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METHOD AND MEANS FOR MAKING JOINTS IN INSULATED CONDUCTORS

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FIG. 3

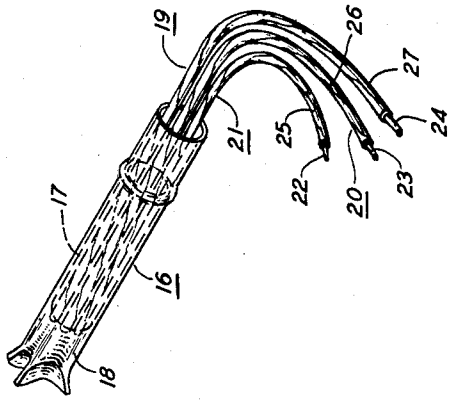


FIG. 2

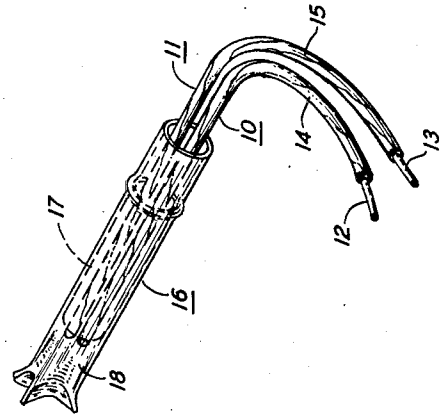
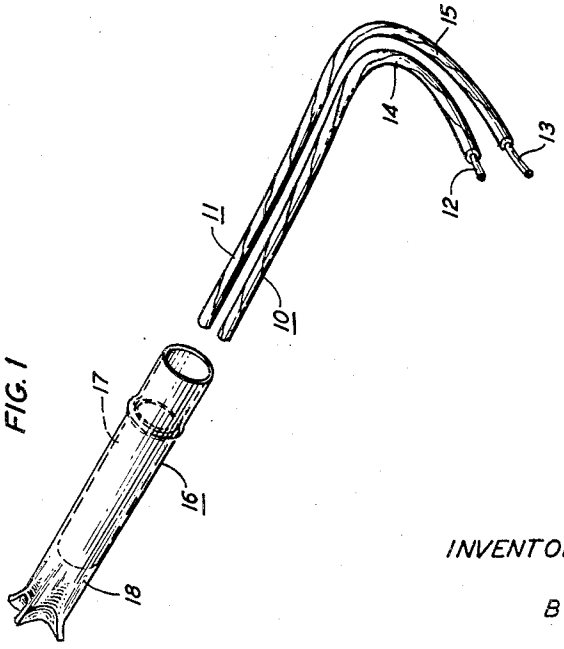


