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[73] Assignee **Flexigrip, Inc.**

[56]

References Cited

UNITED STATES PATENTS

1,693,428	11/1928	Atteberry et al.	138/165
2,388,297	11/1945	Slaughter	138/158
3,380,481	4/1968	Kraus	138/166
3,455,336	7/1969	Ellis	138/156

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[54] **ZIPPER TUBING**
8 Claims, 13 Drawing Figs.

[52] U.S. Cl. 138/156,
138/166
[51] Int. Cl. F16I 11/12
[50] Field of Search. 174/107;
138/102, 128, 156—158, 163—168

ABSTRACT: A continuous thin plastic film tube for containing wires or the like, open along one side with continuous elongate hook at each of the edges of the opening and an elongate closure strip with resilient jaws for engaging the hooks.

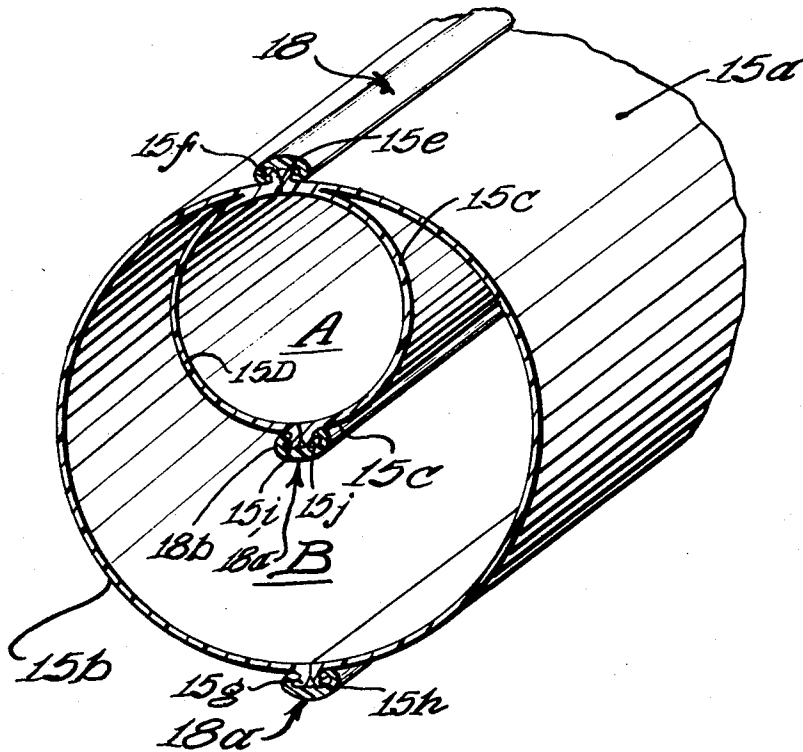


Fig. 1

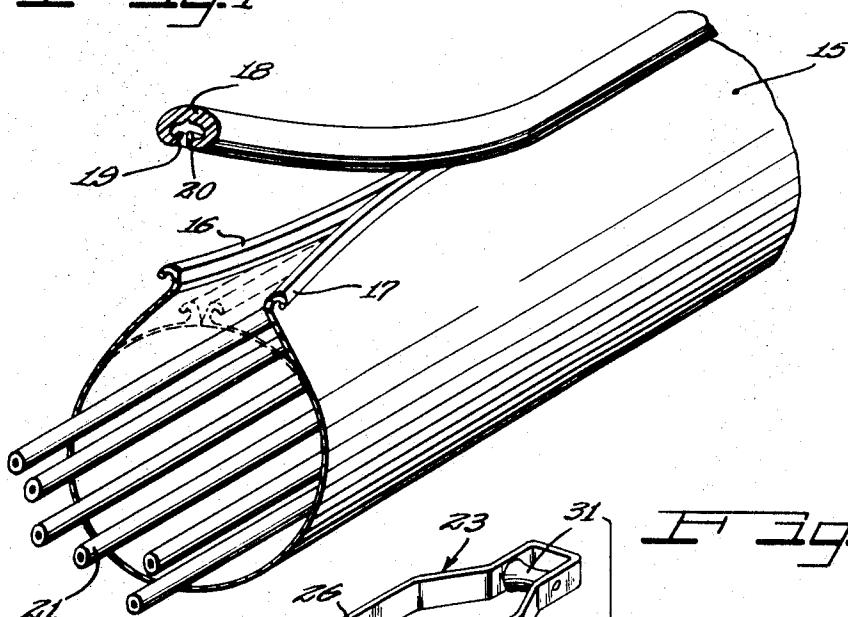


Fig. 3

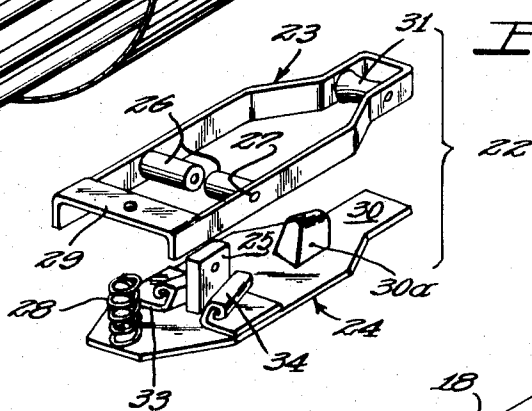
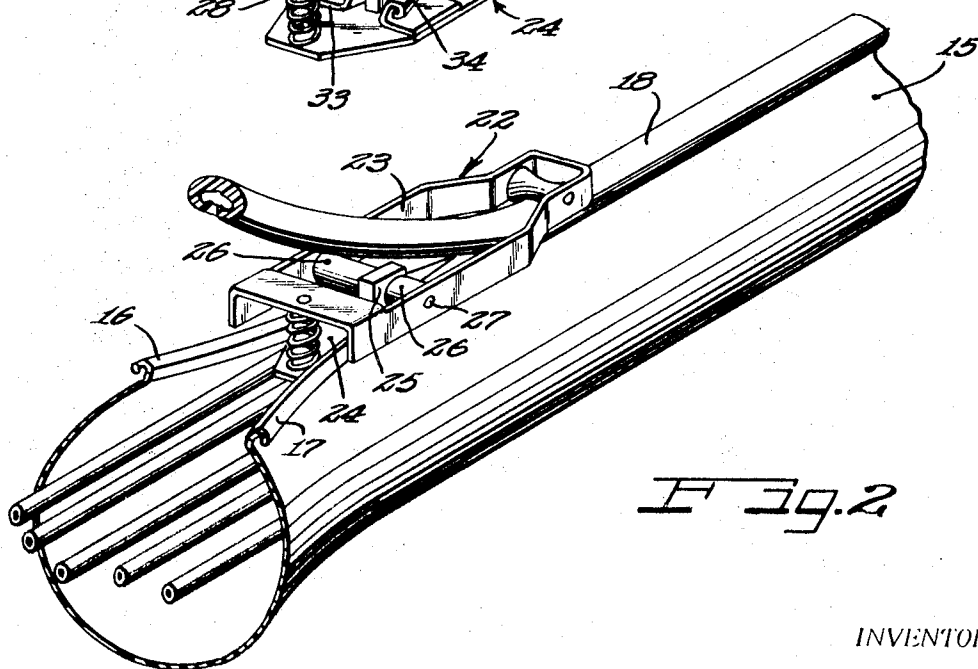


