

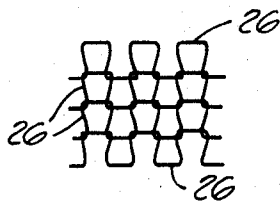
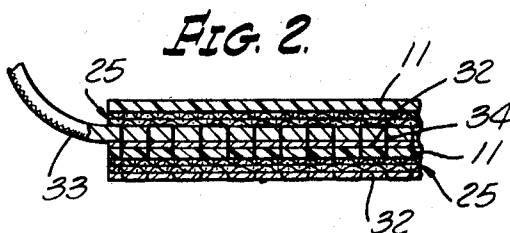
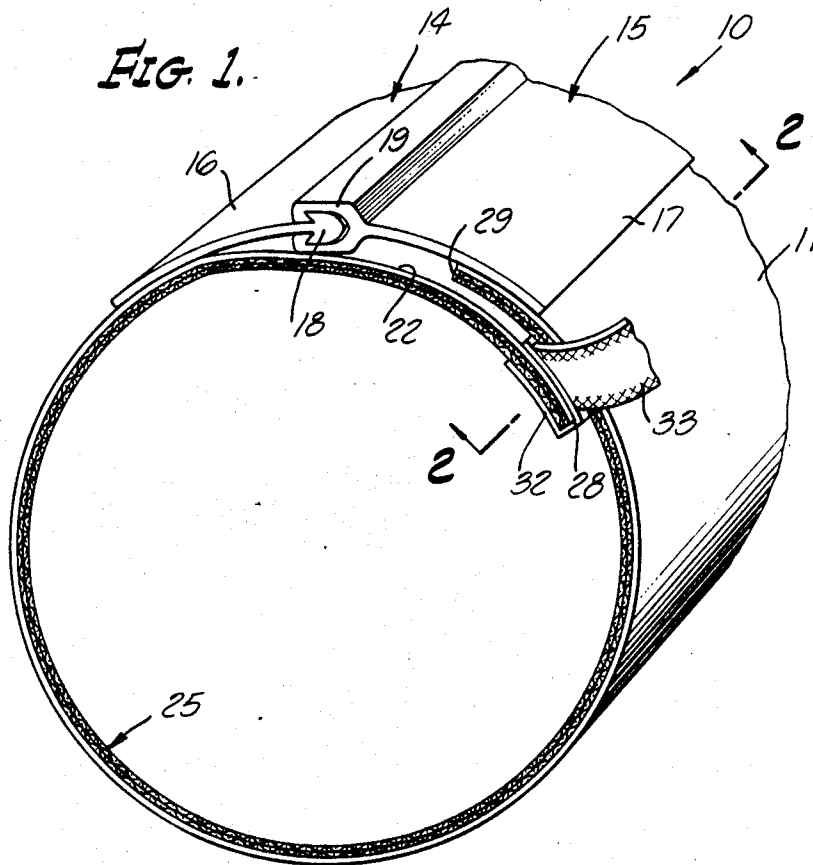
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W. A. PLUMMER

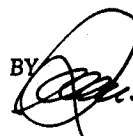
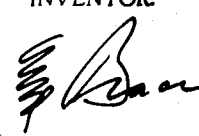
3,467,761

ELECTRICALLY SHIELDED HEAT-REACTIVE JACKET FOR CONDUCTORS

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1

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ELECTRICALLY SHIELDED HEAT-REACTIVE JACKET FOR CONDUCTORSWalter A. Plummer, 3546 Crownridge Drive,
Sherman Oaks, Calif. 91403Continuation-in-part of application Ser. No. 667,444,
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10 Claims 10

ABSTRACT OF THE DISCLOSURE

A detachable electrically shielded jacket for conductors and the like having a flexible metal mesh liner secured along only one lateral edge of a long strip of impervious insulative material which may be heat-reactive and shrinkable into a snug fit about the conductors when heated.

This application is a continuation-in-part of my copending application for U.S. Letters Patent Ser. No. 667,444 filed Sept. 13, 1967 entitled Electrically Shielded Jacket for Conductors.

This invention provides a detachable tubular shielded jacket assembly for use about conductors, cables and the like and serving as a highly effective barrier against the passage of electrical flux field. The assembly comprises an impervious flexible main body of insulating material provided with a pair of seam-foaming tapes along the lateral edge portions thereof and a unique flexible electrically conductive liner co-extensive with the interior of the main body attached thereto only along one lateral edge. The edge to which the liner is attached preferably includes a guard flap portion sufficiently wide to underlie the seam-forming members and to overlap with the other edge of the main body. Conductive material embraces the free edge of this guard flap to the end that the guard flap may be positioned against either side of the other free edge of the liner to form a continuous metal contact therewith thereby assuring a complete tubular shielding barrier surrounding the members enclosed by the jacket assembly.

