May 3, 1938. H. HORN 2,116,266

INSULATING JOINT FOR ELECTRIC CABLES

Filed Jan. 30, 1936

Fig. 1

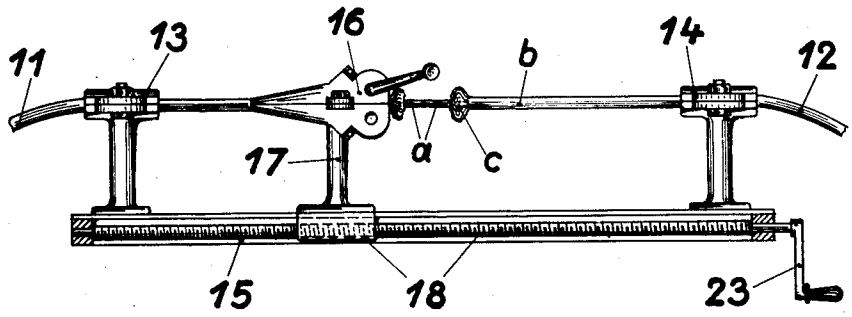


Fig. 2

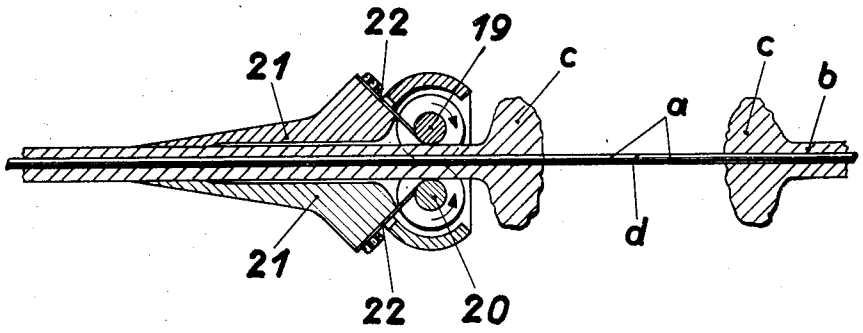
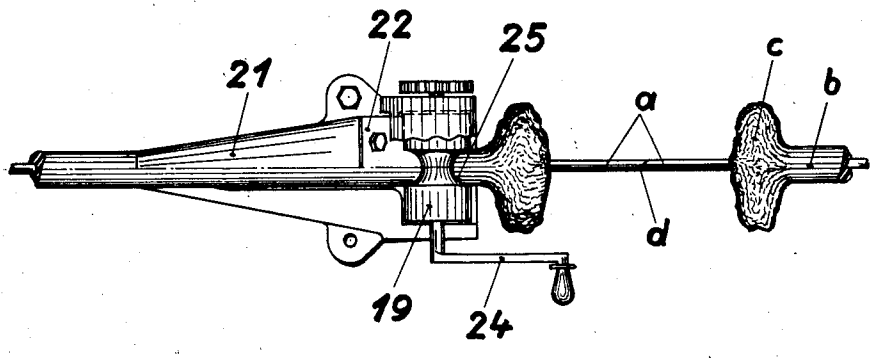


Fig. 3



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INSULATING JOINT FOR ELECTRIC CABLES

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4 Claims. (Cl. 173—268)

This invention relates to a method of and apparatus for producing joints in the insulation of cables, more particularly submarine cables which are insulated with a thermoplastic substance, the invention being applicable to any kind of thermoplastic substance. e. g. guttapercha, balata, caoutchouc, waxes, polyvinyl compounds and mixtures thereof.

Various methods of producing such joints are already known, the common feature of which is that after the insulating ends have been suitably prepared, they are caused to overlap under heat, by using fresh material of the same or different composition, mostly in the form of plates. The production of such joints presupposes a certain amount of skill of manipulation, and generally, can be carried out successfully only by suitable specialized workmen. The difficulty to overcome consists in effecting all the numerous insulating joints of a submarine cable equally well, so that none of the many hundreds of overlapping places shall have a capillary break, through which the water could pass, sooner or later.

The invention mainly relates to a method which enables a seamless joint to be produced. The invention further relates to an apparatus for carrying out this process. The invention will hereinafter be described with reference to the drawing, which illustrates, by way of example, one mode of carrying the invention into effect, the reference letters and numerals denoting the same parts in the various figures.

