June 17, 1930. P. B. COCHRAN 1,764,434

INSULATOR

Filed March 21, 1927

Fig. 1.

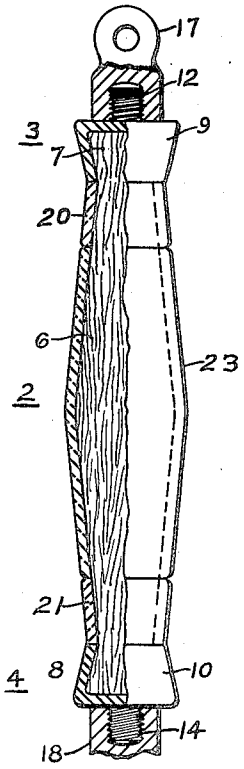


Fig. 2.

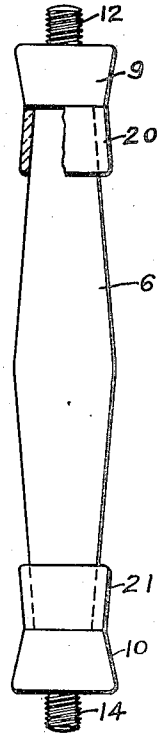
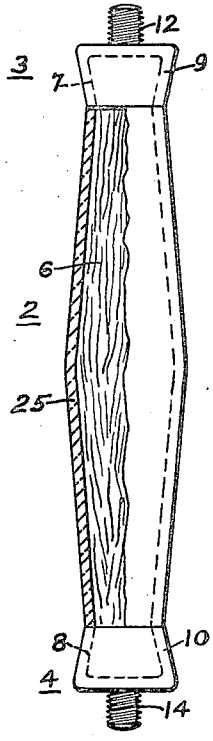


Fig. 3.



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UNITED STATES PATENT OFFICE

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INSULATOR

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My invention relates to insulators and particularly to high-voltage insulators comprising a fibrous main insulating element.

One object of my invention is to provide an insulator, of the above-indicated character, that shall be protected against the damaging effects of the electrostatic field on the fibrous material.

Another object of my invention is to provide a fibrous or similar insulator that shall be weather-resistant.

Another object of my invention is to provide an insulator that shall have a protective coating of uniform thickness thereon.

A further object of my invention is to provide an insulator that shall be simple and durable in construction, economical to manufacture and effective in its operation.

In high-voltage insulators embodying fibrous or similar main insulating elements, damage by charring and disintegration from weather effects are very likely to occur.

Charring is caused by corona and arcs developed by a concentrated electrostatic field, in consequence of which the insulating character of the fibrous element is seriously impaired and sometimes destroyed.

For instance, in subjecting an elongated rod of wood, paper, composition, or similar substances to corona and arc-forming voltages, the initial tendency is to char or carbonize the fibrous material adjacent to the metal terminals of the rod. This is because the electrostatic field is more concentrated near the terminals.

With continued use, the initially relatively short charred area is extended more and more because the charred or carbonized section has become a conductor, and the field concentrates at the outer end thereof rather than on the metal terminals. The carbonizing process is thus a progressive action which, in time, results in breakdown of the insulator and renders the same unfit for further service.

The weather also affects fibrous insulators by alternate wetting and drying, and by extreme temperature changes, so that the wet material becomes a good conductor and the ultimate result is a split, disintegrated or otherwise impaired insulator which also breaks down and becomes unfit for service.

Various suggestions to remedy the above-mentioned conditions have been made, including the coating of the fibrous element with shellac, varnishes and the like, and the enclosing of the element in a cylinder of refractory material, such as porcelain or glass.

The latter method is more or less complicated and expensive, as well as unsatisfactory, by reason of the likelihood of breakage of the comparatively brittle refractory cylinder unless it is made prohibitively heavy in consideration of the voltage to be resisted.

To the best of my knowledge, the hardened liquid or plastic coatings heretofore suggested have all been of organic materials, such as paints, varnishes and certain synthetic resins which char and become conducting, as above set forth. These coatings have also usually been brushed on the insulator or the latter has been dipped in the coating material, so that the coatings have been of varying thickness and weak in spots.

It is my aim to prevent charring and weather effects on fibrous insulators, to thereby render them longer lived and more effective during all of their service, and to obtain these results in an extremely simple and economical manner. Accordingly, in practicing my invention, I so partially or entirely coat the fibrous material between the metal terminals with a molded body of material of uniform thickness which remains insulating under the influence of corona and arcs as to effectually stop the above-mentioned progressive destruction of the insulation. In one form, my invention contemplates the combined use of the non-charring material with a material which, while charrable if subject to corona, is placed where it is not so affected. This form of my invention provides a structure having a series of coatings thereon and that may be more economical than the form in which the fibrous material is entirely coated

with the non-charring material and may have other advantages thereover, depending upon the service for which it is intended and other conditions.

Figure 1 of the accompanying drawing is a longitudinal side view, partially in section and partially in elevation, of an insulator constructed in accordance with my invention, and

Figs. 2 and 3 are similar views of modified forms thereof.

