United States Patent [19]

Lania et al.

[11] **3,914,495**

[45] **Oct. 21, 1975**

[54] **FIRE RETARDANT INSULATING TAPE WRAP**

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[22] Filed: **Apr. 25, 1973**

[21] Appl. No.: **354,369**

Related U.S. Application Data

[62] Division of Ser. No. 274,496, July 24, 1972, Pat. No. 3,745,233.

[52] **U.S. Cl.** ..... **428/255;** 156/164; 156/334; 174/113 R; 174/121 A; 174/121 SR; 428/268; 428/273

[51] **Int. Cl.**[2] **B32B 17/04**

[58] **Field of Search** ..... 161/93, 194, 204, 89, 231, 161/247; 156/163, 164, 324, 334; 174/113 R, 121 A, 121 SR

[56] **References Cited**

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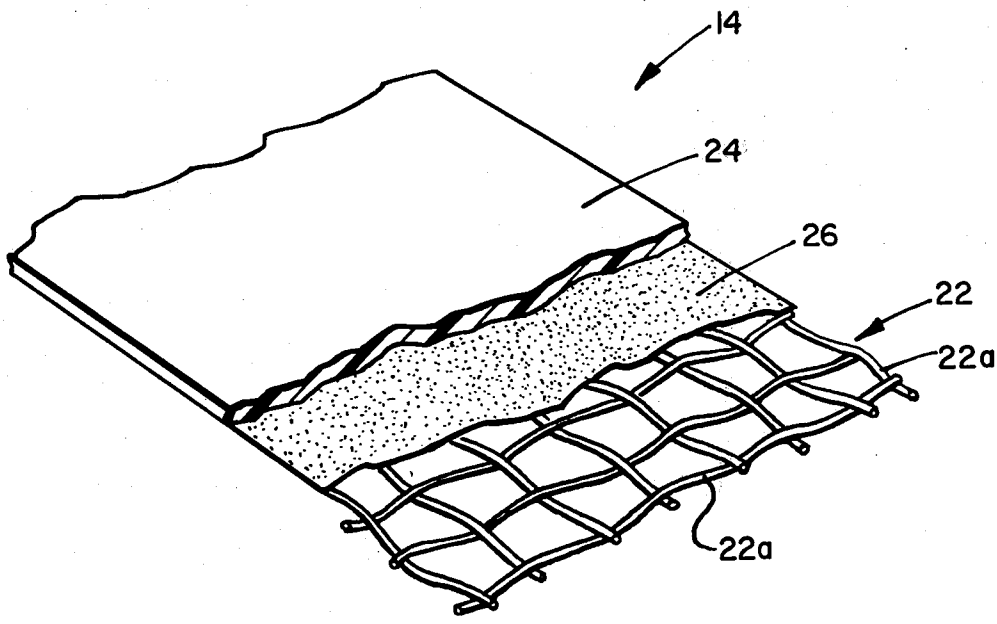
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[57] **ABSTRACT**

A fire-retardant insulating tape wrap having high tensile strength particularly for use in a service entrance cable includes a glass scrim backing to which a continuous polyester film is adhered using a synthetic rubber laminate adhesive which is applied to the film. After the tape is wrapped about the conductors, a continuous polyester sheath is extruded in situ over the wrapped conductors to provide a continuous outer jacket for the cable. The tape is made by coating the adhesive onto the film under relatively low application pressure. Then the film and scrim are brought together in a drying oven with the scrim being under relatively high lengthwise tension and the film being under lesser lengthwise tension.

