

March 12, 1963

W. A. PLUMMER

3,080,892

WIRE HARNESS HAVING PROVISION FOR BRANCHOUTS

Filed July 1, 1960

2 Sheets-Sheet 1

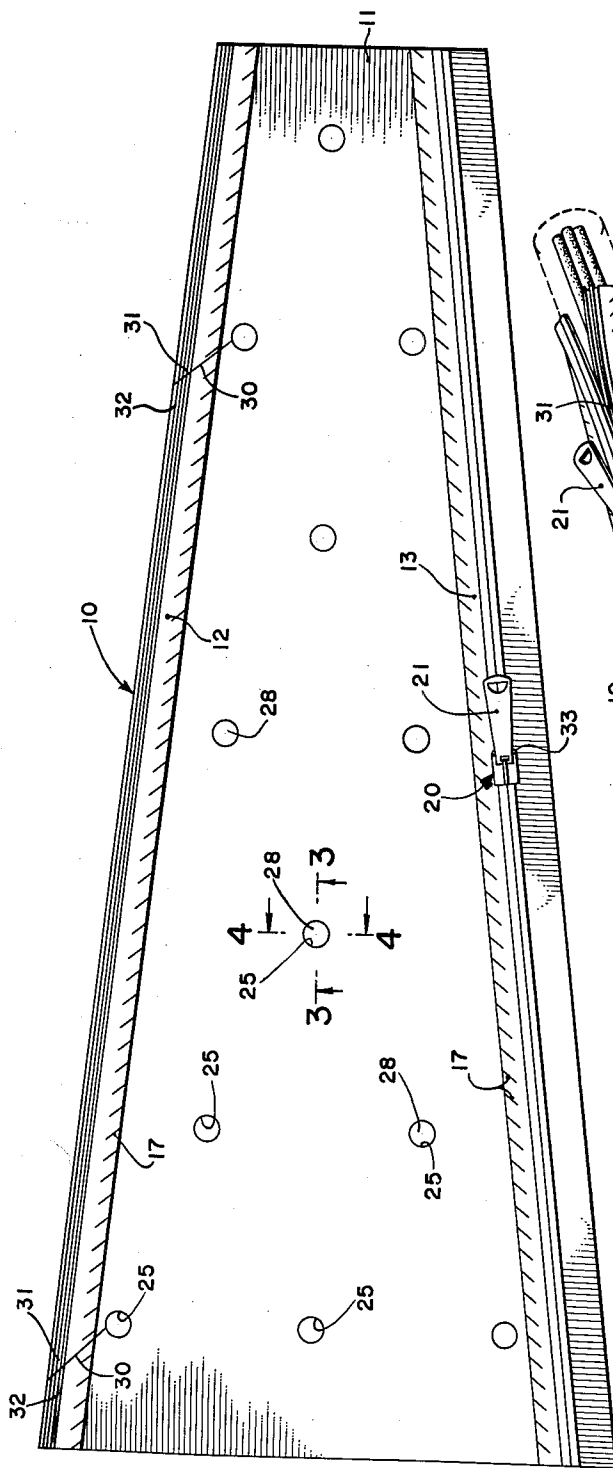


FIG. 1.

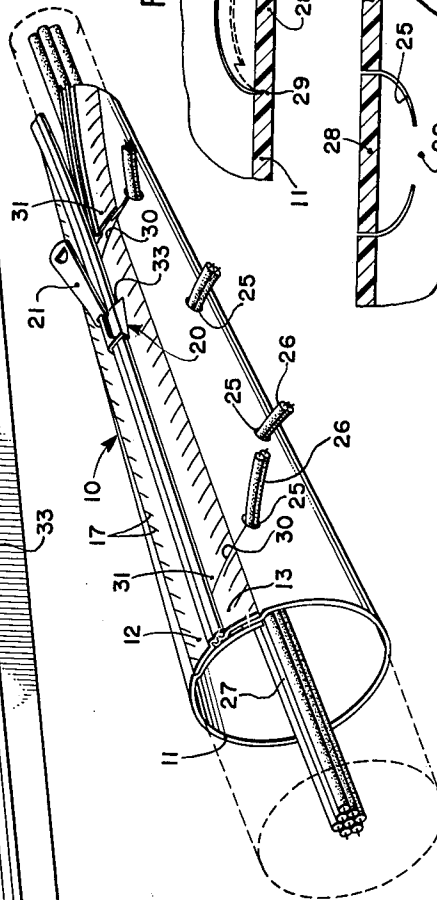


FIG. 2.

