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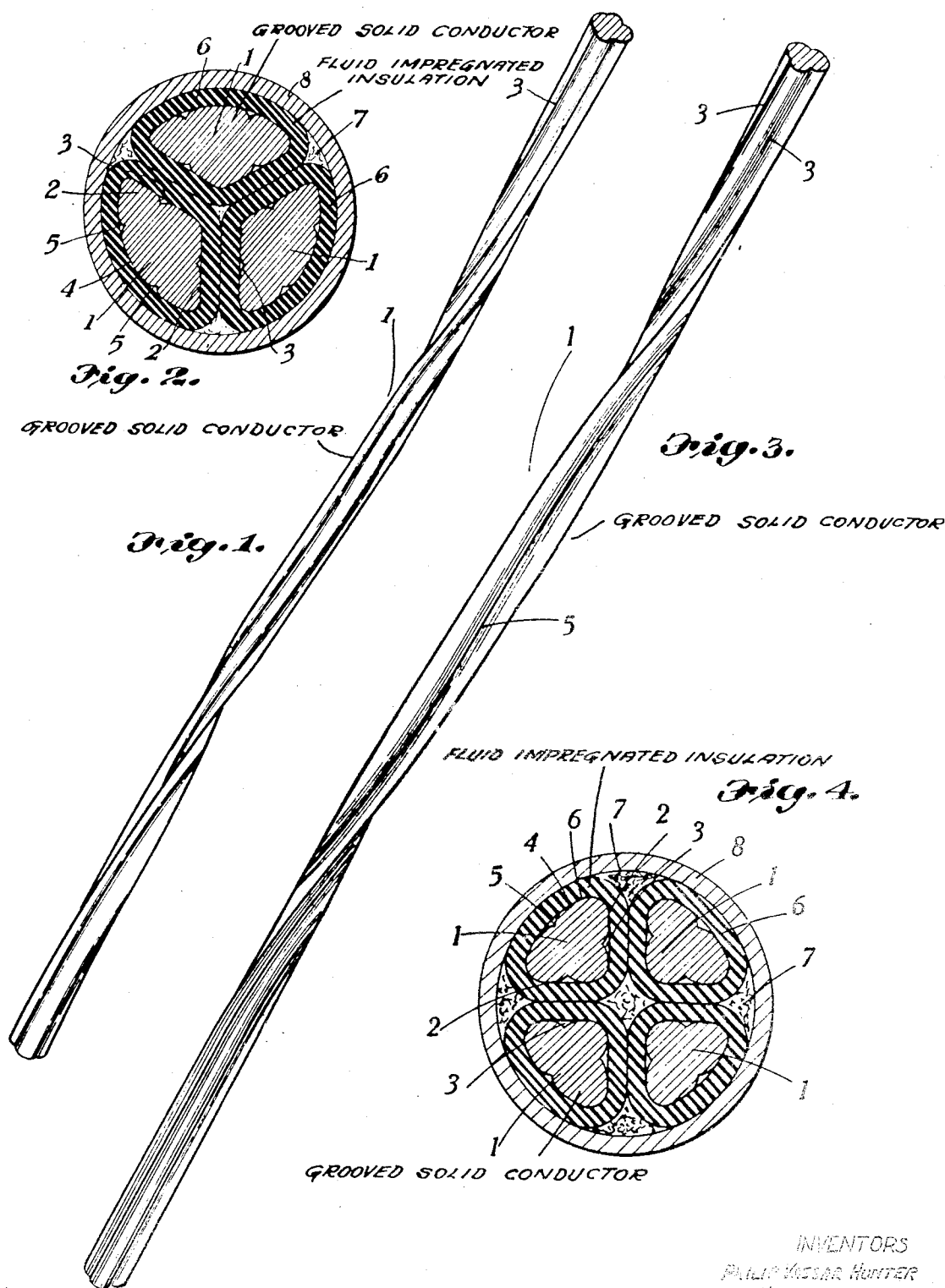
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2,149,772

ELECTRIC CABLE

Filed April 28, 1937

2 Sheets-Sheet 1



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Fig. 5.