Fig. 2

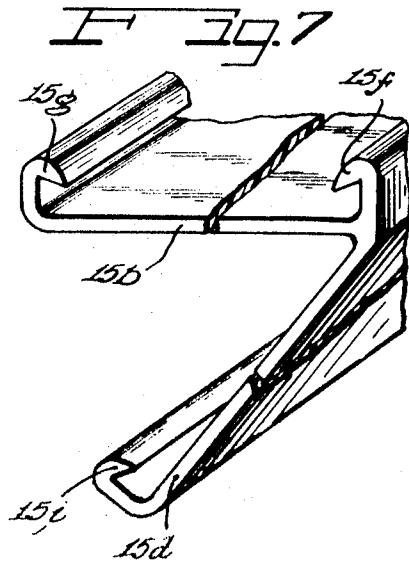
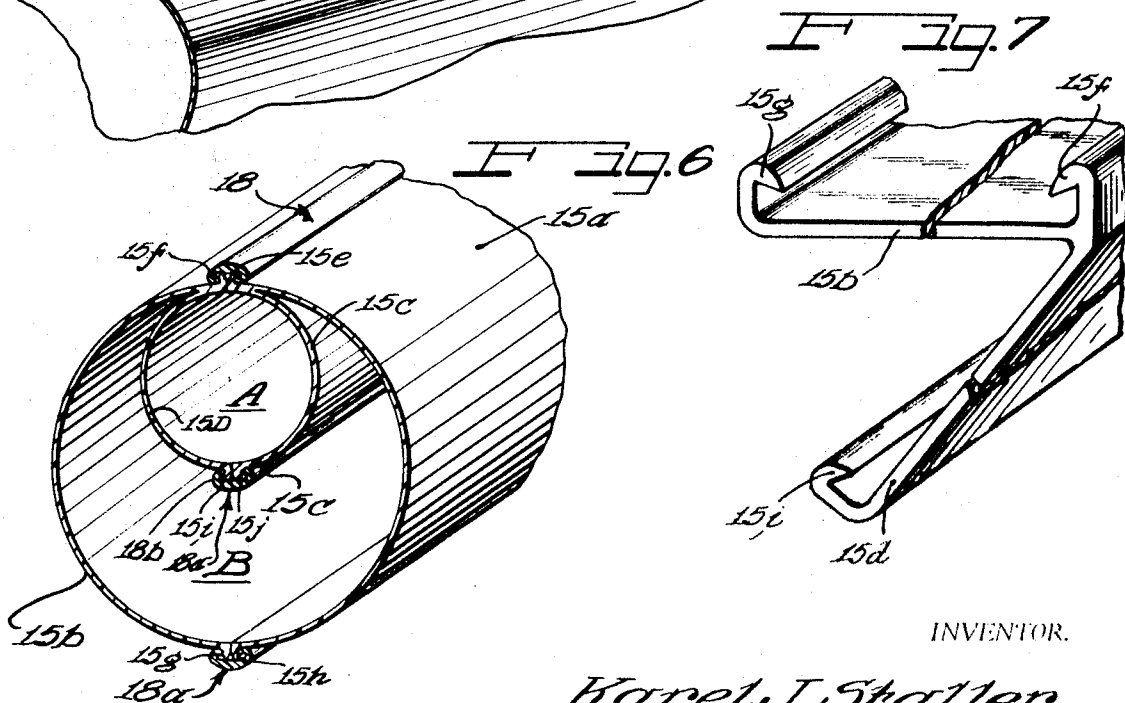