FIG. 3.

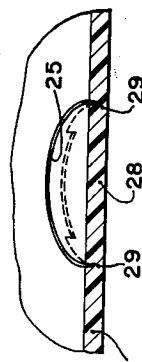


FIG. 4.

INVENTOR.

WALTER A. PLUMMER

BY

W. J. Plummer

ATTORNEY

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W. A. PLUMMER

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2 Sheets-Sheet 2

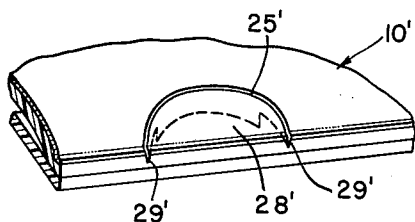


FIG. 8.

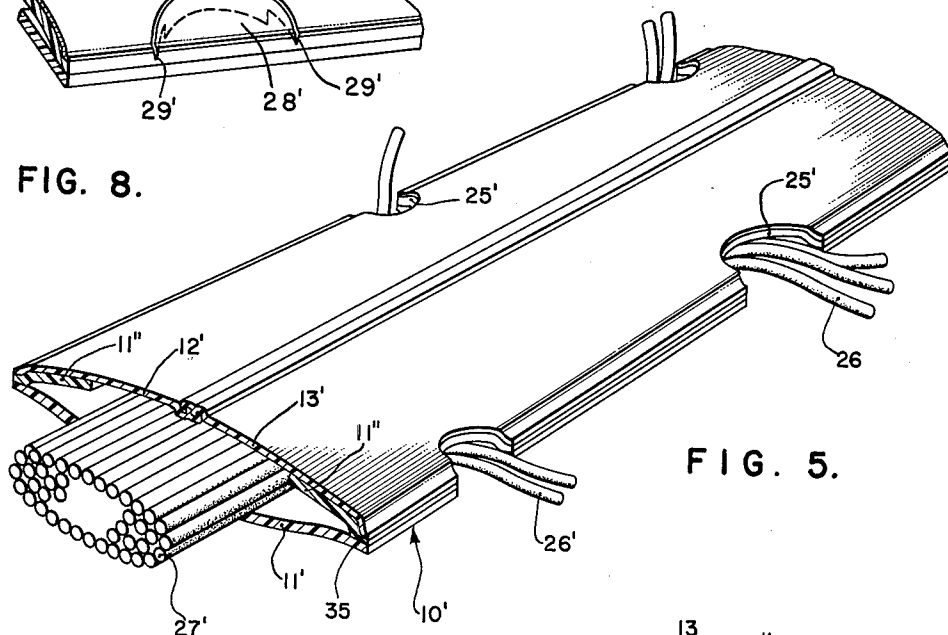


FIG. 5.

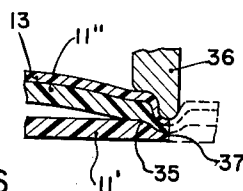


FIG. 6.

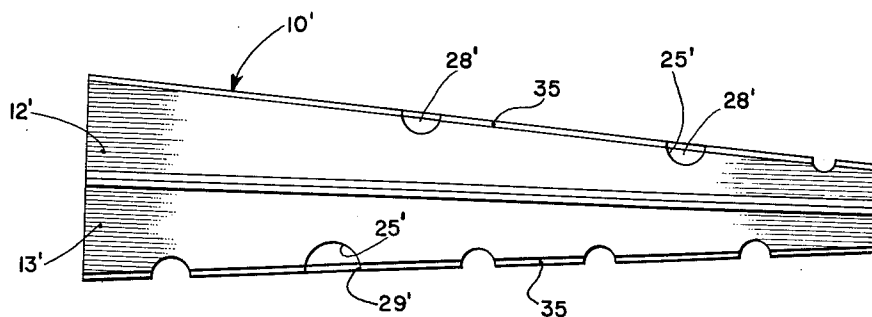


FIG. 7.

INVENTOR.
WALTER A. PLUMMER
BY *W. T. Plummer*
ATTORNEY.

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WIRE HARNESS HAVING PROVISION FOR BRANCHOUTS

Walter A. Plummer, 3546 Crownridge Drive,
Sherman Oaks, Calif.

