Feb. 21, 1928.

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E. I. GREEN

INSULATOR

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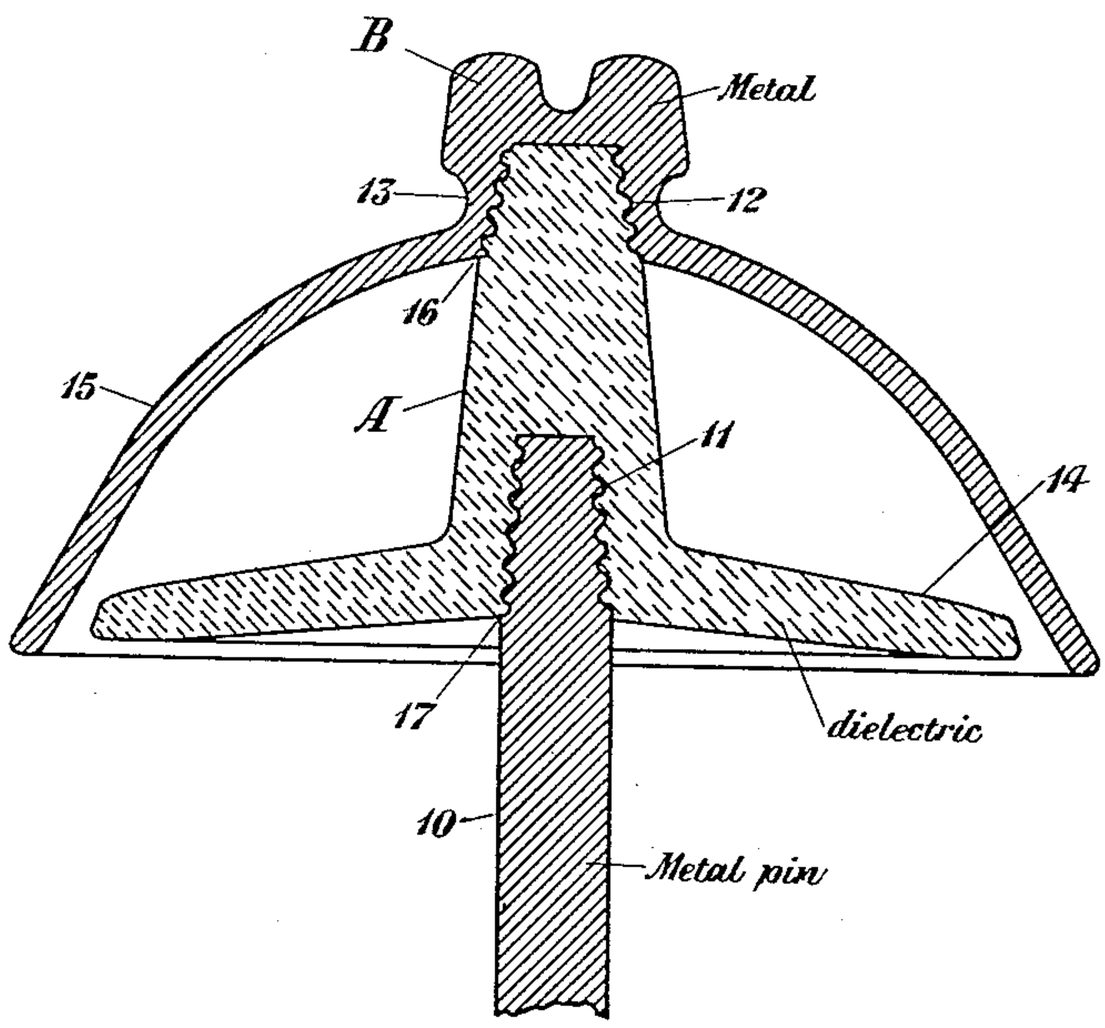

INVENTOR
E. I. Green
BY
ATTORNEY

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UNITED STATES PATENT OFFICE.

ESTILL I. GREEN, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

INSULATOR.

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This invention relates to improvements in insulators and more particularly to a construction of insulator adapted to stabilize the leakage loss under different weather conditions.

With the development of methods of transmitting telephonic and telegraphic signals by means of carrier currents propagated along open wire lines, new transmission problems have been introduced. Owing to the fact that the carrier currents employed are relatively high in frequency as compared with the voice currents or Morse currents utilized in the ordinary methods of communication it has been found that the attentuation is very markedly increased, so much so, in fact, that repeaters for amplifying the transmitted currents must be separated by much shorter distances, thereby adding to the expense of the plant outside the terminal stations at which the carrier apparatus is applied.

A very material part of this attenuation is due to leakage loss through the insulators which are cutomarily employed upon open wire lines, and this loss varies through a very wide range under different weather conditions. The insulator acts like a condenser, the glass of the insulator constituting the dielectric, the line wire and tie wire on the outside of the insulator comprising one plate, and the wooden pin upon which the insulator is supported comprising the other plate. The condenser thus formed introduces a leakage loss due to so-called dielectric hysteresis and this loss varies with the capacity of the condenser.

In dry weather, the outer plate of the condenser, that is, the portion of the line wire adjacent to the insulator and its associated tie wire, constitutes a plate of relatively small area so that the capacity is relatively small and hence the leakage loss, even at carrier frequencies, is small as compared with the total attentuation of the circuit. During wet weather, however, the entire outer surface of the insulator becomes wet, with the result that the conductive area external to the insulator is very much increased. As a result, the capacity, and consequently the leakage loss, is very much increased. During the extremes of wet and dry weather the attentuation of the system varies through a wide range due to this cause alone, and this necessitates the provision of special regulating apparatus for maintaining the transmission equivalent of the circuit constant under all weather conditions.

