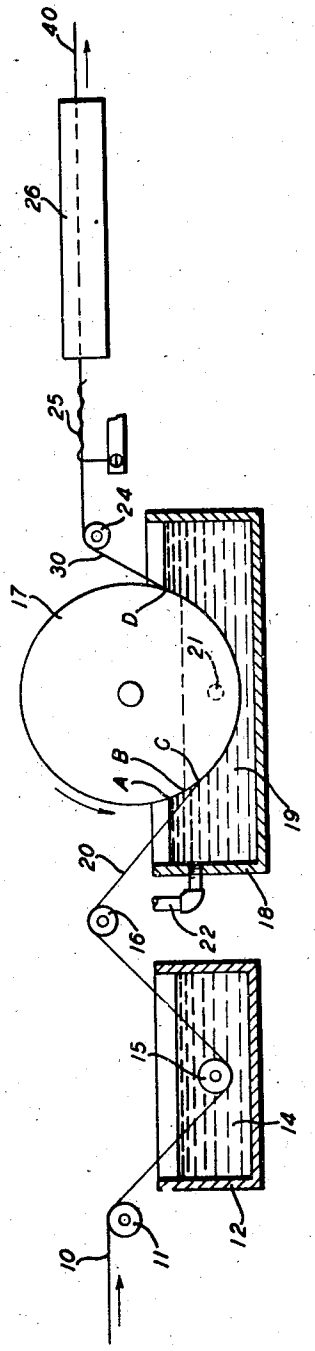
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METHOD OF MAKING FIBER INSULATED WIRE

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METHOD OF MAKING FIBER INSULATED WIRE

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This invention relates to a method of making insulated wire, and more particularly to a method of making insulated electrical conductor wire having a coating of enamel directly on the wire and a seamless sheath of felted pulpous material directly on the enamel coating and strongly adherent thereto.

Electrically conductive wires with or without other insulating sheathings have been, for some years past, provided with a seamless insulating sheath of interfelted fibres of wood pulp, textile fibre pulp, or other analogous fibrous pulps of cellulosic materials. Ordinarily such sheaths are formed by passing the strand to be sheathed over the surface of a fourdrinier drum running in a tank of fibrous material dispersed in water, to form a ribbon of pulp entirely surrounding the strand embedded therein. The ribbon of pulp is then folded around the strand, compacted into cylindrical form, and dried. Sheaths of this kind when properly made have high insulating value in relatively small bulk, and high stability, and are inexpensive. In general these sheaths have sufficient mechanical strength for many uses; and strands so sheathed can ordinarily be handled in the same fashion and by the same machinery as are employed in dealing, for example, with strands having tough sheaths of served textile threads. However, in a few instances, especially when it is desired to apply certain outer coatings over the pulp sheath, it is found that the pulp sheath, particularly when made of ordinary wood fibre pulp, may rupture during the coating operations because the sheath is not sufficiently adherent to the core on which it is made to be given support thereby and has insufficient tensile strength to endure the stresses by itself. This difficulty is particularly troublesome in the case of certain insulated conductor strands comprising a metal wire coated with an insulating enamel on which the pulp sheath is applied, when it is desired to form a coating of cellulose acetate or the like on the pulp sheath by extrusion.

An object of the present invention is to provide a method of making a pulp sheath on an enameled wire which method shall produce a pulp sheathed, enameled core, insulated wire in which the pulp sheath adheres strongly to the surface of the enameled core.

With the above and other objects in view, the invention may be embodied in a method of sheathing an enameled wire which comprises steps of coating an enameled wire with a petroleum oil fraction of about the density and nature of kerosene, forming a ribbon of water wet pulp enclosing the oil coated core, forming the ribbon of pulp into a generally cylindrical sheath about the core, and heating the strand so formed to drive off both the oil and the water.

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Other objects and features will appear from the following detailed description of an embodiment of the invention taken in connection with accompanying drawing, the single figure of which discloses diagrammatically an apparatus adapted to carry on the method which embodies the invention.

The apparatus thus disclosed is adapted to form a seamless outer sheath of pulpous material on and closely and firmly adherent to the surface of an enameled wire 10. This wire comes from any suitable supply (not shown) at the left, passes over a guide sheave 11 and down into a tank 12 containing a body 14 of oil. The wire passes under a guide sheave 15 wholly submerged in the oil and thence up and over a guide sheave 16 and thence under the drum 17 of a pulp ribbon forming machine. The cylindrical surface of the drum 17 is essentially a fourdrinier screen. The drum is immersed, as shown, in a tank 18 containing a body 19 of pulpous material, e. g. wood pulp, dispersed in water. Liquid is continuously pumped out from the inside of the drum through an outlet 21 by means not shown while fresh pulp liquid is supplied in equal volume outside the drum from any suitable supply (not shown) by a supply pipe 22. Thus a constant difference of level of the liquid inside and outside of the drum is maintained as shown, for example at the points A and B. The sheave 16 and drum 17 are so disposed and arranged that the oiled core strand 20 coming from the sheave 16 first touches the drum at a point C below the point A.

