United States Patent

D'Aprile

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[45] July 4, 1972

[54] SCUFF STRIP FOR TOW-ELEMENT HELICALLY WOUND TUBING

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[73] Assignee: **The Wiremold Company**, Hartford, Conn.

[22] Filed: **March 20, 1970**

[21] Appl. No.: **21,243**

[52] **U.S. Cl.** **138/134**, 138/129, 138/154

[51] **Int. Cl.** **F16l 11/16**

[58] **Field of Search** 138/134, 135, 131, 133, 127, 138/154, 129

[56] **References Cited**

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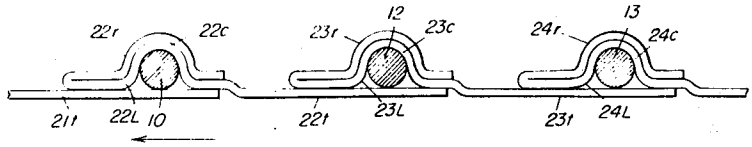
Primary Examiner—Herbert F. Ross

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[57] **ABSTRACT**

Two element collapsible tubing comprising a helical wire wound upon one edge of a helically wound, treated fabric or other kind of strip (of one or more plies thickness), the other edge of the strip overlying the adjacent or nearby convolution of the wire and being reversely folded upon itself, preferably outwardly, so that the wire is covered exteriorly with a double thickness of the flexible strip with the inner surface of the strip facing outwardly where it overlies the wire, thus providing a protective strip for the tubing over the wire. If the overlying folded edge overlies a wire convolution that is beyond the next adjacent convolution the tubing wall will be of multi-ply thickness, even when wound from a single ply flexible strip.

5 Claims, 4 Drawing Figures



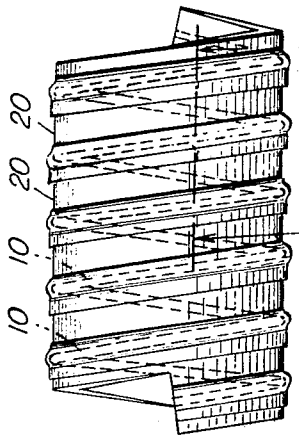


FIG. 1

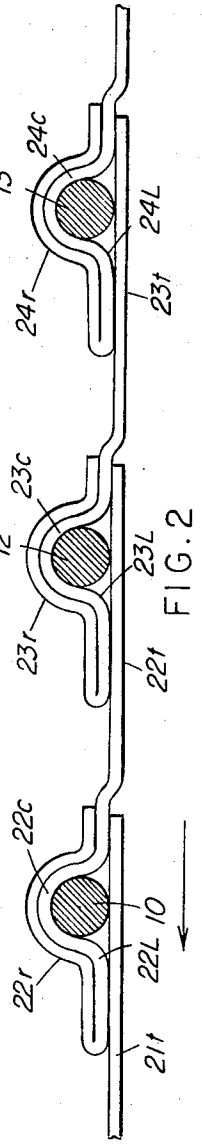


FIG. 2

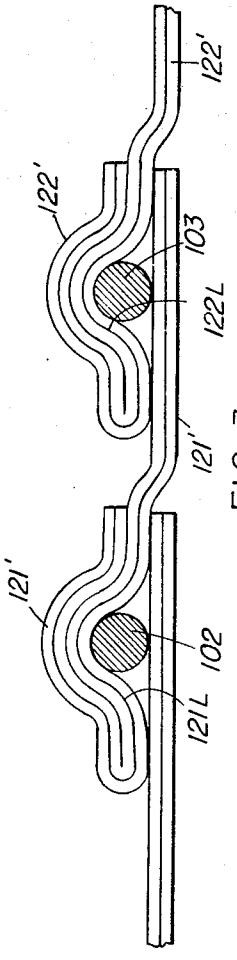
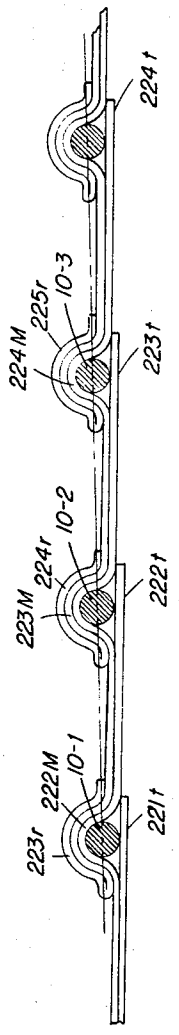


FIG. 3



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SCUFF STRIP FOR TOW-ELEMENT HELICALLY WOUND TUBING

This invention relates to flexible tubing. More particularly it relates to two element flexible tubing of the type having a helically wound resilient forming element covered internally and externally by overlapping edges of a flexible strip.

