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E. F. SVEC

2,941,027

METHOD AND MEANS FOR PROTECTIVELY ENCASING WIRES

Filed Sept. 10, 1957

Fig. 1

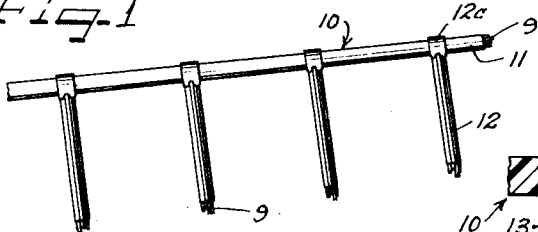


Fig. 2

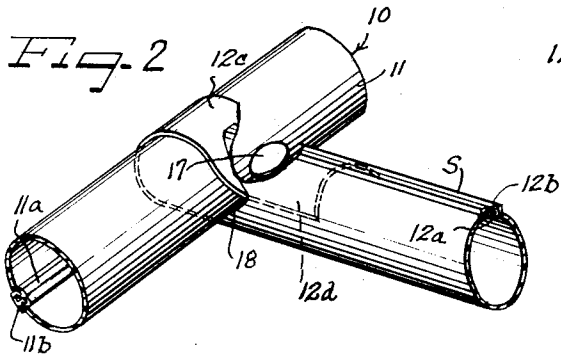


Fig. 3

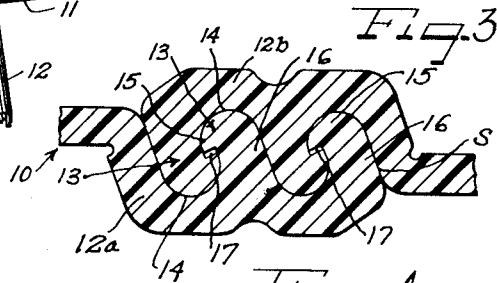


Fig. 4

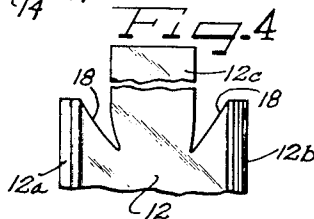


Fig. 5

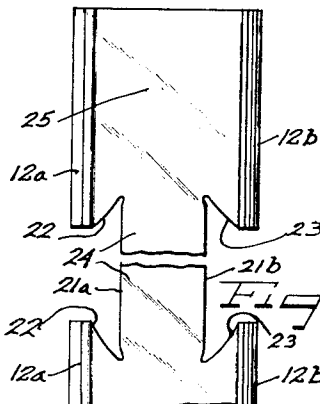
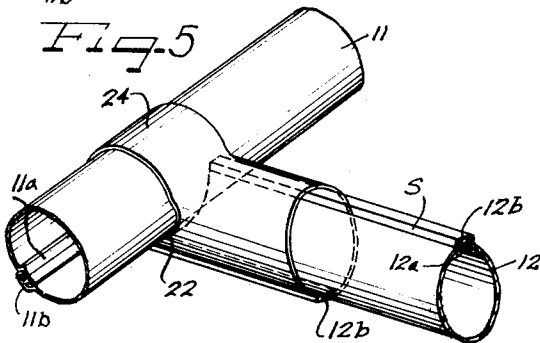


Fig. 7

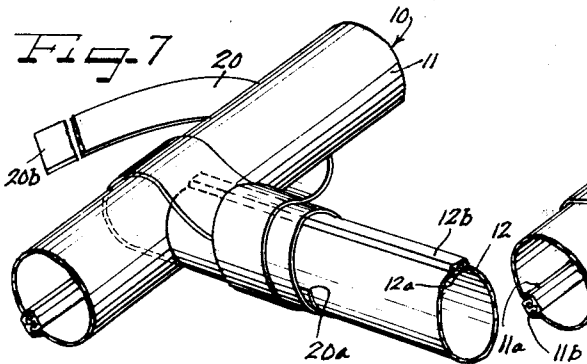
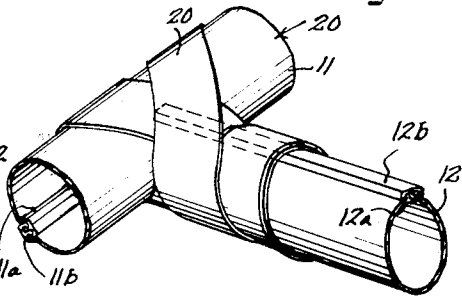


