United States Patent [19]

Mixon, Jr. et al.

[11] **3,878,320**

[45] **Apr. 15, 1975**

[54] **RESILIENT COVER ASSEMBLY HAVING A REMOVABLE EXTERNAL SUPPORT MEMBER AND METHOD OF ASSEMBLING THE SAME**

[75] Inventors: **James Lenhart Mixon, Jr.; Ernest Lloyd Beinhaur,** both of Harrisburg, Pa.

[73] Assignee: **AMP Incorporated,** Harrisburgh, Pa.

[22] Filed: **June 21, 1974**

[21] Appl. No.: **481,606**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 373,528, June 25, 1973, Pat. No. 3,824,331.

[52] **U.S. Cl.** ..... **174/135;** 29/235; 174/84 R; 174/138 F

[51] **Int. Cl.** **H01r 5/00**

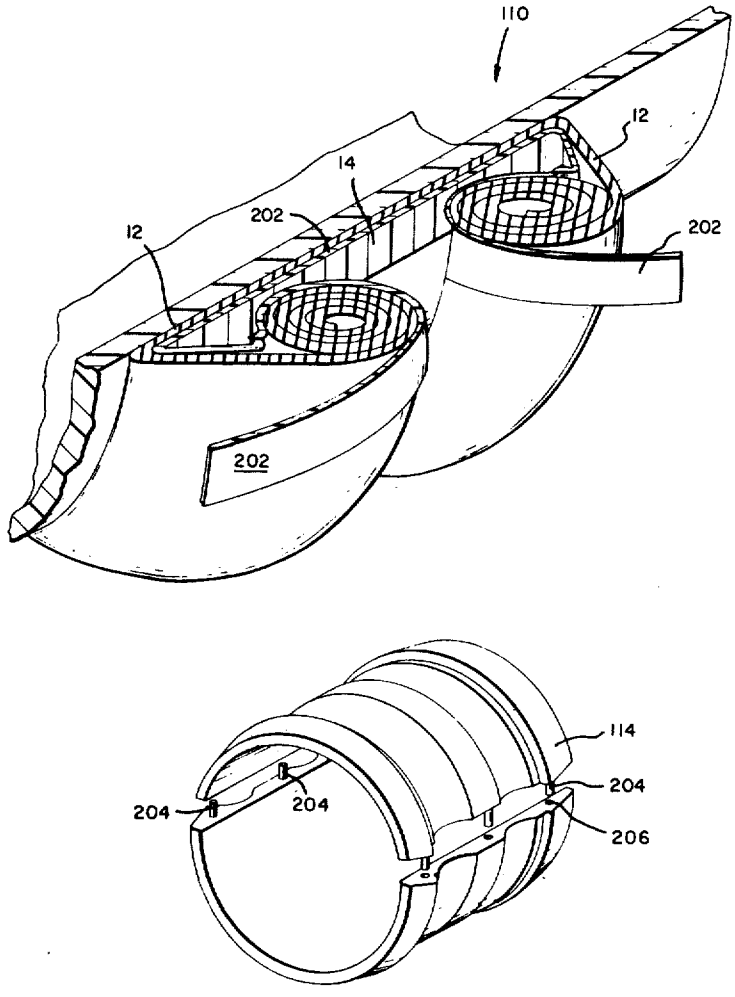
[58] **Field of Search** ..... 174/10, 74 A, 84 R, 84 S, 174/84 C, 135, 138 F; 29/235, 236, 450, 451