1. Heretofore two element tubing has been made by winding a strip of flexible material helically to form a connecting element, and winding helically a wire or other stiff resilient element, to create a forming element, with the wire lying on the trailing edge of the previous convolution of the flexible strip while the leading edge of the being formed convolution of the flexible strip overlies and covers the wire convolution. In use, the flexible strip becomes scuffed and worn as it is moved over and against the surfaces of floors, walls and other things, mainly where the flexible strip covers the forming element. Protective strips over the forming element have been provided for the purpose of protecting the flexible strip where it covers the forming element. But these protective strips have added a third element to the tubing and thus added to the cost of materials. Also added complications and problems were created in placement of the supply of this third element and the introduction and manipulation of it during formation of the tubing.

2. It is an object of the invention to provide protection against scuffing, abrasion and wear for two element tubing of the kind, to which this invention relates, which will not involve introduction of anOther separate element, but which will provide protection over the forming element where the greatest areas of wear are likely to occur.

Another object is to utilize the flexible element of the tubing to provide the aforementioned protection.

Another object is to utilize the flexible element of the tubing to provide the desired protection of the tubing by manipulating the flexible element in a way that will turn the inner surface of the flexible element outwardly as a portion of the flexible element is made to lie on the outer surface of the tubing, thus to take advantage of the possibility of said inner surface having superior scuff resistant properties.

Other objects and advantages of the invention will occur as it is described in connection with the accompanying drawing.

In the drawing FIG. **1** is a plan view of a length of collapsible tubing embodying the invention.

FIG. **2** is a longitudinal section view through the upper part of the tubing of FIG. **1** when the flexible element is of single ply form.

FIG. **3** is a view similar to FIG. **2** of the invention as applied to the tubing when the flexible element is of multi-ply type.

FIG. **4** is a view like FIGS. **2** and **3** of the invention applied to produce double wall flexible tubing from a single-ply flexible strip.

3. Referring to the drawing collapsible tubing is illustrated in FIGS. **1** and **2** made of a resilient helically wound forming element **10** and a flexible helically wound connecting element **20**.

The flexible element in a simple form may be a single ply strip of fabric which quite commonly will be treated on one or both sides, with the same or different substances; or, the strip may be impregnated with a substance to make it impervious to the passage therethrough of gases or liquids. The flexible connecting strip may also be of synthetic plastic material or any other desired material, which possess the property, when produced in thin-strip form, of flexibility and capability of being bent and shaped into the connecting strip of the tubing.

The flexible strip may also be of multi-ply form, with the plies being of the same or different materials, and coated or uncoated, impregnated treated or untreated, or a combination of them, depending upon the fluid which is to pass through the tubing and the degree of flexibility desired.

In view of the very large number of kinds oF flexible connector strips and combinations of them which it is possible to use, and because the strips, per se, are not the subject of this invention, it is not necessary to attempt mentioning various specific examples and categories, it being sufficient to mention as one example of a single-ply strip, a cloth fabric coated on both sides with a synthetic rubbery composition that is impervious to the passage of gases and many liquids.

The forming strip **10** may be a thin ribbon or strip or wire, of metal or equivalent material, that can be formed into a springy or resilient helix and will tend to retain or return to that form upon being compressed.

Most commonly the form-giving element will be thin spring-metal wire which will be referred to hereinafter in an exemplative but not restrictive way in describing the invention. Likewise, the connecting strip will be referred to as the fabric strip or the flexible strip.

Referring to FIGS. **1** and **2**, the form of the invention there illustrated comprises a flexible strip **20** which is wound convolutely, usually on a mandrel by conventional machinery. On the trailing edge **21***t* (FIG. **2**) of the first convolution a spring wire forming element **10** is wound; and the winding proceeds as the tubing is continuously formed.

The leading edge **22L** of the second convolution of the flexible strip is wound on top of the first convolution **10** of the wire, and overlies also the trailing edge **21***t* of the first convolution of the flexible strip. Likewise the second (**12**) and succeeding (**13**) convolutions of the wire are wound on the trailing edges (**22***t*, **23***t*) of the second, and succeeding convolutions of the flexible strip, with the leading edge of the flexible strip in each succeeding convolution, e.g., **23L**, **24L** lying upon and covering the wire convolutions and lapping over onto the trailing edges, e.g., **22***t*, **23***t*, of the second and third succeeding convolutions of the flexible strip.

To provide additional coverage and protection of the wire and more particularly that portion **22***c*, **23***c*, **24c** of the flexible strip which overlies the wire, the portion of the leading edge of the flexible strip, at a point beyond that which covers the wire, is reversely bent as a **22***r*, **23***r*, **24***r* to lie over and upon that portion of that flexible strip which covers the wire and further to lap over on the flexible strip beneath, on each side of the wire.

This forms a double thickness or ply of the flexible strip covering over and enclosing the wire so that the outer ply, i.e., the reversely bent edge **22***r*, protects the inner ply, e.g., **22***c*, and the wire. All the scuffing and wear to which the single-ply, which heretofore covered the wire, was subjected, is now taken by the protective outer ply **22***r*, **23***r*, **24***r*, etc.

