Sept. 15, 1942. R. P. LUTZ 2,295,958

COMPOSITION SUITABLE FOR IMPREGNATING FIBROUS MATERIALS

Original Filed Oct. 31, 1936

FIG. 1

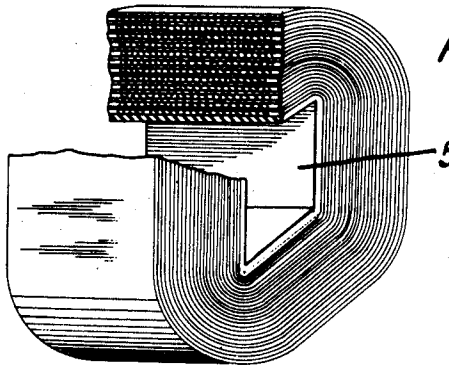


FIG. 2

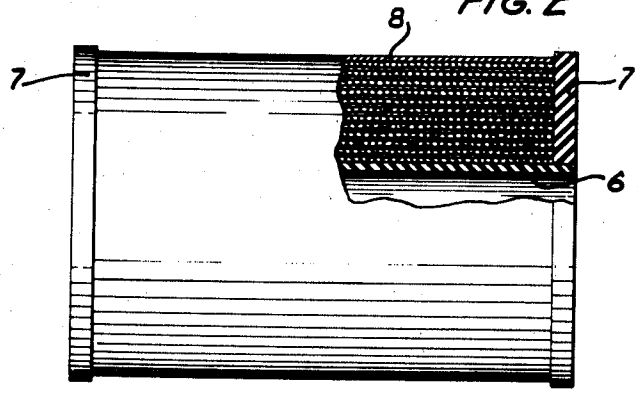
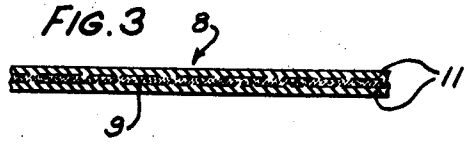


FIG. 3



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Patented Sept. 15, 1942 2,295,958

UNITED STATES PATENT OFFICE

2,295,958

COMPOSITION SUITABLE FOR IMPREGNATING FIBROUS MATERIALS

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Original application October 31, 1936, Serial No. 108,610. Divided and this application January 21, 1939, Serial No. 252,150

2 Claims. (Cl. 106—173)

This invention relates to compositions suitable for impregnating fibrous materials, and is a division of my copending application Serial No. 108,610, filed October 31, 1936, now issued as Patent 2,172,445.

Objects of the invention are to provide materials having good non-hygroscopic and insulating properties for use in electrical apparatus and to provide improved compositions for impregnating fibrous materials.

In accordance with one embodiment of the invention, a fibrous material suitable for filling or encasing electrical coils is impregnated with a solution of "Vinsol" and cellulose derivatives to insulate the coil and prevent corrosion of the electrical conductors.

Other objects and advantages will appear as the description proceeds.

A complete understanding of the invention may be had by reference to the following description taken in conjunction with the accompanying drawing, in which

Fig. 1 is a perspective view, partly in section, of a coil embodying the invention;

Fig. 2 is a modified form of coil embodying the invention; and

Fig. 3 is a fragmentary detail view of the covering for the coil shown in Fig. 2.

Referring now more particularly to Fig. 1, the coil may be provided with a rectangular core of fibrous material or the core may be made of a phenol condensation product, of cellulose acetate, or of a phenol condensation product faced with cellulose acetate. The convolutions of wire are wound in layers on the core and each layer is separated by a fibrous sheet of paper, cloth, or the like and a similar sheet is wrapped around the outer layer of wire. The wire may be bare, if suitably spaced, but preferably comprises enameled wire or wire having a fibrous insulation.

After the coil is wound, it may be immersed in a solution of a resin of the type sold on the market under the trade-name of "Vinsol" by the Hercules Powder Company. Vinsol is a hard dark-colored resinous material comprising a gasoline-insoluble pine wood resin, produced by extracting resinous wood with a coal tar hydrocarbon, removing said hydrocarbon by evaporation, extracting the residue with a petroleum hydrocarbon, and recovering the gasoline-insoluble resin.