Primary Examiner—Laramie E. Askin
Attorney, Agent, or Firm—Allan B. Osborne

[57] **ABSTRACT**

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



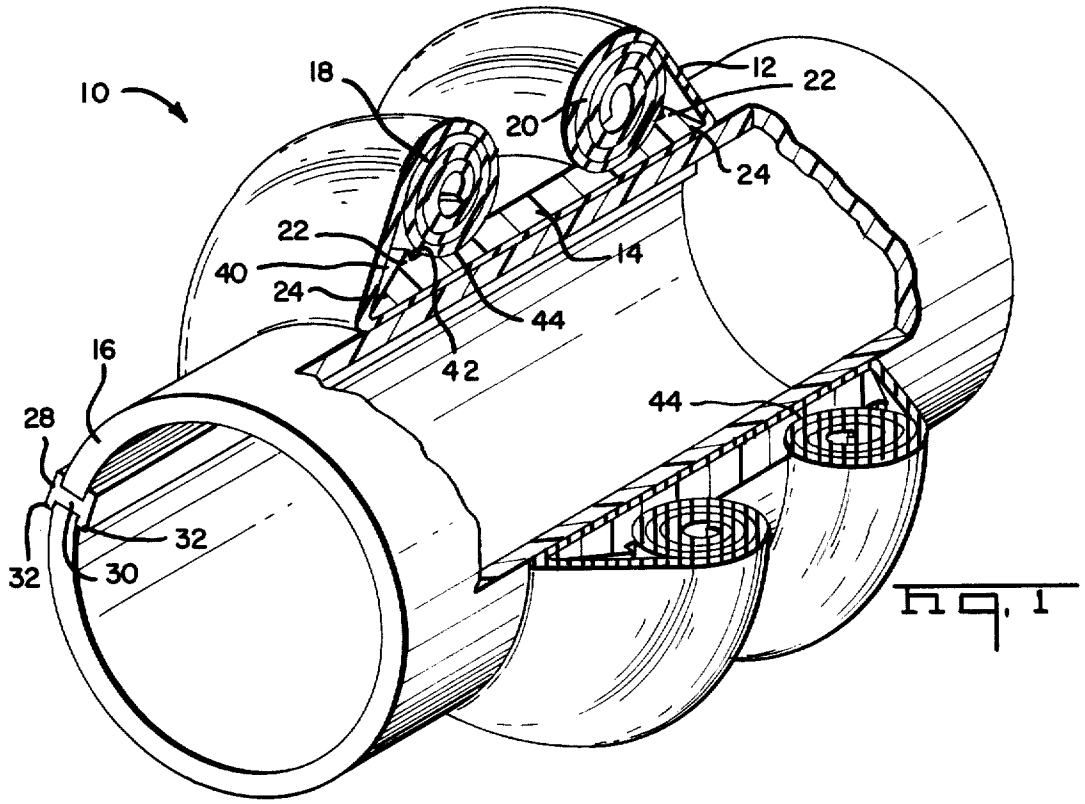


Fig. 1

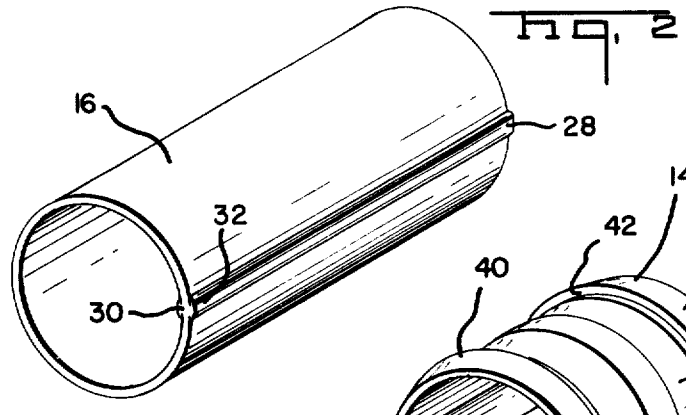


