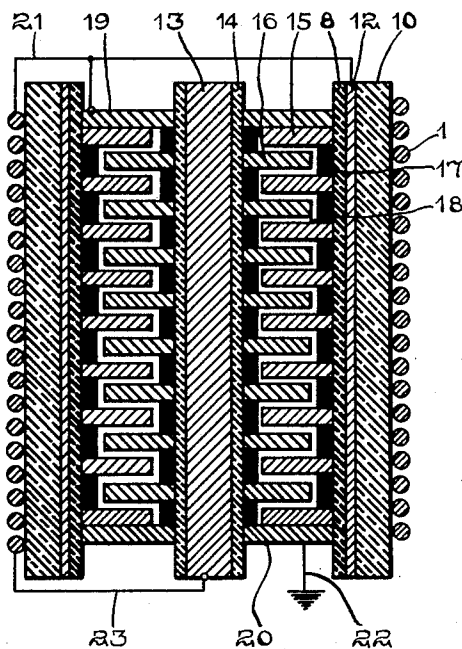


Fig. 1.

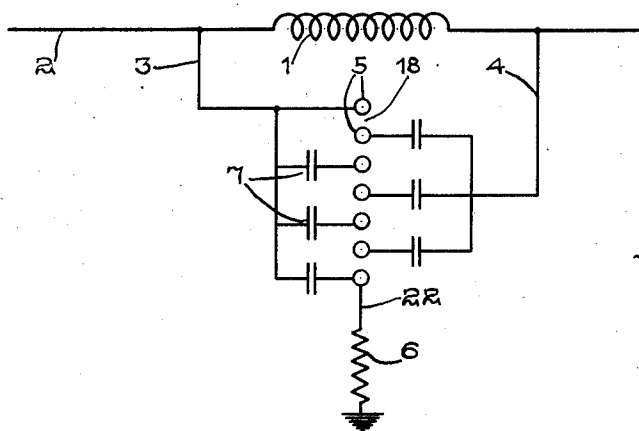


Fig. 2.

WITNESSES:

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IMPULSE LIGHTNING ARRESTER.

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My invention relates to lightning arresters, especially to lightning arresters which are interposed in an electrical circuit to permit the excess electromotive force to establish a low-resistance path to ground.

It is among the objects of this invention to provide a protective device which shall be of simple, compact and durable construction, inexpensive to manufacture and readily adapted to be connected in electrical transmission circuits and the like.

In electrical protective circuits embodying a choke-coil, any serious danger of rupturing the insulation of the apparatus connected in such circuits due to abnormal surges, such as are caused by lightning, may be eliminated by interposing a discharge apparatus between such coil and ground to relieve the surge potential by effecting a discharge thereacross.

In accordance with my present invention, I provide a plurality of condenser and spark gaps which are shunt-connected across the choke-coil of a line circuit having a terminal lead connected to ground. In the event that a surge builds up the voltage across the coil, such voltage is applied through the condensers to the gaps in multiple, causing the latter to break down, which relieves the surge through the gaps in series to ground.

In the accompanying drawing constituting a part hereof, in which like reference characters designate like parts,

Figure 1 is a cross-sectional view of a discharge device embodying the principles of this invention, and

Fig. 2 is a diagrammatic view showing the relation of the elements constituting such apparatus and their connections to the circuit to be protected.

Referring to Fig. 2, an inductance coil or choke-coil 1, connected in series with a line 2, is provided with a shunt connection 3 and 4 having a plurality of series gaps 5 in multiple connected through a series resistance 6 to ground and having a plurality of condenser elements 7 interposed therebetween.

My preferred construction, as illustrated in Fig. 1, embodies, in a single compact device, a cylindrical porcelain tube 10, a choke-coil 1 comprising a plurality of helically-

wound turns of wire surrounding said tube, a metal sleeve 12 disposed therein, an insulating bushing 8 of fibrous material located within the metal sleeve 12, a conductor rod 13 contained within an insulating sleeve 14 and centrally disposed within the bushing 8 and a plurality of electrodes 15 and 16 comprising flat rings disposed in spaced relation, as shown, and a plurality of insulating spacing rings 17 interposed between adjacent rings to provide spark gaps 18. Contact rings 19 and 20 are located at the respective ends of the stacked electrodes to secure them in position within the insulating housing and to provide terminal connections to one end of the coil 1 by a terminal lead 21, which is electrically connected to the sleeve 12, and to the ground by a terminal lead 22. The other end of the choke coil 1 is connected, by a suitable lead 23, to the central conductor rod 13. The device is connected in the line as illustrated in Fig. 2.

