

United States Patent

[11] 3,574,313

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| [45] | Patented | Apr. 13, 1971 |
| [73] | Assignee | Raychem Corporation
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[56]

References Cited

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3,360,894	1/1968	Sharman et al.	138/166X
3,379,218	4/1968	Conde	138/99

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| [54] | WRAPAROUND CLOSURE SLEEVE
7 Claims, 4 Drawing Figs. | |
| [52] | U.S. Cl. | 138/99,
138/168 |
| [51] | Int. Cl. | F16l 25/00 |
| [50] | Field of Search | 138/96-
—99, 168, 178, 110, 147—149; 156/162; 52/108 |

ABSTRACT: A closure sleeve for pipes or the like constructed from a piece of independently dimensionally unstable material, that is, material which will return to its original shape and dimensions upon application of heat alone. The sleeve is split and provided along one edge with a plurality of preshrunk tabs which are folded back over the sleeve. A plurality of corresponding slots are formed adjacent the other edge of the sleeve and the material of the other edge folded back over the slots. To install the closure member, the piece of material is roller into tubular form and the tabs inserted into the slots and the part then heat recovered.

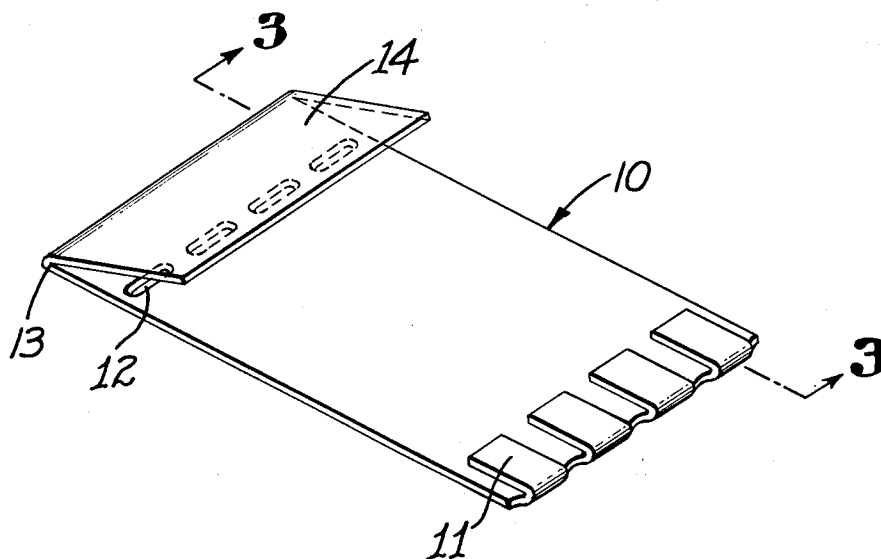


Fig. 1

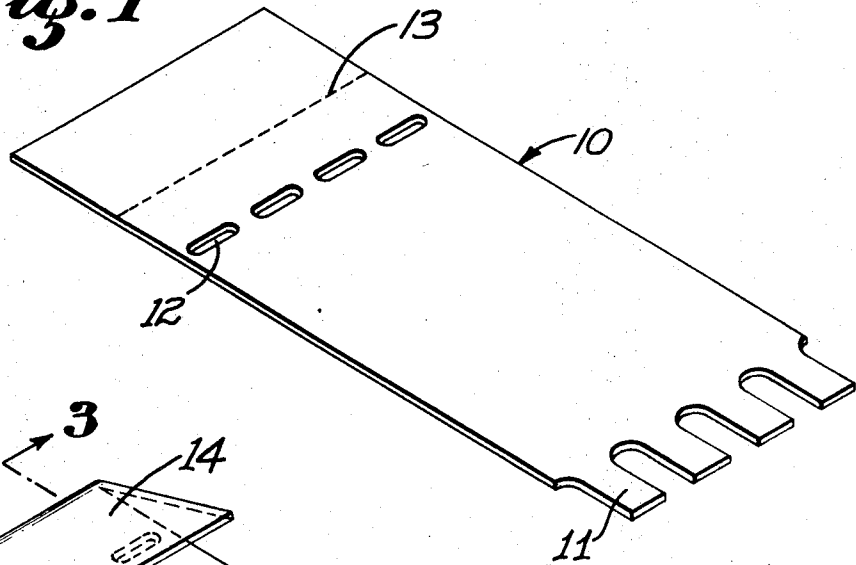


Fig. 2

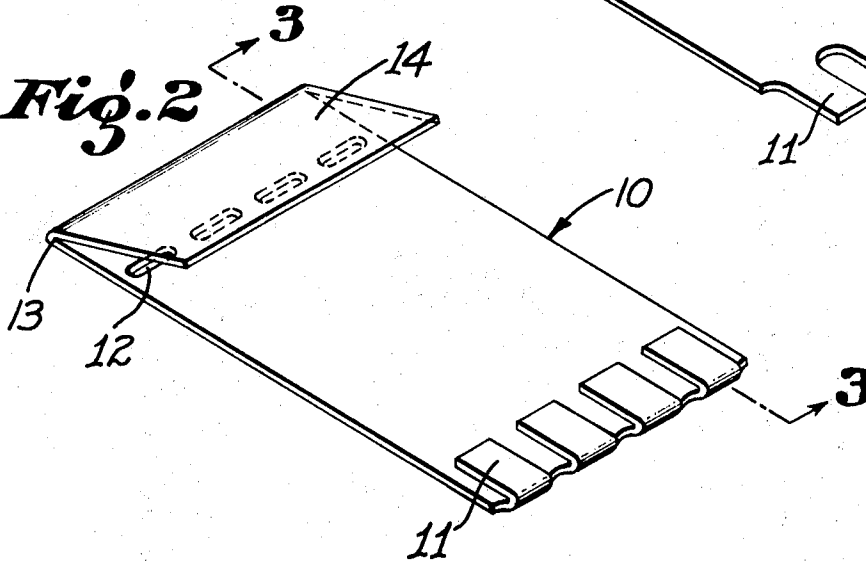