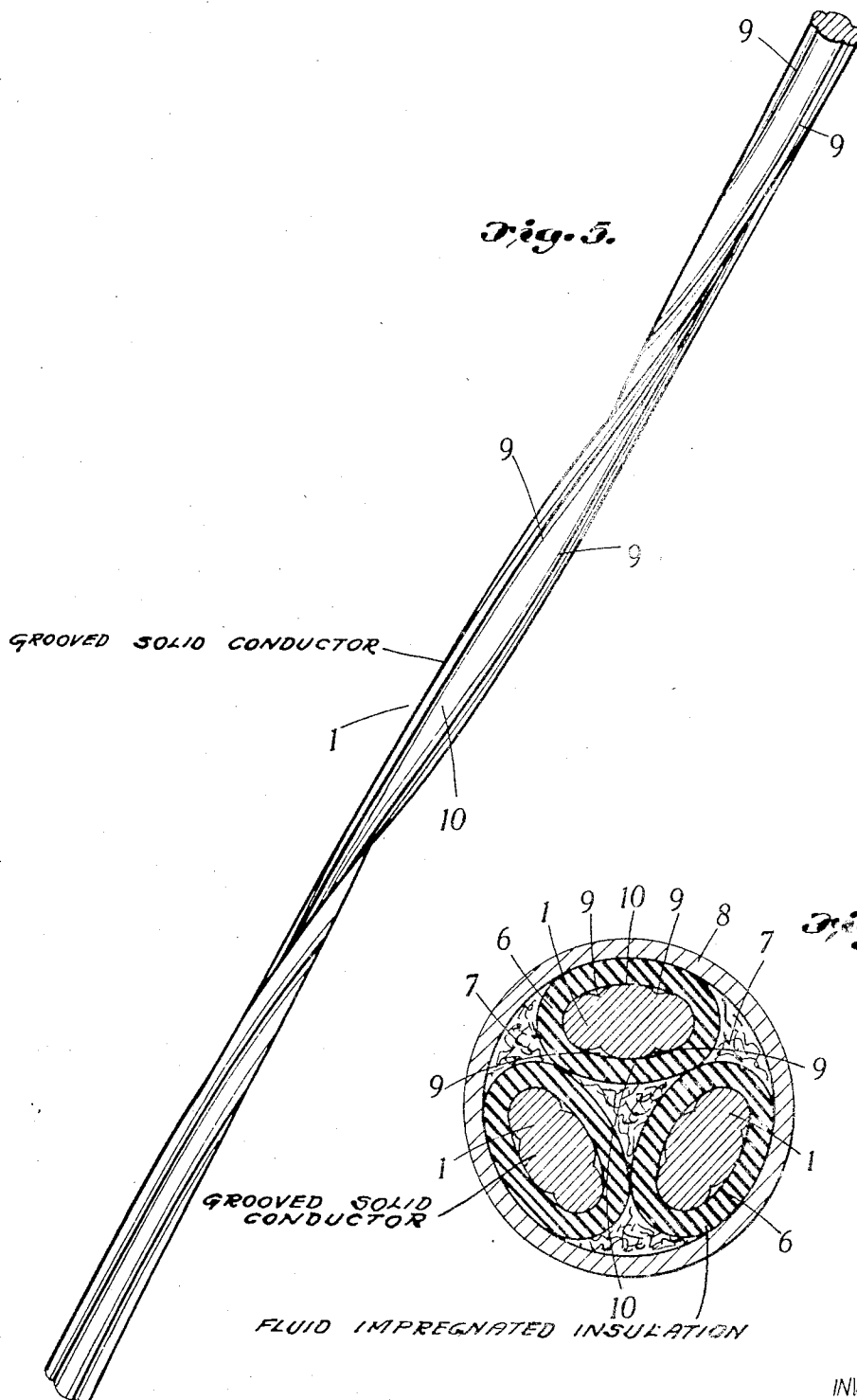
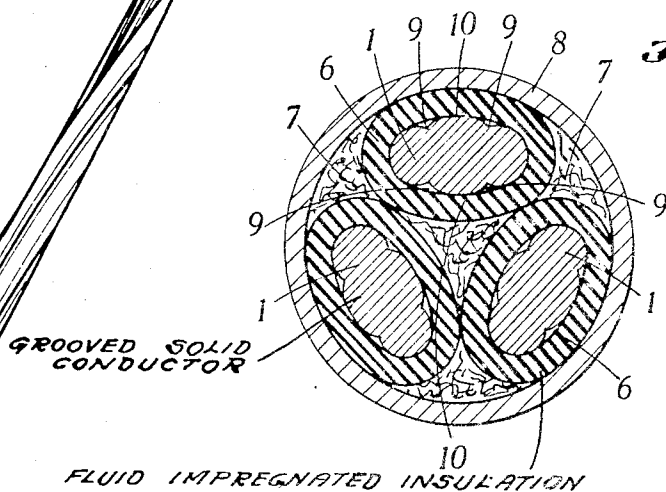


