Nov. 27, 1934. R. R. EVANS 1,982,288

INSULATED WIRE AND METHOD OF MAKING THE SAME

Filed Sept. 6, 1930

Fig. 1.

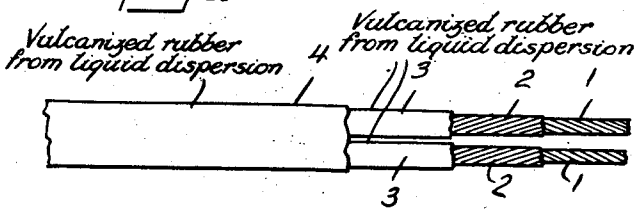


Fig. 2.

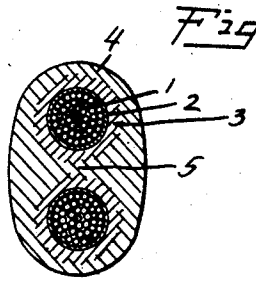


Fig. 3.

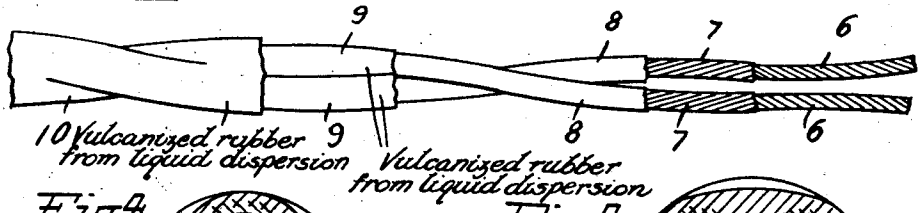


Fig. 4.

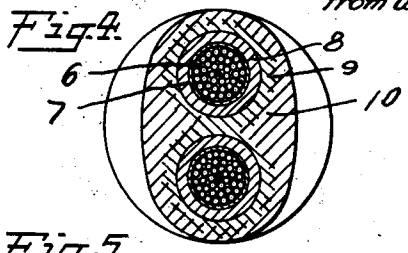


Fig. 6.

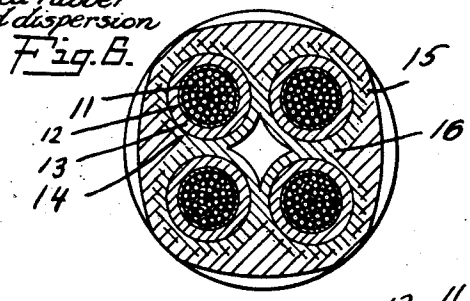
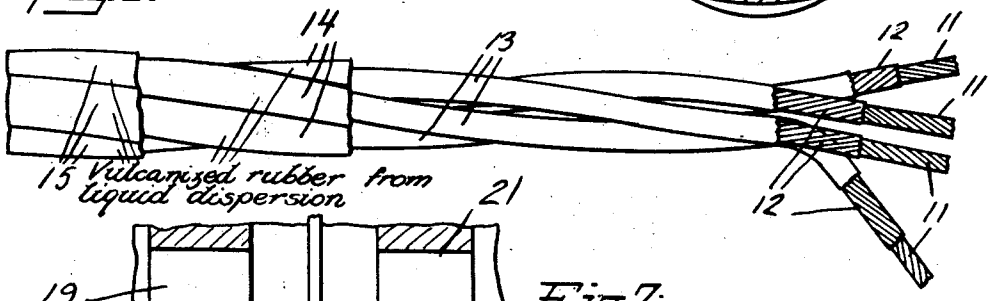


Fig. 5.



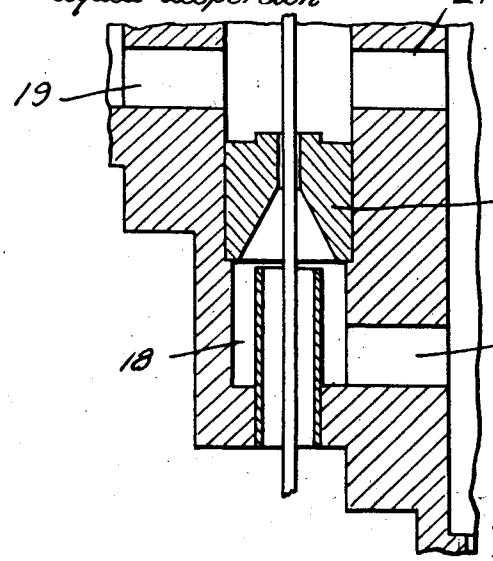


Fig. 7.

