

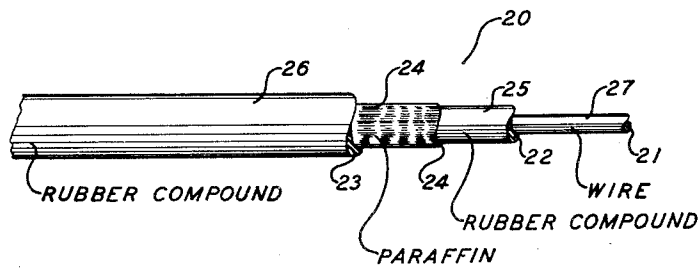
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INSULATED CONDUCTOR AND A METHOD OF MAKING THE SAME

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INSULATED CONDUCTOR AND A METHOD
OF MAKING THE SAMEAlvin N. Gray, Baltimore, Md., assignor to
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6 Claims. (Cl. 174-123)

The invention relates to insulated conductors and a method of making the same and more particularly to rubber insulated wire and a method of making it.

5 Metallic wire with an electrically insulating sheathing may be made by extruding a seamless sheath of suitable plastic insulating material over a wire. When the insulation is a compound of rubber or the like vulcanizable or otherwise
10 heat-hardenable material and it is desired to produce a sheath or coating of considerable thickness, attempts have been made to produce the desired result by applying the coating material in two or more successive layers, each of
15 which is vulcanized or hardened individually to avoid difficulties which may arise when attempt is made to harden a single thick layer of material which is by nature heat insulating as well as electrically insulating. However, in the extru-
20 sion of a second sheath over a preformed and vulcanized or cured sheath, difficulties may arise from the frictional resistance of the sheathed wire to passage through the coating apparatus, from unsatisfactory adhesion of the second
25 sheath to the first, from reduction of dielectric strength of the insulation by lubricants attempted to be used, and other like causes.

It has been found that, in the case of insulation consisting of a vulcanizable mixture com-
30 prising rubber, if a coating of paraffin, preferably hot, be applied to a sheathed conductor prior to the extrusion of a second sheath thereon of like material, the paraffined coated core passes freely through the extrusion apparatus, the sec-
35 ond coating of rubber material adheres tightly to the first and forms a substantially integral mass therewith, and also that the wire thus coated has an insulation resistance which may be as much as three times that of a wire coated
40 with an equal thickness of the same insulation in one operation.

An object of the invention is to provide an insulated electrical conductor having an insulating sheath thereon of improved mechanical
45 and electrical properties, and to provide a method of making such conductors.

One embodiment of the invention contemplates an insulated electrical conductor comprising a conductor strand and a sheath thereon consist-
50 ing of two or more layers of vulcanized rubber material adhered together by paraffin; and a method of making such conductors in which paraffin is applied to rubber covered wire and a second sheath of rubber material is extruded
55 over and cured on such paraffin coated core.

Other objects and features of the invention will appear from the following detailed description of one embodiment thereof taken in connection with the accompanying drawing in which the single figure is a broken view in side elevation of a portion of electrical conductor embody-
5 ing the invention.

In the embodiment of the invention herein disclosed an insulated electrical conductor generally indicated at 20 comprises a core strand 21
10 of metal, which may be a solid individual wire as shown, or may be made up of a plurality of finer wires intertwisted or interbraided together. Over the core 21 is a sheath 22 of heat hardened or vulcanized material such as one of the many
15 minutely varying vulcanizable mixtures containing rubber. Over the sheath 22 is a second sheath 23 of the same or like material. Both sheaths 22 and 23 are in a substantially completely cured or vulcanized state. Between the
20 two sheaths 22 and 23 or, more accurately described, at the interface 25 of union between the two sheaths and intermingled with their substance in the neighborhood of their interface of
25 union is a layer 24 comprising material from both sheaths containing paraffin or the like.