The two conductor ends 11 and 12 to be connected together are first of all treated in such a manner that the thermoplastic insulating material *b* is pushed back from the copper conductor *a* while being heated, so that a large thickening *c* is formed in the insulating covering and a long portion of the copper conductor is laid bare. Thereupon a long portion of the bared copper conductor is cut off; the bare conductors which still project outside need be only so long as will permit a conductor joint *d* to be effected in a known manner, for instance by soldering or welding.

For the production of the insulating joint, use is made of an apparatus which essentially consists of a pair of rolls. This pair of rolls is so arranged that it can be moved along the conductors. For instance, the conductor ends 11, 12 (see Figure 1) may be clamped in two clamps 13 and 14 which are secured to a support 15. The apparatus 16 for the production of the joint is mounted on a frame 17 which can be moved along the conductors by means of a handle operated drive 18. Alternatively, the conductors may be pulled through the stationary pair of rolls.

The apparatus 16 is illustrated in detail in Figures 2 and 3. It mainly consists of the rolls 19 and 20 provided in the middle with a recess 25. This recess is of such a size that it surrounds the insulated conductors, exactly conforming thereto. The rolls rotate in the direction of the arrows indicated in Figure 2. The pair of rolls is mounted in a casing 21, which closely surrounds the conductors, so that no insulating substance can pass through the rolls; the scrapers 22 resting on the rolls serve for the same purpose. The apparatus 16 is so constructed that the upper part with the roll 19 can be turned over or be removed, in order to insert the conductor or take it out.

The insulating joint is produced as follows: The insulation *b*, including the thickened portion *c*, is heated to the temperature necessary to render the insulating material plastic, e. g. by means of a jet of steam or spirit flame (not shown in the drawing). At the same time, the pair of rolls 19, 20 is set into rotation by hand by means of the handle 24, or by means of a motor, and the whole of the apparatus 16 is moved from left to right, for instance, by turning the handle 23 (Figure 1). As soon as the pair of rolls reaches the thickened portion, the heated insulating mass is thoroughly kneaded, in the same way as in the case of the known mills for rolling rubber mixtures.

The construction of the casing 16 and the scrapers 22 prevent any insulating material from passing through the rolls.

As the apparatus 16 is further moved, the pair of rolls 19, 20 reaches also the second thickened portion *c* which has been heated in the meantime, and the insulating material at this point is thoroughly kneaded together with the remainder of the insulating material of the first thickened portion, so that a perfectly homogeneous mass is obtained which is shaped to the normal cross-section of the conductor by the recess in the rolls and the internal diameter of the casing 21. After the actual union of the two ends of the insulation has been effected in this way, the heating of the insulation is interrupted and the rolling apparatus 16 is moved along the conductor, until the rolls come to lie in a place where they are no longer heated. The casing of the rolling apparatus is then opened, any possible traces of insulating material are removed and the completed joint is taken out.

In this way, it is possible, without using any fresh insulating material, to produce a reliable seamless joint of cables with thermoplastic insulation. If desired, use may naturally be made, to a more or less great extent, of fresh insulating material, which is kneaded with the available material to form an integral mass, by means of the mixing pair of rolls. If found advantageous for special reasons, the production of the joint may also be effected, by forming a thickening on the insulation, only on one of the two conductor ends, and therefrom building up the insulation over the soldered point of the copper in the manner above described.

What I claim is:

1. A method of producing a seamless joint in the insulation of electric cables which are insulated with thermoplastic substances, consisting in that the two ends of the insulation to be connected together are softened and kneaded together on the conductor.

2. A method of producing a seamless joint in the insulation of electric cables which are insulated with thermoplastic substances, consisting in that the insulation is pushed back on the ends of the conductors to be connected together and thickenings thereof are thereby formed at a suitable distance from the ends of the conductors, that the conductors are then shortened and the connection between them effected in a known manner, and that the said thickenings of the insulation are softened and kneaded together by rolling.

3. A method of producing a seamless joint in the insulation of electric cables which are insulated with thermoplastic substances, consisting in that the insulation is pushed back on the ends of the conductors to be connected together and thickenings thereof are thereby formed at a suitable distance from the ends of the conductors, that the conductors are then shortened and the connection between them effected in a known manner and that the said thickenings of the insulation are softened and kneaded together by rolling along the joint.

4. A method of producing a seamless joint in the insulation of electric cables which are insulated with thermoplastic substances, consisting in that the insulation is pushed back on the ends of the conductors to be connected together and thickenings thereof are thereby formed at a suitable distance from the ends of the conductors, that the conductors are then shortened and the connection between them effected in a known manner and that the said thickenings of the insulation are then softened and kneaded together by rolling while adding fresh insulating material during the kneading.

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