

May 16, 1944.

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2,348,752

ELECTRIC CABLE

Filed Nov. 8, 1941

Fig. 1.

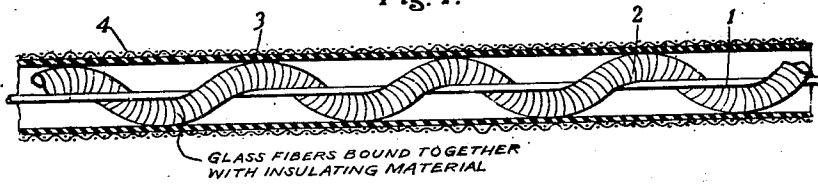


Fig. 2.

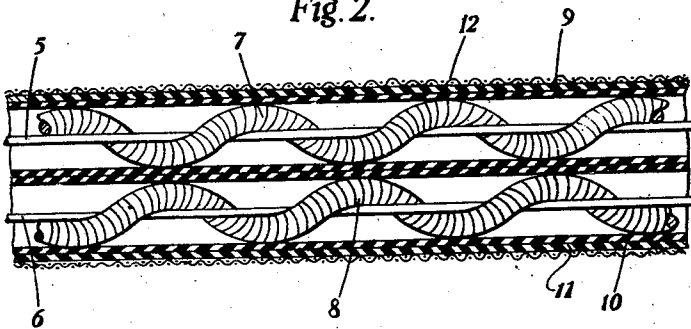


Fig. 3.

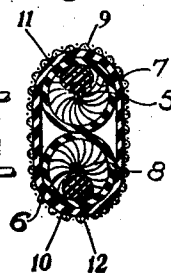
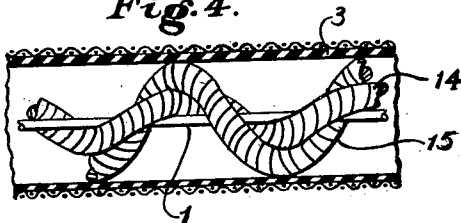


Fig. 4.



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2,348,752

ELECTRIC CABLE

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Application November 8, 1941, Serial No. 418,406
In Great Britain September 17, 1940

7 Claims. (Cl. 174—29)

This invention is concerned with cables, in which a large part of the dielectric surrounding a conductor, particularly that in close proximity to the conductor, is formed of air, the conductor being spaced from its surroundings by solid material which occupies only a small proportion of the intervening space. In particular, it relates to that type of such cables in which the spacing is effected by a cord or string of insulating material wound over the conductor as an open helix. In some cases two helices may be arranged co-axially and may occupy co-axial annular regions one outside the other. In these latter cases the two helices are of different pitch, or of different hand, or of both these differences.

Such cables are most commonly used for communication purposes and are employed where currents of relatively high frequency have to be transmitted, such cables being adopted because their construction is conducive either to low dielectric loss or to low capacity between the conductor and surrounding conductive bodies, or for both of these reasons.

It is obviously desirable that in such cables the spacing helices should be of material which has low loss in the circumstances of its use. It is also desirable that the material should be readily capable of taking up a helical form and retaining this form, that is to say, it should be substantially self-supporting in the open helical disposition around the conductor when it has been formed into that shape. It has been found that certain natural or artificial thermo-plastic materials have the desired properties. On the other hand, a material which is thermo-plastic, while it can readily be placed in position and given the desired shape, has the tendency to yield under the pressure of the conductor, particularly if the cable is bent and/or if the temperature should rise above normal conditions. In such cases the conductor may be displaced from its intended position and thereby its electrical properties may be disturbed with corresponding ill effects on the operation of the circuit of which it forms part.

The present invention provides an improved form of cable of the kind indicated, in which the helical spacer (or spacers) is formed of fine glass fibres built up in the form of cords or tapes and having embodied therein, and/or coated thereon, a suitable binding material. Suitable materials are plastics which have at normal atmospheric temperature a sufficient rigidity to maintain their position in and on the groups of fibres and bind the fibres together, and which have electric losses

of a low order when operating under the conditions for which the cable is required, particularly at the range of frequency concerned. They are found in the classes known as thermo-plastic materials, thermo-setting materials, and cellulose esters and ethers.

By this combination of glass fibres and binding material is produced a member which on account of its rigid skeleton of glass fibres will not be distorted when the cable is bent nor yield under the pressure of the conductor and on account of its filling or coating can readily be formed, by the aid of heat, if necessary, into an open helix and will maintain this form subsequently.