Filed July 1, 1960, Ser. No. 40,412

9 Claims. (Cl. 138—128)

This invention relates to jacketing for cabling and more particularly to an improved, easily applied, flexible walled jacketing having readily openable and closable longitudinal seam means and characterized by the provision for branchouts from cabling enclosed thereby.

The present invention is a continuation-in-part of applicant's co-pending application for United States Letters Patent, Serial No. 687,398, filed October 1, 1957, entitled Plastic Wire Harness, and now abandoned.

Recent developments in plastic tubing make feasible its use as an easily installed and easily opened and reclosed appearance and protective covering for both wiring and conduits. Such tubing is supplied in disassembled flat condition and it is conveniently assembled about a section of cabling or conduit by wrapping the covering or jacket thereabout and pressing its interfitting seam parts together. One of the shortcomings of such coverings has been the lack of satisfactory provision for assembly about trunking section having lateral branches. In the application of cabling to the internal wiring of electrical equipment, branchouts are commonplace. The lack of provision for such branchouts in plastic jacketing heretofore provided for cabling has discouraged the use of such jacketing in the aforementioned application where it is so urgently desired.

In the usual situation the cross-section of the cabling to be covered decreases as branchouts are formed and it is most desirable that enclosing jacketing therefor be so tailored as to conform to the changing size of the cabling. In some applications it is feasible to install the jacketing as an incident to the installation of the cabling and the forming of the branchouts. In other instances, installation is possible only after the cabling and all branchouts have been formed and connected to their terminal assemblies. Heretofore, the latter situation has presented insurmountable problems as respects the application of a one-piece jacketing construction having slide fastener seam means.

The present invention provides a lightweight, thin-walled, flexible jacketing so designed as to avoid the foregoing disadvantages and limitations of prior jacketing. In each of the several design arrangements, the jacketing is characterized in various respects including its one-piece unitary structure and the provision of a longitudinally extending slide fastener type seam adapted to be repeatedly opened and closed if necessary for servicing, inspection or the addition or removal of wires with respect to the internal cable. The openings for branchouts may be formed as an incident to the manufacture of the cabling or some of these may be formed as knockouts wherein the major portion of the rims are severed from the body of the jacket but with minor portions remaining integral with the main body of the jacket to maintain the opening closed unless and until needed for a branchout. Accordingly, only those knockouts need be removed where actually required to accommodate branchouts from the trunk cabling.

If there are to be a number of branchouts, the jacketing preferably tapers from a large diameter end to a smaller diameter, the taper angle being so selected to provide a snug fit with underlying portions of the cabling and an overall neat appearance in accordance with one of the primary functions of the jacketing. The provision for

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cutouts may be formed entirely inside the marginal edges of the jacket, or may open through the flattened edge of the tubing or may be accessible from the edge by way of a slit. Such a slit or keyhole access opening preferably has its stem inclined acutely to the seamed edge of the jacket and extending across this seam. The acute inclination of the slit provides a pointed end found to facilitate the insertion of the severed edge within the slide device customarily used in closing and opening the seam.

According to one embodiment of the invention the jacketing is formed substantially flat or as having a flattened elliptical contour in cross-section. The flattened opposite edges of this construction are preferably heat sealed together as an aid in maintaining the flattened configuration and to provide desirable reinforcement in the branchout zone. A further important feature of this construction is the location of substantially all branchout openings in one or both of these flattened reinforced edges, the access seam to the jacketing extending longitudinally midway between these flattened edges.

Accordingly, it is a primary object of the present invention to provide a tubular jacket adapted to be readily installed about cabling and featuring novel provision for branchouts from the cabling trunk.

Another object of the invention is the provision of flexible plastic tubing having a slide fastener seam extending longitudinally thereof having a plurality of knockouts distributed over the body thereof individual ones of which can be readily detached to provide an opening for branchouts as desired to accommodate individual and differing cabling installations.

Another object of the invention is the provision of a readily installed jacket for trunk cabling having branchouts therefrom which jacketing tapers to accommodate the decreasing size of the cabling and having provision for branchouts.

Another object of the invention is the provision of a one-piece unitary tubular jacket having a longitudinal seam and a larger cross-section at one end than the other and of generally flattened elliptical contour with provision for branchouts along the opposite flat edges thereof.

