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INSULATED WIRE

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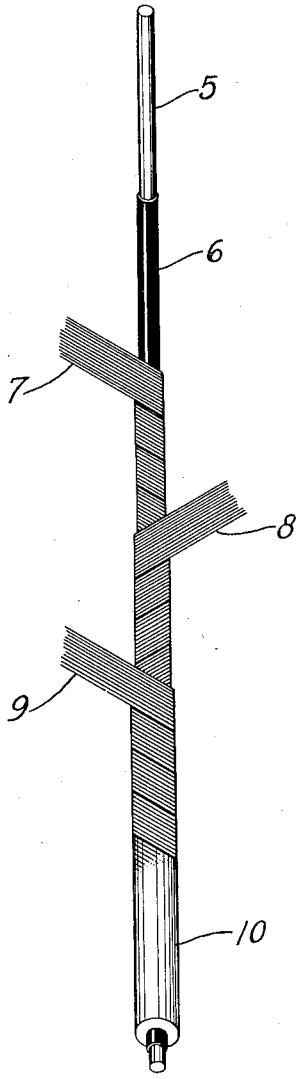

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INSULATED WIRE

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1 Claim. (Cl. 173—264)

This invention relates in general to certain new and useful improvements in insulated wires or conductors, and more particularly to insulated conductors such as are used in telephone switchboard wiring, and the principal object of the invention is to provide an insulated electric wire which has high insulation qualities, and is cheap and economical to manufacture.

A further object of the invention is to provide an insulated electric wire which occupies a minimum of space in a cable comprising a plurality of conductors, so that a larger number of conductors may be employed in a cable which is of relatively the same size as that formerly utilized.

A further object of the invention resides in the provision of an insulated electric conductor having a higher degree of insulation value than that formerly provided without employing additional impregnating compounds and insulating materials formerly required to insulate the conductor.

Wires or conductors have heretofore been insulated by covering conductors with one or a plurality of alternate layers of silk and cotton, cord or threads, each layer of which is usually wound in opposite directions. In addition, these several layers of silk and cotton threads have been rendered more moisture proof by being impregnated with an insulating compound, such as boiled beeswax, after the conductors have been previously baked in an oven at a very high rate of temperature to insure that no moisture remains in them. This method of manufacturing insulated wires or conductors is expensive and requires great care to see that no moisture remains in the insulating silk and cotton wrapping, and in addition expensive machinery is required to place this covering onto the wire. In addition, the cost of the silk and cotton wrapping and the sealing wax for insulating the conductor all contributes to the relatively high cost of this type of insulated conductor.

It is an object, therefore, of this invention to dispense with baking process and the use of the beeswax for insulating conductors and likewise to employ a cheaper and more satisfactory winding or braiding covering for the wire. A feature of the invention therefore resides in the use of a cellulose or other organic or fibrous material for use in wrapping the conductor. This covering is then impregnated with a solution of acetone to partially dissolve the cellulose material so as to amalgamate the whole covering into a homogeneous mass onto the conductor. The solution of acetone partially dissolves the cellulose material and converts it into a more-or-less hard covering on the conductor which adheres tenaciously to it by shrinking slightly onto the conductor.

An electrical conductor insulated in this manner is impervious to moisture, has a higher degree of insulation value than ordinary waxed silk and cotton insulation, occupies a much smaller area in a cable, is very flexible and heat resistant, and finally, is more economical to manufacture.

The above objects and others, not specifically pointed out, will be referred to hereinafter in connection with the drawing which illustrates a preferred embodiment of the invention, although it will be understood that any number of modifications will be apparent to those skilled in the art, and although only a single insulated conductor has been illustrated, it will be apparent that any number of similar insulated conductors may be combined into a single cable of any capacity.

Referring to the accompanying drawing, the numeral 5 indicates a single copper wire or conductor such as is usually employed in switchboard wiring and telephone apparatus. The conductor, or wire 5, if desired, may be covered with a primary insulation covering consisting of a hard baked coating of a residiuum of an oil or enamel. However, this primary insulating coating may be entirely dispensed with. A wrapping 7 comprising a plurality of threads of a cellulose material is then wound upon the conductor. This cellulose, or other similar inorganic compound, is very easily formed into threads as is well known and is commonly known under the trade name of "Rayon" or artificial silk. A single covering of any number of threads may be provided on the conductor, but it is occasionally desirable that a plurality of layers of the cellulose material be wound upon the conductors, each layer being wound in an opposite direction from the preceding layer, for example, the layer of thread 7 may be wound upon the conductor 5 in one direction, while the next layer of thread such as 8 is wound upon the conductor in the opposite direction. On top of the layer of cellulose material 8 an additional layer 9 of similar material may be wound upon the conductor in the same direction as the wrapping 7. The wrapping of cellulose material 7 upon the conductor 5 or the additional wrappings 8 and 9 are applied in a well-known manner, and it is not thought necessary to explain in detail the

manner in which this is accomplished. The wrapping 7 of cellulose material, after having been wrapped upon the conductor 5, is treated or impregnated with a solution of acetone which has the characteristic of chemically reacting on the inorganic cellulose material so that it amalgamates into a homogeneous mass onto the conductor 5. The wrapping 7 of cellulose material after having been treated with the acetone presents a high glossy finish and tightly adheres to the conductor 5 due to the shrinking action of the material after having been treated.