Because of the level difference A—B outside and inside the drum, the water vehicle of the pulp suspension passes continuously through the screen surface of the drum and in doing so deposits pulp continuously on the revolving screen from the point A to the point D and, ordinarily, at a lessening rate since the pulp deposited on the drum builds up in thickness. The level difference A—B and the arc AC are so arranged that about half the desired thickness of pulp is deposited on the screen from A to C. Then the wire 10 is laid on this pulp and the rest deposited over the wire. Thus there is formed a flat ribbon 30 of interfelted water wet pulp containing the wire completely embedded therein.

The pulp ribbon 30 containing the oiled wire 20 embedded therein passes from the drum 17

over a guide sheave or roll 24 and thence through a device 25 which folds the flat edges or wings of the ribbon about the central part containing the wire therein and compacts the pulpous mass into a seamless generally cylindrical sheath about the wire. The strand thus created passes from the device 25 through any suitable oven or other heating device 26 in which substantially all the oil and water contained in the strand is evaporated and driven off. Thus the strand 40 emerging from the oven 26 consists of an enameled wire core with a seamless sheath of dry pulpous material thereon; and it will be found that this sheath clings to the enamel under it far more closely and adherently than is the case if the oil coating put on in the bath 14 is omitted. In particular, when the sheath is made of wood pulp and is put on the enameled wire without the oil coating, the resulting sheath will not ordinarily endure the stresses imposed on it in subsequently coating the sheath with cellulose acetate by extrusion; whereas, when the method of the invention is employed, the wood pulp sheath is tight enough on and adherent enough to the enamel coating of the wire to endure such subsequent coating with cellulose acetate by extrusion without material difficulty.

Emerging from the oven 26, the finished strand 40 passes to some suitable advancing means (not shown) and thence to takeup means or to further manufacturing means also not shown.

The details of structure and operation of the several devices shown in the drawing form no part of the present invention and so only such parts are shown as are needed to illustrate the invention itself. However, it is thought that the oil bath 14 in the tank 12 together with the sheaves 11, 15 and 16 are a complete, if diagrammatic, disclosure of means to coat the enameled wire 10 with oil. Complete details of construction and mode of operation of the apparatus, including the drum 17, for forming a flat ribbon of wet pulp containing the oiled wire therein, of the device 25 for folding and compacting the ribbon into a cylindrical sheath, and of a suitable heating means 26 for driving off the oil and water, may be found respectively in U. S. Patent 1,615,394 of January 24, 1927, to J. S. Little, in U. S. Patent 2,312,448 of March 2, 1943, to J. N. Selvig, and in U. S. Patent 2,318,533 of May 4, 1943, to J. N. Selvig.

While the method of the invention appears to be effective with wire coated with any solid, amorphous, water insoluble and water repellent material, it is particularly applicable to wire coated with the familiar baking enamels, i. e. with a baked or fully prehardened coating of a raw liquid material comprising chiefly the oleo resin of linseed oil, China wood oil or other analogous drying oil, oxidized and polymerized by heat and thinned for application with a vehicle subsequently driven off in the baking.

The oil bath 14 consists essentially of a hydrocarbon oil such as one or another of the petroleum distillation fractions of the general character of kerosene, not so volatile that it will evaporate before the pulp ribbon can be formed over the oil coating on the enameled wire, and not high boiling enough to prevent satisfactory evaporation and removal in the oven 26.

What is claimed is.

1. The method of making a seamless sheath of fibrous pulp material on a wire coated with a fully prehardened baking enamel, which sheath shall be unusually closely and firmly adherent to the surface of the said coating and which method comprises steps of applying to the surface of the enamel on the wire a thin coating of hydrocarbon oil of about the volatility of kerosene, subsequently forming a seamless cylindrical sheath of water wet fibrous pulp over the oil coating, and after that heating to drive off both the oil and the water.

2. The method of making a seamless sheath of fibrous pulp material on a wire coated with a fully prehardened linseed oil baking enamel, which sheath shall be unusually closely and firmly adherent to the surface of the said coating and which method comprises steps of applying to the surface of the enamel on the wire a thin coating of hydrocarbon oil of about the volatility of kerosene, subsequently forming a seamless cylindrical sheath of water wet fibrous pulp over the oil coating, and after that heating to drive off both the oil and the water.

3. The method of making a seamless sheath of fibrous pulp material on a wire coated with a fully prehardened China wood oil baking enamel, which sheath shall be unusually closely and firmly adherent to the surface of the said coating and which method comprises steps of applying to the surface of the enamel on the wire a thin coating of hydrocarbon oil of about the volatility of kerosene, subsequently forming a seamless cylindrical sheath of water wet fibrous pulp over the oil coating, and after that heating to drive off both the oil and the water.

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