Another object of the invention is the provision of an improved tubular jacket for cabling featuring a slide fastener closure seam longitudinally thereof and having keyhole slits for branchouts extending transversely of and at an acute angle with one edge of the jacket.

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

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

FIGURE 1 is an exterior plan view of one preferred embodiment of the tubular jacket prior to being assembled about cabling;

FIGURE 2 is a perspective view on a smaller scale showing the jacket of FIGURE 1 in the process of being closed about trunk cabling having branchouts;

FIGURE 3 and 4 are fragmentary views on enlarged scale taken along lines 3—3 and 4—4, respectively;

FIGURE 5 is a fragmentary perspective view of a modified embodiment of the tubular jacket;

FIGURE 6 is a fragmentary cross-sectional along one lateral edge of the structure shown in FIGURE 5 and illustrating one manner in which the components can be heat fused together;

FIGURE 7 is a top plan view of the jacketing per se according to FIGURE 5; and

FIGURE 8 is a fragmentary cross-section showing details of the knock-out construction employed in the second preferred embodiment.

Referring first to FIGURES 1 to 4, there is shown

one preferred embodiment of tubular jacketing incorporating the features of the present invention. This jacketing designated generally 10 is preferably formed in one unitary assembly and includes a main body 11 formed of suitable flexible electrical insulating material of which the various polyethylene and the vinyl plastics are particularly suitable examples. However, it will be understood that other electrically non-conductive materials may be used for the main body although thermoplastic compositions have many advantages including economic cost, light weight, flexibility, pleasing appearance, impermeability and the ease with which they can be fabricated to other components by heat sealing technique.

Preferably, the main body strip has non-parallel opposite lateral edges to provide a tapering jacket having a larger diameter at one end than at the other to preserve the neatness and tautness of the jacket despite the random branchouts from the main trunk cabling through the several lateral openings in the jacketing to accommodate such branchouts. Heat sealed or otherwise securely connected adjacent the opposite lateral edges of main body 11 are a pair of slide fastener tapes 12 and 13 of a type commercially available on the market and conveniently formed as a homogeneous plastic extrusion. Usually it is desirable in the interest of greater holding power that a seam provided by tapes 12 and 13 exhibit a shore hardness somewhat greater than the shore hardness of the main body 11. This is for the reason that it is desirable that the main body be soft and pliant, a condition consonant with lower shore numbers whereas the interlocking tongues and grooves extending longitudinally along the edges of the slide fastener tapes 12 and 13 are found to have superior holding characteristics when the shore hardness thereof is higher and in the neighborhood of 70 to 95, a preferable value being approximately 90.

As here illustrated, the mounting or web portions of tapes 12 and 13 are preferably provided with short closely spaced slits 17 prior to being fused to body 11 in the manner and for the purposes fully disclosed in my co-pending application for Letters Patent, Serial No. 687,399, filed October 1, 1957, entitled Plastic Tubing Product and Method of Making Same.

The mating of the complementally shaped interlocking tongues and grooves intermesh to provide a high strength, fluid-tight seam adapted to be repeatedly opened and closed by the air of the slide device 20 of a well-known type. Such slider devices are designed to embrace the intermeshing portions of the two tapes. The device is provided with a pull tab 21 having a pivoting sliding connection with an elongated flange of T-shape in cross-section extending lengthwise along the exterior of the slider. As is well known to those skilled in this art, the movement of slide device 20 in one direction lengthwise of tapes 12 and 13 acts to close the tongues and grooves into firm mating relation whereas movement in the opposite direction acts to separate the tongues and grooves and to open the seam.

The main body 11 of the jacket is provided with a plurality of openings 25 through which branchout conductors 26 from the main cable 27 may extend to terminal boards, instrumentation or other parts of equipment being served. Openings 25 may be complete and free of the knockout disc 28. However, certain advantages are to be enjoyed if discs 28 are not completely severed from the jacket body 11 but remain integral therewith through short arcuate connectors 29 (FIGURES 3 and 4) which serve to retain the knockout discs 28 intimately connected to the jacket much in the manner that knockout discs of junction boxes commonly used in the wiring of buildings and in the distribution of power. As herein shown, there are two short arcuate semi-severed connector tabs 29 diametrically disposed on opposite sides of knockout discs 28 and serving to hold each of these discs joined through the body until such time as is desired to remove

them to accommodate branchout wiring from the main cabling.

