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IMPREGNATED WOVEN SHEATH

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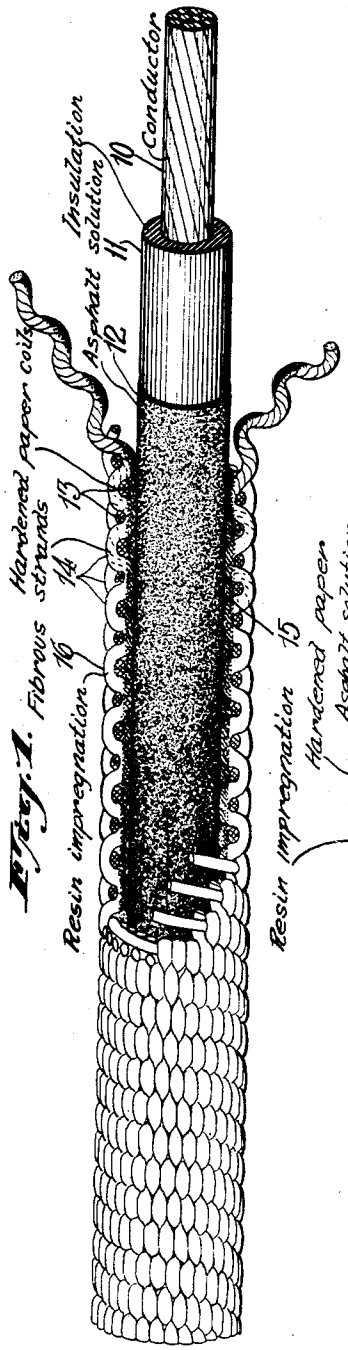


Fig. 1.

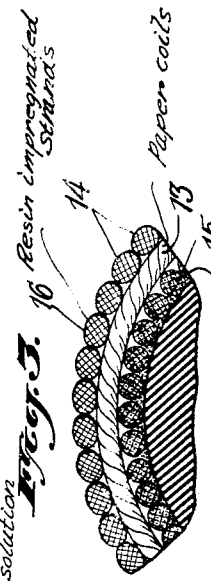


Fig. 3.



Fig. 2.

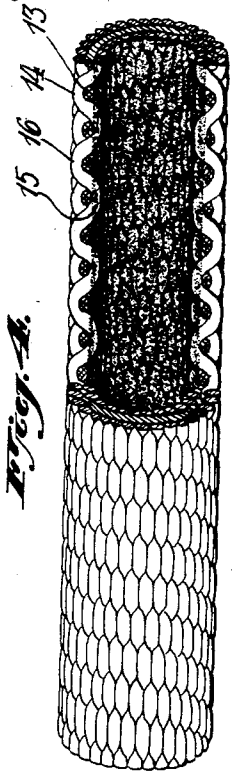


Fig. 4.

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IMPREGNATED WOVEN SHEATH

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6 Claims. (Cl. 173—264)

My invention relates to an abrasion resistant sheath for electric conductors either as a unitary covering structure, or as a conduit into which conductor wires may be drawn for circuit.

Heretofore, it has been the custom to form non-metallic jackets or sheaths for cables, which may be subjected to abrasion of closely spaced helical strands of tough, stiff material, such as paper impregnated with a water insoluble resin. These helical strands are held in place by relatively limp textile warp strands of cotton, or other fibrous material interwoven with the helical strands, so that each warp passes to the inside and outside of the helical structure, as it is woven with successive helical strands.

The resistance to abrasion and wear, and consequently the life of the sheath or jacket is, however, limited by the resistance to abrasion of the interwoven textile strands, for when they become severed the helical filling strands of stiff material become displaced, so that they no longer afford adequate protection to the enclosed electrical cables or conductors.

In my invention, the wear resisting qualities of the textile strands, or warp is very greatly increased while still preserving sufficient flexibility to enable the completed structure to bend or flex and not to give it undue stiffness.

For this purpose, the textile strands are interwoven with strands of any desired type, such as the hard stiff impregnated paper helical strands commonly used and the portions of said textile strands on the outer surfaces of said helical strands, that is, outside of the helical structure formed by said helical strands are impregnated with a water insoluble resin of any suitable type, as for example a formaldehyde phenol resin, while the parts of said strand within the helical structure are kept substantially free from said resins.

As a result, the outer parts of the textile strands, which are the only parts which are subject to the excessive abrasive action or wear, are rendered hard and wear resistant by the resin, while the parts within the helical structure retain their limp flexible character unhardened by impregnation with the resin. The desired flexibility of the sheath is thus preserved. The resin may be kept from penetrating to the parts of the strand within the helical structure by impregnating these portions of the strand with a material, such as asphalt that will resist the penetration by the resin. The sheath may be formed in place on an insulated conductor, or it may be formed independently as on a mandrel, or otherwise, then coated on the inside with the resin resisting material and then coated on the outside. The insulated conductors may thereafter be inserted in the jacket or sheath thus formed.