A solution of the Vinsol may be made by dissolving a quantity of this material in the proportion of 100 parts of the material to 75 parts by weight of acetone. The amount of solvent used is not critical, but excess solvent should be avoided as uneconomical. Such a solution has been found to have a high penetrating power and will thoroughly impregnate the fibrous material in the coil. Tests made on coils made in this manner have been found to have a very low hygroscopicity and high corrosion resistance and due to the high insulation resistance and low dielectric constant of the impregnated fibrous material, the material is excellently suited for insulating coils. For some purposes a coil made as described above may be dipped in a solution of cellulose acetate and Vinsol to provide a more elastic covering for the outside of the coil or it may be dipped in such a solution without previously dipping it in a solution of the Vinsol. It has been found that a solution of cellulose acetate in acetone by itself has poor impregnating properties since it in effect coats only the surface of the accessible fibers of the fibrous material. However, when the cellulose acetate is mixed with a solution of Vinsol in acetone, the cellulose acetate is dissolved, and the Vinsol serves as a carrier to carry the cellulose acetate into the fiber. The addition of the cellulose acetate to the Vinsol raises the melting point of the composition over that of the Vinsol alone and the composition containing the two ingredients is, therefore, more suitable for coils which are operated at high temperatures.

In preparing a solution of cellulose acetate and Vinsol, 100 parts of the Vinsol may be first dissolved in about 75 parts of acetone and 100 parts of cellulose acetate may be dissolved in 400 parts of acetone and the materials then mixed together, or Vinsol may be added directly to a solution of cellulose acetate in acetone.

Preferably the cellulose acetate may constitute an amount equal to the amount of Vinsol, although these materials are soluble in all proportions. It appears that when less than 3% of Vinsol is used, the property of causing the cellulose acetate to penetrate fiber becomes negligible and when more than 95% of Vinsol is used, the product becomes brittle and tends to flake.

Vinsol alone is quite brittle and tends to become powdery when dry. However, a solution of this material with a cellulose ester makes a more plastic or less brittle material for many uses. This composition is thermoplastic and can be formed into sheets or articles in a mold under heat and pressure. The material can be prepared for molding by dissolving the ingredients in acetone, as previously described, evaporating the

solvent, and pulverizing the residue into particles of suitable size. In preparing this material, a relatively viscous solution can be used to reduce the quantity of acetone required for the impregnating solution. It is also feasible to reduce this solution to sheets or molding slugs by evaporating the solvent from solution contained in forms of the proper contour. For other applications the cellulose ester and Vinsol may be mixed in powdered form, placed in a mold, and subjected to heat and pressure to consolidate the material and form a solid solution.

The Vinsol is characterized by its insolubility in petroleum hydrocarbons and turpentines; and, therefore, coils made as described above may be used where they come in contact with lubricating oils or transformer cooling oils without impairing the effectiveness of the insulation.

Fig. 2 illustrates a coil having a core 6 comprised of cellulose acetate or a phenol fiber condensation product faced with cellulose acetate. The coil is wound on the core in layers and the layers are separated from each other by sheets of fibrous material. After the coil has been wound, it is impregnated with a solution of Vinsol or the coil may be impregnated with a solution of Vinsol and cellulose acetate. After the coil is impregnated, heads 7 of cellulose acetate or phenol fiber faced with cellulose acetate are adhered to the core by applying a solution of cellulose acetate in acetone to the ends of the core and pressing the head against the core until the solvent dries. If it is desired to have a hermetically sealed coil, an outer sheet 8 may be applied to the coil. This sheet is made by impregnating a fibrous sheet 9 with a Vinsol or a solution of "Vinsol" and cellulose acetate and then applying a sheet 11 of cellulose acetate to each face of the impregnated sheet 9. The cellulose acetate sheets may be adhered to the impregnated sheet 9 by subjecting the composite sheet to heat and pressure to plasticize the cellulose acetate and mold it integral with the impregnated fibrous sheet. This procedure insures thorough impregnation of the fibrous material so that when the sheet is cut, it will not expose the raw or unimpregnated fiber. In covering a coil, as shown in Fig. 2, a piece of this composite sheet is cut so that its edges will overlap when wound about the coil and the ends will abut the heads 7. A solution of cellulose acetate in acetone may then be applied between the overlapping edges and along the ends where they abut the heads to completely and hermetically seal the coil.

While the invention has been described in connection with particular embodiments thereof, it will be understood that many changes and modifications may be made without departing from the spirit and scope of the invention.

What is claimed is:

1. A composition for impregnating fibrous electrical insulating materials comprising substantially equal parts of a cellulose acetate and Vinsol, and a solvent comprising acetone.

2. A composition for impregnating fibrous insulators employed in electrical apparatus comprising from a substantial amount up to the order of 50% of a cellulose acetate, and the balance substantially Vinsol.

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