Oct. 11, 1932. F. S. MALM 1,881,785

METHOD OF CLEANING AND VULCANIZING MATERIALS

Filed April 30, 1929

Fig. 1.

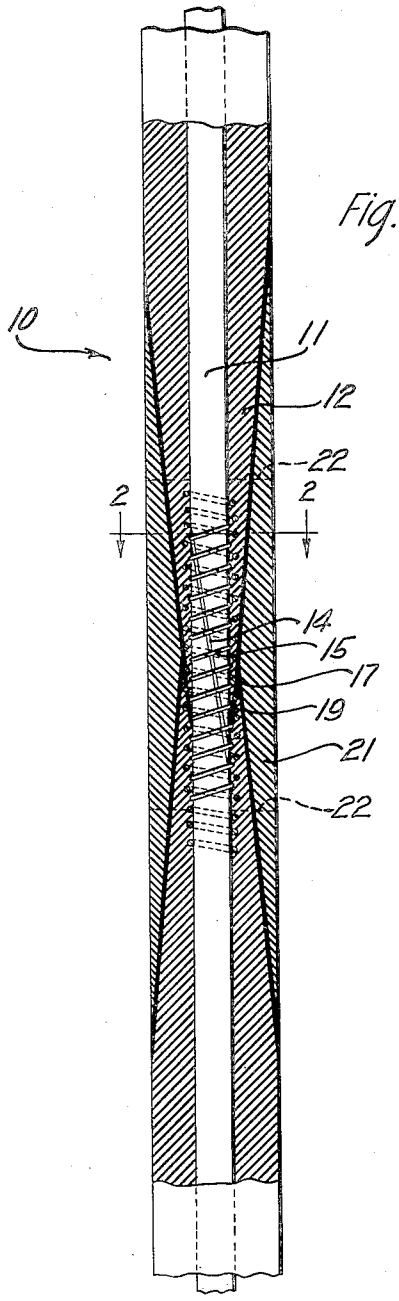
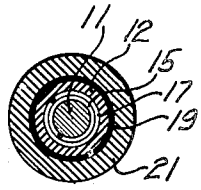


Fig. 2.



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UNITED STATES PATENT OFFICE

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METHOD OF CLEANING AND VULCANIZING MATERIALS

Application filed April 30, 1929. Serial No. 359,336.

This invention relates to a method of and composition for cleaning and vulcanizing materials, and more particularly to a method of and composition for cleaning and vulcanizing materials used in insulating electrical conductors.

Electrical signalling conductors laid beneath large bodies of water in some instances comprise essentially a copper conductor and, beneath a suitable exterior protective material such as heavy iron armor wire, a covering of gutta percha or gutta percha substitute, for the purpose of insulating the copper conductor. The service conditions to which such cable is subjected are sufficiently severe to necessitate that a high degree of care and skill be exercised in jointing sections of the cable when it is being laid and repairing the cable after it is injured.

Heretofore, in jointing submarine cable, it has been the practice in some instances to remove the original insulation for an equal distance on either side of conductor ends, join the conductor and renew the insulation over the jointed area by depositing thereon insulating material in a heated plastic state, and allow the deposition to cool to atmospheric temperature and solidity.

An object of the present invention is to provide a method of and composition for vulcanizing materials which will be rapid, economical and reliable.

The invention contemplates the washing of a prepared portion of the original insulation upon the ends to be joined with a solution composed of a solvent vehicle, a vulcanizing ingredient, and an ultra accelerating agent, which will not only clean the prepared portions for reception of newer plastic insulation, but will also dissolve the surface thereof and deposit thereon a layer of vulcanizing ingredients, over which the new insulation may be applied and vulcanized.

The invention may be more fully understood from the following detailed description, reference being had to the accompanying drawing forming a part thereof, in which

Fig. 1 is a fragmentary longitudinal sectional view of a cable core jointed in accordance with the invention, and

Fig. 2 represents a complete cross-section taken on the line 2—2 of Fig. 1.