Comparing the elements of my device with the diagram of Fig. 2, the electrodes 15 and 16 are equivalent to the electrodes 5 forming the gaps 18 therebetween. Capacity between the electrode rings 15 and 16 with respect to the conducting cylinder 12 and the conducting central rod 13, respectively, is equivalent to the condensers 7.

My device is a construction adapted for embodiment in arresters of the low-equivalent type, and a very low impulse ratio may be possible with this arrangement. Under normal operating conditions all of the gaps are connected in series between the line and ground, requiring a relatively large breakdown voltage. In case of an electrical disturbance on the line, practically the entire surge voltage piles up between the terminals of the choke coil, causing the gaps to break down in multiple at a relatively low voltage, the surge discharging through the broken-down gaps to ground.

It will be obvious from the above description of my invention that a protective device constructed in accordance therewith provides a simple means of protecting the insulation of electrical apparatus connected in the circuit. My device is of a durable compact structure which protects it from dam-

age sustained in other more complicated apparatus heretofore employed.

Although I have shown a specific embodiment of my invention, it will be obvious to those skilled in the art that various modifications may be made in the details of construction. For instance, materials employed for the insulating base, spacer tube, electrodes and conductor members may be of any suitable composition having the characteristics to function in accordance with the requirements of the principles herein set forth. The general design may be altered to adapt it for use to some particular operating conditions. This and other changes may be made in the details of construction without departing from the principles herein set forth.

I claim as my invention:

1. In a protective device, the combination with a choke coil, of a plurality of electrodes constituting serially connected gap devices, a connection between one terminal electrode and one end of the choke coil, a ground connection for the other terminal electrode, a connection including a series condenser between said terminal of the choke coil and another electrode of the series, and a connection including a series condenser between the other terminal of the choke coil and an intermediate electrode.

2. In a protective device, the combination with a choke coil, of a plurality of electrodes constituting serially connected gap devices, a connection between one terminal electrode and one end of the choke coil, a ground connection for the other terminal electrode, a plurality of connections, each including a series condenser, between said terminal of the choke coil and alternate electrodes of the series, and a plurality of connections, each including a series condenser, between the other terminal of the choke coil and intermediate electrodes of the series.

3. In a protective device for an electric line, the combination with reactance means connected in series with said line, of a plu-

ality of electrodes constituting a plurality of gap devices connected in parallel to said line, means connected to one terminal of said reactance means for normally applying the line voltage to the gap devices in series, and means including a connection with another terminal of said reactance means for applying the surge voltage developed in said reactance means to said gap devices in parallel.

4. In a protective device, the combination with a tubular insulating base, of a plurality of helical turns of insulated conductor material wound thereon, a metal sleeve disposed within said base, an insulating tube disposed within said sleeve, an insulating tube of relatively small diameter having a metallic rod inserted therein being centrally disposed within said tubular base and a plurality of annular electrodes of varying diameters alternately disposed between said central tube and said larger insulating tube having a plurality of spacing rings disposed therebetween to provide a plurality of gaps.

5. In a protective device, the combination with a tubular insulating base, of a plurality of helical turns of insulated conductor material wound thereon, a sleeve of conductor material secured to the inner wall of said base, an insulating tubing secured within said conductor sleeve, a conductor rod contained within an insulating tubing centrally disposed within said base, a plurality of annular electrodes mounted between said central and inner tubing having a plurality of insulating spacing rings disposed therebetween to provide a plurality of gaps and a pair of contact rings for holding said electrodes and spacers within said base, said helically wound conductor having one end secured to one of said contact rings and its other end to the said conductor rod and the other of said contact rings having a ground terminal connection.

In testimony whereof, I have hereunto subscribed my name this 10th day of August, 1922.

ALFRED L. ATHERTON.