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METHOD OF INSULATING ELECTRIC CABLE JOINTS

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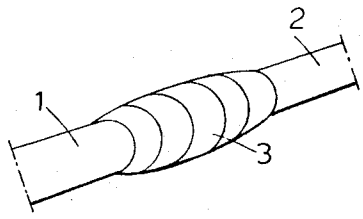

FIG. 1.

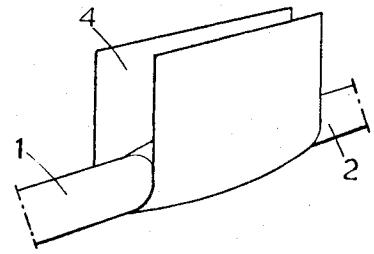

FIG. 2.

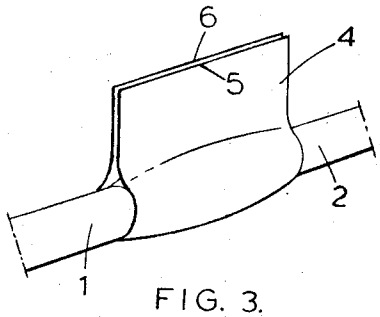

FIG. 3.

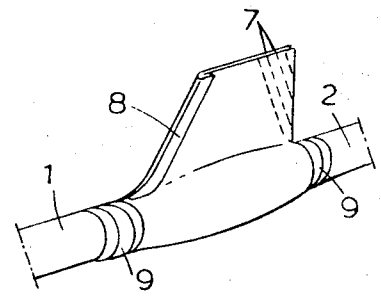

FIG. 4.

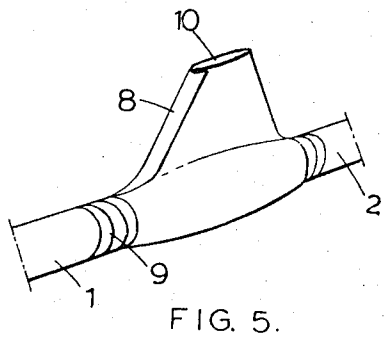

FIG. 5.

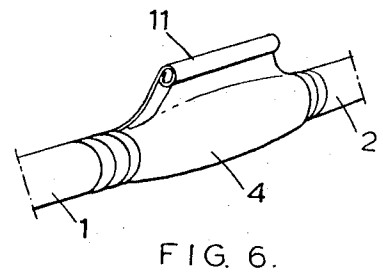

FIG. 6.

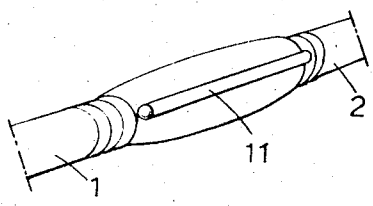

FIG. 7.

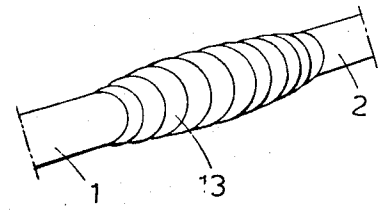

FIG. 8.

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METHOD OF INSULATING ELECTRIC CABLE JOINTS

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ABSTRACT OF THE DISCLOSURE

A method of insulating an electric cable joint, and an insulated joint produced thereby, consisting in enveloping the joint with a sheet of flexible material, folding over the side edges and sealing them to the cable on both sides of the joint, opening apart the end edges and introducing a thioxotropic resin through the opening so provided, and subsequently folding over the end edges so as to produce the required internal pressure.

The invention relates to electric cable joints and in particular, to the application of insulating material thereto, to replace the original insulation of the cables after the conductors have been jointed together.

Many techniques of doing this are available and the method employed in any particular case will be governed in general by the nature of the insulating and sheathing materials in the cables themselves. The extensive use nowadays of synthetic resins, for example polyvinyl chloride, polyethylene, for insulation and sheathing purposes has caused the development of new methods of jointing employing tapes and casting resins of various compositions. Some methods make use of special moulds and pressure injecting devices for applying the casting resin, but it will be appreciated that different moulds are necessary to deal with the many different sizes of cable. The casting resins must have a sufficiently low viscosity to completely permeate the spaces within the joint before setting. These techniques can therefore be wasteful in material, as the injected resin will tend to migrate along the cable from each side of the joint.

The main object of the present invention is therefore to provide an improved technique for applying synthetic resin insulation to an electric cable joint.

Accordingly, the invention provides a method of applying insulation to an electric cable joint comprising the steps of forming an envelope of flexible sheet material around the joint, charging the envelope with a thixotropic resin mix containing a suitable hardener, and manipulating the envelope to apply pressure to the resin, thereby causing the resin to flow throughout the joint. The invention thus employs a resin in thixotropic form, that is, a form in which it will flow only under the application of pressure, in conjunction with a pressurising means formed in situ. To allow the invention to be readily understood and carried into effect, a method in accordance with the invention is described below with reference to the accompanying drawing, in which FIGURES 1 to 8 are perspective views of successive stages in the application of synthetic resin insulation to an electric cable joint.