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INSULATED WIRE AND METHOD OF MAKING THE SAME

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Application September 6, 1930, Serial No. 480,072

3 Claims. (Cl. 173—264)

This invention relates to improvements in electric cords and cables and methods of making the same.

In my copending application Serial No. 430,725 filed February 24, 1930, which has matured into Patent No. 1,870,990, dated Aug. 9, 1932 I have disclosed and claimed a process of applying liquid dispersions of vulcanized rubber to wire to form an insulated wire. The present invention relates to assembled multiple conductors including twinned conductors and twisted conductors and generally comprises a unitary rubber jacket inclosing the conductors individually and as a group.

In the ordinary twinned conductor cord or cable, for example, the two conductors are first covered with insulation, then laid parallel, and then covered with a braid or rubber jacket. The braid or jacket surrounds the assembled conductors but does not extend between them and the opposite sides of the braid or jacket are not connected or united between them.

In carrying out my invention I take ordinary wire, which may or may not be insulated, with rubber or other insulation, and apply a coating of rubber thereto by depositing rubber from a liquid dispersion of vulcanized rubber thereon. This rubber coating may be applied by the method of my prior application or by dipping. I then apply an outer coating of rubber by deposition from a liquid dispersion of vulcanized rubber to the assembled wires first individually coated. The outer coating is applied so that it unites with the coating on the individual conductors to produce a continuous or substantially integral jacket inclosing the assembled wires individually and as a group. In applying the outer jacket the coating on the individual wires must be kept clean in order that the outer jacket may adhere thereto and unite therewith.

My invention may be applied to cords and cables comprising twisted conductor pairs and multiple conductors as well as twinned conductor pairs.

In the accompanying drawing I have shown several forms of the invention together with a diagrammatic view of apparatus for forming the product.

In the drawing,

Fig. 1 is an elevation of a fragment of cord or cable comprising a twinned pair of conductors with the insulation partially removed;

Fig. 2 is a transverse, sectional view of the same on an enlarged scale;

Fig. 3 is an elevation of a fragment of cord or cable comprising a twisted pair of conductors with the insulation partially removed;

Fig. 4 is a transverse, sectional view on an enlarged scale of the same;

Fig. 5 is an elevation of a fragment of a multiple conductor cord or cable with the insulation partially removed;

Fig. 6 is a transverse section on an enlarged scale of the same; and

Fig. 7 is a sectional view of a die chamber showing one method of applying the rubber coating to individual conductors.

Referring to Figs. 1 and 2 of the drawing, the reference numeral 1 designates the wires of a twinned conductor cord or cable. The individual wires may be covered with a fibrous insulation such as cotton or other conventional insulation as indicated at 2 or such insulation may be omitted. Each of the wires is provided with a coating 3 of rubber insulation formed by depositing vulcanized rubber from a liquid dispersion of vulcanized rubber on the wire. As stated, this coating may be applied by dipping or by the process disclosed in my prior application. After the wires have been prepared by the application of the coating 3 an outer coating 4 (see Fig. 2) is applied to the individually coated wires. This outer coating is also formed by deposition from a liquid dispersion of vulcanized rubber. The surface of the coatings 3 on the individual wires is kept scrupulously clean prior to and during the application of the outer coating 4. To promote ease of handling of the individually coated wires without prejudice to the cleanliness necessary prior to and during application of the outer coating, they may be wet with a water dispersed colloid such as casein which reduces the stickiness of the fresh rubber coating without interfering with the application of the outer coating or its adhering to or uniting with the first coatings. The outer coating 4 adheres to and unites with the individual coatings 3 to form a unitary jacket inclosing the conductors individually and as a group. As shown the rubber of the composite jacket of my invention extends between the wires as indicated at 5 producing a better insulation and a stronger jacket than when the wires are merely covered with a braid or jacket in the ordinary manner. The fin 5 also effectively ties the jacket to each conductor.

In Figs. 3 and 4 I have shown the invention applied to a twisted pair of wires in which the wires are shown at 6. A fibrous insulation surrounding each individual wire is shown at 7. A layer 8 of

conventional rubber insulation may be applied to each of the wires, if desired. Regardless of whether or not the insulation 8 is applied, a coating 9 formed by depositing vulcanized rubber from a liquid dispersion of vulcanized rubber is applied to each wire. The outer unifying coating to be applied to the assembly will not adhere to or unite with ordinary rubber insulation and the coating 9 is therefore necessary to cause the outer coating to produce a unitary composite jacket. An outer coating 10 is then applied in the manner heretofore described by deposition from a liquid dispersion of vulcanized rubber and it unites with the coating 9 on the individual wires.