Fig. 3

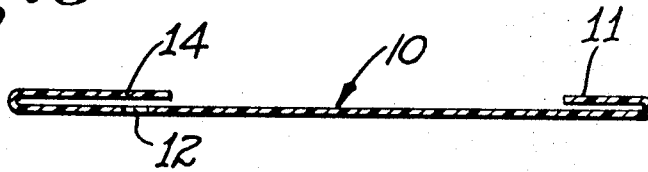
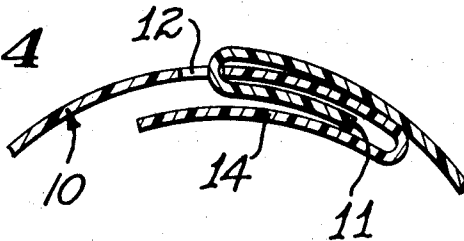


Fig. 4



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WRAPAROUND CLOSURE SLEEVE

BACKGROUND OF THE INVENTION

There are many instances where it is desirable to provide a sealing, insulating or protective closure member for elongated objects such as cables, pipes or the like where the ends of the elongated objects are not accessible, or, if accessible, where it is undesirable to disconnect or otherwise displace them from their original position. One such closure member is disclosed in U.S. Pat. No. 3,379,218 which is assigned to the assignee of the present application. Another such disclosure member is disclosed in U.S. Pat. application Ser. No. 506,161, filed on Nov. 3, 1965 now U.S. Pat. No. 3,355,906 by Roger H. Ellis and assigned to the assignee of the present invention. Still another such closure member is disclosed in U.S. Pat. application Ser. No. 731,200 filed May 22, 1968 by Richard W. Muchmore and also assigned to the assignee of the present application. The disclosures of this patent and these applications are incorporated herein by reference. While each of the closure members disclosed in the aforementioned patent and applications are satisfactory in use, they each present some fabrication requirements that, for economic reasons, are not desirable in all situations.