Fig. 8



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2,941,027

METHOD AND MEANS FOR PROTECTIVELY ENCASING WIRES

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20 Claims. (Cl. 174-72)

This invention relates generally to branched tubular structures and methods of protectively encasing a series of electrical wires and the like.

More particularly, the present invention relates to articles in the form of flexible strips of extended length having inter-engageable edge portions for forming branch and trunk tubes for enclosing and covering the wires, and means for joining the branch and trunk tubes in assembly together.

It has previously been proposed, as in the Kidd patent, No. 2,756,172 that a strip of flexible plastic material having ribbed and grooved edge portions be matingly engaged to provide a covering for pipe and the like. More recently it has also been proposed in the applicant's copending application entitled "Tube Forming Article and Tube Structure Formed Therefrom," Serial No. 659,886, filed May 17, 1957, that a tube having inter-engageable edge portions be provided with angularly related hook-like ribs and complementary shaped grooves to increase the resistance to separation of the mated edge portions.

The present invention involves both a method and structure for protectively encasing electrical wire and the like. The method deals with the step of encasing the wires, which include the steps of connecting the branch and trunk tubes. The present invention further concerns a branched tubular structure comprised of thin plastic strips formed into branch and trunk tubes and novel means for connecting the branch and trunk tubes.

It is therefore an important object of this invention to provide a branched tubular structure with at least one of the trunk and branch tubes comprised of strips of flexible plastic material having inter-engageable edge portions for forming a strip into a tube and with the branch tube having an extension to be wrapped around the trunk tube and secured to the assembly.

It is a further important object of this invention to provide a method of protectively encasing a series of electrical wires and the like, including the steps of encasing the wires by enveloping a trunk tube about the wires, notching the trunk tube, angularly turning the wires with respect to the trunk tube through the notches, protectively encasing the wires extending exteriorly of the trunk tube by interlocking the edges of the flexible plastic strip to form a branch tube, and wrapping a branch tube extension around the trunk tube in such manner as to secure the extension in place, thereby protectively encasing the wire.

Still another object of the present invention is to provide an effective method and means for protectively encasing electrical wire and the like.

Yet another object of this invention is to provide a low cost, relatively simple to install branched tubular structure for protectively encasing electrical wire and the like.

Other and further important objects of this invention will become apparent from the following detailed description and the appended claims, and from the accom-

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panying drawing illustrating several embodiments of this invention, and in which:

Figure 1 is a fragmentary elevation of a branched tubular structure;

Figure 2 is an enlarged fragmentary perspective view of a portion of the branched tubular structure shown in Figure 1;

Figure 3 is an enlarged fragmentary cross-sectional view showing the manner in which edges of the tubular strips appearing in the other figures may be engaged in the assembly;

Figure 4 is a fragmentary enlarged plan view illustrating the manner in which the branch tube strip of Figure 2 is formed so as to provide an extension;

Figure 5 is an enlarged fragmentary view similar to Figure 2, only illustrating a modified form of my invention;

Figure 6 is an enlarged fragmentary plan view of the branch tube shown in Figure 5;

Figure 7 is an enlarged fragmentary perspective view similar to Figures 2 and 5, only illustrating a modified form of the invention with the branch and trunk tubes shown in a preliminary stage of assembly; and

Figure 8 is an enlarged fragmentary perspective view of the structure shown in Figure 7, with the branch and trunk tubes shown in a final state of assembly.