4 Claims, 2 Drawing Figures



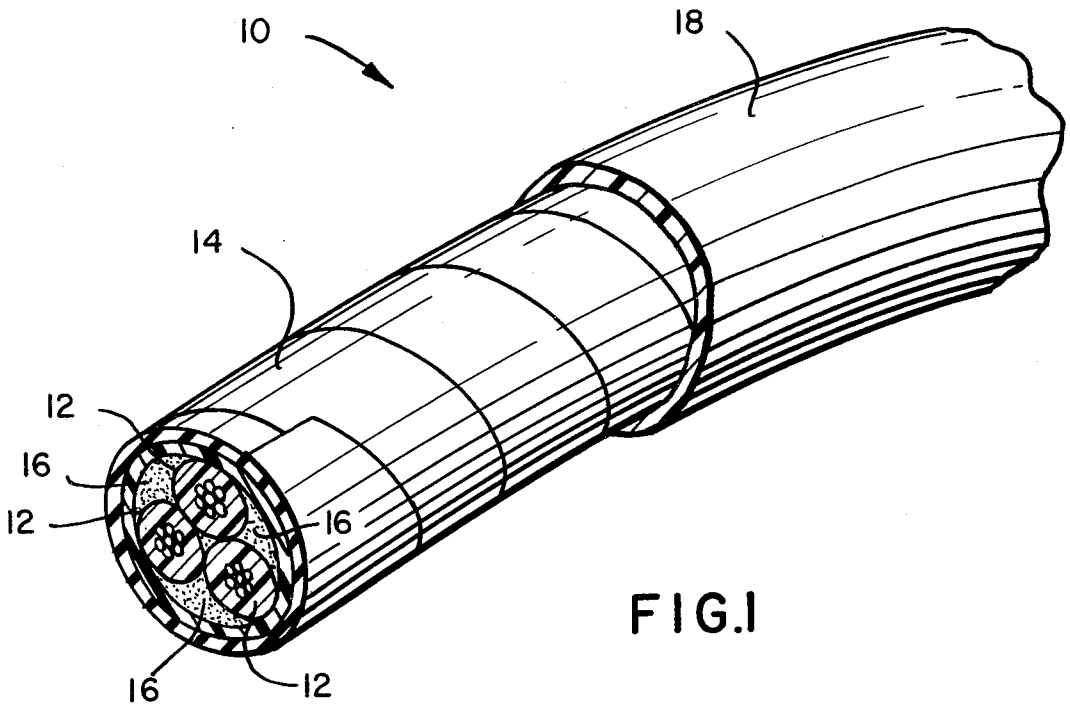


FIG.1

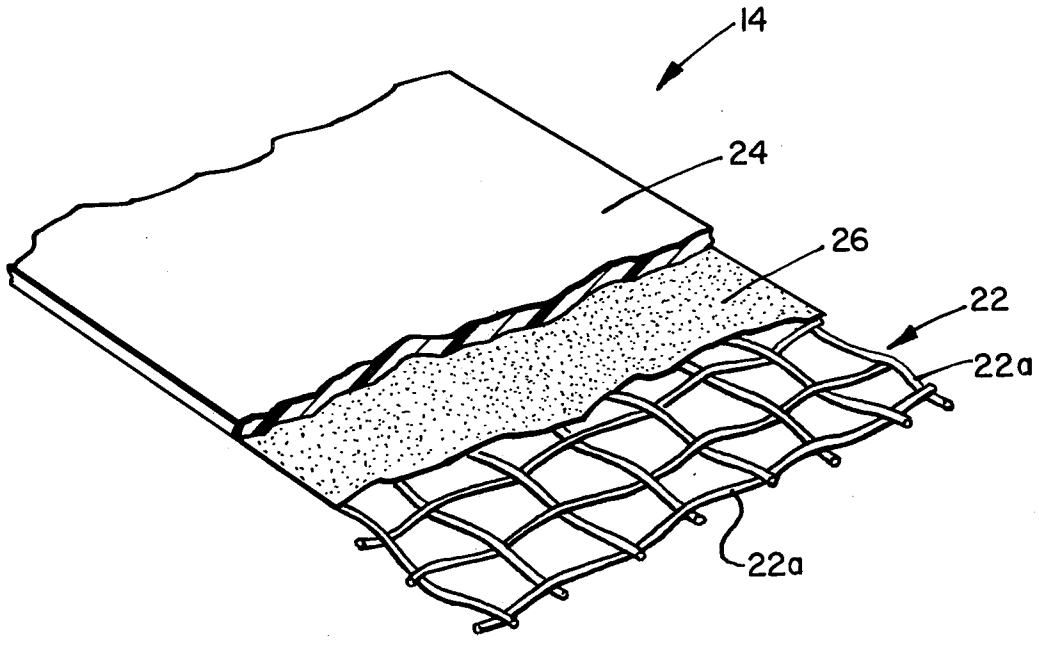


FIG. 2

FIRE RETARDANT INSULATING TAPE WRAP

This application is a division of application Ser. No. 274,496, filed July 24, 1972, entitled FIRE RETARDANT INSULATING TAPE WRAP now U.S. Pat. No. 3,745,233, dated July 10, 1973.

BACKGROUND OF THE INVENTION

This invention relates to electrical cable. It relates more particularly to fire-retardant insulation in sheet and tape form for cables which are exposed to the elements and which must be able to withstand rough usage, e.g. a service entrance cable.

Exterior cable of this type have to satisfy the stringent test requirements of the Underwriters' Laboratories, Inc. For example, service entrance cable, which is the cable which conducts electricity from overhead power lines into a user's house, must pass the UL 3CO amp. test. This test is described in detail in U.S. Pat. No. 3,602,636 and will not be detailed here. These cables must also pass other tests concerning their fire resistance, heat resistance, abrasion resistance, strength, etc.

The most prevalent type of service entrance cable in use today employs conductors wrapped with a layer of polyethylene terephthalate which is, in turn, surrounded by braided in situ fiber sheath impregnated and covered with asphalt and then lacquered.

Fairly recently, another type of cable has been introduced which does not require the aforesaid braided sheath. This type of cable is described in the aforesaid U.S. Pat. No. 3,602,636. Basically, it uses an open weave glass fiber tape wrapped around the clustered conductors. A barrier layer in the form of a skim coat of flame-retardant unvulcanized polychloroprene is calendered on the glass cloth and finally an outer jacket of synthetic rubber is extruded in place onto the taped conductors and fused to the underlying barrier layer.

While that type of cable passes the required UL tests and is an improvement over the prior braided cable in terms of cost, it still has certain drawbacks. Many of these drawbacks can be traced to the inclusion of the barrier layer which is calendered onto the glass cloth. This layer is composed of fairly dense material and is relatively thick so