Certain of the openings 25 located closely adjacent closure tape 12 are aptly known as keyhole openings and will be understood as having slits 30 opening thereinto transversely of seam forming tape 12. Desirably, slits 30 are arranged at an acute angle to the edge of tape 12 in order to provide a pointed end 31 on one side of the slit and an obtuse end 32 on the other side thereof. This arrangement is found to facilitate very appreciably the passage of the seam closing slider device 20 crosswise of slits 30. To this end, slider 20 is assembled to the grooved portions of tapes 12 and 13 in such manner that its larger cross-section advance end 33 faces toward the pointed ends 31. When so arranged and the pull tab 21 is pulled toward pointed ends 31 in the closing of the seam in the manner illustrated in FIGURE 2, it will be recognized that pointed ends 31 serve as a pilot in the guidance of the seam parts into mating junction as the slider is pulled crosswise of the associated slits 30. Should there be any tendency for the slider to catch, it is a simple matter for the operator to grasp the edge of the tape forwardly of pointed end 31 and to feed it into the larger end of the slider as the other hand is employed to pull the slider across slit 30.

It will also be recognized that the keyhole type branchout openings are particularly useful in assembling the jacket about cabling already installed and having the branchouts therefrom already connected to terminal boards or instrumentation. The presence of slits 30 avoids need for disconnecting the conductors or disturbing them in any way as these branchouts are assembled into the keyhole openings of the jacketing following which the seam is closed by slider 20.

Referring now to the second preferred embodiment shown on the second sheet of drawings, the one-piece unitary tubular jacket designated generally 10' differs from the first described embodiment in minor but important respects. In the shown construction, the jacket is of tapered tubular form and of flattened or relatively wide thin elliptical shape in cross-section. The jacket tends to retain this configuration in use due to the mode of manufacture now to be described.

Jacket 10' has a main body formed from a flat sheet of flexible plastic material 11'. Pairs of strips 11'' of the same material are heat fused to the web portions of a pair of slide fastener tapes 12', 13' of the same general form described above in connection with the first embodiment. The mating grooved edges of tapes 12', 13' are pressed together and this assembly is then laid flat against the backing strip 11'. The outer lateral edges of the parts are firmly joined together either by suitable adhesive or preferably by heat fusion to form a relatively heavy-duty seam 35 along either lateral edge of the parts. As here shown, seams 35 are inclined to one another and to the longitudinal axis of the jacket. However, it is to be understood that seams 35 may be parallel to one another if desired and this is particularly true if the jacket is to be used about a portion of cabling having very few or very small branchouts. Where larger branchouts are being accommodated, it is desirable to employ the tapered construction to the end that the jacket may fit the varying cross-section of the cable.

One convenient mode of forming seam 35 is best illustrated in FIGURE 6. The parts are placed together in a high frequency electrical welding machine of known construction with backing strip 11' lowermost and lying against a flat lower electrode. The overlying welding electrode 36 having a long lower edge contoured as shown is then pressed downwardly against the parts and parallel to the lower electrode (not shown) pressing them together under pressure while heating the contacting surfaces of layers 11', 11'' to the point of fusion. Owing to the contour of upper electrode 36, the layers are partially pinched apart by the narrow downwardly projecting rib

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of the electrode. After fusion of the parts takes place, the upper electrode is withdrawn and the parts are removed. Thereafter, the salvage is trimmed away along the vertical line 37 by a suitable shear to provide the finished product illustrated.

The next step comprises providing openings for branchouts 26' from main trunk cabling 27'. This is done by forming suitably shaped knockouts along the reinforced lateral edges of the jacket. As here shown, knockouts 28' are semi-circular in shape with their straight edge lying flush with adjacent lateral edge of the jacket. These are distributed along the jacket at locations desired for branchouts and are preferably formed similarly to that described above in connection with the knockouts 23 of the first embodiment. That is to say, the major portion of the line of separation 25' between the knockouts 28' and the body of the jacket is severed while leaving a pair of short arcuate tabs 29' integral with the body of the jacket. Preferably connecting tabs 29' lie along seam 35 though they may be located at other points along the rim of the knockout if so desired. Removal of the knockouts is a simple matter and accomplished by severing tabs 29' by the aid of a pair of shears or a knifeblade.

