

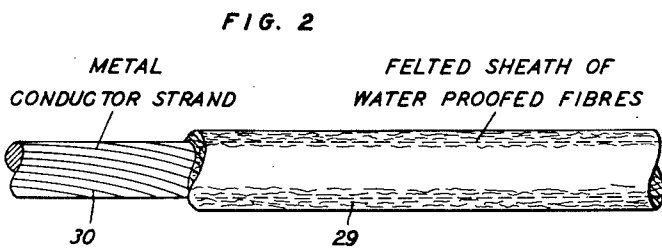
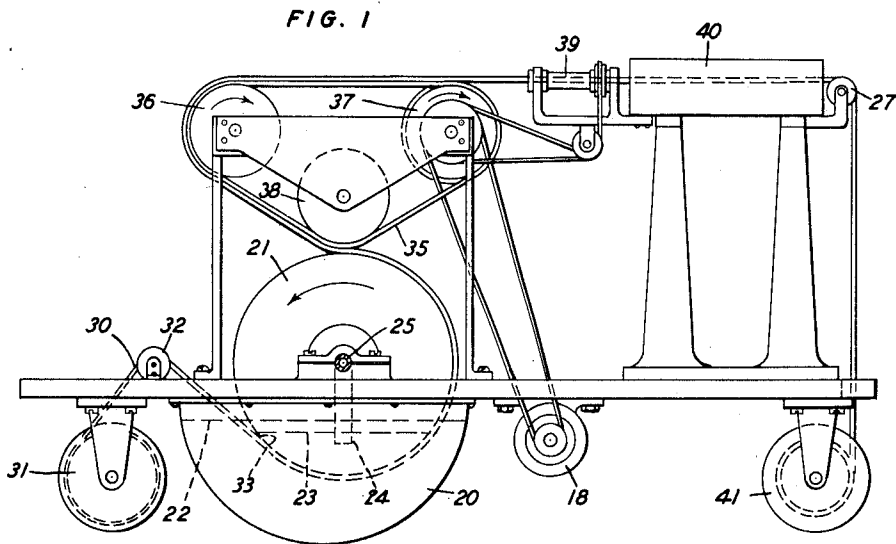
July 22, 1941.

V. L. JOHANNESSEN

2,249,959

INSULATED ELECTRICAL CONDUCTOR

Original Filed Sept. 15, 1938



INVENTOR
V. L. JOHANNESSEN
BY *E. R. Nowlan*
ATTORNEY

UNITED STATES PATENT OFFICE

2,249,959

INSULATED ELECTRICAL CONDUCTOR

Vaughn L. Johannessen, Cranford, N. J., assignor
to Western Electric Company, Incorporated,
New York, N. Y., a corporation of New York

Original application September 15, 1938, Serial
No. 230,030. Divided and this application
August 5, 1939, Serial No. 288,475

1 Claim. (Cl. 174—121)

This invention relates to insulated electrical conductors and more particularly to 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 an electrical conductor having an insulating sheath comprising matted fibers and a material to render the fibers of the pulp water repellent and also to increase the insulating quality of the sheath.

With the above and other objects in view, one embodiment of the invention in an insulated electrical conductor strand may comprise a metal wire having a sheath thereon of felted fibers in which the several fibers of the sheath are each provided with a waterproofing coating of a water repellent resinous material having a melting point between 150° F. and 200° F., such, for example, as a condensation product of cashew nut oil.

Other objects and features of the invention will appear from the following detailed description of a strand made in accordance with 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 for making a strand embodying the invention, and

Fig. 2 is an enlarged fragmentary view of a portion of a strand embodying the invention.

The apparatus for and method of making the strand disclosed herein are not claimed herein, being disclosed and claimed in patent application Serial No. 230,030, filed September 15, 1938, by the present inventor and of which this application is a division.

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 repellent 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 hori-

zontal drum 21 is rotatably supported in such fashion that its lower portion dips below the level 22 of the pulp mixture in the tank. The strand 32 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 liquor within the drum at a line 23 below the level 22 outside of the drum and still above the point 33. Hence the liquor 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 liquor 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 U. S. Patent No. 2,180,554, granted November 21, 1939 to John N. Selvig, 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 liquor 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 liquor comprises about 6 parts by weight of wood fiber in about 194 parts by weight of water. As one step in the method of making the strand 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 repellent 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 liquor are more or less uniformly coated with more or less scattered particles of the powder.

This liquid having the water repellent material in powder form beaten into it is used in the tank 20 in the manner described above, instead of the ordinary pulp liquor 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 repellent material.

While an ordinary, externally heated drying oven 40, such as is described in the patent to 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 repellent 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, this insuring a substantially moistureless product.

While a particular waterproofing material, namely a condensation product of cashew nut oil melting from 180° F. to 200° F. has been specified in the illustrative embodiment of the invention other compounds having similar physical properties may also be used, such, for example, as ethyl-cellulose, polystyrene or vinylidene chloride, or the like.

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 claim.

What is claimed is:

In an insulated electrical conductor, a conductive strand, and a seamless sheath thereover comprising fibers of paper pulp material felted together, each fiber of the felted material having an individual coating of a condensation product of cashew nut oil substantially covering the surface of the fiber without entering materially into the substance of the fiber.

VAUGHN L. JOHANNESSEN.