This invention pertains to a resilient tubular cover supported in a stretched and rolled-up condition by an easily removable support member positioned around the outside of the cover and to a device incorporated in the rolled-up cover which facilitates the unrolling of the cover. Further, the apparatus for and method of assembling the resilient cover onto the support member is disclosed. More particularly, the invention resides in a hollow member which may be of one or two piece construction through which the resilient cover passes and on which rolled portions of the resilient cover are received and removably retained. The method of assembly includes means for expanding and stretching the tubular cover prior to rolling the ends thereof up onto the support member.

7 Claims, 19 Drawing Figures
3,878,320

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RESILIENT COVER ASSEMBLY HAVING A REMOVABLE EXTERNAL SUPPORT MEMBER AND METHOD OF ASSEMBLING THE SAME

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part application of Ser. No. 373,528, filed June 25, 1973 now U.S. Pat. No. 3,824,331.

BACKGROUND OF THE INVENTION

The instant application is directed to improvements of the device and method disclosed and claimed in U.S. Pat. No. 3,824,331. Specifically, the improvements reside in the provision of means to facilitate the unrolling of the rolls of the stretched, resilient, tubular cover member thereof. Further, improvement has been made to the support member to facilitate its removal from the completed splice.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view, partly in section, showing the preferred embodiment disclosed and claimed in U.S. Pat. No. 3,824,331.

FIGS. 2 and 3 show the inner and outer support members respectively of the embodiment of FIG. 1.

FIG. 4 shows the detail of the facing sides of the outer support member of FIG. 3.

FIG. 5 illustrates another embodiment disclosed in U.S. Pat. No. 3,824,331.

FIGS. 6-11 illustrate the assembly of the embodiment of FIG. 1.

FIGS. 12-17 illustrate the use of the embodiment of FIG. 1.

FIG. 18 illustrates yet another embodiment of the present invention; and

FIG. 19 illustrates a modification of the element shown in FIG. 3 in accordance with the present invention.

DETAILED DESCRIPTION OF FIGS. 1-5

FIG. 1 shows a resilient cover assembly 10 ready for use in insulating and sealing a splice area on mine cable or the like. The assembly consists of a resilient tubular cover member 12, an outer annular support member 14 and an inner sleeve 16. Resilient cover 12 has been longitudinally stretched and while in the stretched condition, rolled back on itself from either end to form two outside rolls 18 and 20.

The stretched and rolled cover member is retained in that condition and shape by rolling rolls 18 and 20 over annular projections 22 located at either end 24 of outer support member 14.

The inner sleeve 16, also illustrated in FIG. 2, is split lengthwise to receive between the sides removable dividing means which increases the sleeve's diameter. Such dividing means may include an "I-beam" strip 28. The increase in diameter of the sleeve is a function of the width of web portion 30 of the strip. The cross bars 32 of the strip prevent cantilever movement of the sides defined by the split. Inner sleeve 16 and strip 28 may be machined or molded from rigid plastic such as polyvinyl chloride.

Outer support member 14, clearly shown in FIG. 3, is a sleeve-like structure from which in the case of milling, a strip of material of appreciable width has been removed to define a lengthwise clearance 36. In the case of molding the member, the clearance is provided in the mold. The sides 38 of clearance 36 are zigzagged in mating relation to prevent radial movement when the sleeve is squeezed inwardly under pressure to tubular cover member 12. The zigzag sides are shown in an enlarged view in FIG. 4.

The outer surface of support member 14 includes the aforementioned projections 22 at each end 24. The outwardly facing sides 40 of the projections are beveled to facilitate rolling rolls 18 and 20 thereofover. The inwardly facing sides 42 are perpendicular to the longitudinal axis of the member to restrain rolls 18 and 20 from rolling back off.

Adjacent each inwardly facing side 42 and on the outer surface of the support member are roll-receiving, annular grooves 44. These grooves cooperate with sides 42 to define roll retaining means.

On the inner surface of support member 14 and directly opposite clearance 36 is a shallow inwardly facing groove 48 which extends the length of the member. The groove is the surface representation of reducing the wall thickness of support member 14 at that location to provide a hinge area about which the member opens and closes relative to clearance 36.