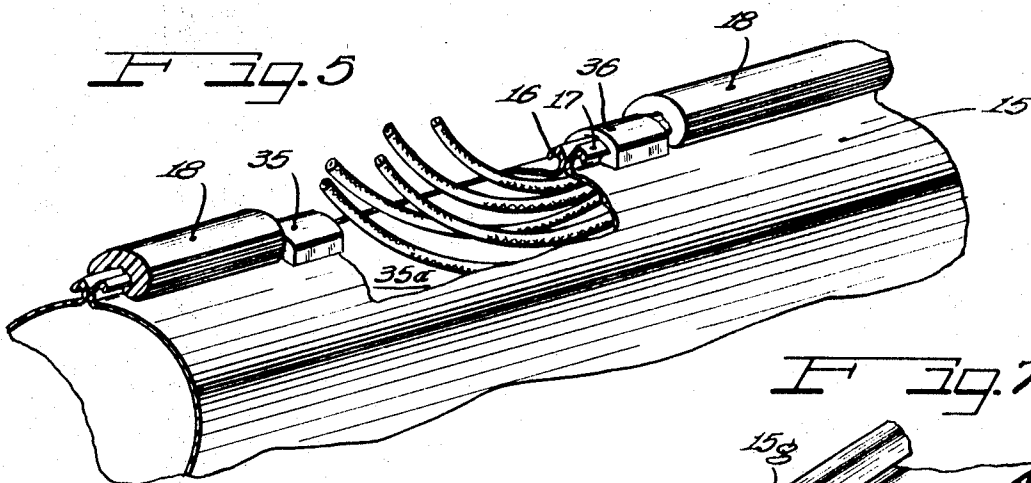
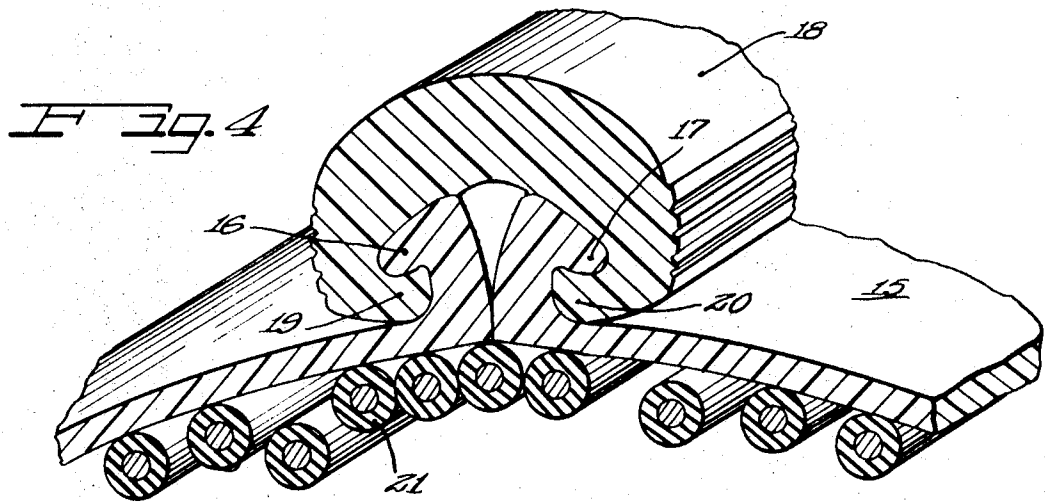