Fig. 2

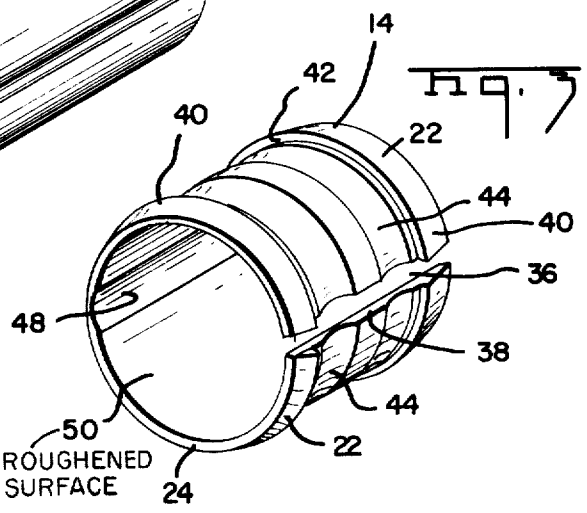


Fig. 3

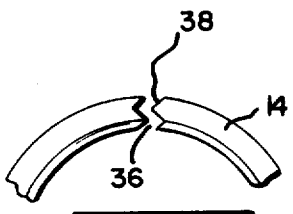


Fig. 4

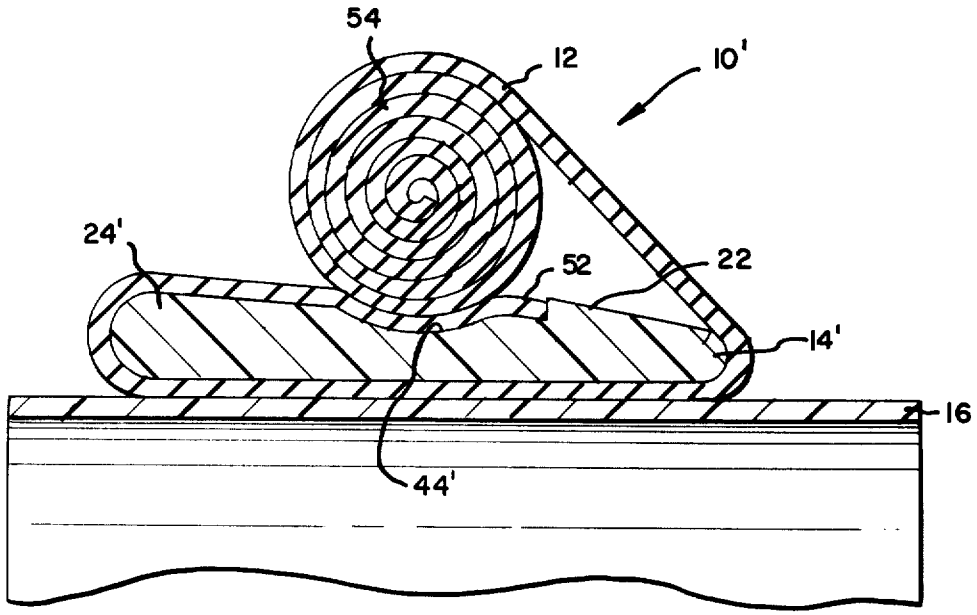


Fig. 3

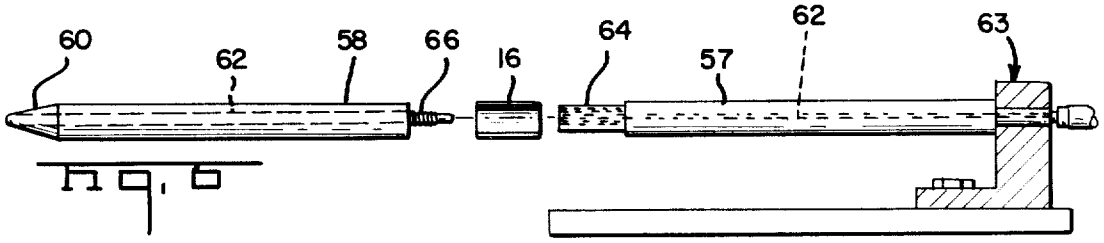


Fig. 6

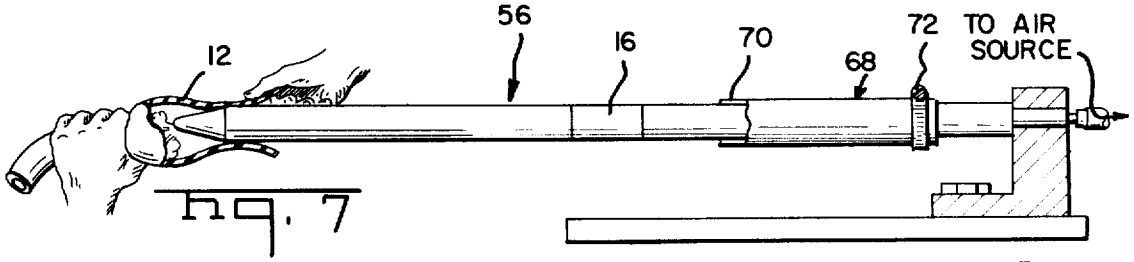