that it gives the overall cable a relatively high unit weight. Also, the glass cloth must be dipped in weave set of chlorprene which acts as a primer prior to being coated with the barrier layer. Otherwise, the layer will not adhere properly. That extra step, coupled with the fact that a full crew is needed to calender the material onto the glass cloth, means that the overall cost of the prior cable is higher than need be. Still further, the tensile strength of the prior cable tape is not as high as it might be, although it does pass the UL test for this characteristic.

That prior type of cable is disadvantaged too because the unvulcanized barrier layer is not completely continuous; it contains pinholes which provide passages for air or moisture which adversely affect the dielectric strength of the cable insulation. Also, the unvulcanized rubber-coated glass cloth is applied to the conductors in the form of tape which is unwound from a roll. In actual practice, the barrier layer tends to "pick off" from the cloth as the tape is unwound from the roll and it also undergoes a certain amount of cold flow. These factors further adversely affect the overall insulating characteristics of the cable. A similar tape employing a fiberglass substrate impregnated with polymerized

chloroprene disclosed in U.S. Pat. No. 3,649,744 has many of the same disadvantages.

SUMMARY OF THE INVENTION

Accordingly, this invention aims to provide a tape for insulating a cable such as a service entrance cable which is relatively easy to make in uniform quality lots.

A further object of the invention is to provide a bedding and binding tape which is relatively economical to manufacture.

Yet another object of the invention is to provide a service entrance cable tape which satisfies all of the UL tests.

A further object of the invention is to provide an improved fire-retardant cable tape.

Still another object of the invention is to provide a cable tape which has a relatively high tensile strength.

Another object is to provide a method of making tape having one or more of the above characteristics.

Still another object is to provide a service entrance cable employing one or more layers of such tape between the cable conductors and the cable outer jacket.