Fig. 6.



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UNITED STATES PATENT OFFICE

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ELECTRIC CABLE

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4 Claims. (Cl. 174-26)

This invention relates to electric cables of the kind having two or more cores which are so shaped that when laid up together they form by themselves an approximation to a complete cylindrical body. The cores in such cases are in the form of sectors with more or less rounded corners or in the form of ovals approximating to such sector shapes. The invention is concerned with the production of a cable of improved and relatively cheap construction which results in minimum overall dimensions and minimum quantities of material used in the construction. The basic feature of the improved construction is the use for each conductor of a solid rod of non-circular cross-section with a surface of a particular kind, which rod has been accurately formed before the insulating material is applied to it so that the core when laid up with the others occupies the appropriate position without tendency to spring therefrom. Such conductors will hereinafter for the sake of brevity be termed pre-spiralled, solid conductors. The conductor is covered with insulating material (usually paper) in the form of strips lapped on and impregnated. Each core may, as in other constructions, have a conductive covering of metallised paper or foil. The assembled cores are sheathed and the sheath may be protected in any appropriate manner.

If the surface of such a conductor is made perfectly smooth it has both advantages and disadvantages as compared with the surface of a conductor made of stranded wire. The advantage of the smooth surface is that it reduces the value of the maximum intensity of electric stress in the dielectric at the surface of the conductor. The disadvantage is found in the difficulty of obtaining complete impregnation of the insulating material which is in contact with the conductor. This is, of course, the place where it is most important that impregnation should be complete. By utilising the particular form of surface, to be described, the advantages of smoothness are obtained, while the disadvantages as regards impregnation are avoided. According to the present invention the surface is provided in certain parts with shallow grooves or depressions running substantially longitudinally. These parts are so chosen that the smooth surfaces at the place of minimum radius of transverse curvature are not broken into; that is to say, the minimum radius of curvature to be found on the surface of the conductor is not decreased by the provision of the longitudinal grooves or depressions. They are provided where the radius

of transverse curvature approaches a maximum so that the provision of the depressions or grooves does not decrease this radius to an undesirable extent. It can, for instance, be kept to a value not less than that which occurs on the smooth parts of the conductor owing to the general transverse shape thereof.

Examples of conductors constructed in accordance with the invention are shown in the accompanying drawings, wherein:

Figure 1 is a perspective view showing one form of pre-spiralled sector shaped conductor constructed in accordance with the invention.

Figure 2 is a cross-section through a 3-core cable comprising three conductors of the form shown in Figure 1.

Figure 3 is a perspective view of a second form of sector shaped conductor constructed in accordance with the invention.

Figure 4 is a cross-section through a 4-core cable comprising four conductors of the form shown in Figure 3.

Figure 5 is a perspective view of a pre-spiralled oval conductor constructed in accordance with the invention, and

Figure 6 is a cross-section of a cable comprising three oval conductors of the form shown in Figure 5.