In addition to groove 48, the inner surface of support member 14 is serrated or ribbed as indicated at 50. These annular serrations which have a relatively low profile, provide a roughened surface to facilitate assembly of cover member 12 onto support member 14 by reducing the tendency for the cover member to slide.

Tubular cover member 12 is a resilient, elongated sleeve structure which may be molded using butyl rubber or other like insulating material. The inner diameter of the member will be slightly smaller than the diameter of the cable on which the cover member is to be installed.

FIG. 5 shows a modified embodiment 10'. The change therein is to outer support member 14', herein designated 14'. As can be seen, one end 24' is smooth and the support member has but one groove 44'. One non-rolled end 52 is first positioned over end 24' and across groove 44'. The other end of the cover member is then rolled up onto the support member 14' and into groove 44' on top of non-rolled end 52. In this manner, rolled end 54 retains non-rolled end 52, and projection 22 on support member 14' retains the rolled end.

ASSEMBLY PROCEDURE

FIGS. 6 through 11 illustrate the various steps taken and apparatus used in assembling cover member 12, outer support member 14 and inner sleeve 16 into a cover assembly 10 ready for use by a repairman or other workers in those industries likely to use the same.

FIG. 6 shows the installing of inner sleeve 16 onto a mandrel 56 consisting of two sections 57 and 58, the latter having a cone-shaped nose 60 and both having a colinear air passage 62 therethrough by dashed lines. The mandrel may be supported by any conventional holding device, one such being indicated by reference numeral 63. Inner sleeve 16 is placed on sleeve receiving stud 64 on mandrel section 57 after which the two sections are joined via a threaded stud 66 on section 58 and companion threads (not shown) on section 57. Note that the outer diameters on mandrel 56 and inner sleeve 16 are the same (FIG. 7).
After joining the two mandrel sections, a first stretcher subassembly 68, consisting of a sleeve 70 and adjustable clamp 72 is slid onto the assembled mandrel 56. The sleeve has an inner diameter very slightly larger than the outer diameter of the mandrel.

With pressurized air from an air source (not shown) flowing through mandrel passage 62, cover member 12 is worked onto mandrel 56 by shutting off one end of the cover member with one hand and pulling on the other end with the other hand as seen in FIG. 7. This method is necessitated because cover member 12 has a considerably reduced inner diameter relative to inner sleeve 16 and mandrel 56. After a sufficient length of cover member has been worked onto mandrel 56, it is rolled back on itself, subassembly 68 moved into the voided area so that the cover member can be unrolled onto sleeve 70. After the remaining length of cover member 12 has been worked onto the mandrel, it too is rolled back on itself, a second stretcher subassembly 68B is slid onto mandrel 56 and the remaining length unrolled onto sleeve 70.

Cover member 12 is now linearly stretched by first tightening a clamp 72 so as to immobilize the underlying sleeve 70 against mandrel 56 and then sliding the second subassembly 68B away therefrom and stretching cover member 12. Upon stretching the cover member the appropriate length, the second subassembly 68B is immobilized by tightening adjustable clamp 72B.

While cover member 12 is in the stretched condition as shown in FIG. 9, the outer support member 14 is placed therein overlying registration with inner sleeve 16 and held thereon in an immobile position by means of a plier-like hand tool containing suitable jaw members, such tool being generally designated by reference numeral 74. One end of cover member 12 is rolled back on itself, over projection 22 on support member 14 and into groove 44 to form the aforementioned roll 20 as seen in FIG. 10.

Tool 74 is removed as roll 20 holds support member 14 in a closed position. The other end of cover member 12 is rolled back on itself and onto another end of support member 14 to form roll 18, which also completes the formation of cover assembly 10. The assembly is removed from mandrel 56 by simply unthreading mandrel section 58 and sliding the assembly off stud 64.

UTILITY AND METHOD OF APPLICATION

FIGS. 12-17 illustrate the preferable purpose for which the cover assembly was developed and its method of application.

Two cables 80, comprising stranded conductors 82 and insulating jackets 84, are shown in FIG. 12, their ends 86 prepared for splicing by removal of a portion of jackets 84. Cover assembly 10 is slipped over one of the cable ends 86 prior to joining the two ends as seen in FIG. 13. The splice may be made using a conventional, crimp-type wire ferrule 88 or the like.