FIG. 1



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METHOD AND MEANS FOR MAKING JOINTS IN INSULATED CONDUCTORS

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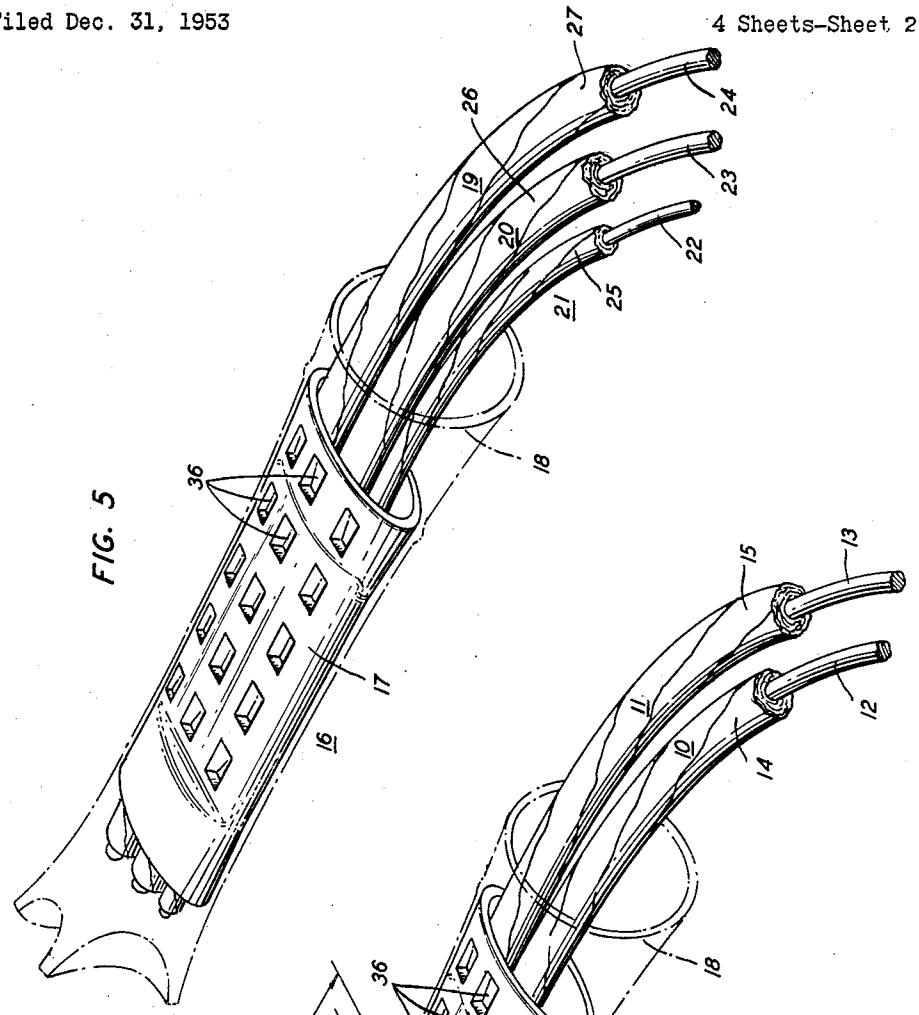

FIG. 5

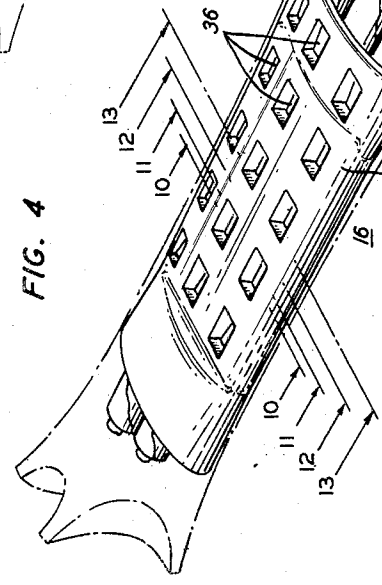

FIG. 4

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METHOD AND MEANS FOR MAKING JOINTS IN INSULATED CONDUCTORS

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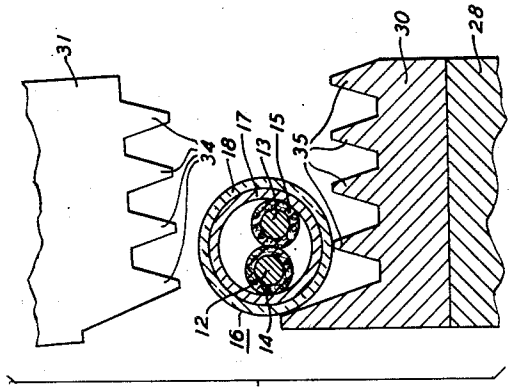