Other objects will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the several steps and the relation of such steps with each of the others and the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth and the scope of the invention will be indicated in the claims.

Briefly, the present cable tape has a backing composed of an open weave glass fiber scrim. A thin, continuous polyester film is bonded to the scrim using a fire-retardant synthetic rubber laminate adhesive.

The adhesive is coated onto the polyester film under relatively low application pressure and then the film and scrim are brought together while in a drying oven, the scrim being under relatively high lengthwise tension and the coated film being under a lesser tension, with the result that the scrim and film adhere tenaciously to one another.

When the tape leaves the drying oven, it has a continuous outer surface which is substantially free of pinholes or other discontinuities. Moreover, the tape surface is relatively smooth. Consequently, even after it has been in roll form for a relatively long time, the tape may be pulled from the roll without "pickoff" of the film from the scrim.

In use, the tape is wound about the clustered electrical conductors with conventional filler material being provided if need be to fill the spaces between the conductors so that the cable assures a generally round cross section. Finally, an outer resinous jacket is extruded in situ over the taped conductors, thereby forming a second continuous barrier or film around the conductors.

The present cable has several distinct advantages over its conventional counterparts as exemplified by the cables described in the aforesaid patents. First, while satisfying all of the UL mechanical and electric tests for such cable, the present product is lighter in weight. This means that it is easier to handle and can be shipped at a lower cost. The main reason for this is because the polyester film and adhesive coating thereon is thinner and less dense than the relatively heavy unvulcanized rubber or neoprene barrier coating calendered on the prior tapes.

The utilization of the laminate adhesive also improves the fire-resistance characteristics of the cable. More particularly, even though the polyester film is not fire-retardant, the application of the adhesive to the film to bond it to the scrim makes the overall laminate fire-retardant.

The subject cable insulation also has a relatively high tensile strength as compared with prior products. It is believed that this is due primarily to two factors. First, the tape components do not require high lamination pressures. It has been found that the glass fibers in scrim tend to crack when subjected to high pressures such as those encountered during a typical calendering operation. These cracks tend to lower the tensile strength of the fibers. Secondly, the utilization of the relatively low viscosity adhesive as the bonding agent provides a lubricant which seems to wick up between the individual fibers in the scrim, thereby reducing the tendency of the fibers to abraid one another under stress.

All of these factors make the present tape a highly successful commercial product whose attributes are also enjoyed by the cable system into which the tape is incorporated.

BRIEF DESCRIPTION OF THE DRAWING

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawing, in which:

FIG. 1 is a fragmentary perspective view with parts cut away of a service entrance cable embodying the present invention; and

FIG. 2 is a scrap view with parts broken away showing the bedding and binding tape in the FIG. 1 cable in greater detail.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to the drawing FIG. **1,** a section of service entrance cable is shown generally at **10.** Cable **10** is comprised of a cluster, herein three, of insulated stranded conductors **12.** Special cable insulation tape **14** to be described presently is helically wrapped about the clustered conductors **12** with the adjacent turns of the tape overlapping one another. Desirably, also, a filler **16** composed of asbestos fibers or other such material is wrapped along with conductors **12** so that it fills the spaces between the conductors, thereby giving the cable a cross section which is essentially round.

An outer jacket **18** of a waterproof resinous material such as polyvinyl chloride, neoprene, or the like, is extruded in situ over the wrapped conductors, thus completing the cable **10.** As will be seen presently, the tape **14** and jacket **18** together form a double continuous insulating barrier which is substantially impervious to moisture and the elements.

Turning now to FIG. **2,** tape **14** is comprised of a 20 × 10 open weave glass fiber cloth or scrim **22.** A continuous film **24** made of polyester, such as that sold under the tradename "Mylar," is bonded to the scrim using a relatively low viscosity fire-retardant plastic laminate adhesive **26.** Suitable adhesive materials include acrylic, acrylic-polyvinyl chloride copolymers and polyurethane. A particularly desirable adhesive is composed of carboxyl-modified acrylonitrile-butadiene copolymer, chlorinated paraffin resin and a nonresinous filler.