SUMMARY OF THE INVENTION

According to the present invention a heat recoverable closure member is provided which can be simply and easily fabricated from extruded material, either in sheet form or in tubular form. The extrusion in tubular form is particularly desirable because of the ease in then imparting the material with the property of elastic memory. After the tubular material is expanded, it is longitudinally split to form a more or less flat sheet. One edge of the sheet is then cut to form a plurality of tabs which are folded back over the sheet. A row of slots is made adjacent the other edge of the sheet and the material of that edge folded back over the slots. When the closure is to be installed, it is wrapped around the pipe or the like to be protected and the tabs inserted in the slots so that a tubular member is formed. The sleeve can now be heat recovered around the object, the fold of material beneath the slots preventing the tabs from being pulled out of the slots. The closure member of the present invention does not require an external and separate closure device to hold the two edges of the sheets together and it provides a very low profile and readily follows irregular contours in the object to be covered. The closure sleeve of the present invention is particularly useful where it is desired to protect the joint or junction where two pipes meet, particularly where the pipes are of large diameters such as water supply pipes.

It is therefore an object of the present invention to provide a heat recoverable closure member.

It is another object of the present invention to provide such a member which is relatively inexpensive to fabricate and easy to install.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the closure member of the present invention after its initial fabrication;

FIG. 2 is a perspective view of the closure member of the present invention after the tabs and sealing flap have been folded;

FIG. 3 is a cross-sectional view taken along lines 3-3 of FIG. 2 after folding has been completed; and

FIG. 4 is an enlarged sectional view showing the closure member of the present invention after it has been secured in tubular form.

DESCRIPTION OF THE INVENTION

As mentioned above, the closure member of the present invention utilizes an independently dimensionally heat unstable member. In general, such a member is made of a material capable of having the property of elastic or plastic

memory imparted thereto which is heated to above its recovery temperature and expanded under pressure to a configuration greater than its normal configuration and then cooled while kept under pressure. A part treated in this manner will retain its expanded position until it is again heated to its heat recovery temperature at which time it will recover to its original shape. Examples of such heat recoverable material is found in Currie U.S. Pat. No. 2,027,962 and Cook et al. U.S. Pat. No. 3,086,242, the disclosures of which are incorporated herein by reference. Polymeric materials which have been cross linked by chemical means or by irradiation, for example, with high energy electrons or nuclear radiation, are preferred for use in the present invention. Noncrystalline polymeric materials exhibiting the property of plastic or elastic memory, such as polyurethane, ionomers, etc., could also be used in practicing the present invention. Since the closure members of the present invention can be made from material having either plastic or elastic memory, the terms "elastic memory" and "plastic memory" are used interchangeably and are intended to be mutually inclusive.

According to the present invention, a flattened sheet of material having the property of elastic memory, that is, of being heat recovered, is used, the piece of material either being extruded or molded in the flattened form, or, preferably, being extruded in tubular form and then expanded, for example, in the manner taught in the aforementioned Cook et al. patent and then slit longitudinally. Such a flattened piece of material is shown at 10 in the drawing. The piece of material 10 is provided with a series of tabs or fingers 11 along one edge. These tabs 11 can be cut, stamped, or formed in any other suitable manner. The piece of material 10 is also provided with a series of slots 12 which preferably correspond, in number and spacing to the tabs 11. The slots 12 are formed more or less adjacent the end of the piece of material 10 remote from the end on which the tabs 11 are formed but are spaced inward of the edge so that enough material is left to form a flap that can be folded back over the slots along a line 13.

FIG. 2 shows the member after the flap 14 has been formed by folding the piece of material 10 along the line 13. FIG. 2 also shows the tabs 11 folded back. The folds are made by hot-folding the material at a temperature just below its recovery temperature. The tabs or fingers 11 are then prerecovered so that their longitudinal recovery is released. This selective shrinking of the tabs is preferably done by placing a large block of copper or other highly heat conductive material on the remainder of the material 10 and exposing the fingers to a hot air blast or the like. The copper block serves as a heat sink which prevents the remainder of the material from being heated to its recovery temperature. The recovery of the fingers results in their being thicker and stronger than the rest of the material. If desired, the fingers may be folded along a line slightly displaced from where they meet the remainder of the material so that their alignment will be more certain. If this is done, the portion of the material which is folded back with the fingers is also heat recovered. It has been found that the proper length of the fingers is a balance between the desirability of having them short so that they are easier to make and install, and the necessity to have them of sufficient length that they will not pull out of the slots 12 once they have been installed therein. FIG. 3 shows the closure member after the folds have been completed.

