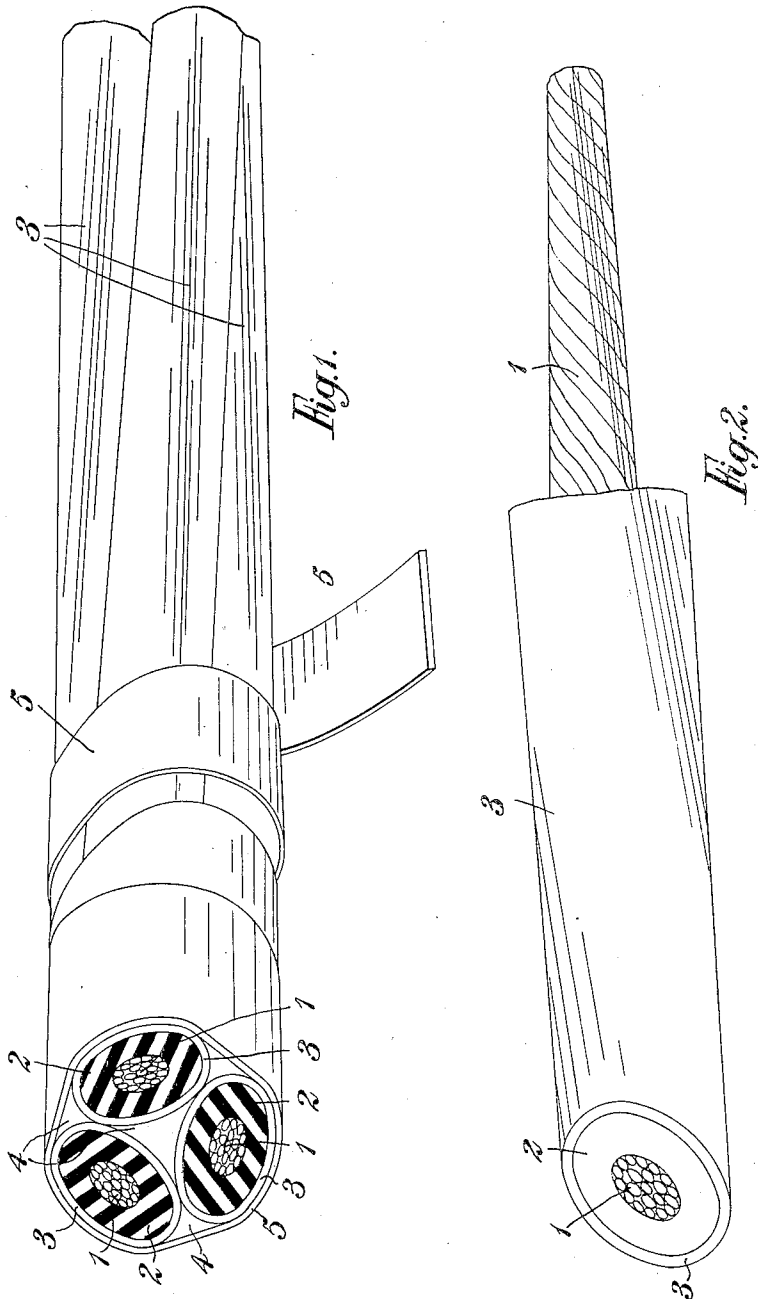


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MULTICONDUCTOR CABLE

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## MULTICONDUCTOR CABLE

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4 Claims. (Cl. 173—266)

This invention relates to electric cables, more particularly to multiple-conductor cables which are composed of single core cables commonly called and hereinafter referred to as "singles", each of which is lead covered, i. e. provided with its own lead sheath.

Such cables are known in the art under the name of "SL-type" cables and up to the present they have been made from singles with a circular cross-section.

Recently, however, it has become desirable for several electrical engineering purposes, to make the cross-section of each single of such cables, non-circular, for instance, sector shaped or oval.

Now, while the stranding of circular shaped singles to a multi-core cable offers no particular difficulty, the stranding of such cables composed of non-circular singles is more difficult.

The drawbacks of such a cable consist mainly in the difficulties which arise from the necessary twisting of each single round its axis during the stranding and from the damage which is thereby done to the insulation and still more to the sheath and the binding or armor applied upon the same.

If the sheath and the armoring, or binding tapes round the same, of such an oval single are twisted during the stranding together of the single cables, then any imperfections or impurities existing in the lead, or other material composing the sheath, are liable to result in damage to the sheath. At the same time the binding or armoring will be loosened from the sheath and thereby lose its desired effect or will be broken or pressed into the lead according to the direction of the twisting relatively to that of the taping.

The object of this invention is to avoid such damage to the sheath and binding or armoring of each single core cable by avoiding the twisting of the sheathed cables about their own respective axes.

Other objects and advantages will become apparent to those skilled in the art from the following description of a preferred practical embodiment of the invention. It is to be understood that the invention may assume other forms according to the extent to which the various advantages are desired, and as determined by the particular class of service to which the cable is to be put, the availability of materials of various kinds and other similar factors, without in any way departing from the scope of the invention as defined in the appended claims.

The invention is based on the discovery that it

is possible and advantageous to apply the sheath and also the binding or armor, if any, to a pre-twisted insulated conductor.

Referring to the accompanying drawing illustrating a preferred mode of carrying the invention into effect:

Figure 1 is a perspective view, partly broken away, of a section of the cable, and

Figure 2 is a similar view, illustrating only one of the single-core cables, prior to the assembly into a multi-core cable.

