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METHOD OF MAKING INSULATED ELECTRICAL CONDUCTORS

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FIG. 1

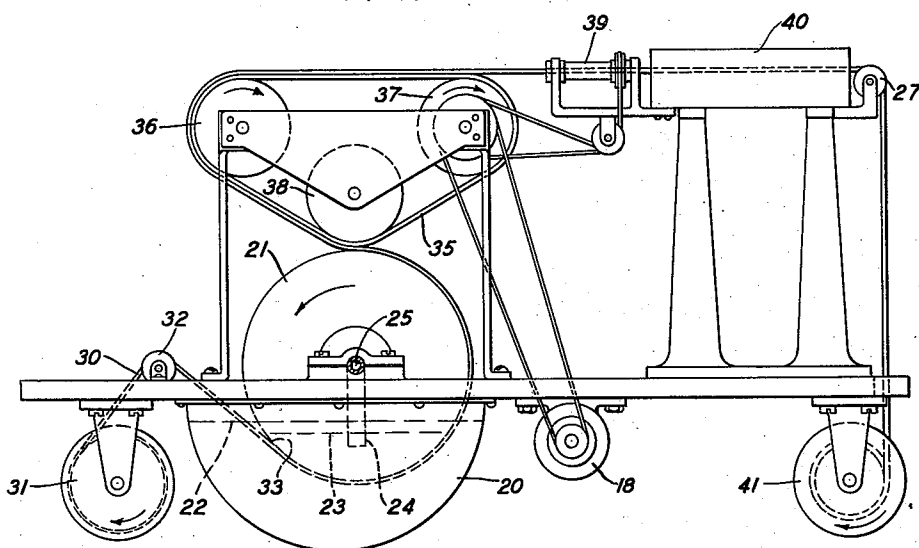
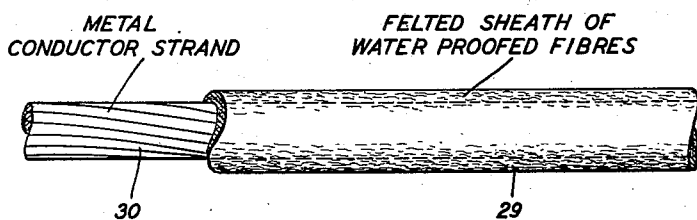


FIG. 2



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METHOD OF MAKING INSULATED  
ELECTRICAL CONDUCTORS

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3 Claims. (Cl. 92—41)

This invention relates to a method of making insulated electrical conductors, and more particularly to a method of making copper wire having a seamless sheath of felted fibers.

Electrical conductors have been manufactured having a sheath of insulating material consisting solely of a seamless felt or paper formed directly on the wire in a paper making machine. Such insulated conductors are satisfactory for many purposes; but in some instances it is preferable to include in the paper pulp sheath some additional material to render the fibers of the sheath more adherent together and substantially non-absorptive of water, whether in the form of atmospheric contained vapor or as liquid.

Objects of the invention are to provide a method of making an electrical conductor having an insulating sheath comprising matted fibers and a material to render the fibers of the pulp water repellant and also to increase the insulating quality of the sheath.

With the above and other objects in view the invention may be embodied in a method of producing such a paper insulated conductor which is characterized by a step of beating a suitable proportion of the water repellant material into the wet paper pulp before the pulp is used to form the sheath on the wire, whereby a certain amount of the water repellant material is caused to adhere in powder form to the outer surface of each fiber before the latter are felted together; and the method is further characterized by including a final step in which after the wet pulp has been formed into a sheath about the wire the wet sheathed wire is suitably heated not only to drive off water from the sheath but also to melt the powdered water repellant material adherent to the fibers to form a coating on the individual fibers in the felted mass.

Other objects and features of the invention will appear from the following detailed description of an apparatus constructed to carry out the method of the invention taken in connection with the accompanying drawing in which the same reference numerals are applied to identical parts in the several figures, and in which—

Fig. 1 is a diagrammatic view of an apparatus constructed for carrying out the method of the invention; and

Fig. 2 is an enlarged fragmentary view of a portion of a strand produced by the apparatus and method of Fig. 1.