FIG. 4 shows the manner in which the closure member is installed. As can be seen, the piece of material 10 is rolled into tubular form and the tabs 11 are passed through respective slots 12. The closure member can then be heat recovered around the object it is to protect. The flap 14 serves a dual purpose. First, it covers the slots 12 so that a complete seal is formed. Second, it serves to hold the tabs 11 in place during recovery so that they cannot pull out of the slots 12. Preferably, the entire inner surface of the material 10 and the flap 14 are covered with a suitable mastic or hot-melt adhesive so that a bond is formed between the closure member and the object on which it is recovered.

The closure member of the present invention is particularly useful in protecting joints or junctions of large diameter pipes such as water supply pipes. These pipes may have diameters as large as 6 feet or more which requires that the length of the piece of material 10 be on the order of 20 feet. To form such a closure member, it has been found desirable to expand a piece of tubing of suitable length longitudinally rather than diametrically and then slit it along its length. The tabs 11 are then formed on one end of the expanded tubing while the slots 12 and the flap 14 are made at the other end.

Because of the length of such a closure member, the more conventional methods of heat recovering it are not always wholly satisfactory. In place of such conventional methods as hot air blowers or a torch, the closure member may be recovered by combining it with pyrotechnic materials in the manner taught by Wetmore application, Ser. No. 586,954 filed Oct. 17, 1966, and assigned to the assignee of the present application and Deal et al. application Ser. No. 727,074, filed May 6, 1968, and also assigned to the assignee of the present application. The disclosures of both of these applications are incorporated by reference herein. As disclosed in these applications, suitable pyrotechnic material for use in combination with the closure sleeve of the present invention are aluminum trichloride and water or a fabric impregnated with potassium nitrate. As disclosed in the aforementioned applications, these pyrotechnic materials may be combined with other material such as greases or may be structurally combined with heat shields or the like.

The invention may be embodied in other specific forms not departing from the spirit or central characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

I claim:

1. A heat recoverable closure member comprising an elongated independently dimensionally heat unstable member having a pair of edge portions which can be brought into adjacency to form a tubular member, a first of said edges

having a plurality of tab means formed thereon, said tab means being folded back over said member, said member having a plurality of slots formed adjacent the other edge portion thereof for receiving said tab means and retaining said member in tubular shape, in closure operation the free end portions of said tab means abutting the interior surface of said other edge portion.

2. The member of claim 1 wherein said member is provided with a flap adjacent said other edge portion and covering said slots.

3. The member of claim 1 wherein said tab means are prerecovered.

4. A heat recoverable closure comprising a piece of independently dimensionally heat unstable material having a pair of edge portions, a plurality of tabs being formed along one of said edge portions, said tabs being folded back over said piece of material, the other edge portion of said piece of material being folded back to form a flap, said piece of material having a series of slots formed therein adjacent said flap, said tab means being inserted into corresponding slots to form said piece of material in tubular shape, said flap serving to maintain said tab means in said slots during heat recovery of said member, the free end portions of said tab means abutting the interior surface of said other edge portion.

5. The member of claim 4 wherein said tab means are heat recovered prior to being inserted in said slots.

6. The member of claim 4 wherein the inner surface of said piece of material is covered with sealing material.

7. A heat recoverable closure member comprising an elongated independently dimensionally heat unstable member having a pair of edges which can be brought into adjacency to form a tubular member, a first of said edges having a plurality of tab means formed thereon, said tab means being folded back over said member, said member having a plurality of slots formed adjacent the other edge thereof for receiving said tab means and retaining said member in tubular shape, said member being provided with a flap adjacent said other edge and covering said slots, that surface of said member which in closure operation is the inner surface being coated with sealing material.

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