In the application of the invention to cords and cables comprising multiple conductors the process is essentially the same and the product is shown in Figs. 5 and 6. Referring to these figures, the wires 11 may be provided with a fibrous insulation 12, if desired, and may also be provided with conventional rubber insulation 13, if desired. A coating 14 of rubber deposited from a liquid dispersion of vulcanized rubber is then applied to each of the wires and the outer unifying coating 15 is then applied to the assembled individually coated wires. As in the other forms of the invention, the outer coating adheres to and unites with the jackets 14 to form a unitary composite jacket extending into the space between the wires as indicated at 16.

As stated above, the coatings formed from the liquid dispersion of vulcanized rubber may be applied by dipping or by the process of my prior application. In Fig. 7 of the drawing I have shown a die chamber of the character disclosed in my prior application with a single wire passing through it for the application of the coating 3, 9 or 14. In the apparatus I provide a die 17 having a vertical aperture therethrough which is smallest in section above its lower end and which flares outwardly below this smaller section to a substantially larger section at its lower end. A trap 18 is arranged beneath the die and is provided with an aperture in alignment with the aperture in the die. The aperture is at least as large in section throughout as the smallest section of the aperture through the die and is smaller in section at its upper end than the lower end of the aperture through the die. The liquid dispersion to be applied to the wire passed upwardly through the die 17 is supplied through inlet 19 at a rate fast enough to maintain a pool of the liquid dispersion on the upper face of the die 17. The liquid passing through the die aperture is discharged from the trap 18 through outlet 20. Any excess from the pool on the top of the die may be discharged through an outlet 21.

The coatings 3, 9 and 14 may be applied to the individual wires by means of the apparatus disclosed in Fig. 7 of the drawing. The outer coatings 4, 10 and 15 are then applied to the assembled wires by substituting for the die 17 a die having a proper opening. As stated, the surface of the coatings 3, 9 and 14 must be kept scrupulously clean so that the outer coating will adhere to and unite with the individual coatings to produce a continuous and unitary jacket inclosing the individual conductors and the assembled conductors. In this way the conductors or insulated conductors are separately jacketed and at the same time the assembled twinned or twisted or multiple conductors are jacketed as a group so that there is a continuous jacket surrounding each of the conductors and the assembled conductors.

It has heretofore been proposed to make a twinned conductor cord or cable with a fin extending between the conductors, but in the constructions so proposed this fin and the outer jacket have not been united to coatings on the individual conductors to form a composite unitary jacket corresponding to that of my invention. So far as I am aware there has never been produced a twisted conductor or a multiple conductor cord or cable with a fin integral with an inclosing jacket extending between the individual insulations of the individual conductors. By prior processes it would be necessary to twist the wires at the same time that they were being jacketed whereas by my process the coatings 9 and 14 are first arranged on the wire and then after twisting, pairing or cabling the wire the outer coatings 10 and 15 are applied so as to adhere to and unite with the individual coatings to produce a substantially continuous and unitary rubber jacket inclosing the conductors individually and as a group and corresponding in external contour to the general contour of the group of conductors.

Instead of applying the jackets from a liquid dispersion of vulcanized rubber, as stated above, I may employ a liquid dispersion of unvulcanized rubber to which the proper amount of sulphur, accelerators and any other desired compounding agents are added prior to application to the wire. The deposition then produces a coating of unvulcanized rubber which may be heated to drive off the water and to vulcanize the rubber at the same time.

I claim:

1. The method of making insulated cables which comprises coating each of a plurality of conductors with pre-vulcanized rubber from a liquid dispersion, assembling the conductors, maintaining the surface of the individual conductors in such condition that a subsequent coating of a pre-vulcanized rubber from a liquid dispersion will integrally unite with the aforesaid coating and applying rubber from such a liquid dispersion directly to the aforesaid coating of the assembled conductors.

2. The method of making insulated cables which comprises coating each of a plurality of conductors with pre-vulcanized rubber from a liquid dispersion, twinning the conductors together, maintaining the surface of the individual conductors in such a condition that a subsequent coating of pre-vulcanized rubber from a liquid dispersion will integrally unite with the aforesaid coating, and applying rubber from such a liquid dispersion directly to the aforesaid coating of the twinned conductors.

3. The method of making insulated cables which comprises coating each of a plurality of conductors with pre-vulcanized latex from a liquid dispersion, assembling the conductors, maintaining the surface of the individual conductors in such condition that a subsequent coating of a pre-vulcanized latex from a liquid dispersion will integrally unite with the aforesaid coating, and applying latex from such a liquid dispersion directly to the aforesaid coating of the assembled conductors.

RALPH RUSSELL EVANS.