The conductors of two cables **1, 2** shown in the drawings are first jointed by methods well known in the art. The jointed conductors are then wrapped with either a dry or resin-impregnated tape **3** of a mesh construction as described, for example, in our earlier United States patent application, Ser. No. 257,686, now U.S. Patent No. 3,203,544. The joint is then in the condition shown in FIGURE 1. A sheet **4** synthetic resin material, of generally rectangular form, is then bent round this wrapped

core, in a way which will be clear from FIGURE 2. The top edges **5** and **6** of the sheet are next brought together as shown in FIGURE 3.

In the next following steps, illustrated in FIGURE 4, side edges of the sheet **5** are folded in together at an angle on lines as at **7**, and creased as at **8**; then the side portions round the cables **1, 2** are taped to the cable sheathing with lengths of a suitable self-adhesive synthetic resin insulating tape **9**, so as to form an envelope around the cable. The envelope is now opened at the top (FIGURE 5) to form a mouth **10** by which it is filled with a thixotropic epoxy resin mix containing a suitable hardener. The top edges of the envelope are subsequently folded over together and creased, thereby forming a closed bag containing the resin. By rolling the top edges of the envelope towards the jointed cables, as indicated in FIGURE 6, pressure is applied to the resin mix, thereby forcing it to flow into the interstices and the insulation of the joint. This stage of the process can be completed and pressure also applied by wrapping the rolled edge **11** and any portion of the envelope still upstanding, around the joint, so that this appears as in FIGURE 7.

On completion of the pressurising operation, pressure is released, and pressure-stabilisation taking place, the thixotropic resin will harden and set. The joint to which insulation is thus applied is finally completed by a final overall wrapping **13** of suitable self-adhesive synthetic resin insulating tape, shown applied in FIGURE 8.

The sheet **4** can be a synthetic resin layer laminated with a metal foil, the latter being positioned on the inner side of the sheet as folded around the joint. The use of such a laminate will ensure a moisture-proof barrier around the joint and will also provide an electric screen.

The resin can, but need not, be of the same chemical nature as that forming the original insulation of the cable. For example, if they are different and the jointed cables comprise conductors insulated with polyvinyl chloride, the applied thixotropic resin can be of the epoxy type.

A suitable formulation for the thixotropic resin mix is

Component:	Amount parts by weight
Araldite (trademark) MY 753—(a mixture comprising: (a) 100 parts by weight of an epoxy resin prepared from 2,2-bis (4-hydroxyphenyl)-propane and epichlorohydrin having a 1,2-epoxide content of between 5.0 and 5.2 equiv./kg. and a viscosity of between 200 and 400 poises at 21° C. and (b) 20 parts by weight of di-n-butyl phthalate)	100
Filler DT 075 (finely dispersed silica)	8
Hardener HY 951 (triethylene-tetramine)	10

From the foregoing it will be appreciated that the invention provides a simple method of insulating an electric cable joint requiring no pressure injection or special tooling.

As preformed moulds are not required, the invention is applicable to joints of any size or form. Complete impregnation of the joint is assured and loss of resin is kept to a minimum.

What I claim and desire to secure by Letters Patent of the United States is:

1. A method of insulating an electric cable joint, comprising the steps of forming an envelope around the joint by bending a sheet of flexible material around it so as to leave the end edges projecting beyond the cable, folding together adjacent side edges extending between the said end edges and the cable on both sides so as to seal those side edges, separating the end edges to form a mouth, charging a thixotropic resin through the said mouth into the envelope, sealing the mouth by folding

over the end edges and manipulating the sealed envelope to apply pressure to the resin, thereby causing the resin to flow around the joint.

2. A method according to claim 1 in which the manipulation of the envelope includes folding the end edges over one another to apply the pressure to cause the resin to flow.

3. A method according to claim 2 in which after folding over the end edges any remaining extending portion of the envelope is wrapped around that portion already extending around the joint.

4. A method according to claim 1 in which the side edges of the envelope sheet are, in addition to being folded together, sealed around the cable.

5. A method according to claim 4 in which the side edges of the envelope are sealed around the cable by means of a wrapping of self-adhesive synthetic resin insulating tape.

6. A method according to claim 1 including an initial step of wrapping the joint with a tape of mesh construction.

7. A method according to claim 6 in which the tape is resin-impregnated.

8. A method as claimed in claim 1 and further comprising applying wrapping of a self-adhesive synthetic resin insulating tape over the envelope.

9. A method as claimed in claim 1 wherein the flexible material is a laminate comprising a layer of synthetic resin material and a metal foil, the foil being at the inside of the envelope.

10. A method as claimed in claim 1 wherein the thixotropic resin is of the same chemical nature as the original insulation of the jointed cables.

11. A method as claimed in claim 1 wherein the cables comprise conductors insulated with polyvinyl chloride and the thixotropic resin is an epoxy resin.

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