To make the tape, the relatively low viscosity adhesive **26** is coated onto the polyester film using a conventional coating roll set for minimum applied pressure. Then the coated film and scrim **22** are gradually brought together in a drying oven so that the two become bonded together. During this bonding process, the coated film and scrim are not pressed together with any great amount of force. Rather, the scrim **22** and coated film **24** are maintained under different lengthwise tensions which causes the two to be urged together in the drying oven with the result that they become firmly bonded to one another.

In a typical tape, the polyester film **24** is on the order of 0.5 mil thick and the adhesive layer is only on the order of 0.2 to 0.3 mil in thickness. Therefore, the thickness and, hence, weight of the tape as a whole are less than those of conventional service entrance cable tape incorporating a natural or synthetic rubber barrier layer which is calendered directly onto the scrim.

When the tape is constructed in this fashion, the polyester film **24** therein is substantially continuous and devoid of pinholes and presents a continuous, smooth surface so that the tape **14** can be served from a roll without the film adhering to itself and picking off from the scrim. Consequently, when the tape **14** is wrapped on the conductor as shown in FIG. **1,** it constitutes a substantially continuous membrane all around the tape from one end of the tape to the other. Finally, after the jacket **18** is applied, the conductors are shielded by double continuous membranes.

When the film **24** is bonded to the scrim **22** by way of the intervening layer of adhesive **26,** relatively little bonding pressure is applied. Rather, as pointed out above, the scrim **22** is maintained under a higher tension than the film in the drying oven. Therefore, the two layers are urged together without the glass fibers in the scrim being cracked by excessive pressure. As a result, the scrim as a whole maintains its original tensile strength. Also, by virtue of the low viscosity adhesive working up between the glass fibers **22*a*** in the scrim, the tensile strength of the tape is actually enhanced because the adhesive seems to form a buffer between the individual fibers **22*a***, reducing their tendency to abrade one another. The net result is a superior insulating, bedding and binding tape which can be made at a lower cost than prior comparable products and which, when incorporated into an exterior cable system, enables the latter to easily pass all of the UL tests for such cables.

Table I below compares pertinent characteristics of the present tape **14** with those of conventional tapes as typified by those in the aforementioned U.S. Pat. No. 3,602,636.

TABLE I

Measured Characteristic	Tape 14	Prior Tape
Overall thickness	0.0045 inch	0.006 inch
Weight per 100 sq. yds.	15 lbs.	40 lbs.
Tensile strength	70 lbs./inch	40–70 lbs./inch

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently obtained and, since certain changes may be made in the above construction and in

the above method without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described.

We claim:

1. Bedding and binding tape comprising

A. a sheet or strip of open weave glass fiber scrim,

B. a thin, continuous polyethlene terephthalate film coextensive with the scrim, and

C. an adhesive coating selected from the group consisting of synthetic rubber or plastic based adhesives on the film bonding the film to the scrim.

2. The tape defined in claim **1** wherein said adhesive forms a buffer means between fibers of said scrim.

3. Bedding and binding tape comprising

A. a sheet or strip of open weave glass fiber scrim,

B. a thin, continuous polyethylene terephthalate film coextensive with the scrim, and

C. a thin adhesive coating on the film bonding the film to the scrim, said adhesive coating being comprised of one of a group consisting of polyurethane adhesive, acrylic adhesive, an adhesive based on acrylic-polyvinyl chloride copolymers and an adhesive based on a copolymer of carboxyl-modified acrylonitrile-budadiene.

4. Bedding and binding tape comprising

a. a sheet or strip of open weave glass fiber scrim,

b. a thin continuous polyethylene terephthalate film coextensive with the scrim, and

c. a thin flame-retardant adhesive coating selected from the group consisting of synthetic rubber or plastic-based adhesives on the film bonding the film to the scrim.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,914,495 Dated October 21, 1975

Inventor(s) Anthony R. Lania et al

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 17 "3C0" should be --300--

Signed and Sealed this

Twentieth Day of July 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks

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