Referring to the drawing, a cable core jointed in accordance with the invention and designated generally by the numeral 10 comprises a conductor 11 of copper or other suitable conductive material and an original insulating covering 12, composed of gutta percha or gutta percha substitute. The adjacent portions of the conductor are jointed together, the contacting surfaces having been scarfed or faced diagonally with respect to each other as indicated by the numeral 14. The scarfed surfaces are brought into contact with each other and bound together by means of an electrically conductive wire 15 which is tightly wrapped spirally therearound for the extent of the scarfed surfaces. This wrapping of wire is soldered in position about the conductor and a second wrapping 17 of the wire is imposed tightly therearound and extended beyond each side of the underlying wrapping 15 for an appreciable distance along the conductor 11, to which the ends of the superimposed wrapping 17 are soldered. The joint in the conductor 11 and the bindings 15 and 17 therearound are shown protected by a quantity of the original insulating material 12 which is applied thereto in a manner as will be more fully brought out below. A vein 19 of vulcanized insulation extends between portions of the original insulation 12 and between the original insulation and a deposition of newer insulating material 21 which is applied around the joint.

In jointing the conductor, the original insulation is removed from the conductor for a sufficient distance from the ends of the sections to be jointed to permit scarfing and binding of the conductors as explained above. In this instance, the extent to which the original insulation was removed is indicated by the dotted lines 22—22. By jointing the conductor ends with the wire wrappings 15 and 17, the conductivity of the conductor 11 is preserved through the joint, and the wire bindings assist in preventing diminution thereof due to mechanical stresses under cable-laying or service conditions.

After the jointing of the conductor has been

accomplished, the portions of the original insulation adjacent the joint are heated by means of a blow torch, hot water bath, or other suitable source of heat, to a temperature in the vicinity of 180° F., whereby the insulation is reduced to a plastic state. The temperature selected is one sufficient to maintain the insulation in a plastic state without permitting it to flow. Permissible limits of variation where the insulation is composed, for instance, of deresinated balata—35 grams, deproteinized rubber—35 grams, and benzol-extracted Montan wax—30 grams, on a basis of 100 grams of compound, have been found to be 170° to 200° F. It should be understood, however, that in addition to the above compound, the invention is equally applicable to insulation composed of any of the vulcanizable materials, particularly those in the thermo-plastic group. By applying a kneading pressure thereto, the portion of the original insulation to the right of the wrapped area is forced from its original position and caused to extend along and envelop the conductor a considerable distance beyond the mid-point of the joint, as shown on the drawing. A similar pressure is applied to the original insulation on the other side of the joint in an opposite direction, causing it also to be pressed along and envelope the conductor, care being taken, however, that this portion of the insulation is advanced at least as far as the mid-point of the joint in order to insure that it overlaps for an appreciable distance, as shown in the drawing, that portion of the original insulation which has been pressed from the right. Before the overlapping is attempted, however, the surface of the underlying portion is washed with the cleaning and vulcanizing solution described below, for the purpose of cleaning the contacting surfaces of the insulation, and vulcanizing the two portions firmly together.

Upon completion thereof, the newly formed original insulation on both sides of the jointed area is washed with a cleaning and vulcanizing compound for the purpose of effectually removing the grease, moisture and other foreign matter which may be accumulated upon the surface of the insulation by the process. This compound may be applied in any convenient manner as, for instance, by means of a brush, sprayer, etc. The composition of the compound is such that it dissolves and removes all foreign matter from the surface to which it is applied, and simultaneously attacks the covering itself to dissolve the surface thereof and deposit thereon a film of vulcanizing materials.

Since the application of the liquid is made promptly after the forming operation has been completed, the heat still latent in the original insulation insures that the cleaning and vulcanizing compound be effective at a temperature of approximately 170° F. and the joint completely vulcanized upon the expiration of approximately five minutes. The compound consists of a solvent vehicle, a vulcanizing agent, and an ultra accelerator and, in the present instance, comprises the following materials and proportions: carbon disulphide—100 cubic centimeters, sulphur—3 grams, zinc butyl xanthate—6 grams. This compound has been found satisfactory at temperatures ranging from 170° to 200° F., the exact proportions used depending upon the temperature of the insulation to which it is applied, and the length of time which is allowed for vulcanization. Satisfactory results may be obtained by varying the proportions and using, on the basis of 100 cubic centimeters of carbon disulphide, from two to five grams of sulphur, and from two to six grams of zinc butyl xanthate. For instance, a smaller proportion of accelerator or a lower temperature, or both, may be used when a longer time than five minutes is allowed for vulcanization, or a correspondingly larger proportion may be used if a quicker action is desired. It will also be noted that solvent vehicles other than carbon disulphide may be used, as for instance, an equal part mixture of acetone and benzol, or a mixture composed of 40% carbon disulphide and 60% carbon tetrachloride; and also that in the place of zinc butyl xanthate specified above, any of the ultra accelerators may be substituted as, for instance, those in the zinc alkylxanthate and the dithio-carbamates groups. It is customary to use a small quantity of zinc oxide with ultra accelerators in order to increase the potency of the accelerators in vulcanizing. It is also possible to use zinc oxide with the solution described above when it is desired that the vulcanization be completed in less than five minutes; however, caution should be exercised in adding zinc oxide to the solution to insure that the potency of the solution be not exhausted before the newer insulating material 21 has been applied to the film of cleaning and vulcanizing solution.