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Fig. 8

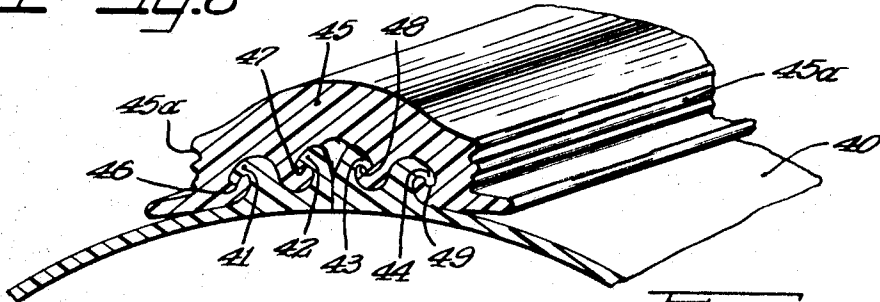


Fig. 9

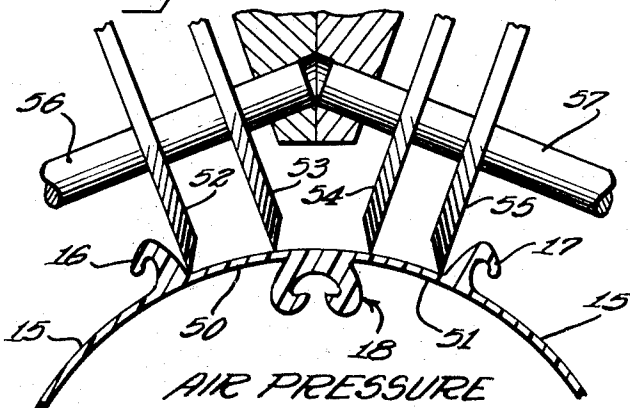


Fig. 10

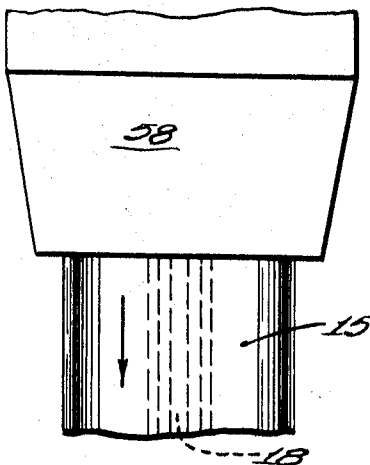


Fig. 11

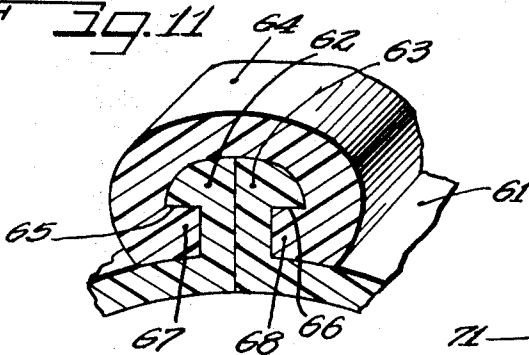


Fig. 12

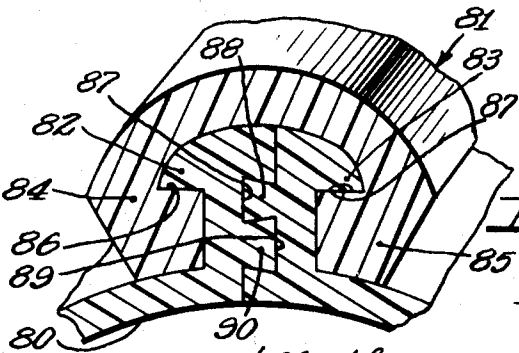
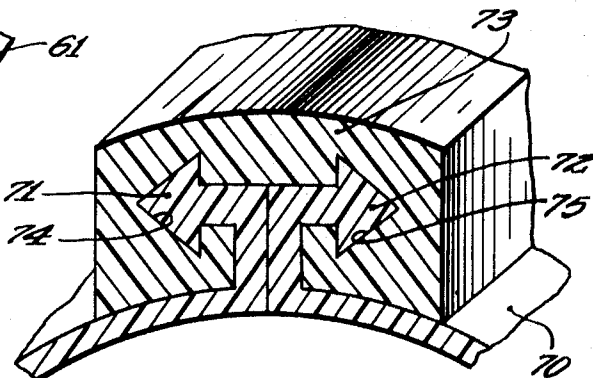


Fig. 13

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ZIPPER TUBING

BACKGROUND OF THE INVENTION

The present invention relates to improvements in plastic tubing for containing a plurality of wires which has a removable closure strip.

More particularly, the invention embodies elongated plastic film tube with a continuous axial separation along its length with the edges of the tube each having a continuous hook or fastener tooth to be engaged by crescent-shaped flexible strip which has jaws for engaging the teeth to hold the edges of the tube together. The fastener strip is removable for exposing and removing or reinserting the contents of the tube. The teeth or hooks at the edges of the tube are continuous and coextensive with the tube. The invention also embodies the method of manufacturing the tube and fastener strip by single continuous operation.

An object of the invention is to provide a flexible continuous tubing, wherein the tubing can be closed and opened with a slidable fastener on the outside of the tube without any interference with wires or other contents of the tube.

A further object of the invention is to provide a closable zipper-type tubing wherein a window can be provided at any predetermined location for access to the tubing, such as is needed for taking out or replacing wires contained within the tubing.

A still further object of this invention is to provide a zipper tubing that will fit snugly around a plurality of wires.

A still further object of the invention is to provide a structure of the type above described, wherein the tubing and the closing-fastener strip can be formed of different materials, each having optimum characteristics for their own function.

A general object of the invention is to provide an improved zipper tubing affording a conduit for wires which can be opened and reclosed, which is easier to install and work with than structures heretofore available.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary perspective view of a zipper tubing structure embodying the principles of the present invention;

FIG. 2 is another fragmentary perspective view also showing a slider for closing and opening the tubing;

FIG. 3 is an exploded perspective view showing details of the slider;

FIG. 4 is an enlarged fragmentary perspective view showing the structure for holding the tubing closed;

FIG. 5 is a perspective view with parts broken away illustrating a form of the invention;

FIG. 6 is a perspective view with parts broken away;

FIG. 7 is a perspective view with parts broken away;

FIG. 8 is a perspective view with a portion broken away showing another form of the invention;

FIG. 9 is a fragmentary sectional view showing a step in the method of making the structure;

FIG. 10 is a fragmentary elevational view showing a step in the manufacture of the structure; and

FIGS. 11, 12 and 13 are fragmentary enlarged perspective views showing different structural forms of locking arrangements of the zipper tubing.