Fig. 7

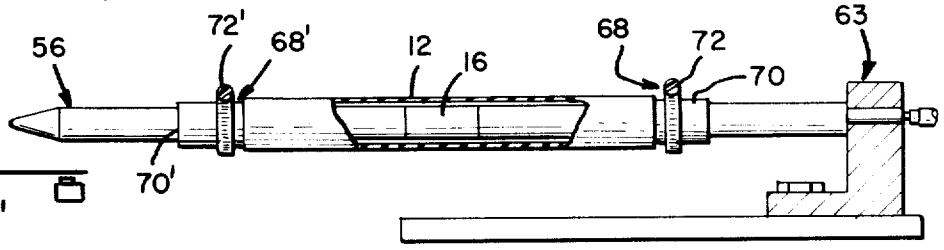


Fig. 8

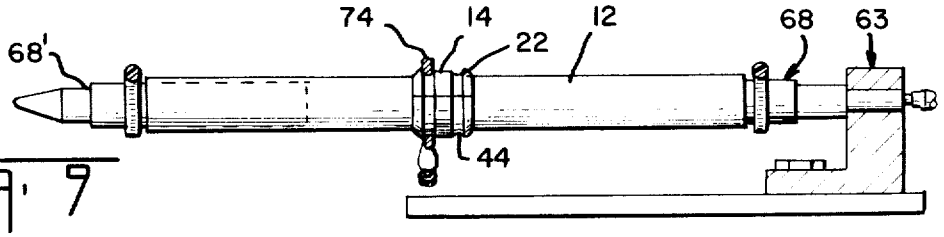


Fig. 9

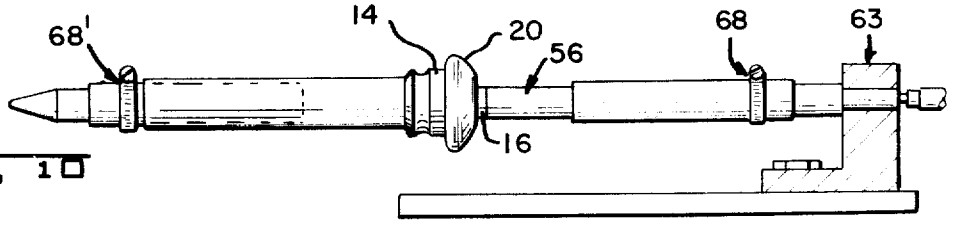


Fig. 10

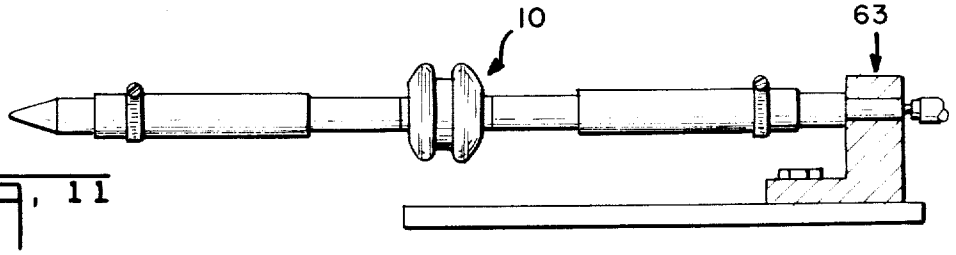


Fig. 11

Fig. 12