FIG. 7

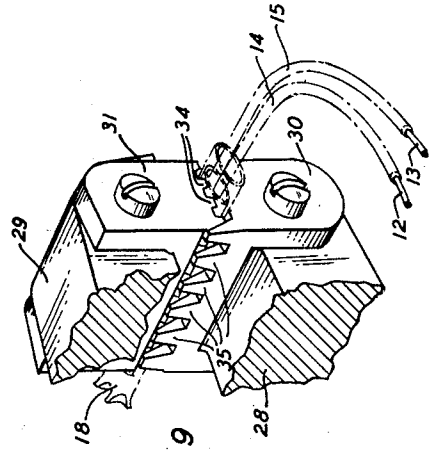

FIG. 9

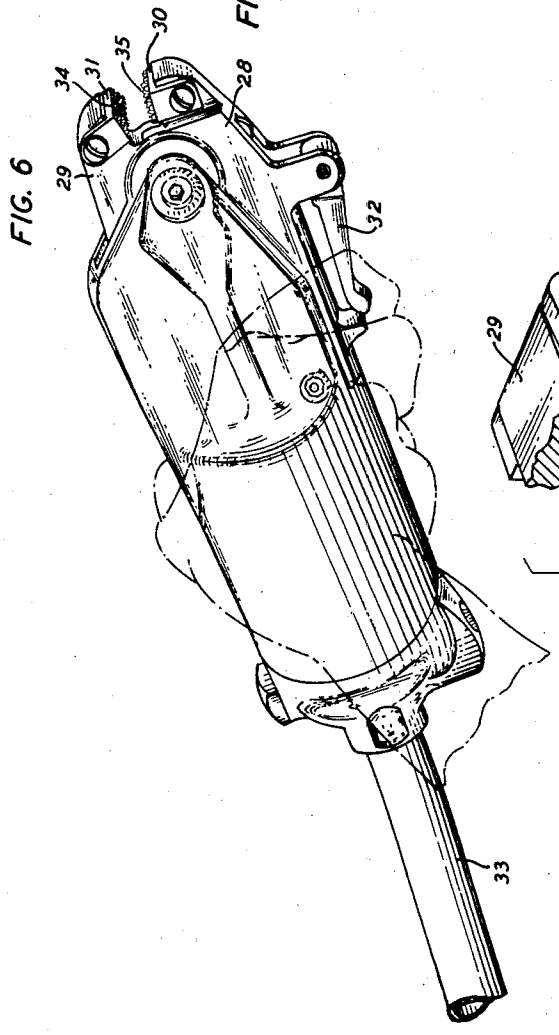

FIG. 6

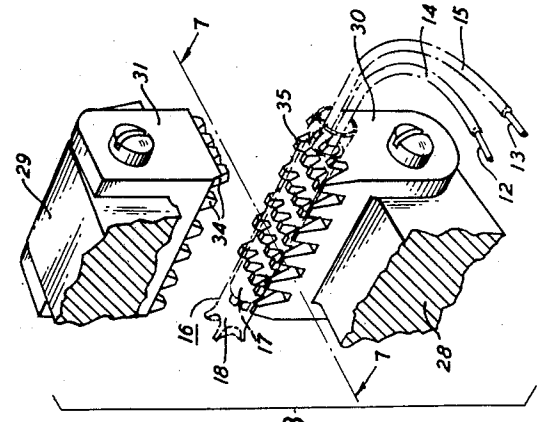

FIG. 8

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FIG. 10

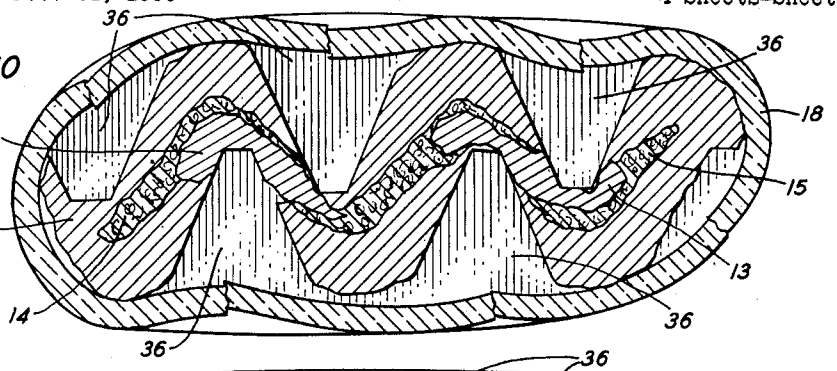


FIG. 11

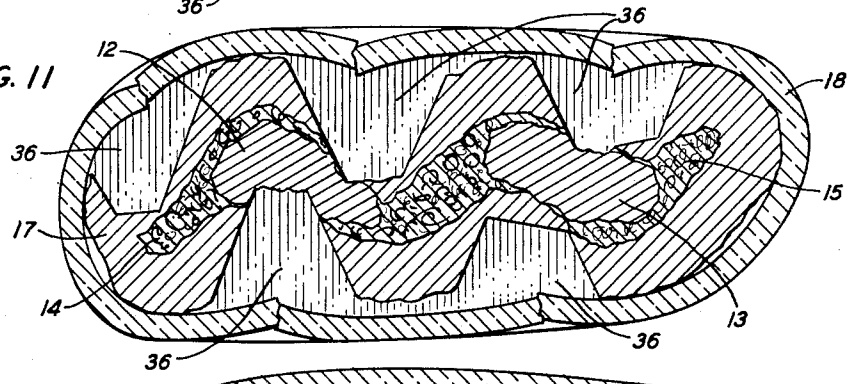


FIG. 12

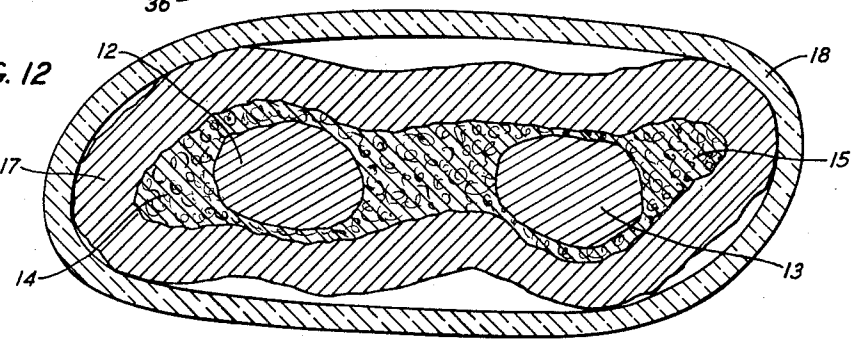
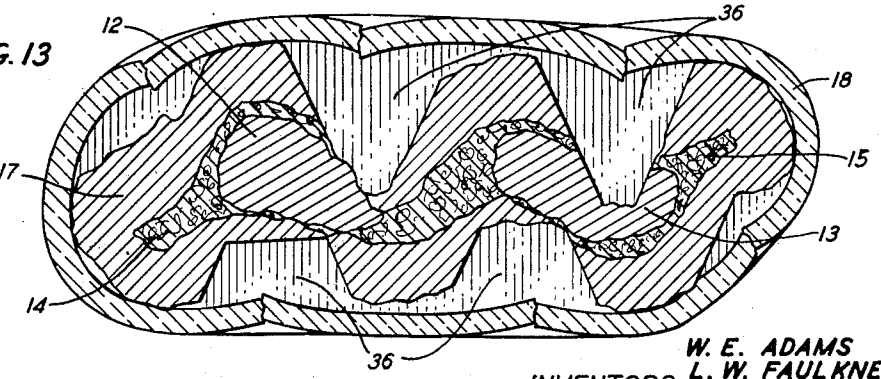


FIG. 13



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2,828,353

METHOD AND MEANS FOR MAKING JOINTS IN INSULATED CONDUCTORS

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Application December 31, 1953, Serial No. 401,642

5 Claims. (Cl. 174—87)

This invention relates to the joining of electrical conductors and more particularly to a method of making solderless insulated joints in insulated conductors.

An object of the invention is the provision of a joint for insulated conductors wherein the ends of the conductors are joined together and insulated in a single operation and by a unitary structure.