Referring to Fig. 1, the device comprises, in general, a main insulating element 2, an upper terminal structure 3 and a lower terminal structure 4. The element 2 comprises a main body portion 6 in the form of an elongated rod of fibrous insulating material, such as wood, having substantially frusto-conical end portions 7 and 8 for the reception of metal members 9 and 10 constituting portions of the terminal structures 3 and 4. The members 9 and 10 are initially of substantially cylindrical cup-shape and swaged, to the form shown, in longitudinal interlocking relation to the frusto-conical ends 7 and 8, in accordance with well-known practice. Studs 12 and 14 are provided in the metal members 9 and 10 and are preferably integral therewith.

The terminal structure 3 further comprises an eye or clevis member 17 screw-threadedly attached to the stud 12 for mounting the insulator.

The terminal structure 4 further comprises a member 18 similar to the member 17 for attaching the insulator to another structure or supporting a conductor (not shown).

In structures of the above-described character, in which the member 6 is uncoated or coated with the usual organic substances, concentration of the field, resulting in corona and arcs adjacent to the inner edges of the members 9 and 10, causes charring of the material of the member 6 or the coating thereon adjacent to the members 9 and 10. This charring at first may extend only relatively short distances from the members 9 and 10 but the charred material itself thereby becomes conducting and, in effect, extends the terminals farther inwardly along the member 6. This action or effect is continued until the surface of the rod 6 becomes sufficiently conducting to destroy the usefulness of the insulator.

To remedy this defect, I coat the rod 6 with bodies 20 and 21 of material which remains insulating under the influence of the electrostatic field and which bodies extend for only relatively short distances from the metal members 9 and 10. I have found that a suitable material for the bodies 20 and 21 is soft rubber, although other materials having the required characteristics may be employed. The distances through which the bodies 20 and 21 extend are determined by the distances covered by the corona-forming field and may be different for different voltages and lengths of the rod 6. The bodies 20 and 21 may extend under the members 9 and 10 and around the extreme ends of the rod 6 or stop at the edges of the members 9 and 10 to which they are sealed. An intermediate coating 23 may be provided to protect the remainder of the rod 6 from the weather and be united to the adjacent edges of the bodies 20 and 21 to entirely seal the rod 6 and protect the edges of the bodies 20 and 21. The selection of the coating 23 may be for economy or other reasons. In any event, since the bodies 20 and 21 are also weather resistant, the entire rod 6 is prevented from both charring and deterioration from the effects of weather.

In the form of my invention shown in Fig. 2, in which corresponding parts are designated by corresponding reference characters, the construction is the same as in the above-described structure with the exception that the intermediate coating 23 is omitted. This construction is of advantage and economy where the effects of weather are not present.

In the form of my invention shown in Fig 3 the construction is also similar to the other forms with the exception that the rod 6 is entirely covered with a coating 25 of the material of the bodies 20 and 21 of the other figures.

In all of the forms, the coatings or bodies 20, 21 and 25 are preferably molded in position on the rods 6 to ensure that the coatings will be of uniform thickness, in contradistinction to coatings which are brushed on or effected by dipping the rod and are thereby of widely variant thicknesses.

These brushed or dipped coatings are of uncertain character and may be so thin or defective at certain points as to cause early destruction of the insulator.

The molded coatings of my invention are of such uniform character and thicknesses as to ensure uniform performance of the insulator and to provide against early breakdown from defective coatings.

While I have shown and described particular forms of my invention, changes may be effected therein without departing from the spirit and scope thereof, as set forth in the appended claims.

I claim as my invention:

1. An insulator comprising a fibrous insulating member, a metal terminal member therefor and a coating of insulating material on the insulating member which extends for only a relatively short distance from said terminal and remains insulating under the influence of the electrostatic field of the insulator.

2. An insulator comprising a fibrous insulating member, metal terminal members

therefor and a coating of insulating material on the insulating member between the terminals which extends for only a relatively short distance from one of the terminal members and remains insulating under the influence of the electrostatic field of the insulator.

3. An insulator comprising a fibrous insulating member, metal terminal members therefor, coatings on the insulating member extending from each of said terminal members for only a relatively short distance therefrom, said coatings consisting of a material which remains insulating under the influence of the electrostatic field of the insulator, and a coating of other material between said first coatings.

4. An insulator comprising an insulating member of material subject to progressive charring by corona from a terminal portion thereof toward the opposite terminal portion and means for covering a sufficient portion of the member to prevent said charring including a dielectric element which remains insulating under the influence of corona and extends only a relatively short distance from said first terminal portion toward said opposite terminal portion.

5. An insulator comprising an insulating member of material subject to progressive charring by corona from a terminal portion thereof toward the opposite terminal portion and means for covering a sufficient portion of the member to prevent said charring including a rubber element extending only a relatively short distance from said first terminal portion toward said opposite terminal portion.

6. An insulator comprising a combustible insulating member, a metal terminal member therefor and a coating of rubber on the insulating member extending only a relatively short distance from said terminal member.

7. In a tension insulator, an elongated rod of dielectric material of high mechanical strength and subject to charring by corona, said rod having a laterally enlarged end head, a metal terminal member having a cup portion fitting said end in longitudinal interlocking relation thereto, and means for preventing the charring including a tubular-sleeve entirely of soft rubber in direct hermetically-sealed intimate joinder to said body over the corona-exposed surface thereof and to the mouth-end edges of said cup portion, whereby the cup and the sleeve constitute, in effect, a single operatively integral elongated envelope for the rod free of openings in its side and end walls.

In testimony whereof, I have hereunto subscribed my name this 17th day of March, 1927.

PAUL B. COCHRAN.