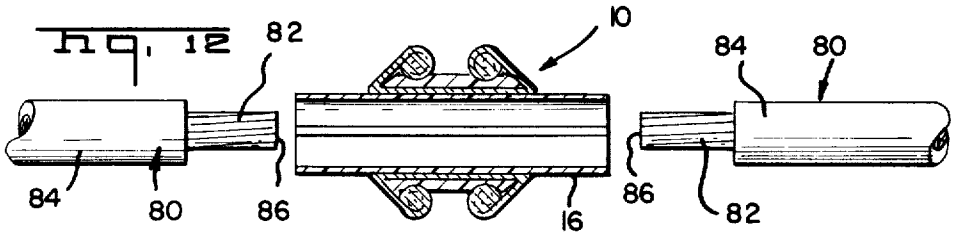


Fig. 13

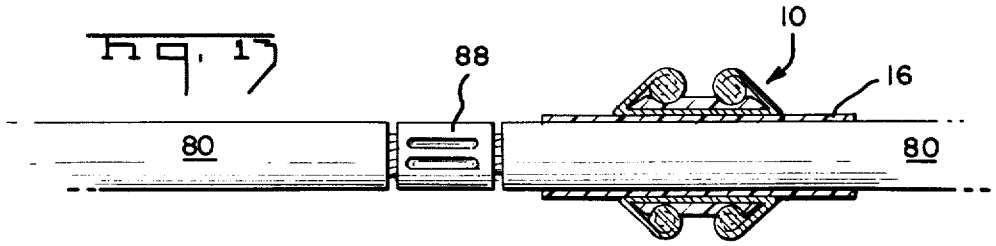


Fig. 14

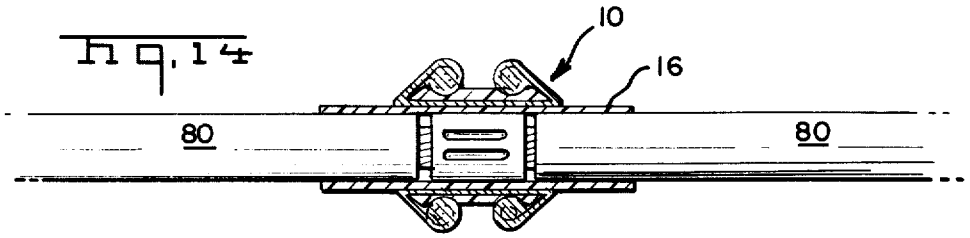


Fig. 15

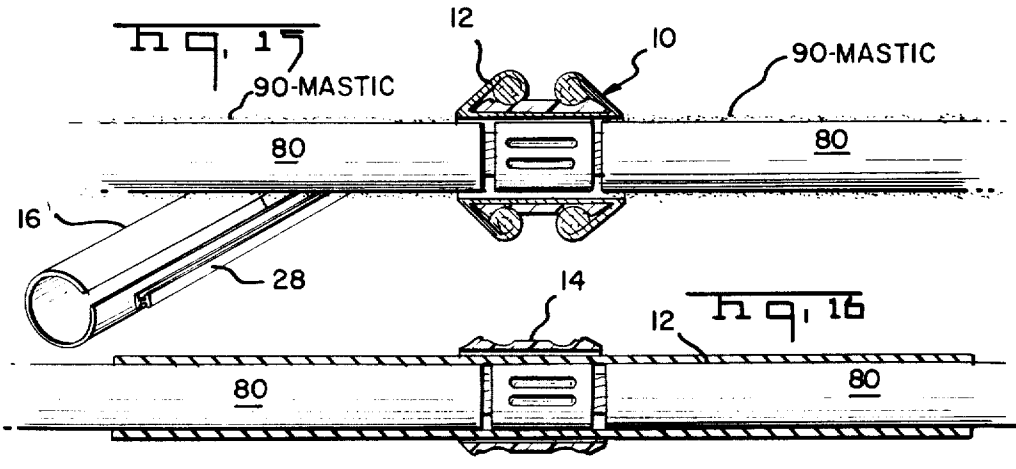
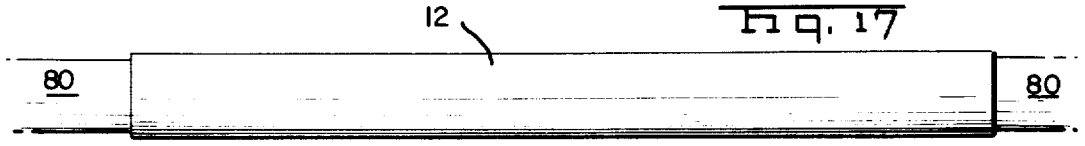


