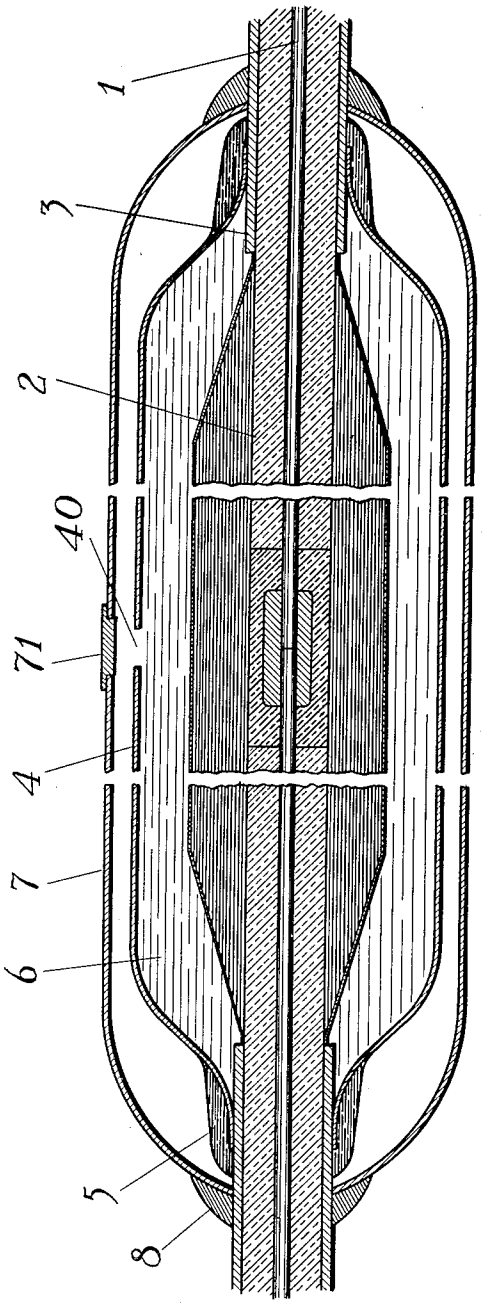
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D. M. SIMONS

CABLE JOINT

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UNITED STATES PATENT OFFICE.

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CABLE JOINT.

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My invention relates to improvements in the making of joints in electric cables, and is found both in method and in the structure by virtue of which the method is accomplished. The object is the avoidance of defect and the more certain production of an electrically secure structure.

In the accompanying drawing a cable joint is shown in medial and longitudinal section in the building of which and in the structure of which my invention may be realized.

In this drawing two cable ends are shown to be united. The cable structure includes essentially a conductor 1, an envelope of insulation 2, and a sheath 3. The cable may be a single-conductor cable or a multiple-conductor cable, and the conductor may be solid or stranded. These various forms of cable are well known, and for simplicity I show typically a cable whose single conductor is a solid wire. The insulating envelope may be formed of wrapped-on paper or equivalent material, filled with viscid or fluid substance, ordinarily termed insulating compound. Specifically, the insulating envelope may be the oil-filled envelope of Letters Patent of the United States No. 1,574,076, granted February 23, 1926, on the application of Henry W. Fisher. The sheath is ordinarily the familiar metal sheath. The essential conditions or the essential characteristics of cable structure upon which my invention is predicated, are a metal-sheathed cable whose envelope of insulation contains, includes or consists of a body of liquid or viscid substance.

In the building of the joint of such a cable the usual procedure is to cut away for sufficient distances the sheath and the envelope of insulation, to unite electrically the bared conductor ends, to envelop the union in insulation, and then to enclose the whole in a sleeve of lead. This sleeve of lead, initially slipped over one of the cable ends, is, after the union has been made and the envelope of insulation applied, advanced to place, shaped at its ends, and then at its ends united by wiped solder joint to the sheath of the cable on either side of the union of the conductors. In place of the wiped solder joint of the lead sleeve with the cable sheath, other forms of mechanical union have been proposed, but the art has come to the standard practice of making a wiped solder joint, for this particular form of joint has been found most satisfactory, both in the matter of mechanical strength and in the matter of the exclusion of moisture.

In the jointing of high-voltage cables a defect consequent upon this usual procedure in joint-making, appears. The making of the wiped solder joint involves application to the exterior surface of the metal-sheated cable and at a point near the joint, of a relatively large body of molten solder, and maintenance of this body of molten metal in contact upon the surface of the cable and over an extended area of contact, while it cools and solidifies. The incidental localized heating of the cable causes the body of liquid or viscid substance which is contained in or which constitutes the insulating envelope of the cable to become more fluid and to expand. The insulating material so changed in character is prone to flow; the adjacent, insufficiently enclosed end of the insulating envelope is liable to "bleed". When thereafter the joint cools and the body of fluid or viscid insulation contracts, bubbles of air may be drawn into the envelope of insulation. This matter of ingress of air into the envelope of insulation at the cable joint is a matter of such relatively small magnitude that in the laying and maintenance of cables for low-tension service it is negligible, but with high-tension cables it becomes a source of deterioration and break-down.

My invention consists in proceeding with the building of the joint in the usual or in any preferred manner, up to the placing of the sleeve around the insulated union of the conductors and the shaping of the ends of the sleeve to the cut-away ends of the cable sheath. This sleeve (conveniently of lead) is in the accompanying drawing indicated at 4, and the drawing shows it shaped at its ends, closely to encircle the cable sheath 3 at or near the cut-away end. The ends of the sleeve 4 are then united upon the cable sheath at either side of the joint in a union which while not involving such heating as is incident to the making of a wiped solder joint is tight against the leakage of oil. Various forms of union responsive to the requirements indicated, are known to the art: a stuffing-box union, for example, or again a union completely by a

wrapping on of tape. I show in the drawing, by way of example merely, a union effected by a wrapping 5 of rubber tape or what is termed "friction" tape—that is to say, a fabric tape faced with unvulcanized or incompletely vulcanized rubber, made thin with a proper solvent and spread. Such union I characterize in contradistinction to union by wiped solder joint, a low-temperature union.

The sleeve 4 after it has been so applied and secured is filled with a body 6 of high-grade insulating oil. A filling orifice 40 in sleeve 4 is provided for this purpose. When this has been done a second and sufficiently larger sleeve 7 of lead which previously had been slipped over one of the cable ends is brought to place around the thus far completed joints, and at its ends it is shaped and secured by wiped solder joints 8 to the cable sheath. Such bleeding of the body of insulation as then occurs is but a bleeding into the body 6 of oil, and when thereafter the structure cools again the contraction of the viscid or fluid insulation will have the effect of drawing into the structure, not bubbles of air, but oil, and so the envelope of insulation is maintained intact with respect to its electrical strength.

After cooling the whole space within the outer sleeve 7 may be filled with oil, supplying any deficiency of the fullness of the inner sleeve 4, and then the filling orifice in the outer sleeve may be closed in any preferred manner, as by a plug 71 soldered to place.

I claim as my invention:

The steps herein described in a method of jointing an insulated metal-sheathed cable whose insulation includes material of fluidity increasing with rise of temperature, which consists in bringing a sleeve to position around the electrically united cable ends, making low-temperature oil-tight union between the sleeve at its ends and the ends of the cut-away cable sheath, filling the so applied sleeve with liquid insulation, bringing a sleeve of metal to place around the sleeve first named, and uniting said second sleeve by wiped solder joint to the cable sheath.

In testimony whereof I have hereunto set my hand.

DONALD M. SIMONS.