DESCRIPTION OF THE INVENTION

FIG. 1 illustrates an elongate plastic film tube 15 formed of polyethylene, polyvinylchloride or other suitable plastic film adapted for forming a conduit for housing and protecting a group of wires 21. The tubing 15 has an opening along one side and at the edges of the tubing, which separate to form the opening, are continuous hooks or teeth 16 and 17. These hooks are of one piece and are integral with the tubing and are continuous so as to be of uniform size along the length of the elongate tube for facilitating manufacture in a one-piece continuous extrusion process.

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The slot or gap in the side of the tube is closed by a crescent-shaped fastener strip 18. The strip has jaws 19 and 20 which engage the teeth or hooks 16 and 17, and clamp them together in the closed condition. The strip however is removable from the teeth 16 and 17 to permit opening of the tube 15. The strip 18 is formed of a resilient plastic with sufficient thickness to firmly and relatively rigidly clamp the teeth 16 and 17 and hold the tube together.

In some forms it may be desirable to form the plastic closure strip 18 of a plastic material different than the tube 15. The tube 15 may be formed of a tough lightweight plastic material having optimum properties for housing the wires 21 and the strip 18 be formed of a plastic which has optimum properties for firmly, yet resiliently, gripping the jaws 16 and 17. It is also contemplated that in some instances the jaws 16 and 17 may be made of a different plastic than the film of the tube 15, utilizing plastic materials for each of the elements which has optimum properties for its own function. However, for most utilizations, the plastic of the closure strip 18 may be the same as the plastic of the tubing 15 and the teeth 16 and 17.

As shown in FIGS. 2 and 3, a slider 22 may be provided for opening the side of the tube, or closing it by pressing the fastener 18 into place. In the illustration of FIG. 2, the slider 22 is moved to the left to draw the teeth 16 and 17 toward each other and close the gap in the side of the tube, and to press the strip 18 into place so that the jaws 19 and 20 grip the teeth 16 and 17.

The closure slider may take various structural forms but the preferred form employs an upper yoke 23 with a lower plate 24 permanently attached thereto. The plate has an upstanding block 25 which extends between pivot supports 26, with a pin that extends through the opening 27 in the supports 26 and through the opening in the block 25, and the yoke 23, thereby holding the entire assembly together.

A compression spring 28 is positioned between the forward end of the plate 24 and the cross portion 29 of the yoke 23 and pushes a paddle end 30 of the plate upwardly toward a pressing roller 31 on the yoke. The force between the paddle end 30 and the roller 31 presses the fastener strip 18 down over the teeth 16 and 17, which have been aligned by guides 33 and 34, to cause the jaws 19 and 20 to grip the teeth when the slider 22 is moved in a closing direction. In order to press the fastener strip 18 over teeth 16 and 17, it may be necessary to first separate the jaws of the strip 18 by running these over a block 30a placed near the pressing roller 31.

When plate slider 22 is moved in an opening direction (which is to the right in FIG. 2), the teeth 16 and 17 are pulled apart by teeth receiving guides 33 and 34 mounted on the plate 24. These guides are angled so that they bring the teeth together when the slider is moved in a closing direction, and draw the teeth apart as the slider is moved in an opening direction. The supports 26 force the closure strip 18 upwardly to lift it off of the teeth 16 and 17 when the slider is moved in the opening direction.

FIG. 4 shows the relationship between the jaws 19 and 20 and the teeth 16 and 17 in the closed position of these elements. As will be noted, the sides of the tube 15 are forced firmly together and the joint between them is covered by the strip 18 so as to seal the interior of the tube against dirt and moisture.