This layer or circumferential region 24 is only diagrammatically shown in the drawing, of necessity. It is originally applied as a dip, spray or other form of coating over the preformed and
30 precured coating 22, and the sheath 23 is formed and cured on the paraffin coated sheath 22. However, it is found that in the finished article the two sheaths 22 and 23 have become closely
35 adherent, even quasi-welded to each other, and the paraffin has dissolved into or permeated the compound near the original interface 25 of the sheaths. In effect there is now a single sheath of rubber material containing little or no paraffin
40 at or in the neighborhood of its exterior surface 26 and its interior surface 27, and containing a maximum of paraffin at and near the site of original interface 25.

To make such a conductor, a strand 21 as described above is covered with a sheath of cured
45 rubber material, preferably in an extrusion apparatus such as is familiar in the art, e. g., as disclosed in U. S. Patent 1,689,206 issued October 30, 1928, to Leslie F. Lamplough. The sheathed conductor is then provided with a second sheath
50 of the same or like material in the same or a like machine, but just prior to being fed into this machine is coated with paraffin. This coating is preferably hot and may be applied in any convenient manner, e. g., it may be painted on
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by hand with a brush, sponge, rag or the like, or it may be sprayed or squirted on, or the singly coated wire may be led through a tank or other container of molten paraffin material just before entering the machine in which the second insulating sheath is applied and hardened.

During the passage of the paraffin coated strand into and through the extrusion head of the machine, the paraffin acts as a lubricant. At the same time a part of the paraffin is absorbed into the rubber sheath. When the material of the second sheath is applied, being hot and under pressure, it absorbs the remainder of the paraffin and comes into direct contact with the mass of the inner sheath. The two sheaths are not separated by a layer or lamina of paraffin. All the paraffin is absorbed into the material of the two sheaths.

Apparently in some manner not clearly understood, the paraffin assists in the union of the two sheaths at their interface during the extrusion and subsequent heat-hardening of the outer layer, and remains in the double thick sheath thus formed concentrated about the medial zone of the sheath.

An essential feature of the invention is the use of a waxy material at 24 which is a lubricant to reduce the friction of the surface 25 of the singly coated strand while passing through the coating machine to the extrusion point, which is absorbable by or soluble in the hardened material of the layer 22 and in the material of the layer 23, which does not prevent but rather assists in bringing about the close adhesion or union of the layers 22 and 23, and which enhances the insulation resistance of the material of the layers 22 and 23. Paraffin is one material having the requisite properties, the word paraffin here being understood to include the greasy and waxy, heavy members of the saturated open chain hydrocarbons whether thick oils, soft waxes or hard waxes in consistency, such as the heavy oil known commercially as "Nujol", the soft waxes or pastes known as petrolatum, and the hard waxes commonly called "paraffine", "Superlo wax", etc.

The embodiments of the invention herein disclosed are merely illustrative and may be modi-

fied and departed from without departing from the spirit and scope of the invention as pointed out in and limited only by the appended claims.

What is claimed is:

1. A method of making an insulated electrical conductor which comprises forming a sheath of rubber compound on a conductive strand, applying paraffin to the sheath, and forming an adhering second sheath of rubber compound upon the paraffin treated surface of the first sheath.

2. A method of making an insulated electrical conductor which comprises extruding and vulcanizing a sheath of rubber compound on a conductive strand, applying paraffin to the sheath, and extruding and vulcanizing a second sheath of rubber compound upon the paraffin treated surface of the first sheath said sheaths being adheringly united.

3. A method of making an insulated electrical conductor which comprises extruding a sheath of rubber compound on a conductive strand, applying hot paraffin to the sheath, and extruding a second sheath of rubber compound upon the hot paraffin treated surface of the first sheath said sheaths being adheringly united.

4. A method of making an insulated electrical conductor which comprises extruding and vulcanizing a sheath of rubber compound on a conductive strand, applying hot paraffin to the sheath, and extruding and vulcanizing a second sheath of rubber compound upon the hot paraffin treated surface of the first sheath said sheaths being adheringly united to form in effect a single sheath.

5. An insulated electrical conductor comprising a conductive core, an insulating layer of rubber compound having its surface impregnated with paraffin, and a second layer of rubber compound over the first layer and adhered thereto.

6. An insulated electrical conductor comprising a conductive core, an insulating layer of rubber compound on said core, a second layer of rubber compound adheringly united with said first layer, and paraffin contained at the juncture of said layers.

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