After washing with the above described compound, the core is subjected to the operation of a gutta percha insulation extruding machine of the type described in the Patent No. 1,583,815 issued to Bruno N. A. Trebes, on May 11, 1926, whereby a sufficient quantity of vulcanizable thermo-plastic insulation is applied to the joint over the film of vulcanizing material to restore to the cable its original contour and thickness, the additional insulation being furnished at a temperature commensurate with the temperature of the formed portion of the original insulation, namely, 170° to 200° F.

The heat latent in the additional plastic insulation renders effective the vulcanizing ingredients contained in the deposited film to vulcanize the upper surface of the formed original insulation, and to vulcanize thereto

the under surface of the newer insulating material, which is deposited thereon by the extruding machine.

It is, of course, apparent that the invention may be practiced by depositing the newer insulating material by hand or by means other than that disclosed by the above identified patent to Trebes. Experience has shown that the compound forms between the original and the newer insulation, but integrally with both, a tough vein of vulcanized material, which is more elastic and of greater imperviousness to water than the unvulcanized portions of the insulation. The overlapping of the formed portions of the original insulation, and the vulcanizing of the surfaces thereof renders it impossible for water or foreign matter to reach the conductor encased therein; and even under the most extreme climatic conditions encountered in the tropics the vulcanized vein is less affected by heat than any of the other portions of the insulation.

The practice of the invention outlined above constitutes a convenient form of its application; it should, however, be understood that the invention should not be limited thereby other than is warranted by the scope of the appended claims.

What is claimed is:

1. The method of treating materials which includes the steps of heating a surface thereof and cleaning and simultaneously vulcanizing the surface.

2. The method of treating materials which includes the steps of heating the materials and cleaning and simultaneously depositing upon the surface thereof a vulcanizing accelerator.

3. The method of treating materials which includes the steps of heating a surface thereof and cleaning and simultaneously accelerating the vulcanization of the surface.

4. The method of treating materials which includes the steps of heating a surface thereof and then simultaneously depositing upon the surface a vulcanizing agent and a vulcanizing accelerator.

5. The method of treating materials which consists in removing a portion thereof, heating the remainder, cleaning an exposed surface of the remainder, and simultaneously vulcanizing said surface.

6. The method of treating cable which consists in removing a portion of the insulation thereof, heating the remaining insulation, cleaning and simultaneously vulcanizing an exposed surface of the remaining hot insulation, and rebuilding the cable to substantially normal contour by vulcanizing new insulating material to the vulcanized surface.

7. The method of treating cable which consists in removing a portion of the insulation, heating the remaining insulation, cleaning and simultaneously vulcanizing an exposed surface of the remaining hot insulation and protecting said exposed surface by vulcanizing new insulating material thereto.

8. The method of treating cable which consists in removing a portion of the insulation therefrom, reducing a remaining portion to a plastic condition by the application of heat, cleaning and simultaneously vulcanizing the heated portion and vulcanizing new insulating material to the heated portion to provide a protective covering therefor.

9. The method of treating cable which consists in heating a portion of the insulation to a temperature ranging from 170° to 200° F., cleaning and simultaneously vulcanizing a surface of the heated portion and vulcanizing thereto a covering of new insulated material.

10. The method of treating submarine cable which consists in removing a portion of the insulation, heating the remaining insulation, treating the exposed surface of the remaining hot insulation to clean and vulcanize it, and applying to the surface so treated new insulating material before the vulcanization has been completed.

11. The method of jointing submarine cable which consists in removing the original insulation for a distance along portions of the conductor to be jointed, jointing the portions, softening portions of the remaining insulation by heat, kneading the softened portions of insulation to cover the joint and respectively overlap, cleaning and simultaneously vulcanizing a surface of the hot softened portions, vulcanizing to the cleaned surface new insulating material in a softened state, and treating the joint to restore to the cable its original solidity and contour.

In witness whereof, I hereunto subscribe my name this 20th day of April, A. D. 1929.

FRANK SIGFRID MALM.