Various proposals have been made in the past to provide a protective shielding enclosure for cables, conductors and other components and capable of preventing the passage of any substantial electrical flux in either direction through the barrier assembly. Although certain of these are quite effective from a functional standpoint they are subject to certain disadvantages sought to be overcome by the present invention. In particular, prior shields of conductive material lack the requisite flexibility and deformability found desirable in many applications of shielding assemblies. For example, bundles of wiring having numerous branchouts and used to connect sub-assemblies of electrical components vary widely in size and contour owing to cross-over of wires within a particular branch and other causes. As a result, attempts to assemble shielding jackets having barrier or shielding layers formed of foil rupture if undue stress is placed on them. Such ruptures are unlikely to be detected and result in serious loss of shielding efficiency for reasons not readily ascertainable or observable from the exterior of the assembled jackets.

By the present invention there is provided a simple, inexpensive and highly versatile shielded jacket assembly avoiding the foregoing and other disadvantages of prior constructions. The jacket features at least one, and preferably a multiplicity, of superimposed layers of fine knit wire mesh and preferably secured to the insulated main body of the jacket only along one lateral edge thereof. The remainder of the mesh layer is free to stretch, con-

2

tract and flex substantially without interference from the jacket body and as necessary to accommodate the shielding material to the contour of the conductors or other structure being enclosed. The liner is sufficiently wide that one lateral edge overlaps and bears directly against the other lateral edge in the fully assembled position of the jacket thereby assuring a continuous tubular enclosure of electrically conductive material. The main body of the jacket is preferably formed of supple stretchable thermoplastic material having interlockable plastic seam-forming means secured to its edges in such manner as to hold the conductive and shielding liner assembled in the manner just described. More specifically and in addition to the aforementioned characteristics, the jacket body is preferably heat-reactive and capable of pronounced shrinkage upon the application of heat for a short interval thereby facilitating the assembly of the jacket loosely about the conductors, cabling or other object to be shielded and thereafter shrunk into a snug fit with the enclosed object. The flexible, stretchable and contractable shielding contracts in response to the shrinkage of the jacket or, in certain instances, stretches as the shielding assembly is pulled taut about some bulge or obstacle being enclosed by the jacket as shrinkage occurs. Prior shielding layers would be subject to rupture or damage by shrinkage of the body layer about an obstruction or protuberance.

Accordingly, it is a primary object of the invention to provide an inexpensive highly versatile high-efficiency jacket assembly for enclosing cabling and the like to safeguard against the passage of electrical flux fields.

Another object of the invention is to provide a detachable unitary seamed jacket assembly for enclosing cables, conductors and the like with a continuous tubular electrical shield capable of stretching, contracting and conforming to a wide variety of shapes and sizes.

Another object of the invention is the provision of a detachable unitary jacket assembly for conductors or other object to be enclosed within an electrical shield wherein both the shield and the supporting layer are stretchable and contractable to accommodate irregularities and variations in size and shape without risk of rupture or failure to the electrical shield.

Another object of the invention is the provision of a unitary tubular shielding jacket assembly effective as a barrier to electrical flux fields and including an impervious body of heat-reactive insulative material and an attached shielding layer of stretchable contractable conductive mesh.

Another objective is the provision of a unitary jacket assembly having a heat-reactive main body and a layer of electrical shielding material attached to said main body only along a narrow strip and said main body being otherwise free to stretch and contract independently of said shielding material.

These and other more specific objects will appear upon reading the following specification and claims and upon considering in connection therewith and attached drawing to which they relate.

Referring now to the drawing in which a preferred embodiment of the invention is illustrated.

FIGURE 1 is a fragmentary perspective view of a preferred embodiment of the invention with the seam thereof closed;

FIGURE 2 is a fragmentary cross-sectional view on enlarged scale taken along line 2—2 on FIGURE 1; and

FIGURE 3 is a fragmentary view of a small area of a single layer of the liner.