The reference numeral 9 indicates generally a series of electrical wires or tubes which are encased by my branched tubular structure 10 which is comprised of a trunk tube 11 and a series of branch tubes 12, which tubes may be of the same or any suitable diameter. As illustrated the trunk and the branch tubes are all comprised of strips of thin flexible plastic material, suitably formed from a plastic, such as a vinyl polymer or copolymer, as for instance, polyvinyl chloride, or from polyethylene, or other substantially water- and moisture-proof plastic material having high dielectric strength and suitable strength against being torn or ruptured despite its relative thinness.

The trunk and branch tubes may be provided with parallel, longitudinally extending edges 11a, 11b, 12a, and 12b, which may be of the same material as the bodies of the strips and which are preferably integrally formed therewith by extrusion either as a flat or tubular strip of indefinite extended length. If extruded as a tube initially, the tube is severed between the thickened edge portions to permit it to be flattened out.

According to the principles of the present invention, the trunk tube may optionally be comprised of a strip of material having its edges interlocked in assembly. As illustrated in Figure 3, where an enlarged sectional view of the inter-engaged edges 12a and 12b is shown, the inter-engaged edges or edge portions may be of an interlocking type of construction similar to that shown in the Madsen patent, No. 2,637,085, or more specifically like that in my aforementioned copending application.

In this case, the edge portions 12a and 12b are each provided with an alternating series of hook-like extensions 13 and hook-like or complementally shaped grooves 14. The median planes of the hook-like ribs and grooves are sloped at an angle less than a right angle to the plane of the strip so as to increase the resistance to separation of the matingly engaged edge portions when oppositely acting forces are applied to the strip either during the wrapping operation to place the strip in tubular form or after the tube has been formed.

The closure strips 12a and 12b are identical in cross section but offset in opposite directions from the plane of the strip 10 and adapted to confront each other when overlapped. Since the closure strips 12a and 12b are otherwise identical, only one need be described. The closure strip is provided with alternating, adjacent ribs

13 and grooves 14 that extend continuously along the edge portion thereof. Two such ribs and two such grooves are shown, although a greater number of grooves and ribs can be used if desired. The ribs are complementally formed and the ribs are provided with enlarged head portions 15 and restrictive neck portions 16, between which are formed edges 17 that impart to the ribs a hook-like contour. When the closure strips 12a and 12b are matingly inter-engaged, the edges 17 of the adjacent ribs 14 are in opposed relationship to resist separation of the edges 12a and 12b.

Closure of the tube to form a seam S can be effected manually by incrementally pressing together successive portions of the confronting closure strips of the edge portions 12a and 12b. While a slider could be used for the purpose it is preferable not to use a slider, since then the seam S can be substantially water-and-moisture-tight throughout its extent, whereas this is not generally possible when a slider is used. Where the tubes are made of a thermal plastic material, the seam S can be permanently closed by heat sealing the edge strips 12a and 12b together along their contact surfaces. As illustrated, the trunk tube 11 is also provided with identical closure strips 11a and 11b of the type shown in Figure 3.

In order to protectively encase bundles of wires, conduits, small diameter tubes, or for other covering or enclosing purposes, the trunk tube is preferably notched at 17 providing openings or open areas along the length thereof at a selected number of intervals corresponding to the number of branch tubes 12 required.

According to principles of the present invention, the branch tubes 12 may be provided with particularly constructed integral extensions 12c, which are of a length sufficient for the extension to be wrapped around the trunk tube 11 and so that the extension may be attached to secure the branch and trunk tubes 11 and 12 in assembly together. As is illustrated in Fig. 2, one end of the branch tube is notched axially of the branch tube in an axial direction providing the tube with a notched area 18. The notched area 18 includes generally V-shaped connected edge portions disposed on opposite sides of the opening 17 for close cooperation with the trunk tube 11 and so that the branch tube is in axial alignment with the trunk tube notch or opening or open area 17.