It is also pointed out that the second preferred embodiment may be manufactured without knockouts and that provision for branchouts may be made in the field and at the particular points along the jacketing at which branchouts are desired using a punch to blank out branchout openings 25'. It will also be understood that either tape 12' or 13' may be provided with an inclined slit similar to slit 30 described above and having the same purposes and advantages.

As is clearly evident from FIGURE 5, the described plastic jacketing provides an unusually neat protective enclosure for cabling and is particularly suitable for use with smaller diameter conductors. The flattened tubular or relatively wide thin elliptical configuration of the jacket tends to flatten the cabling so as to lie flush against the back wall of a panel box and to spread the conductors for convenience in fanning them out to branchouts through either lateral edge of the jacketing. Furthermore, the seam provided by the grooved tapes 12', 13' is conveniently disposed along one face of the jacket and between the oppositely directed branchouts.

While the particular wire harness having provision for branchouts 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. An elongated one-piece generally tubular enclosure for cabling having a plurality of closely spaced branchouts of relatively small size in comparison with the size of the cabling as a whole, said enclosure comprising an envelope of heat-fusible substantially homogeneous insulating material preformed along its lateral edges to exhibit normally a relatively wide thin elliptical shape in cross section with the opposed walls normally lying close to one another, said elliptically shaped enclosure having openings spaced along at least one lateral edge thereof of a size readily accommodating the insulation-covered wires of individual branchouts from the main body of cabling adapted to be encased by said enclosure.

2. A tubular enclosure as defined in claim 1 characterized in the provision of readily openable and reclosable seam means extending longitudinally thereof and spaced between the spaced apart lateral edges thereof.

3. A tubular enclosure as defined in claim 1 characterized in that said flattened opposite edges converge toward one another lengthwise of said enclosure and at a rate such that the cross-section of the enclosure decreases

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generally with the number of cabling conductors remaining to be enclosed.

4. A tubular enclosure as defined in claim 3 characterized in that both of the flattened lateral edges thereof have openings formed therethrough to accommodate branchouts from cabling to be encased by said tubular enclosure.

5. An elongated tubular jacket of thermoplastic material comprising a unitary generally tubular tapering casing, said jacket having its side walls along its opposite lateral edges flattened and heat fused together to provide a jacket which tends to remain flat, seam means extending lengthwise and between said flattened edges adapted to be opened and reclosed, and at least one opening along said flattened edges through which branchout wires from cabling enclosed by said jacket may project.

6. A tubular jacket as defined in claim 5 characterized in the provision of a plurality of branchout openings along either flattened edge of said jacket.

7. A tubular jacket as defined in claim 6 characterized in that said seam means comprises continuous complementally shaped tongue and groove means shaped to interlock with one another when pressed together under pressure.

8. An elongated tubular jacket of thin-walled, flexible, pliant material for assembly about a length of cabling having branchouts therealong, said jacket having a readily openable and reclosable seam of pliant material extending lengthwise from end-to-end thereof, incomplete knockouts distributed along said jacket which knockouts are removable to provide an opening through the wall of the jacket for a branchout from cabling therewithin, said knockouts being partially severed from the adjacent wall portions of the jacket and partially integral therewith, the opposite sides of said tubular jacket being flattened and fuse-creased in this condition, and at least certain of said knockouts being located along and opening into said fused creases whereby to provide openings for cabling branchouts when selected ones of said knockouts are detached from said jacket.

9. An elongated tubular jacket of thin-walled, flexible, pliant material for assembly about a length of cabling having branchouts therealong, said jacket having a readily openable and reclosable seam of pliant material extending lengthwise from end-to-end thereof, incomplete knockouts distributed along said jacket which knockouts are removable to provide openings through the wall of the jacket for branchouts from cabling therewithin, said knockouts being partially severed from the adjacent wall portions of the jacket and partially integral therewith, an access slit opening into the rim edge of certain of said knockout openings and extending across the adjacent seam-forming edge of said jacket at an acute angle to the length of said seam and permitting branchout wiring to be assembled into the opening upon the detachment of the knockout therefrom while the jacket seam is open, said seam including a slider device embracing mated portions of said seam and being shaped to open and to close said seam depending on the direction in which the same is pulled lengthwise of the seam, and said acute-angled slit providing a pointed end in an adjacent portion of said seam which pointed end facilitates guidance of said slider device thereover during closing of the jacket seam.

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