In the arrangement of FIG. 5, a window 35a is formed in the side of the tubing. The window is shown with portions of the tubing broken away but normally will be formed merely by pulling apart the flexible teeth 16 and 17 to provide a gap into the side of the tube. The sides of the gap are kept from spreading along the length of the tubing by clamping locks 35 and 36, which are formed of metal or hard plastic so as to firmly and relatively permanently hold the sides of the slot together. The closure strip 18 may be broken or punched at that location and the ends of the strip extend to the locks 35 and 36. The window or gap in the tubing side is located at a position where wires are to be removed or replaced, making it unnecessary to open and reclose the tubing before access thereto. In some in-

stances, no auxiliary clamping locks are needed such as when strip 18 is sufficiently strong to hold teeth 16 and 17 in place.

In the arrangement of FIG. 7, the tubing is shown forming separate compartments, each for containing separate wires. Access to the inner compartment A is obtained by removing the fastener strip 18. Access to the outer compartment B is obtained by removing the fastener 18a, which joins adjoining edges of tubing sections 15a and 15b. The tubing sections 15b and 15d are integral with each other. Sections 15a and 15c are also integral. The strip 18 joins the common edge 15e at one side of sections 15a and 15c, and the common edge 15f at the other side of sections 15b and 15d. Strip 18a joins the edges 15g and 15h. Strip 18b closes compartment B along its other edge joining edges 15i and 15j. FIG. 7 shows a possible extrusion strip for the above application of FIG. 6.

In the arrangement illustrated in FIG. 8 multiple teeth are formed at each edge of tubing 40. At one side, teeth 41 and 42 are provided, and at the other side teeth 43 and 44 are provided.

A closure strip 45 has plural grooves to lockingly receive the teeth. Grooves are formed at 46 and 47 to receive the teeth 41 and 42, and grooves are formed at 48 and 49 to receive the teeth 43 and 44. The fastener strip 45 is attached and removed in the same manner as the strip having single jaws. Ribs, such as 45a, may be provided at the edges of the strip 45 for aiding in gripping the strip for handling, or in the event that it is to be removed manually.

An important facet of the invention is a process of manufacturing the structure in a single extrusion step. As illustrated in FIG. 10, a plastic extrusion head 58 is provided with a die opening shaped to extrude the tube 15 and the closure strip 18 in a single extrusion pass. The extruded structure is illustrated in FIG. 9 wherein tube 15 and strip 18 are constructed so as to be one piece. This is accomplished by forming them into a continuous cylinder with plastic film portions 50 and 51 bridging the space between the hooks 16 and 17 and strip 18.

These bridging portions 50 and 51 are cut out of the cylinder before the structure is used so as to separate the tube 15 from the fastener strip 18. This can be accomplished in the manner illustrated by the use of rotary knives 52, 53, 54 and 55 mounted on rotating shafts 56 and 57. If the tube 15 with the bridging portions 50 and 51 is supported interiorly, the knives can be applied to the surface, cutting the portions 50 and 51 out of the cylinder. With this process of making the tube and the fastener strip, extrusion can be accomplished in a single rapid step. In some instances, it may be desirable to eliminate the bridging portions 50 and 51 so that only a single cut at each side is necessary to separate the fastener strip 18 from the tube 15.

FIGS. 11 through 13 illustrate various forms of locking arrangements to join the teeth of the tube arrowhead-shaped the fastener strip. These alternate structures may be used in certain circumstances where increased locking strength is desirable.

In the arrangement of FIG. 11, a tube 61 has its ridged teeth 62 and 63 joined by a fastener strip 64. The teeth are shaped with radially inwardly facing planar surfaces 65 and 66 which are confronted by cooperating planar surfaces on the jaws 67 and 68 of the fastener strip.

In the arrangement of FIG. 12, a tube 70 has teeth 71 and 72 which are shaped with the arrowheads pointing circumferentially away from each other. Grooves 74 and 75 are provided in the closure strip 73, and the grooves are also arrowhead shaped so that a positive locking engagement occurs between each of the arrowhead teeth 71 and 72 and the fastener strip 73. This reduces the necessity of the fastener strip jaws applying a rigid pressure to hold the edges of the tube 70 together.