Referring now to the drawings, it will be seen that each of the flat sides 2 of the conductors shown in Figures 1 and 2, has a centrally disposed groove 3 and the curved side 4 is provided with a pair of parallel grooves 5, all extending substantially longitudinally of the conductor. It will be seen from Figure 2, that the three conductors when insulated with a layer of insulation 6 and assembled together, form an approximation to a cylindrical body and that very little packing 7 is required to fill the small spaces between the assembled cores and the surrounding lead sheath 8. In the case of the conductors shown in Figures 3 and 4, each flat side 2 of each conductor is provided with a groove 3 as described with reference to Figures 1 and 2 but the curved face 4 of the conductor is furnished with only one groove 5. In the case of the conductors shown in Figures 5 and 6, a pair of grooves 9 are formed on each of the two flatter sides 10 of the conductor, one on each side of the minor axis of the conductor, i. e., in the region where the radius of transverse curvature approaches a maximum. It will be observed that in all cases the grooves are kept away from the corner parts or other surfaces where the radius of curvature approaches a minimum and

that the sides of the grooves are so rounded off that the radius of curvature of the solid conductor in the neighbourhood of the grooves is not decreased to an undesirable extent by the provision of the grooves. It will be appreciated of course that the conductors shown in the drawings are described merely by way of example and that the number, location and cross-sectional form of the grooves may be varied, for instance to suit the shape of the conductor and the type of cable in which it is to be employed. For example they may be made deeper where the viscosity of the impregnant at the temperature of impregnation is high and instead of being continuous, as shown, they may be of comparatively short length and provided at frequent intervals along the length of the conductor.

By the use of this improved form of conductor the advantage of complete impregnation combined with minimum dielectric stress and minimum size of cable for a given area of the conductor cross-section is obtained. The smooth form of the solid conductor also has the advantage of favouring the smooth and regular application of the insulating material. Although the rigidity of the solid conductor may in large sizes place a limit on its use, there is a large and important range of sizes within which the construction may be employed with advantage.

The improved conductor is preferably made by a rolling process, in which the shape in cross-section and the helical form are produced in one operation, this is not, however, essential.

The solid conductor has the further advantage over the stranded conductor that it can be annealed, after forming and thereby be made better adapted for handling in the subsequent stages of the manufacture of the cable.

What we claim as our invention is:

1. An insulated electric cable comprising a pre-spiralled, solid conductor having a cross-sectional contour comprising portions of different radius of curvature, fibrous dielectric material surrounding said conductor, insulating fluid impregnating said dielectric material, and an impervious

sheath surrounding said dielectric material, said conductor having in its surface at least one shallow groove extending lengthwise of the conductor and so located that the minimum radius of curvature of cross-sectional contour is not decreased by its presence.

2. An insulated electric cable comprising a pre-spiralled, solid conductor of which the general cross-sectional form is that of a sector with rounded corners, fibrous dielectric material surrounding said conductor, insulating fluid impregnating said dielectric material, and an impervious sheath surrounding said dielectric material, said conductor having in its surface a number of shallow grooves extending lengthwise of the conductor and located away from the neighbourhood of the corner parts of the conductor.

3. An insulated electric cable comprising a pre-spiralled solid conductor of which the general cross-sectional shape is that of an oval, dielectric material surrounding said conductor, insulating fluid impregnating said dielectric material, and an impervious sheath surrounding said dielectric material, said conductor having in its surface a number of shallow grooves extending lengthwise of the conductor and located near the ends of the minor axis of the oval, the surface in the region of the ends of the major axis being free of grooves.

4. An insulated electric cable comprising a pre-spiralled solid conductor of which the surface comprises portions having a small radius of transverse curvature united by portions having a relatively large radius of transverse curvature, said conductor having in its surface a plurality of longitudinally extending shallow grooves, each of said grooves being located throughout its length entirely in one of said portions of relatively large radius of transverse curvature, fibrous dielectric material directly surrounding said conductor, insulating fluid impregnating said dielectric material, and an impervious sheath surrounding said dielectric material.

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