Another object of the invention is the provision of a joint for insulated conductors wherein a plurality of insulated conductors are connected together in a composite sleeve which forms a unitary structure and provides an insulated joint having a low electrical resistance.

A further object of the invention is a provision of a solderless connection for insulated wires wherein a composite sleeve is deformed to provide a plurality of internally extending tangs certain ones of which have a lesser degree of penetration to prevent conductor breakage for establishing electrical connection between the conductors confined in the sleeve, without previously removing the insulation.

A still further object of the invention is the provision of a tool for compressing a composite sleeve around the ends of the insulated conductors to be joined, wherein the outer material of the sleeve, which forms the insulation for the joint, permits the metal liner to be deformed to establish contact with the conductors.

The present invention contemplates the use of a smooth bore composite sleeve, closed at one end, and having an inner liner of ductile metal and an outer covering of insulating material. The ends of the unskinned wires to be joined, are inserted in the open end of the sleeve after which the sleeve is deformed by a tool to provide a plurality of internally extending tangs which rupture the insulation on the conductors and establish intimate electrical contact between the metal portion of the sleeve and the conductors.

The invention will be more clearly understood from the following detailed description when read in connection with the following drawings in which:

Fig. 1 is an exploded perspective view showing the composite sleeve and the conductors ready to be inserted therein;

Fig. 2 is a view similar to Fig. 1 but shows the conductors inserted in the sleeve prior to the deformation of the sleeve;

Fig. 3 is a view similar to Fig. 2 except that three conductors are positioned in the sleeve;

Fig. 4 is an enlarged perspective view of the completed joint with the metal portion of the sleeve deformed to provide a plurality of internally extending tangs which establish electrical contact with the conductors in the sleeve. The insulating covering on the sleeve is indicated by dot and dash lines;

Fig. 5 is a view similar to Fig. 4 except that three conductors are connected together by the sleeve;

Fig. 6 is a view in perspective of a tool suitable for making the joint of this invention with the deforming dies open for the reception of the sleeve;

Fig. 7 is an enlarged cross-sectional view taken on line 7—7 of Fig. 8;

Fig. 8 is a fragmentary view in perspective of the deforming dies as shown in the tool of Fig. 6 with the sleeve and a pair of conductors shown in dot and dash lines, positioned between the open dies;

Fig. 9 is a view similar to Fig. 8 but with the jaws of the tool closed and the dies deforming the sleeve;

Figs. 10, 11, 12 and 13 are enlarged cross-sectional views taken on lines 10—10, 11—11, 12—12, and 13—13 of Fig. 4 at increments of approximately .010 inch apart.

Referring now to Fig. 1, the insulated conductors 10 and 11, which comprise central metallic cores 12 and 13 and insulating jackets or coverings 14 and 15 thereover, are inserted in the sleeve 16 as shown in Fig. 2. The sleeve 16 is a composite structure, that is, it comprises inner liner 17 of ductile metal, for example copper or aluminum, and an outer covering or jacket 18 of suitable insulating material such as vinyl plastic which extends some distance beyond the ends of the liner 17 and is closed at one end. The jacket 18 is preferably one of the well-known plastics which may be readily deformed without breaking and which possesses a memory.

It is desirable though not essential, that the ends of the conductors 10 and 11 be inserted into the sleeve 16, the full length of the bore, into liner 17 so that as much of the metal core of the conductors 10 and 11, as possible, may be engaged by the deformed metal liner 17.

As shown in Fig. 3, three conductors 19, 20 and 21 are positioned in the sleeve 16. These conductors are of the same construction as conductors 10 and 11. However, the two conductors 19 and 20 are of one size and the conductor 21 of a different size. All of these conductors are provided with metallic cores 22, 23 and 24 having insulating jackets 25, 26 and 27 thereon.

One form of tool which has been found satisfactory for carrying out our invention is shown in Fig. 6. This tool is operated by compressed gas which causes the jaws 28 and 29 and their associated dies 30 and 31, to be forced toward each other into intimate engagement as shown in Fig. 9.