Referring more particularly to FIGURE 1 there is shown a typical shielding jacket assembly designated generally 10 embodying the principles of this invention. This assembly includes a main body 11 of thin, supple, im-

pervious stretchable insulating material as, for example, any of a variety of thermoplastic materials such as polyvinyl chloride, polyethylene, tetrafluoroethylene polymer and many others. This main body is made in a continuous strip having a width such that its opposite lateral edges will overlap one another by a substantial distance when the jacket seam is closed. Preferably the main body strip is treated by any one of several well-known techniques to render the same heat-reactive or shrinkable when subjected briefly to relatively low temperature heating, as by an ultra-red lamp, a hot air blower or the like.

As herein illustrated, by way of example, the seam comprises a pair of tapes 14, 15 each having a mounting web 16, 17. Their adjacent lateral edges are provided with any suitable interlocking tongue and groove means cooperating when mated to provide a strong continuous seam extending lengthwise of the jacket. As herein shown, tape 14 is provided with a T-shaped head portion 18 insertable between the legs of the U-shaped portion 19 along the free edge of tape 15. It will be understood that tapes 14 and 15 are preferably formed of a suitable thermoplastic readily extruded in the cross-sectional shape desired. Mounting webs 16 and 17 of the tapes may be suitably bonded or heat-fused to the main body strip 11, web 16 of tape 14 being secured to the jacket body sufficiently inwardly of one edge to provide a wide guard flap 22. As is made clear by FIGURE 1, this guard flap entirely bridges the seam-forming tapes and overlaps substantially with the other edge of the main body. This serves not only to prevent the conductors or other material being enclosed from interfering with the closure of the seam but, in particular, assures that the electrical barrier material will completely encircle the cable without the possibility of gaps through which electrical fields might pass.

The electrically conductive shielding barrier 25 featured by this invention comprises at least one, and preferably a plurality of closely superimposed layers of knit mesh material in intimate contact with one another and each typically fabricated as shown in FIGURE 3. Thus it will be seen that each layer of this material includes a maze of fine, flexible, resilient wires 26 interlocked by a multiplicity of loops with the similarly looped wire to either side thereof. The individual wires as well as the loops in each are very small and highly effective in barring the passage of electrical flux fields. This is particularly true when two or more layers of the knit mesh are superimposed. Only two layers are shown in FIGURE 1 but it will be understood that additional layers may be employed depending upon the importance of complete shielding effectiveness. Owing to the fineness of the wire, its resiliency and flexibility, as well as the knit character of the mesh, it will be understood that the material exhibits unusual flexibility, stretchability, contractability and ability to conform to the shape and size of the conductors being enclosed. Additionally, the mesh material has unusual strength and rupture resisting characteristics.

Desirably, the mesh liner 25 is secured to main body 11 only along one edge of the main body and preferably along the free edge 28 of guard flap 22. The remainder of liner 25, including its other lateral edge 29 of the liner, according to a preferred mode of construction, is free of attachment to the main body. Accordingly, the entire liner is free to contract, expand, and stretch relative to its individual layers and relative to the main body 11.

It will be understood that the free edge of guard flap 22 may be inserted along the interior surface of the conductive liner or between the free edge 29 thereof and the adjacent inner surface of the jacket body. As illustrated in FIGURE 1, the guard flap is located in the former position.

The mode of assembly of the liner to the guard flap,

as herein shown, utilizes a strip of U-shaped metal foil 32 embracing the edge of the guard flap and the adjacent edge of the liner and secured in position along with a strip of metal braid 33 or the like conductive wire by stitching 34. This detail is shown in FIGURE 2.

As manufactured, it will be understood that jacket assembly 10 lies flat with the seam-forming tapes 14 and 15 disengaged and with the liner mesh 25 lying flat against main body 11. The assembly of the jacket about a cable is accomplished by embracing the opposite edges of the jacket and liner about a bundle of conductors, care being taken to insert the free edge of guard flap 22 either beneath the free edge 29 of the liner or between this edge and the adjacent body of the jacket. Thereafter, the T-head portion 18 of tape 14 is advanced between the tanged end of the legs of the U-shaped portion 19 of tape 15 until the parts interlock. If desired, a suitable tool may be employed to facilitate the seam closing operation. The flexibility and resiliency of the jacket assembly, including both the metallic liner 25 and the main body 11, enables the jacket to accommodate itself easily and quickly to the shape and size of the conductors being enclosed without risk of disrupting or interfering with the continuous and excellent electrical contact between the overlapped edges of the shielding liner 25. A snug fit is assured if the main body is heat-reactive and subjected to heat from a hot air blower or a heat lamp until the jacket has shrunk into a snug fit whereupon further heating is discontinued.