Inner sleeve 16 can be removed before or after cover assembly 10 is slid into position over the spaced area (FIG. 14). This is accomplished by grasping strip 28 with a pair of pliers (not shown) and pulling it out. Sleeve 16 is then squeezed in and freely withdrawn from assembly 10 as shown in FIG. 15. Subsequent to removing sleeve 16, mastic 90 which may be in the form of a coating or pads, is applied to cables 80.

With mastic 90 in place the rolled up cover member 12 is unrolled off either end of support member 14 and onto both cables 80 as FIG. 16 shows. As the cover is unrolled, it contracts about cables 80 to form a closely conforming and tightly retained protective covering. The mastic forcefully bonds the cover member 12 to cables 80 by the contraction of the cover member as it is unrolled onto the cables. An environmentally insulated, protective cover over the splice area results.

Outer support member 14 is removed from the now single cable 80 by simply spreading and slipping it off. FIG. 17 is a view of the completed covered splice area. As cover member 12 is resilient, flexing of the cable is not impaired thereby.

DESCRIPTION OF THE IMPROVEMENTS CONSTITUTING THE PRESENT INVENTION

With reference to FIGS. 18 and 19, the improvements constituting the present invention are illustrated. The resilient cover assembly 110 seen in FIG. 18 is the same in all respects except one as cover assembly 10 shown in FIG. 1. The one difference and improvement thereto is that a single ribbon 202 has been added to facilitate the unrolling of rolls 18 and 20. As FIG. 18 shows, ribbon 202, which may be of cloth, plastic or like material, extends between the cover member 12 and support member 14.

Rolls 18 and 20 are easily unrolled by grasping the free ends of ribbon 202 and pulling each in the proper direction.

FIG. 19 illustrates an improved support member 114. Rather than being in one piece as is support member 14, support member 114 is made in two halves to facilitate its removal from spliced cable 80 (FIG. 16). Three pins 204 and aligned holes 206 are provided to insure alignment of the halves during assembly (FIG. 9).

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, as some modifications will be obvious to those skilled in the art.

What is claimed is:

1. A resilient cover assembly useful for covering the spliced area of cables, which comprises:
a. an annular support member;
b. an elongated ribbon extending through the support member; and
c. a stretched, elongated resilient cover member extending through the support member with the ends of the cover member rolled up to provide rolls which are removably positioned on the outer surface of either end of the support member and with the ends of the ribbon extending out from either roll so that the rolls may be unrolled by pulling on the ribbon ends.

2. The resilient cover assembly of claim 1 wherein the annular support member is split longitudinally from end to end to facilitate removal of the support member from around the cover member after the rolls have been unrolled.

3. The resilient cover assembly of claim 1 wherein the annular support member is formed from two halves.

4. The resilient cover assembly of claim 3 wherein each half of the annular support member has pins on one side and holes on another side so that said halves may be aligned when assembled.

5. The resilient cover assembly of claim 1 further including a removable inner sleeve extending through the portion of the rolled cover member which passes through said support member, said sleeve permitting
easier installation of the assembly onto one of the cables being spliced together.

6. A method of assembling a resilient cover assembly of the type useful for covering the spliced area of cables, which comprises the steps of:
   a. providing an annular support member;
   b. placing an elongated ribbon through the support member with the ends of the ribbon positioned on the outer surface thereof;
   c. positioning a resilient sleeve-like, cover member through the support member; and
   d. rolling up the ends of the cover member toward the center thereof and onto the ends of the support member with the ends of the ribbon positioned between the rolled up cover member and the support member and extending out from each rolled up end.

7. A method of assembling a resilient cover assembly of the type useful for covering the spliced area of cables, which comprises the steps of:
   a. providing an annular support member having annular projections at each end thereof;
   b. placing an elongated ribbon through the support member with the ends of the ribbon positioned on the outer surface thereof;
   c. positioning a resilient, sleeve-like cover member through the support member;
   d. stretching the cover member axially;
   e. rolling up the ends of the stretched cover member toward the center thereof; and
   f. positioning the rolled up ends onto the ends of the support member so that said annular projections removably retain them and the ends of the ribbon are positioned between the rolled up ends and the annular projections and extend outwardly therefrom.

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