In assembling the trunk and branch tubes 11 and 12, the wires 9 may be initially telescoped into the tube 11 after the trunk tube 11 has been formed to shape. As is illustrated, the trunk tube 11 may be formed to shape by pressing together the edges 11a and 11b thereby interlocking the edges in assembly. As the wires are strung through the trunk tube 11 certain of the wires are angularly turned with respect to the trunk tube and are extended laterally outwardly through the notches 17. In order to facilitate threading of the wires, the branch tubes 12 may be offset slightly downstream with respect to the notches 17 as is shown in Figure 2. The branch tubes 12 may be pre-assembled to enable the branch tube to be longitudinally moved into overlying relation with respect to the wires so that the notched area 18 is engaged against the trunk tube 11 at the notch 17. On the other hand, the branch tube may be assembled on the job merely by wrapping the strip of material about the tube and interengaging the hooks 13 with the grooves 14 to thereby form the branch tube. In any case, the extension 12c may be wrapped around the tubular trunk tube with a terminal end 12d of the extension 12c overlapped and telescoped into the tube 11 to thereby secure the branch tube 12 in assembly with the trunk tube 11 (Figure 2).

As another alternative, and as is illustrated in Figures 7 and 8, the terminal 12d may be engaged against the external peripheral surface of the branch tube 12 and suitably secured in place by such means as a piece of adhesive material or tape 20 wrapped around the branch

and the trunk tubes to provide a moisture proof type seal between the tubes. As is illustrated in Figures 7 and 8, one end of the tape at 20a is secured to the branch tube 12 and wrapped one or more times therearound, whereupon the tape is wrapped in a criss-cross manner over the trunk tube 11 and the opposite terminal end 20b of the tape is then wrapped around the branch tube 12 and adhesively secured in place in assembly therewith.

Illustrated in Figures 5 and 6 is still another form of my invention wherein the branch strip is intermediately notched at 21a and 21b, which notches in the illustrated form cut across the edges 12a and 12b and are each provided with pairs of diverging notch edges 22, 22 and 23, 23 thereby providing the branch strip with an intermediate portion or extension 24 which has a reduced width as compared with the remainder of the strip (Fig. 6). The extension 24 is made of sufficient length so that it is capable of extending a predetermined distance about the trunk tube 11, as is illustrated in Figure 5, in such manner that terminal end portion 25 of the branch strip may then be enveloped about the outer periphery of the tubular branch tube 12 with the edges 12a and 12b inter-engaged as is shown at 12b in Figure 5 to complete the assembly of the trunk and branch tubes 11 and 12. The edges 12a and 12b shown in Figures 5 and 6 may be formed in any suitable manner such as is shown in Figure 3.

If desired, the terminal portion 25 may have its edges 12a and 12b interlocked over the wires, the extension 24 then may be wrapped about the trunk tube 11, and finally the main portion of the branch tube may have its edges interlocked so that the tubular terminal portion 25 is enclosed thereby.

With respect to the modification shown in Figures 5 and 6 the extension 24 may also comprise an intermediate portion or extension along either of the strip edges 12a or 12b so long as there is provided a suitable branch tube extension to be wrapped around the trunk tube and secured to the assembly.

In all forms of my invention, regardless whether the trunk tube is formed from a single strip of material in the manner illustrated, or is extruded or is formed in some other way of any suitable material, the trunk tube 11 is adapted to be notched at 18 along the length of the tube at any suitable location and the branch tubes 12 are adapted to radiate from the trunk tube at any suitable angle with any suitable spacing therebetween along the length of the trunk tube. In assembly of the trunk and branch tubes, in all forms of my invention, the branch tube is provided with an extension which is adapted to be wrapped about the trunk tube generally at the location of the notch in the trunk tube. The wires may be threaded through the tubes in any suitable manner and the branch tube edges 12a and 12b may be engaged together to encompass the branch wires with the branch tube extension suitably secured in place to maintain the trunk and branch tubes in assembly.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

What is claimed is:

1. A method of protectively encasing a series of electrical wires and the like, the steps of encasing the wires by enveloping a trunk tube about the wires, cutting the trunk tube at selective intervals along the length of the trunk tube providing a series of branch line outlet openings, angularly turning the wires with respect to the trunk tube at selective intervals along the length of the trunk line through the branch outlets, protectively encasing the wires extending exteriorly of the trunk tube at each of the outlet openings with a strip of material by interlocking the edges of the strip forming a branch tube about the portion of the wires extending outwardly through the opening, and wrapping a branch tube extension about the

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trunk tube and securing the extension in place thereby protectively encasing the wire and assembling the branch and the trunk tubes together.

2. In a method of protectively encasing a series of electrical wires and the like, the steps of encasing the wires by enveloping a trunk tube about the wires, providing the trunk tube along its length with at least one branch line outlet opening, angularly turning the wires with respect to the trunk tube through the branch outlet opening, protectively encasing the branch wires with a strip of material by interlocking the edges of the strip forming a branch tube about the branch wires, and wrapping a branch tube extension about the trunk tube and securing the extension in place thereby protectively encasing the wires and assembling the branch and the trunk tubes together.

3. The method of claim 2 further characterized by securing the extension in place after wrapping the extension about the trunk line by enveloping the branch tube adjacent the junction of the tube by wrapping portions of the extension about the branch tube and securing the portions together.

4. The method of claim 2 further characterized by telescoping the terminal of the branch tube extension internally into the branch tube after wrapping the extension about the branch line.

5. The method of claim 4 further characterized by wrapping and adhesively securing a piece of tape about the branch and trunk lines protectively sealing the joint between branch and trunk lines.

6. A branched tubular structure for protectively encasing wires and the like comprising trunk and branch tubes with the branch tubes formed from separate pieces of initially flat, elongated, thin, flexible plastic sheet having integral closure strips extending along the edges thereof and adapted when the sheet is in tubular form to be matingly engaged to form a closed seam, said closure strips having a plurality of ribs and grooves for engagement with one another, said trunk tube having a selected number of open areas along the length thereof with one of said branch tubes being axially aligned with each of said open areas, and means including an extension integral with said branch tube extending longitudinally thereof and wrapped about said trunk tube with said means securing said branch and trunk tubes in unitary assembly together.

7. The branched tubular structure of claim 6 further characterized by said extension being looped around said trunk tube with a terminal end telescoped into the branch tube into underlapping engagement therewith.

8. The branched tubular structure of claim 6 further characterized by said extension not only being wrapped about said trunk tube but also being wrapped around said branch tube and having integral closure strips extending along edges thereof adapted to be matingly engaged to form a closed seam.

9. The branched tubular structure of claim 8 further characterized by said closure strips on said extension having a plurality of ribs and grooves for locking engagement with one another.

10. The branched tubular structure of claim 6 further characterized by said means including adhesive tape wrapped about said branch tubes securing said extension in unitary assembly therewith.

11. The branched tubular structure of claim 6 further characterized by said means including adhesive tape wrapped about both said trunk and said branch tubes securing said extension in unitary assembly therewith.

12. A branched tubular structure for protectively encasing wires and the like comprising trunk and branch tubes with the branch tubes formed from separate pieces of flexible plastic sheet having integral closure strips extending along the edges thereof and adapted when the sheet is in tubular form to be matingly engaged to form a closed seam, said closure strips having a plurality of ribs

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and grooves for engagement with one another, said trunk tube having a selected number of open areas along the length thereof with one of said branch tubes being aligned with each of said open areas, the branch tubes being notched in an axial direction providing them with notched areas for nesting cooperation and engagement with the main tube, and means between each of said branch tubes and said trunk tube for maintaining them in assembly together and with said open areas in longitudinal alignment with said branch tubes and with the notched areas on the branch tubes being thereby secured in nested engagement with the main tube.