While the particular electrically shielded heat-reactive jacket for conductors herein shown and disclosed in detail is fully capable of attaining the objects and providing the advantages hereinbefore stated, it is to be understood that it is merely illustrative of the presently preferred embodiments of the invention and that no limitations are intended to the details of construction or design herein shown other than as defined in the appended claims.

I claim:

1. A tubular jacket assembly for detachable assembly about conductors, cabling and the like to provide an effective barrier to electrical fields, said jacket assembly comprising an elongated main body strip of thin flexible thermoplastic material having a pair of interlocking seam-forming plastic tapes secured along the opposite lateral edge portions thereof with one tape spaced inwardly from one edge of said strip to provide a flap wide enough to underlie and bridge said tapes when closed and to overlap with the other lateral edge of said strip, electrical shielding means forming a liner for said tubular jacket assembly formed of fine wire knit mesh having good electrical conductivity, resiliency and readily stretchable within a limited range, said lining having a width and length corresponding generally to the width and length of said main body strip and adapted to have its opposite lateral edges overlapped and in electrical contact throughout their lengths in the closed condition of said jacket assembly, and means securing one lateral edge only of said liner to said free edge portion of said flap leaving the remainder of said liner free of attachment to said main body strip.

2. A tubular jacket assembly as defined in claim 1 characterized in that said liner comprises a plurality of superimposed layers of said knit mesh in intimate contact with one another and mutually cooperating to form a multi-layered effective barrier to the passage therethrough of an electrical flux field.

3. A tubular jacket assembly as defined in claim 2 characterized in the provision of electrically conductive means embracing the free edge of said flap whereby the free lateral edge of said liner may be in good and continuous electrical contact with the conductive means embracing the free edge of said flap.

4. A unitary tubular jacket assembly for detachable assembly about conductors, cabling and objects in need of a protective electrical shield against flux fields, said jacket assembly comprising an elongated main body strip of thin elastic heat-reactive thermoplastic material having

5

a pronounced shrinkage factor upon being heated and equipped with a pair of interlocking seam-forming tapes secured along the opposite lateral edge portions thereof for use in holding said assembly installed about conductors or other object to be shielded, said main body strip being sufficiently wide to be easily installed and thereafter shrunk into a snug fit with the object being shielded, electrical shielding means forming a liner interiorly of said main body strip formed of fine wire knit mesh having good electrical conductivity and resiliency and readily stretchable and contractable within a limited range, said means securing said liner to said main body strip only along one narrow band extending lengthwise of said main body strip thereby leaving the remainder of said liner free to shift, expand and contract independently of said main body strip, and said liner having a width and adequate for its opposite lateral edges to overlap and lie in good electrical contact with one another throughout the length of said assembly in the installed closed condition of said seam-forming means.

5. A tubular jacket assembly as defined in claim 4 characterized in that the shrinkage of said heat-reactive main body strip into taut condition about an object is effective to hold the overlapped lateral edges of said conductive liner in continuous firm contact with one another.

6. A tubular jacket assembly as defined in claim 4 characterized in that said main body strip comprises heat-reactive tetrafluoroethylene polymer having a shrinkage factor circumferentially of said assembly of at least five percent.

7. A tubular jacket assembly as defined in claim 6 characterized in that said liner is secured to said main body strip along one lateral edge portion only thereof.

8. A tubular jacket assembly as defined in claim 7 characterized in that said liner comprises a plurality of layers of mesh in closely compacted relationship to one another.

9. A tubular jacket assembly as defined in claim 4 characterized in that said liner comprises at least one

6

flattened tube of mesh material having a flattened width adequate for the opposite lateral edges overlap to a substantial degree when said seam-forming tapes are assembled.

10. That method of providing cabling with a snug-fitting highly effective protective cover and electrical shield which comprises: providing a seamed jacket of flexible stretchable heat-reactive thermoplastic material sized for convenient slightly loose assembly about the cabling, providing said jacket with a lining of conductive stretchable and contractable knit mesh material secured to said thermoplastic jacket only along a single narrow band extending lengthwise thereof and otherwise unattached to said thermoplastic material, and sufficiently wide that the opposite lateral edges thereof overlap one another when wrapped about cabling, embracing the cabling with said liner and thermoplastic material and closing the seam thereof, heating said assembled jacket to shrink said heat-reactive material into a snug-fit about the cabling, and utilizing the hoop tension present in said shrunk jacket to hold the overlapped edges of said liner in continuous firm electrical contact and firmly pressed against the underlying portion of said cabling.

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