The three conductors 1 of the three-core cable shown in Figure 1 are each constructed of a number of metallic wires or strands which are helically twisted, it being, however, understood that they may also consist of one solid wire. The twisting of this strand, or solid wire, is effected according to one of the methods well-known in the art. By this pre-twisting, the conductor, shown here as being of oval cross-section, is provided with a helical pitch, which is so calculated with reference to the pitch of assembly of the three cables that the conductor, when insulated and sheathed, will be of such configuration and shape that it will automatically take its place in the assembly without further twisting round its own axis. Each such pre-twisted conductor 1 is then provided with paper taping or other insulation 2, and if desired with an electric shield, in the form of a surface metallization, a tape of metal, conducting paper or otherwise, such shield or tape being perforated or not, and wound with overlap or with intervals between turns.

Such pre-twisted conductors and their manufacture are known per se in the art. It is also well known how to strand such pre-twisted insulated conductors together to a multi-core cable, which is then impregnated and finally provided with a lead sheath and armor.

According to this invention, however, the pre-twisted insulated conductors are provided with a lead sheath 3 each separately, before a plurality of these lead-sheathed twisted conductors, i. e. pre-twisted singles are stranded together to a multi-core SL-type cable.

It has been found that the passing of the pre-twisted insulated conductors through the lead press or other machine to cover them with a water-tight sheathing can be carried out, in spite of the particular corkscrew-like shape of these conductors. Up to a certain amount of deviation of the oval or sector shape from the circular form, it is even possible to use a circular shaped die-box, without rotating the same or the conductor. It is only necessary to arrange the die

proximately in such a way that it would produce a certain lead sheath of the same circumference as the circumference needed for the non-circular cross-section.

5 Figure 2 shows a pre-twisted single-core cable produced in the above way so that it has already the configuration and the shape that it will finally have, when assembled in the cable according to Figure 1.

10 In assembling, all the known arrangements and precautions may be used to vary the speed of the machine, to suitably shift the angular position of the individual single-core drums and otherwise, in order to adapt the pitch of the stranding to the pitch of the single-cores. During  
15 the assembly, the spaces 4 may be provided with fillers of insulating material or they may be left free, or distance pieces, in the form of wire spirals, tubes, etc., may be inserted therein.

20 The three singles as assembled, are held together in any well known manner, for instance, by bindings or wrappings of textile material, metal tapes or wires. A sheath of lead or other material may also be applied to enclose the stranded separately lead-sheathed cores and on  
25 this outer sheath any known protection, bedding and armoring may be employed. In Figure 1, a metal tape 5 of steel or other suitable material is shown to be wound round the assembled conductors.

30 The outer protecting sheath or armor may be circular or non-circular, the latter form being shown in Figure 1.

In Figure 1, the cores are shown to be stranded  
35 together, with the lead sheaths 3 touching each other. But, of course, any known wrapping or other protection, without or combined with a reinforcing armor in the form of a metal tape or otherwise may be applied on these separately  
40 lead-sheathed cores, before they are stranded together.

The metallization of the surface of the insulated cores is not shown in Figures 1 and 2, as  
45 it is not essential for the invention, and it may be applied or not before the lead sheathing of the cores, according to the particular purpose.

It is to be understood that the invention is not limited to pluralities of single conductors of the construction shown in the drawing. What is  
50 essential is that the outer surface of the single-core cables shall be non-circular and pre-twisted. The inner construction of the single is immaterial. While the simplest form of an oval conductor is shown in the drawing, namely, one  
55 with a solid oval conductor, i. e. with an oval cross-section throughout, any other form of conductors, solid or hollow, circular or non-circular, may be employed instead. The non-circular surface may be obtained with a circular conductor

in different known manners; for instance, by means of eccentric insulating layers or spacings, by a crushing of a circular shaped insulation to make it oval, by a non-uniform thickness of the lead, or otherwise.

5 If the insulation of the single core cables is to be impregnated, the material and the manner of carrying out such impregnation is immaterial with regard to this invention; the impregnating process may take place in any of the well  
10 known manners before or after lead sheathing, after the assembly or even after the laying of the cable.

What I claim is:

1. The method of manufacturing multiple-  
15 conductor cables with separately insulated and sheathed conductors laid up in helical form, which comprises preshaping each individual conductor to a helical form and in a configuration  
20 suitable for the helical assembly of the several conductors, applying insulation in a non-circular form to each individual conductor, applying a continuous water-tight extruded metallic sheath-  
25 ing to the individual preshaped non-circular insulated conductors, assembling the sheathed conductors helically in accordance with the pre-shaped configuration thereof to form a cable substantially devoid of internal torsional stresses.

2. A multiple-conductor cable comprising a  
30 plurality of insulated single conductors of non-circular form, each insulated conductor being pretwisted to helical form so that the plurality of conductors may be laid together helically  
35 around the cable axis, and a continuous extruded metal sheath applied to each pretwisted insulated conductor, the individual sheathed conductors being free of torsional twist on their individual axes.

3. A multiple-conductor cable comprising a  
40 plurality of insulated single conductors, each conductor being pretwisted to helical form so that the plurality of conductors may be laid together helically around the cable axes, and a continuous extruded metal sheath of non-circular form applied to each pretwisted insulated conductor, the  
45 individual sheathed conductors being free of torsional twist on their individual axes.

4. A multiple-conductor cable comprising a  
50 plurality of insulated single conductors, each conductor being pretwisted to helical form so that the plurality of conductors may be laid together helically around the cable axis, and a continuous extruded metal sheath of non-circular form applied to each pretwisted insulated conductor, the  
55 individual sheathed conductors being free of torsional twist on their individual axes, and a metal protective covering for said sheathed conductor.

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