Fig. 16

Fig. 17



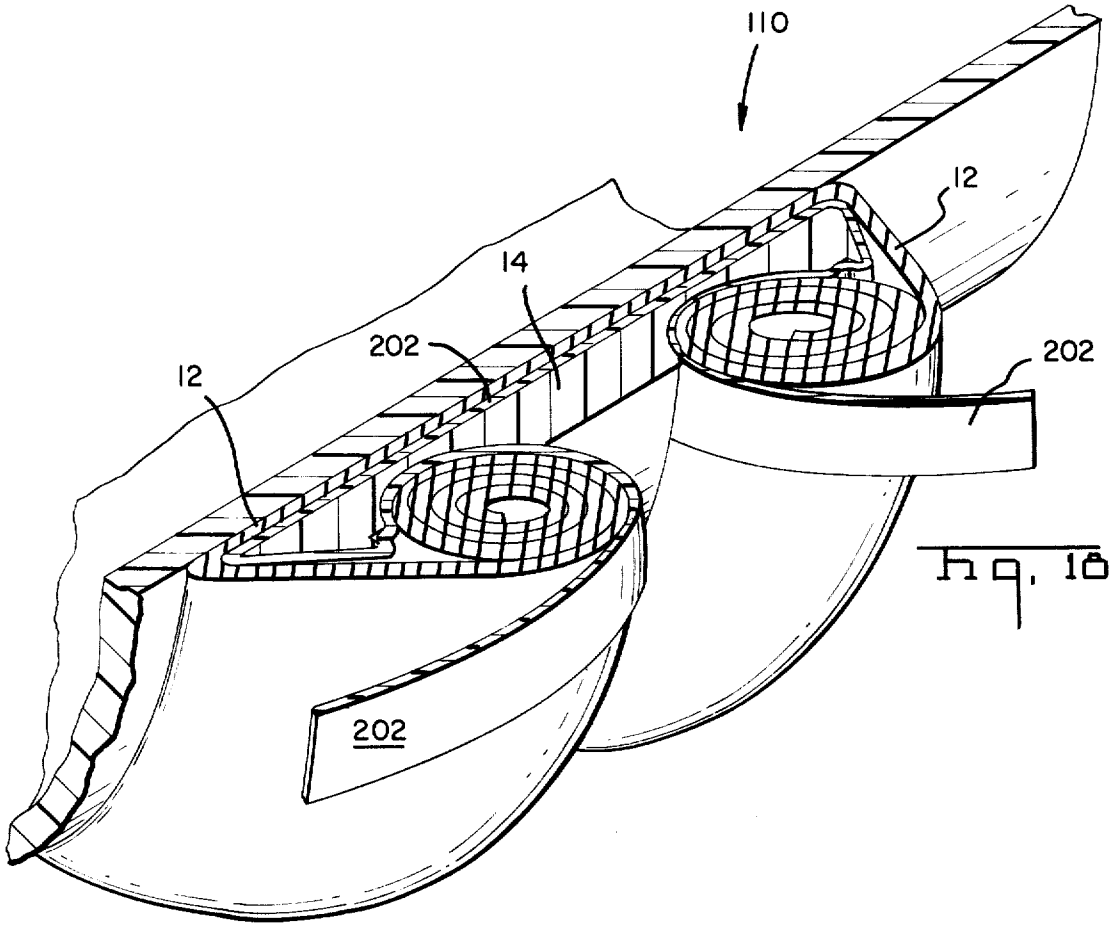
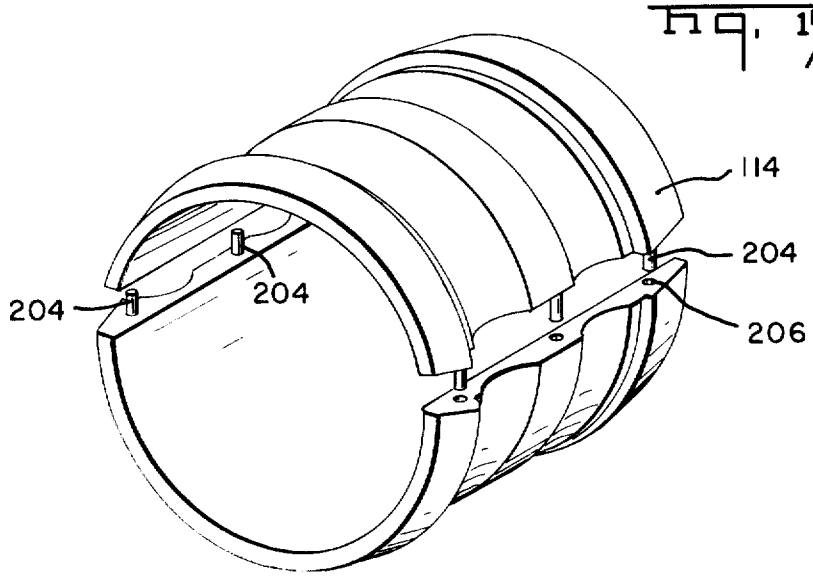


Fig. 18

Fig. 19



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 inbetween 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 zagged in mating relation to prevent radial movement when the sleeve is squeezed inwardly under pressure to tubular cover member **12**. The zagged 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** thereover. 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 shown 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 **68'** 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 **68'** away therefrom and stretching cover member **12**. Upon stretching the cover member the appropriate length, the second subassembly **68'** is immobilized by tightening adjustable clamp **72'**.

While cover member **12** is in the stretched condition as shown in FIG. **9**, the outer support member **14** is placed thereon in 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 spliced 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.

* * * * *