If desirable, the additional wrappings 8 and 9 of cellulose material or rayon silk which may be wrapped upon the layer 7 are in turn treated with acetone in a similar manner as the layer of wrapping 7. The application of the acetone to the wrapping 8 amalgamates the wrapping with the wrapping 7 and binds the same into a solid mass by the dissolving action of the acetone. If further wrappings are required on the conductor, the wrapping 9 is applied on top of the wrapping 8 in the opposite direction from it, and this in turn is likewise treated with a solution of acetone to convert the last wrapper into a mass with the first two wrappers 7 and 8.

After having been treated with the solution of acetone, the insulation upon the conductor 5 has the appearance as indicated at 10 by the conductor acquiring a smooth hard finish which is heat resisting and moisture proof, clings tenaciously to the conductor in a manner similar to the anamel 6, does not crack when bent, is an excellent insulator, and due to the shrinkage action of the cellulose material, after having been treated with the acetone, requires a very much smaller space when a conductor treated in this manner is inserted in a cable.

A plurality of these conductors may be bound together to form a cable of any proportion. In cables it is usually necessary that the individual wires making up the cable be provided with certain identifying means whereby the various conductors may be attached to certain electrical telephone apparatus such as is used in the telephone art, and for this purpose each conductor has a particular color of thread running throughout its entire length, and as the "Rayon" silk or cellulose material may be very easily dyed in different colors, the method of identifying the conductors is easily effected with this invention.

In previous types of cables wherein silk and cotton thread wrappings have been used for insulating the wires, it is often necessary that a cable made up in this manner be cut at short intervals when it is required that the wires be multipled between similar pieces of apparatus. At the portions where the wires are cut, the silk and cotton threads on the wire become frayed and loose from the conductor. The wax with which the conductors have been impregnated does not hold the frayed ends tightly against the conductors after the conductors have been cut and a considerable length of the bare copper conductor is exposed, in fact more than is necessary to properly solder the conductor to its required connection. This frequently results in short circuits. However, through the use of the acetone treated cellulose covering for insulation on wires, this is entirely obviated. The insulation may be scraped off or removed from any section of the conductor desirable without fraying at any place as the cellulose covering, after having been treated, assumes a condition such as presented by the hard enamel coating 6 on the conductor 5.

As has been stated previously, if desirable, the black enamel coating 6 may be entirely dispensed with from the wire 5 and merely the layer, or layers, of cellulose material wrapped upon the conductor and then treated with acetone. Only a single layer of cellulose material 7 may be necessary, although it is desirable that more than one layer 8 and 9, each wound in the opposite directions be provided. Furthermore, each wrapping by itself may be treated separately with the solution of acetone, or a plurality of wrappings superimposed upon the conductor 5 may be finally treated with the solution. In any event, the total number of wrappings are each amalgamated by the solution of acetone into a single homogeneous mass upon the conductor.

The insulation covering for copper wire as disclosed by this invention, may be furthermore provided with a braided tar covering and in addition a rubber composition covering so that it may be utilized for outdoor signalling use or in any other capacity.

The solution of acetone may be applied to the cellulose wrapping on the conductor 5 by running the wire through a tank containing a quantity of the solution. The acetone, after having been applied to the conductor, dries very quickly, after the conductor has been withdrawn from the solution, and the wire is ready for use.

From the foregoing it is apparent that no baking process is required for excluding moisture from the conductor or from the cable and furthermore that the cable constructed according to the invention does not require further insulation as has been previously performed by boiling the cable in a mixture of beeswax or paraffin to further insulate it. The wrapping of cellulose material provides a perfect insulator for the conductor.

While the use of "Rayon" or artificial silk has been indicated for wrapping the conductors, it is to be understood that any other cellulose material or organic compound may be utilized which may be partially dissolved by a solution of acetone. It is, therefore, not desired to be limited to the specific embodiment of the invention illustrated and described, but only by the scope of the appended claim.

What is claimed is:

The method of producing an insulated electric conductor which consists in applying a coating of enamel to the conductor, in wrapping multithread strands of cellulose material in layers over said enamel, and in treating the layers of material with a solvent of said material to thereby amalgamate the material into a homogeneous mass and cause it to adhere to said enamel.

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