In order to avoid the expense of the regulating arrangements it becomes desirable to device some method for stabilizing at some constant value the capacity of the insulator, and hence its dielectric loss. In order to reduce the loss to the smallest proportions it is also desirable to so design the insulator that it will be stabilized at a low capacity value. It is the purpose of the present invention to accomplish these results by the arrangements hereinafter disclosed. The invention may now be more fully understood from the following detailed description when read in connection with the accompanying drawing, in which the figure represents a preferred embodiment of the invention.

In the usual type of telephone insulator, for example, the line conductor and tie wire are connected to the insulator by means of a groove in the outer surface thereof at a point surrounding the supporting pin. As already stated, in wet weather the entire outer surface of the insulator becomes conductive and operates as one plate of a condenser, of which the supporting pin constitutes the other plate. During dry weather, the area of the outer plate of the condenser is limited to the line conductor and tie wire so that, obviously, the capacity and hence the dielectric loss varies through a wide range with different weather conditions. The capacity may be stabilized at the wet weather condition by covering the outer surface of the insulator with a permanent conducting layer. Owing to the relatively small dielectric space between the supporting pin and this layer, however, the capacity under these conditions is very large. By the present invention the insulator is so constructed that the line conductor and tie wire are secured at a point somewhat above and distant from the supporting pin and the exterior metallic conducting surface extends downwardly and outwardly, so as to be at all points at a considerable distance from the supporting pin and at the same time protect the inner parts of the insulator from moisture. The capacity will thus be stable and at the same time will not be unduly large.

Referring to the figure of the drawing, 10 designates the supporting pin which is preferably of metal and is provided with screw

threads at the top, as is usual. Upon the supporting pin is mounted a dielectric cob A, which is provided with an interior screw-threaded opening at 11 so that it may be mounted on the supporting pin. The top of the dielectric cob at some distance above the supporting pin is screw-threaded, as shown at 12, so that a metallic button-like member B, having a suitable groove 13 for carrying the line conductor and tie wire may be mounted upon the dielectric cob A. Near the bottom of the dielectric cob a wide flange member 14 is provided, the edges of which are located at some distance from the supporting pin 10. The button-like member B, to which the line conductor and tie wire are secured, is provided with a substantially bell-like flange 15, which extends outwardly and downwardly so that its lower margin lies just outside of the outer edges of the dielectric flange 14.

It will be seen that the button B, with its plate 15, constitutes the outer plate of a condenser of which the cob A, with its flange 14 and the intervening air, constitutes the dielectric and of which the supporting pin 10 constitutes the other plate. It is inherent in the construction that there is wide separation at all points between the two plates of the condenser, and that the dielectric of the condenser consists in part of air for all except for a small area on each plate, so that the capacity is comparatively small, notwithstanding the fact that the entire outer surface is conductive. The bell-like flange 15 protects the entire dielectric cob A with its flange 10 from moisture during wet weather and by reason of the flange 14, which is thus protected, an extremely long dry path is provided, this path extending from the point 16 where the dielectric cob A joins the flange 15, down along the shank of the cob A, then over the upper surface of the flange 14 to the outer margin thereof, and thence back under its under surface to the junction point 17 between the cob and the metal pin.

Obviously, the capacity of the insulator thus constructed, and hence the dielectric loss (which is proportional to the capacity) is fixed and stabilized at a value determined by the extent of the outer metallic surface and by the separation between such surface and the supporting pin. This stabilized value will be much smaller than the capacity of the ordinary insulator during wet weather conditions. Also, the direct current leakage is stabilized at the dry weather condition by the provision of the unusually long dry path under the outer flange of the insulator. It is unnecessary to provide any additional repeaters by reason of the use of the outer metallic shell, as repeaters must be provided even with existing insulators to give sufficient gain for the worst transmission conditions. As a matter of fact, since the maximum capacity is less for an insulator of the type herein disclosed than for the ordinary insulator under wet weather conditions, a actual reduction in the number of repeaters is possible. Furthermore, since there is substantially no variation in the capacity of the insulator under different weather conditions the equipment for maintaining the transmission constant may be eliminated and the expense proportionately cut down.

It will be obvious that the general principles herein disclosed may be embodied in many other organizations widely different from those illustrated without departing from the spirit of the invention as defined in the following claims.

What is claimed is:

1. An insulator comprising a supporting pin, a cylindrical cob of dielectric material adapted to be mounted on said supporting pin, said cob having a laterally extending flange of dielectric material at its lower edge where it is secured to the supporting pin, and a metallic button-like member adapted to be mounted on the top of the cob at a distance from the supporting pin approximately equal to the radius of said lateral flange in order to permit the line conductor and tie wire to be secured thereto, said button having a flange projecting outwardly and downwardly adjacent to but separated from said dielectric flange to protect the cob from moisture.

2. An insulator comprising a supporting pin, a cylindrical cob of dielectric material adapted to be mounted on said supporting pin, said cob having a laterally extending flange of dielectric material at its lower edge where it is secured to the supporting pin, and a metallic button-like member adapted to be mounted on the top of the cob at a distance from the supporting pin approximately equal to the radius of said lateral flange in order to permit the line conductor and tie wire to be secured thereto, said button having a flange projecting outwardly and downwardly adjacent to but separated from said dielectric flange to protect the cob from moisture, said outwardly and downwardly extending flange being so shaped as to substantially surround said first mentioned flange of dielectric material, thereby providing a dry path along the shank of the cob and over the upper and lower surfaces of said dielectric flange.

In testimony whereof, I have signed my name to this specification this 29th day of June, 1925.

ESTILL I. GREEN.