In the structure of FIG. 13 the tubing 80 is closed by a fastener strip 81. The tubing is provided with teeth 82 and 83, which have downwardly facing planar surfaces with construction somewhat similar to the arrangement of FIG. 11, and these planar surfaces are engaged by mating planar surfaces

86 and 87 of the gripping jaws 84 and 85 of the fastener strip. In addition to this interlocking relationship, an actual interlocking additionally occurs between the teeth themselves. The teeth are formed with mating interlocking ribs and grooves. The tooth 83 has a rib 88 and a groove 89. The rib 88 seats in a groove 87 of the tooth 82 and the groove 89 receives a tooth 90 of the rib 82. Thus, a plural interlocking relationship exists with the sides of the tubing being held by the jaws of the fastener strip and being additionally interlocked to each other. As will be appreciated, the slider of FIG. 3 will successfully lock and release the structures of FIGS. 11 through 13, although slight modifications in shape may be employed to additionally facilitate this function. Also, in some instances manual interlocking may be achieved by drawing the teeth at the opposing sides of the gap together and forcing the locking strip into gripping engagement over the teeth.

Thus, it will be seen that the present invention has provided the objectives and advantages above set forth and obtains an improved zipper tubing which is fast and convenient to manufacture and affords advantages of secure and rapid closing and capabilities of reopening.

While minor modifications might be suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted hereon all such modifications as reasonably and properly come within the scope of my contribution to the art.

I claim:

1. A flexible tubular conduit for wires or the like comprising,

a first elongate tube having a flexible wall with a continuous axial separation along its length and having edges with said separation accommodating the insertion and removal of elongate conductors from the tube interior,

a first tube fastener element along one of said edges,

a second tube fastener element along the other of said edges,

a flexible resilient elongate closure strip for extending across said separation and having first and second fastener elements shaped for coactingly engaging with the first and second tube fastener elements respectively for holding the tube edges together to close the first tube, and

a second elongate tube circumferentially surrounding the first tube and attached to the first tube along said edges and being provided with another continuous axial separation along its side with first and second tube fastener elements and a flexible resilient elongate closure strip having fastener elements for engaging the fastener elements of the second tube holding the tube edges together.

2. A flexible tubular conduit in accordance with claim 1 wherein said first tube is formed of two parts with one of said fastener elements of each part, and wherein a second axial separation is formed between said parts with third and fourth fastener elements on the parts at the edges of the second separation, and a second closure strip is provided for said second separation.

3. A flexible tubular conduit for wires or the like comprising;

an elongate tube having a flexible wall with a continuous axial separation along its length and having edges with said separation accommodating the insertion and removal of elongate conductors from the tube interior,

a first tube fastener element along one of said edges,

a second tube fastener element along the other of said edges,

a flexible resilient elongate closure strip for extending across said separation and having first and second fastener elements shaped for coactingly engaging with the first and second tube fastener elements respectively for holding the tube edges together to close the tube, and

a slider straddling said closure strip and having means for separating the fastener elements of the strip for interengaging with the tube fastener elements.

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4. A flexible tubular conduit in accordance with claim 3 and including means on said slider for separating the closure strip from the fastener elements of the tube.

5. A flexible closed tube comprising, a first circumferential wall portion having circumferentially spaced continuous first and second tube fastener elements projecting from the surface thereof and having a second circumferential spaced portion between said fastener elements with a continuous closure strip projecting from the surface thereof and having fastener elements on the strip shaped for coactingly engaging with the tube fastener elements,

said tube being slitable along its length for separating the closure strip from said first and second tube fastener elements and said first and second portions having been simultaneously extruded.

6. A tube in accordance with claim 5 wherein said closure strip projects inwardly and said tube fastener elements project outwardly.

7. A flexible tubular conduit for wires or the like comprising;

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a first elongate tube having a flexible wall with a first and second continuous axial separation along its length and having a pair of edges with each of said separations accommodating the insertion and removal of elongate conductors from the tube interior,

a tube fastener element along each edge of said pair of edges associated with said first and second separations,

a flexible resilient elongate closure strip for extending across each of said separations and having fastener elements shaped for coactingly engaging with the fastener elements on the pair of edges respectively for holding the pair of edges together to close the tube, and

a second tube member attached at its edges to the edges of the first tube at the first separation and said second tube being located within said first tube.

8. A flexible tubular conduit in accordance with claim 7 including a separation in said second tube with a closure strip for extending across the separation and engaging elements at the edges of the separation.

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