The apparatus herein disclosed comprises a supply reel 31 to contain a supply of wire 30 which is to be provided with a suitable sheath 29

of felted water repellant fibers. From the supply reel 31 the strand 30 passes over a guide sheave 32 and down into a tank 20 containing a supply of paper pulp beaten up in the manner customary in the paper making art. A cylindrical drum 21 is rotatably supported with its axis horizontal in such fashion that its lower portion dips below the level 22 of the pulp mixture in the tank. The strand 30 passing down into the tank makes contact with the drum 21 at a point 33 some distance below the level 22 and passes on around the drum to about the top point of the drum. Here it makes contact with and accompanies an endless belt 35 of felt running over guide rollers 38 and 36 and over a belt driving roller 37 which itself is driven by a motor 18.

The drum 21 is a hollow shell suitably supported by means (not shown) on shaft 25 and the shell is foraminous. A pump (not shown) whose intake is indicated at 24 keeps the level of the pulp suspension within the drum at a line 23 below the level 22 outside of the drum and still above the point 33. Hence the suspension outside of the drum tends to be drawn through the drum between levels 22 and 23, thus forming on the left hand side a thin mat of felted fibers on the drum. Then the wire 30 is laid on the drum over this felt and continues along with the drum until it again rises above the level 23 on the right, when further pulp material is laid on the drum over the wire 30. Thus, as the wire emerges from the suspension but still on the drum at the right hand side of the latter it is enclosed within a ribbon of felted pulp and when the wire leaves the drum 21 at the top of the latter and passes against the felt belt 35 it is accompanied by this ribbon like sheath of felted paper fibers. The wire and its crude sheath leave the belt 35 at the top of the belt driving roller 37 and pass together into a sheath forming device 39 in which the flat ribbon of crude fiber is formed and polished into a substantially cylindrical sheath about the wire.

From the polisher 39 the wire with its still wet sheath passes through a heating device 40 in which the water is removed from the sheath and thence to a take-up reel 41.

The procedure and apparatus thus far described is not new but is described and fully disclosed in application Serial No. 110,611, filed November 13, 1936 by John N. Selvig, upon which application Patent No. 2,180,554 was granted on November 21, 1939, and hence it is thought that it is not necessary to describe these general features of the process and apparatus more in detail

at this time since reference may be had to the above application for such detail.

The pulp suspension supplied to the tank 20 is ordinary unsized paper pulp such as is used for the manufacture of good quality newsprint paper and the like in the paper making art, and being familiar and well known requires no further description here except to say that it consists substantially entirely of fairly pure cellulose fibers derived from wood, and beaten up in water so that the suspension comprises about 6 parts by weight of wood fiber in about 194 parts by weight of water. As one step in the method of the present invention, however, when the crude wood fiber as received from the paper pulp manufacturer is torn apart and beaten up in water to make this pulp there is added about 3 parts by weight of a water repellant material, making the water proportion then about 191 parts by weight. This material is preferably a powdered condensation product of the oil which is found in the shell of the cashew nut. The characteristics of this oil and the manner of preparing suitable condensation products therefrom are described in detail in U. S. Patent 1,725,791 issued August 27, 1929, to Mortimer T. Harvey, and hence will not be further described here except to say that the particular condensation product here in question is one which melts between 180° F. and 200° F., and as found in commerce is fairly dense, fine grained powder apparently totally insoluble in and unaffected by water. This powdered material is beaten in an ordinary pulp beater with the pulp until it is thoroughly and uniformly disseminated throughout the liquor and then the liquor is transferred to the tank 20. It is believed that at this time substantially all of the cellulose fibers in the suspension are more or less uniformly coated with more or less scattered particles of the powder.

In the method of the invention this suspension having the water repellant material in powder form beaten into it is used in the tank 20 in the manner described above, instead of the ordinary pulp suspension customarily used. Thus, when the strand with its formed but still wet sheath passes from the polisher 39 into the drying oven 40, each of the matted fibers which compose the felt like sheath on the wire is individually more or less coated with powdered water repellant material.