The glass skeleton of the helical members may be in the form of roving, yarn or string, that is to say, fibres twisted together more or less, or it may consist of fibres laid side by side and bonded together solely by the binding material. This material must be applied in a liquid, or semi-liquid, state, which may be arrived at by the aid of a solvent, or by emulsifying, or by softening with the aid of plasticizers and/or heat. Examples of suitable materials are polystyrene, polythene—that is the normally solid products of the polymerisation of ethylene—Oppanol (registered trade-mark)—that is polymerised isobutylene—thermo-setting resins of the Novolak type, cellulose triacetate, and ethyl cellulose. It will be clear that if these are used with plasticisers, or any other added materials, such materials should also have low loss characteristics. It will be understood that the binder will be applied to the spacing element before the latter is applied to the conductor.

A conductor with the helical spacing element, or elements, of the kind indicated, may be built up in to a complete cable in known manner; for instance, it may be enclosed in an outer conductor forming a substantially complete tube with or without the interposition of a tube of dielectric material. Alternatively, two or more conductors with their spacers can be combined together in a single cable.

Two forms of construction of cable, in accordance with the invention are shown as examples in the accompanying drawing wherein—

Figure 1 is a longitudinal sectional view of one form;

Figure 2 is a similar view of the second form of construction;

Figure 3 is an end sectional view of the cable shown in Figure 2; and

Figure 4 illustrates another modification.

In Figure 1 the cable comprises a central wire conductor 1 around which is wound an insulating spacing member 2. The latter has the form of an open helix of relatively long pitch and consists of a string made from fine glass fibres impregnated with an insulating binding material. Around the spacing member 3 is disposed an insulating tubular member 3 which may be for example, a glass fibre braided tube or it may be a tube made of polythene. The assembly is surrounded by a conducting tubular member 4 made of wire braid.

The cable in Figures 2 and 3 comprises two wire conductors 5, 6 provided respectively with spacing members 7 and 8 each having the form of an open helix. The conductor 5 and spacing member 7 are enclosed in a tubular member 9 and the conductor 6 and spacing member 8 in a tubular member 10. The tubular members 9 and 10 are made of glass fibre braid or of polythene, and are enclosed in a tubular member 11 which is itself enclosed in a conducting tubular member 12 of wire braid. The tubular member 11 is of glass fibre braid or of polythene. The complete assembly forms a flat twin air space cable.

In Figure 1 the conductor 1 and in Figures 2 and 3 the conductors 5 and 6 are surrounded largely by air as the dielectric material.

Fig. 4 illustrates a modification of the construction shown in Fig. 1 wherein two helices 14 and 15 are arranged coaxially around a central conductor 1 so as to occupy coaxial annular regions, one outside the other.

What is claimed is:

1. An air space electric cable comprising in combination a pair of conductors, a spacing member surrounding each conductor in the form of a cord arranged in an open helix and comprising a skeleton of glass fibres bonded together with a thermo plastic dielectric binder, a tube of dielectric material surrounding each said

spacing member and a conducting screen embracing both-said tubes to form a flat twin air space cable.

2. An air space electric cable as claimed in claim 1 wherein said tubes of dielectric material are composed of braided glass fibres.

3. An air space electric cable as claimed in claim 1 wherein said tubes of dielectric material are composed of polythene.

4. An air space electric cable as claimed in claim 1 wherein said tubes of dielectric material are enclosed in a tubular member of dielectric material positioned between said conducting screen and said tubes.

5. An air space electric cable comprising a conduit, a conductor within the conduit and a spacing member between the conductor and the conduit, said spacing member being in the form of a cord of insulating material comprising glass fibres pre-impregnated and bound together with a thermo plastic dielectric binder, wound in an open helix around the conductor and leaving substantial air space between the conductor and the conduit.

6. An air space electric cable comprising a conduit, a conductor within the conduit and a spacing cord wrapped in a loose helix around the conductor between the conduit and the conductor, said spacing cord being formed of fine glass fibers impregnated with an insulating binding material, and being substantially unyielding under pressure.

7. An air space electric cable comprising a conduit, a conductor concentrically within the conduit and a spacing cord wrapped in a loose helix around the conductor between the conductor and the conduit, said cord containing a skeleton of fine glass fibers bound by a thermo-plastic material and being substantially non-deformable and unyielding.

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