The tool as shown in Fig. 6 is controlled by a trigger 32 which permits compressed gas to enter the tool through the supply hose 33 thereby causing the dies 30 and 31 to intermesh with considerable pressure and deform the composite sleeve 16 positioned therebetween.

As shown in Figs. 6 to 9 inclusive, the meeting faces of the dies 30 and 31 are provided with intermeshing substantially pyramidal shaped teeth 34 and 35 which when forced into intimate contact with the sleeve 16, as shown in detail in Fig. 9, deform the sleeve as shown in Figs. 4 and 5 to provide a plurality of internally extending metal tangs 36. The internally extending tangs 36 when formed by the dies 30 and 31 rupture and displace the insulation 14 and 15 on conductors 10 and 11 thereby establishing a stable contact of low electrical resistance with the metal cores 12 and 13 and at the same time deforming the metal cores of the conductors as shown in Figs. 10 to 13 inclusive.

Inasmuch as the insulated jacket 18 on the sleeve 16 comprises a resilient plastic or other suitable material having a memory, the perforations made in the jacket by the dies 30 and 31 will be substantially closed as shown thereby preventing metallic contact between adjacent joints.

From the foregoing it will be observed that in the improved method of joining the insulated conductors as exemplified by our invention, a joint is expeditiously made without removing the insulation prior to the mak-

ing of the joint with a minimum amount of time and effort and also provides a joint the electrical resistance of which is substantially the same as that of the wire itself and is so dimensioned that it occupies a minimum amount of space in a cable splice.

While we have shown and described one embodiment of our invention, it is to be understood that various changes and modifications may be made therein without departing from the spirit of our invention and it is not our intention to be limited to any specific number of wires in the sleeve or by the materials which comprises the sleeve structure, or the number of tangs in the sleeve.

What is claimed is:

1. A method of making solderless joints in insulated electrical conductors which comprises inserting the unbared ends of the insulated conductors, to be joined, in a sleeve having a metal liner and an insulating outer jacket, applying external pressure to said sleeve to perforate the metal liner within said insulating jacket and thus provide a plurality of internally extending sharp edged tangs which rupture the insulation on the electrical conductors and establish intimate contact between the metal liner and the electrical conductors confined therein.

2. A method of making solderless joints in insulated electrical conductors which comprises inserting the unbared ends of the insulated conductors, to be joined, in a sleeve having a metal liner and an insulating outer jacket, applying external pressure to said sleeve to perforate the metal liner and thus provide a plurality of internally extending opposed intermeshed sharp edged tangs which rupture the insulation on the electrical conductors and establish intimate contact between the metal liner and the electrical conductors confined therein.

3. A method of making solderless joints in insulated electrical conductors which comprises inserting, in laterally adjacent relation, the unbared ends of the insulated conductors to be joined in a sleeve closed at one end and having a metal liner and an insulating jacket thereover, applying external pressure to said sleeve to perforate the metal liner and thus provide a plurality of internally extending opposed intermeshed sharp edged tangs which rupture the insulation on the electrical conductors and establish intimate contact between the metal liner and the electrical conductors confined therein.

4. A joint for insulated electrical conductors and the like comprising a composite sleeve having a metallic inner lines and an outer insulating jacket extending some distance beyond the ends thereof, a plurality of insulated electrical conductors having their end portions confined in and embraced by said liner, said liner including perforations to provide a plurality of internally extending sharp edged tangs which pierce the insulation on the conductors for establishing electrical contact.

5. A joint for insulated conductors and the like comprising a composite sleeve having a metallic inner liner and an outer insulating jacket extending some distance beyond the ends thereof, one end of said insulating jacket being closed, a plurality of insulated electrical conductors having their end portions confined in and embraced by said liner, said liner including perforations to provide a plurality of misaligned internally extending sharp edged tangs for piercing the insulation on the conductors and establishing electrical contact.

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