The various features of the invention are illustrated in the accompanying drawing, in which—

Fig. 1 is a longitudinal view, part being broken away to show the interior construction of a jacketed insulated cable embodying the invention; Fig. 2 is a longitudinal section; Fig. 3 is a cross section on a larger scale of a part of the jacket and insulation; and Fig. 4 is a part longitudinal, part sectional view of a conduit or sheath formed separately of the electrical conductor.

In the construction shown in Fig. 1, an electric conductor **10**, as, for example, a cable composed of such strands of wire, is enclosed in a rubber insulating jacket **11**. The rubber jacket **11** is then coated, as at **12**, with a solution of asphalt in a suitable volatile solvent and the sheath structure, composed of closely spaced helical turns **13** of paper impregnated and hardened with a water insoluble resin and a limp strand **14** of textile or fibrous material interwoven in a longitudinal direction with strands **13**, is then formed on the freshly applied layer **12**. Preferably, a rubber filled fabric tape is wound over the rubber insulation to protect it from the solvent in which the asphaltic material is dissolved.

The textile or fibrous material absorbs the asphalt solution up to about the level of the helical strands **13**, as indicated in the dotted or stippled portion **15** in Figs. 1, 2 and 3. A large excess of asphalt solution, sufficient to saturate all of the textile strands is to be avoided as this would prevent the later impregnation with the resin. The amount of asphalt solution adhering to the rubber insulation **11** is generally sufficient to provide a proper limited impregnation of the sheath, if the sheath be applied promptly before the asphalt dries through the evaporation of the solvent. After the strands **14** have thus been coated on the inner side of the helical structure, the coating is permitted to dry and a liquid resin or resin solution, or resin forming materials are applied to the outer surface of the woven sheath structure in such manner that the resin is absorbed into and impregnates the fibre strands inwardly until it reaches the asphalt impregnation.

It thus hardens and unites the outer parts of the textile strands, as at **16**, with the resin material. While the textile strands are thus rendered stiff, hard and wear resistant against abrasion, the inner parts of the strands remain pliable and, therefore, do not stiffen the structure to such an extent that it would not be flexible as would be

the case if the resin also impregnated the parts of the strand, within the helical turns 14.

In the construction shown in Fig. 4, the helical strand 13 and the fibrous strands 14 are positioned, as in Fig. 1, 2 and 3. The asphalt impregnation 15 and the resin impregnation 16 are also the same as in Figs. 1, 2 and 3. This structure may be formed of a mandrel which will be coated with a suitable asphalt solution, as in the case of the insulation 11 of Fig. 1. Or the interior of the structure may be sprayed by any suitable means immediately as it leaves the mandrel.

What I claim is:

1. A sheath for electric conductors comprising closely spaced helical strands of stiff hard material and longitudinally extending flexible fibrous strands interwoven with said helical strands, the parts of said fibrous strands outside said helical structure being saturated with a hard wear resistant resin and the parts of said longitudinally woven strands inside said helical structure being substantially free of resin and impregnated with an asphaltic material.

2. A method of forming a woven wear resistant covering for electric conductors which comprises interweaving helical wear resistant strands with longitudinally extending fibrous strands, coating the interior of the resulting structure with a material to resist penetration by resinous varnishes and thereafter impregnating the outer surface of said structure with a resin varnish.

3. A method of forming a fibrous wear resistant jacket on an electric conductor which comprises coating the insulated surface of said conductor with an asphaltic solution, weaving a fibrous jacket on said insulation while wet with said asphaltic solution, permitting said solution to dry and then impregnating the resulting structure from the exterior with a resin varnish.

4. A conduit comprising woven strands, said strands being saturated with a wear resistant resinous material inwardly from the outer surface to a limited depth and being substantially free from said resinous material and impregnated with asphaltic material from the inner surface outwardly to the resin saturated part.

5. A conduit comprising woven strands, said strands being saturated with a wear resistant resinous material inwardly from the outer surface to a limited depth and being substantially free from said resinous material and impregnated with a material resistant to saturation with resins inwardly of said resin saturated outer part.

6. A sheath for electric conductors comprising spaced helical strands and longitudinally extending flexible fibrous strands interwoven with said helical strands, the parts of said fibrous strands outside said helical structure being saturated with a hard wear resistant resin and the parts of said longitudinally woven strands inside said helical structure being substantially free from resin and impregnated with a material resistant to penetration by resins.

HARRY E. THOMPSON.