While an ordinary, externally heated drying oven 40, such as is described in the copending application of John N. Selvig above identified, is satisfactory, nevertheless it is preferred to substitute for the ordinary oven 40 an induction heating coil through the axis of which the sheathed wire passes from the polisher 39 and over the guide sheave 27 to the take-up reel 41. The coil is supplied with high frequency electric current of such voltage and frequency as will provide a strong alternating electromagnetic field within the coil within which the crude sheathed strand passes. In the well known manner of induction heating, eddy currents are generated within the wire which are converted in the body of the wire into heat. By suitably regulating the current supply to the induction coil the wire may be thus heated to the point at which first the water contained in the crude pulp sheath is driven off and, secondly, the finely powdered cashew oil product on the individual fibers is caused to melt and become a thin substantially waterproof coating upon each fiber individually. Thus, when the finished product is wound up

upon the take-up reel 41 it is a wire having a seamless sheath of individually water repellant felted fibers of the cellulose.

The sheath thus coated is physically and mechanically a very different thing from that obtained by applying a waterproofing material, such as a resin dissolved in a volatile solvent, to the finished sheath and subsequently driving off the solvent, for in such case the solvent carries the resinous waterproofing material into the substance of the fiber and a much larger ratio of resin to fiber is required to produce the same degree of water repellence as is obtained in the present method, in which the waterproofing material is applied substantially only to the surface of each fiber and does not enter materially into the body of the fiber.

It has been found that a generally satisfactory product can be made by the use of an externally heated oven 40, although in some instances it is found that superficial fibers of the sheath may become dried out and adhere together in a substantially impervious film before the body of the film is thoroughly dry and thus prevent the escape of the residual moisture under the film. For this reason it is thought preferable to use induction heating in the manner described to dry the wet sheath, because by so doing the sheath is heated from within outwardly, and the escape of the vaporized moisture from the body of the sheath is neither prevented nor hindered, thus insuring a substantially moistureless product.

The new type of coated strand produced by the use of the method and apparatus disclosed is not claimed herein, being disclosed and claimed in copending application Serial No. 288,475, a division of the present application, filed August 5, 1939, by the present inventor and upon which application U. S. Patent No. 2,249,955 was granted to the present inventor on July 22, 1941.

While a particular illustrative embodiment of the invention has been herein disclosed the invention is not limited to the specific details of the disclosure but may be modified and departed from in many ways without departing from the spirit and scope of the invention as pointed out in and limited solely by the appended claims.

What is claimed is:

1. A method of making an insulated electrical conductor which method comprises steps of mixing together about 6 parts by weight of paper pulp and about 3 parts by weight of a powdered solid condensation product of cashew nut oil having a melting point from 180° F. to 200° F. by beating the same together in about 191 parts by weight of water to disperse the pulp fibers in the water and to coat each fiber with grains of the powdered product, forming from the resulting pulp suspension a ribbon of pulp combined with a conductive strand, forming the ribbon into a substantially cylindrical sheath about the strand, and so heating the sheathed strand as to drive off moisture from the pulp and to melt the grains of powder on each of the felted fibers into a coating substantially superficially covering but not impregnating each fiber individually.

2. A method of making an insulated electrical conductor which method comprises steps of mixing together about 6 parts by weight of paper pulp and about 3 parts by weight of a powdered solid condensation product of cashew nut oil having a melting point from 180° F. to 200° F. by beating the same together in about 191 parts by weight of water to disperse the pulp fibers in the water and to coat each fiber with grains of the powdered

product, forming from the resulting pulp suspension a ribbon of pulp combined with a conductive strand, forming the ribbon into a substantially cylindrical sheath about the strand, and passing the sheathed strand through an energized induction coil to so heat the sheathed strand from within outwardly as to first drive off moisture from the pulp and then to melt the grains of powder on each of the felted fibers into a coating substantially superficially covering but not impregnating each fiber individually.

3. A method of making an insulated electrical conductor which method comprises steps of mixing together about 6 parts by weight of paper pulp and about 3 parts by weight of a powdered

5 solid condensation product of cashew nut oil having a melting point from 180° F. to 200° F. by beating the same together in about 191 parts by weight of water to disperse the pulp fibers in the water and to coat each fiber with grains of the powdered product, forming from the resulting pulp suspension a substantially cylindrical sheath about the strand, and so heating the sheathed strand as to drive off moisture from the pulp and to melt the grains of powder on each of the felted fibers into a coating substantially superficially covering but not impregnating each fiber individually.

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