13. A branched tubular structure for protectively encasing wires and the like comprising a trunk and branch tubes, said trunk tube having a selective number of open areas along the length thereof with one of said branch tubes being in axial alignment with each of said open areas, and means securing said branch and trunk tubes in unitary assembly together including thin, flexible, plastic sheet having integral closure strips extending continuously along edges of the strip and adapted to be matingly engaged to form a closed seam, said closure strips having complementary rib and groove means for mated locking engagement to maintain said branch and trunk tubes in assembly together.

14. A branched tubular structure for protectively encasing wires and the like comprising trunk and branch tubes comprised of plastic material, said trunk tube having a selected number of open areas along the length thereof with one of said branch tubes being axially aligned with each of said open areas, and means including an extension integral with said branch tube extending longitudinally thereof and wrapped about said trunk tube with said means securing said branch and trunk tubes in unitary assembly together.

15. A branched tubular structure for protectively encasing wires and the like comprising trunk and branch tubes comprised of plastic material, said trunk tube having a selected number of open areas along the length thereof with one of said branch tubes being axially aligned with each of said open areas, and means including an extension integral with said branch tube extending longitudinally thereof and wrapped about said trunk tube with said means securing said branch and trunk tubes in unitary assembly together, said extension being looped around said trunk tube with a terminal end telescoped into the branch tube into underlapping engagement therewith.

16. A branched tubular structure for protectively encasing wires and the like comprising trunk and branch tubes comprised of plastic material, said trunk tube having a selected number of open areas along the length thereof with one of said branch tubes being axially aligned with each of said open areas, and means including an extension integral with said branch tube extending longitudinally thereof and wrapped about said trunk tube with said means securing said branch and trunk tubes in unitary assembly together, said extension not only being wrapped about said trunk tube but also being wrapped around said branch tube and having integral closure strips extending along edges thereof adapted to be matingly engaged to form a closed seam.

17. A branched tubular structure for protectively encasing wires and the like comprising trunk and branch tubes comprised of plastic material, said trunk tube having a selected number of open areas along the length thereof with one of said branch tubes being axially aligned with each of said open areas, and means including an extension integral with said branch tube extending longitudinally thereof and wrapped about said trunk tube with said means securing said branch and trunk tubes in unitary assembly together, said extension not only being wrapped about said trunk tube but also being wrapped around said branch tube and having integral closure strips extending along edges thereof adapted

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to be matingly engaged to form a closed seam, said closure strips on said extension having a plurality of ribs and grooves for locking engagement with one another.

18. A branched tubular structure for protectively encasing wires and the like comprising trunk and branch tubes comprised of plastic material, said trunk tube having a selected number of open areas along the length thereof with one of said branch tubes being axially aligned with each of said open areas, and means including an extension integral with said branch tube extending longitudinally thereof and wrapped about said trunk tube with said means securing said branch and trunk tubes in unitary assembly together, said means including adhesive tape wrapped about said branch tubes securing said extension in unitary assembly therewith.

19. A branched tubular structure for protectively encasing wires and the like comprising trunk and branch tubes comprised of plastic material, said trunk tube having a selected number of open areas along the length thereof with one of said branch tubes being axially aligned with each of said open areas, and means including an extension integral with said branch tube extending longitudinally thereof and wrapped about said trunk tube with said means securing said branch and trunk tubes in unitary assembly together, said means including adhesive

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tape wrapped about both said trunk and said branch tubes securing said extension in unitary assembly therewith.

20. In a method of forming a branched tubular structure for protectively encasing electrical wires and the like and of assembling the structure with said wires, the steps of locking edges of a strip of material together over the wires to form a trunk tube, providing the trunk tube along its length with at least one branch line outlet opening and extending at least one of the wires through the opening, locking the edges together of a second strip of material to enclose the wire and to form a tubular branch line, centering the tubular branch line with the opening, wrapping an extension of the tubular branch line about the tubular trunk line, and securing the extension in place thereby assembling the branch and the trunk tubes together.

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