The folded-over edges or outer plies of the flexible strip may be caused to adhere to the ply of the strip beneath it by any adhesive commonly used with the particular strip material, applied before the outer ply is folded over on the inner ply. Likewise, the trailing edge of a previous convolution of the flexible strip may be caused to adhere the leading edge of the succeeding convolution by such adhesive, applied before those edges are laid on one another.

4. As above indicated, the invention is applicable to multi-ply material as illustrated in FIG. **3**, in the same way as with the single ply of FIG. **2**. In FIG. **3**, the leading edge **121L** of the flexible strip is reversely bent, or folded over on itself, as the edge covers the wire, thus leaving the inner ply **121'**,**122'**, etc., outermost over the wire convolutions **102**, **103**, etc.

In the case of either a single-ply or a multiply flexible strip, the protection over the wire is double the thickness of the strip. Since the scuffing and wear of the tubing is greatest over the convolutions of the wire, the double protection in that area is of considerable value.

In a less desirable alternative form of the invention, the reversely folded portions, **22***r*, **23***r*, **24***r*, may be folded inwardly instead of outwardly. This provides a double cover over the wire convolutions and presents a more finished appearance by eliminating all raw edges on the outside of the tubing, but the main body of the flexible strip will take up the wear instead of the folded-over strip.

In FIG. **4**., the invention has been utilized for provision of tubing with a multi-ply wall by winding a single-ply flexible strip instead of the multi-ply strip that was illustrated in FIG. **3**.

In FIG. 4., the wire is wound on the trailing edge of the flexible strip as before. Likewise, flexible strip has its leading edge folded over--outwardly as shown, but inwardly if desired. The flexible strip is preferably wider in the FIG. 4. form--at least wide enough so that it can extend from beneath one convolution of the wire over the next wire convolution and beyond to the wire convolution that is one more away.

Specifically, the first wire convolution **10–1** is wound on the trailing edge **221***t* of the first fabric strip convolution. The second wire convolution **10–2** is wound on the trailing edge **222***t* of the next fabric strip convolution, while the mid-position **222M** of that convolution is laid over the wire convolution **10–1**.

The third fabric convolution has its folded-over edge **223***r* laid on the over-lying mid-portion **222M** of the second fabric convolution, beneath which is the first wire convolution **10–1**.

The mid-portion **223M** is wound upon the second wire convolution **10–2** and on top of it is wound the leading folded edge **224***r* of the fourth fabric-strip convolution while the third wire convolution **10–3** is wound on the trailing edge **223***t* of the third fabric-strip convolution. The fourth fabric-strip convolution has its mid-portion **224M** wound on the third wire convolution **10–3**, and so forth.

It will be observed that a double wall or two-ply thickness wall is provided between each of the successive convolutions of the wire by the foregoing method and tubing structure.

Also, the wire is covered by a double or two-ply thickness plus an additional scuff strip, all by the use of a single-ply flexible connecting strip.

As in the previous forms, the folded edge may be twined inwardly or outwardly; and a multi-ply flexible strip may be wound in the same way as the strip in FIG. 4.

Other modifications within the scope of the invention will occur to those skilled in the art. Therefore, the invention is not limited to the specific embodiments shown and described.

What I claim is:

1. Two element collapsible tubing comprising a resilient helically wound forming element, a flexible helically wound strip connecting adjacent convolutions of said forming element, a convolution of said forming element overlying one edge portion of one convolution of said connecting strip, the mid-portion of a previous convolution of said connecting strip overlying said one convolution of said connecting strip, the other edge portion of a succeeding convolution of said connecting strip overlying said over-lying mid-portion and being reversely bent and folded over to provide an additional protective layer of said flexible strip over said forming element.

2. Two element collapsible tubing comprising a resilient helically wound forming element, a flexible helically wound strip connecting adjacent convolutions of said forming element, characterized by

successive convolutions of the forming element lying upon the outwardly facing surface of one edge of successive convolutions of said strip,

the other edge of the convolutions of said strip overlapping the convolutions of the forming element,

said other edge of the strip being reversely bent and folded over to provide an additional protective layer of said flexible strip over said forming element.

3. Two element collapsible tubing as claimed in claim **2** in which the flexible strip is interiorly coated, and in which the interior coated surface faces outwardly along said folded edge.

4. Two element collapsible tubing as claimed in claim **2** in which the flexible strip is coated on one surface, and in which said surface faces oppositely along said folded edge from the direction in which it originally faced.

5. Two element collapsible tubing as claimed in claim **2** in which the flexible element is a multi-ply strip and the inner surface of the inner ply faces oppositely along the length of the folded edge from the direction it originally faced.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,674,056 Dated July 4, 1972

Inventor(s) Paul J. D'Aprile

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Title, "TOW" should be -- TWO --.

Column 1, after the title, following paragraph to be inserted: -- The methods herein disclosed are claimed in my copending divisional application Serial No. 225,864, filed February 14, 1972. --

Column 1, line 29, "anOther" should be -- another --.

Column 1, line 72, "oF" should be -- of --.

Signed and sealed this 26th day of December 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents