

Jan. 1, 1963

L. V. S. LUNDAHL
METHOD OF AND APPARATUS FOR MAKING AND FILLING
FLEXIBLE-WALLED TUBES

3,070,927

Filed Dec. 28, 1960

3 Sheets-Sheet 1

FIG. 1A

FIG. 1B

FIG. 2A

FIG. 2B

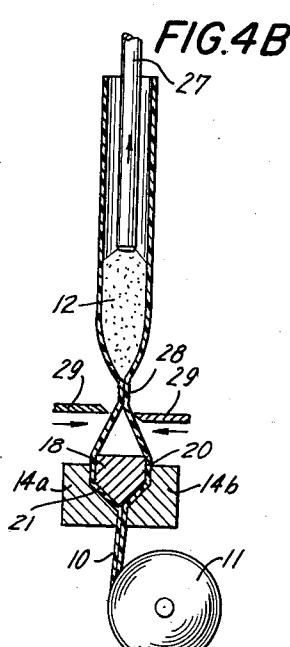
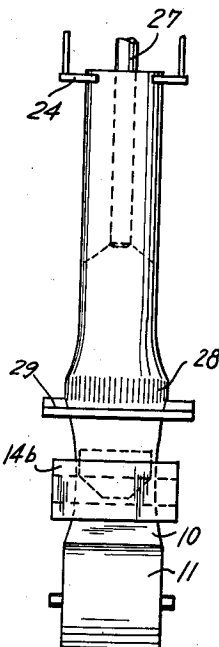
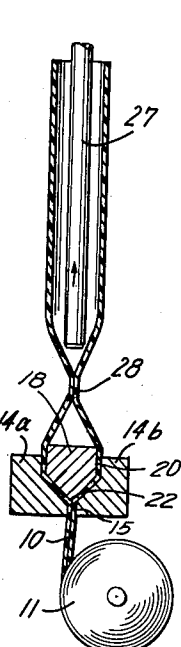
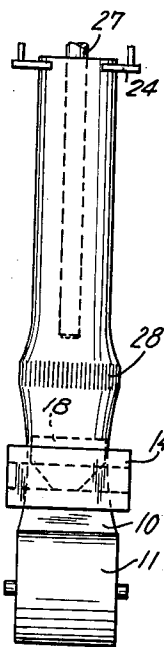
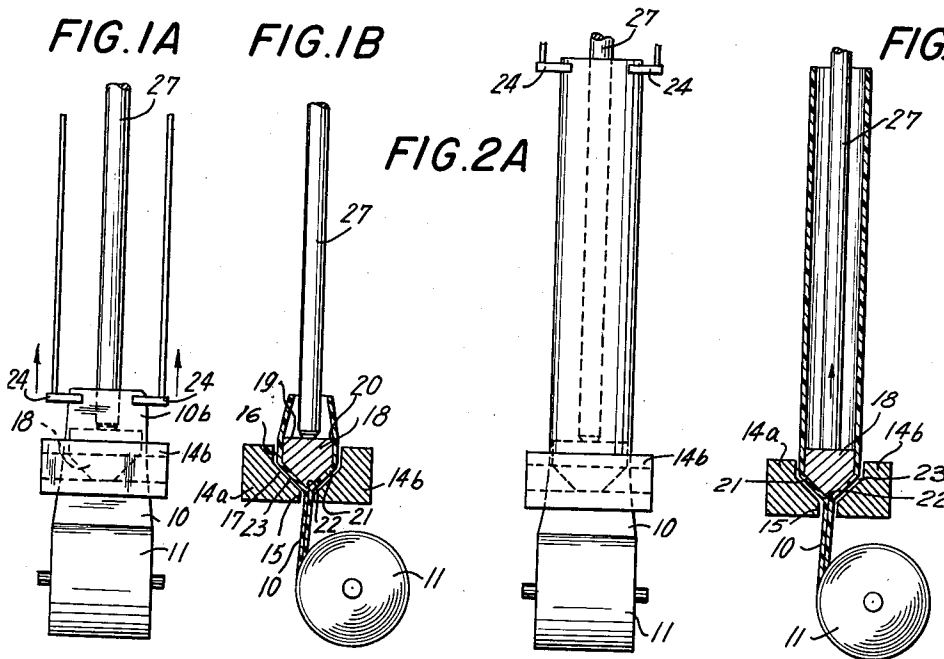


FIG. 3A

FIG. 3B

FIG. 4A

FIG. 4B

INVENTOR
Lennart Viktor Samuel Lundahl
BY
Edmund O. Kurlander
his ATTORNEY

Jan. 1, 1963

L. V. S. LUNDAHL
METHOD OF AND APPARATUS FOR MAKING AND FILLING
FLEXIBLE-WALLED TUBES

3,070,927

Filed Dec. 28, 1960

3 Sheets-Sheet 2

FIG. 5A

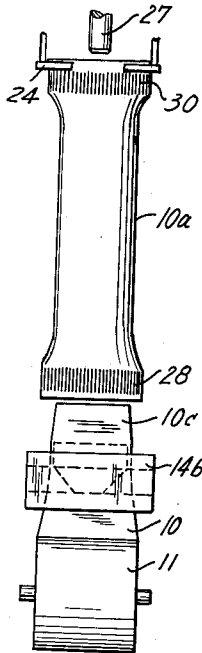


FIG. 5B

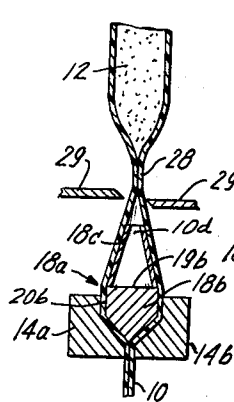
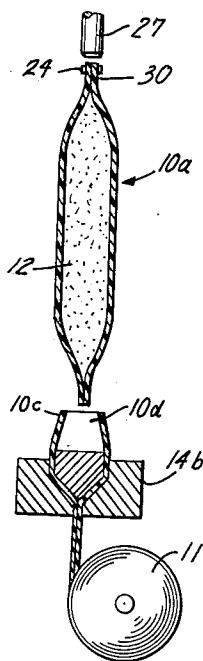


FIG. 6A

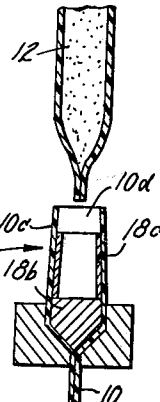


FIG. 6B

FIG. 7A

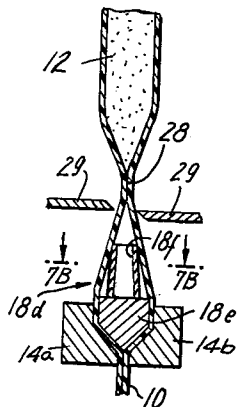


FIG. 7B

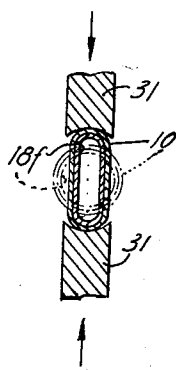


FIG. 8

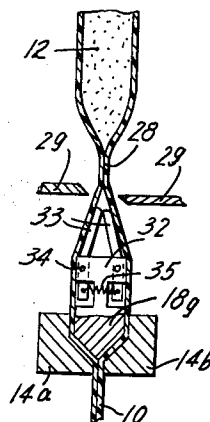
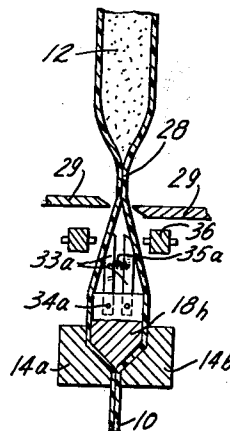


FIG. 9



INVENTOR
Lennart Viktor Samuel Lundahl
BY
Edmund A. Tander
ATTORNEY

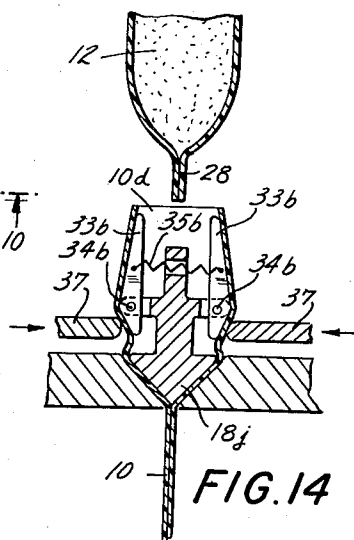
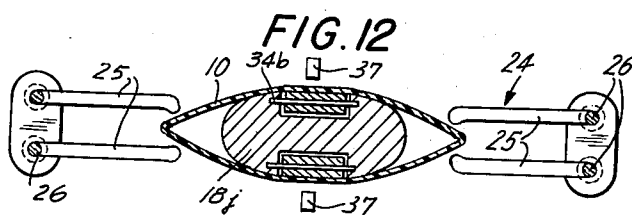
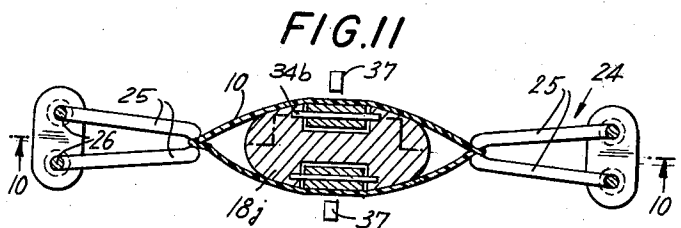
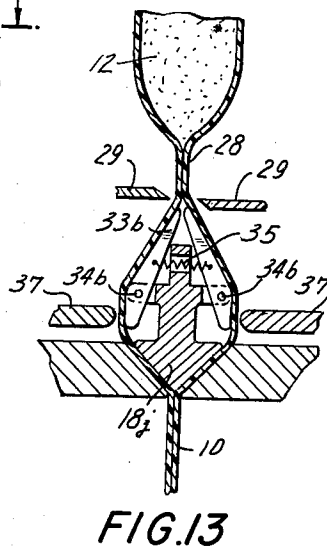
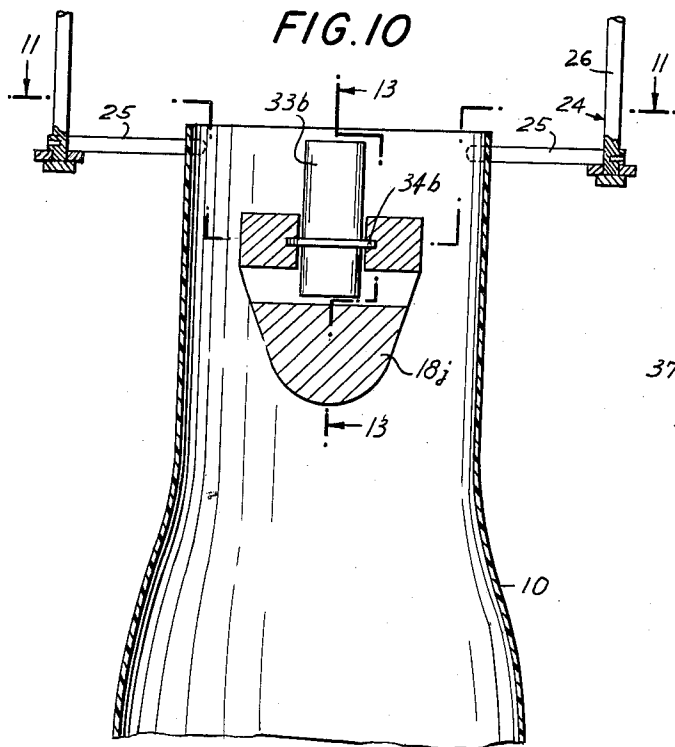
Jan. 1, 1963

L. V. S. LUNDAHL
METHOD OF AND APPARATUS FOR MAKING AND FILLING
FLEXIBLE-WALLED TUBES

3,070,927

Filed Dec. 28, 1960

3 Sheets-Sheet 3



INVENTOR
Lennart Viktor Samuel Lundahl
BY
Edmund Q. Franke
his ATTORNEY

1

3,070,927

METHOD OF AND APPARATUS FOR MAKING AND FILLING FLEXIBLE-WALLED TUBES

Lennart Viktor Samuel Lundahl, Multragatan 102, Vallingby, Sweden

Filed Dec. 28, 1960, Ser. No. 78,913

Claims priority, application Sweden Dec. 30, 1959
23 Claims. (Cl. 53—29)

This invention relates to a method of and apparatus for forming individual tubes from an elongated flexible-walled hollow member and filling each tube with a body of material.

To produce tubes of this type, each containing a body of material, it has usually been the practice to seal an end section of the elongated flexible-walled hollow member at a region remote from its open end, flowing material into such sealed-off end section, cutting the hollow member at a region in back of the seal and closing the tube thus formed at its open end. Difficulty is often encountered when tubes are produced in this manner with an elongated hollow member formed of thin-walled material, such as plastic sheeting like polyethylene, for example, which is not self-sustaining in character and lacks stability. When the elongated hollow member is formed of thin-walled material, the edges of the material often tend to stick and adhere to one another when pressed together in the act of cutting successive end sections from the elongated hollow member. This is objectionable because the extreme ends of newly formed end portions of the flexible-walled hollow member remain closed and are not open to facilitate the forming of tube sections and introducing material into such sections.

It is an object of this invention to provide an improved method of and apparatus for forming individual tubes from an elongated flexible-walled hollow member in which, after each end portion of the tubular member is cut to produce an individual tube, an opening will always be formed at the extreme end of the newly formed end portion of the elongated flexible-walled hollow member.

Another object of the invention is to provide an improved method of and apparatus for forming individual tubes from an elongated flexible-walled hollow member formed of material having elastic properties in which the tension developed in the elastic material when the elongated hollow member is cut is relied upon to form an opening at the extreme end of the newly formed end portion of the elongated hollow member.

A further object of the invention is to provide an improved method of and apparatus for forming individual tubes from an elongated flexible-walled hollow member in which an element positioned within the hollow member is compressed when the latter is cut and subsequently expands to form an opening at the extreme end of the newly formed end portion of the elongated hollow member.

A still further object of the invention is the provide an improved method of and apparatus for forming individual tubes from an elongated flexible-walled hollow member in which an element positioned within the hollow member includes provisions which normally are inactive and may be rendered active to promote opening of the extreme end of a newly formed end portion of the hollow member after the latter has been cut to produce an individual tube.

The above and other objects and advantages of the invention will become apparent as the following description proceeds, and the features of novelty which characterize the invention will be pointed out with particu-

2

larity in the claims annexed to and forming a part of this specification.

For a better understanding of the invention, reference may be had to the following description taken in connection with the accompanying drawing, in which:

FIG. 1A is a front elevation illustrating more or less diagrammatically an apparatus embodying this invention and operable in accordance with the principles thereof;

FIG. 1B is a vertical side view, partly in section, of the apparatus shown in FIG. 1A;

FIGS. 2A-2B to 5A-5B are views illustrating the apparatus of FIGS. 1A-1B with parts thereof in relative positions different from the one shown in FIGS. 1A-1B;

FIG. 6A is a view similar to FIG. 4B illustrating another embodiment of the invention;

FIG. 6B is another view of the embodiment of FIG. 6A with parts thereof in a relative position different from the one shown in FIG. 6A;

FIG. 7A is a view similar to FIG. 4B illustrating a further embodiment of the invention;

FIG. 7B is a horizontal sectional view taken at about the height 7B-7B in FIG. 7A with parts in a relative position different from the one shown in FIG. 7A;

FIGS. 8 and 9 are side views similar to FIG. 4B illustrating still further embodiments of the invention;

FIG. 10 is a view, partly in section, taken at line 10-10 of FIG. 11 illustrating a still further embodiment of the invention;

FIG. 11 is a horizontal view, partly in section, taken at line 11-11 of FIG. 10;

FIG. 12 is a horizontal view similar to FIG. 11 with parts thereof in a relative position different from the one shown in FIG. 11;

FIG. 13 is a vertical sectional view taken at line 13-13 of FIG. 10 with parts in a relative position different from the one shown in FIG. 10; and

FIG. 14 is a view similar to FIG. 13 with parts thereof in a relative position different from the one shown in FIG. 13.

In the present invention a hollow flexible-walled tubular member 10, which is flattened and spirally wound on a rotatably mounted drum 11, is intermittently fed from the drum by apparatus capable of filling each successive elongated section 10a of the tubular member 10 with a body of material 12. The apparatus shown for intermittently feeding the tubular member 10 from the drum 11 comprises a pair of cooperating guiding and holding members 14a and 14b which are maintained in a fixed vertical position with respect to the drum 11 and are movable toward and from one another. The inner faces of the members 14a and 14b are formed with bottom and top vertical wall sections 15 and 16 and outwardly sloping wall sections 17 therebetween providing a cavity in which an element 18 is positioned. The element 18 is formed with a flat top 19, upright side walls 20 and side walls 21 which are inclined toward one another and form a bottom pointed end 22. The outer open end 10b of the tubular member 10 passes through a gap or passage 23 which is formed between the members 14a-14b and the element 18.

A pair of vertically movable clamps 24 is arranged to grip and hold diametrically opposing sides of the outer open end 10b of the flexible-walled tubular member 10, as diagrammatically illustrated in FIG. 1A. As shown in FIGS. 11 and 12, each clamp 24 may comprise a pair of fingers 25 fixed to spaced upright rods 26, the fingers being angularly movable toward one another to grip and firmly hold opposing sides of the outer open end 10b of the tubular member 10.

In FIGS. 1A-1B an upright hollow tube 27 is posi-

tioned with its lower open end bearing against the top 19 of element 18. When the clamps 24 are raised from the position shown in FIG. 1A to the elevated position shown in FIG. 2A, the upright tube 27 acts against the element 18 to prevent upward movement thereof as the tubular member 10 is being unwound from the drum 11 and moved through the passage 23 formed between the element 18 and cooperating members 14a-14b.

The upright tube 27 is vertically movable from the position shown in FIGS. 1A-1B and 2A-2B to the positions shown in FIGS. 3A-3B, 4A-4B and 5A-5B. In FIGS. 3A-3B the lower end of the hollow tube 27 is raised a sufficient vertical distance so that a portion of the tubular member 10 can be sealed along a zone 28. When the tubular member 10 is formed of thermoplastic material, for example, the tubular member 10 may be heat sealed along the zone 28 in any well-known manner. For example, a pair of electrically heated members may be clamped about the tubular member 10 to seal the latter.

Before the tubular member 10 is sealed at 28, the cooperating members 14a-14b are moved towards one another against the element 18 to hold the tubular member 10 therebetween. Accordingly, while the tubular member 10 is being sealed at the zone 28, the tubular member 10 is more or less stretched and there is no slack in the tubular member between the cooperating members 14a-14b and the clamps 24.

After the tubular member 10 is sealed at 28, a flowable material 12 is introduced into the tubular member 10 through the upright tube 27, as illustrated in FIGS. 4A-4B. While the material 12 is being introduced into the tubular member 10 through the tube 27, the latter is raised so that its lower open end will always be above the surface level of the material 12 in the tubular member.

While the material 12 is being introduced into the tubular member 10 or after the filling operation is completed, the tubular member 10 is cut at a region which is being the seal 28 and above the top 19 of the element 18. Such cutting of the tubular member 10 to provide the tubular section 10a may be effected by a pair of cooperating knife-edged members 29, as shown in FIGS. 4A-4B, which are movable toward and from one another.

When the tubular section 10a is filled with material 12 to the desired level, the introduction of material into the tubular section is terminated and the tube 27 is withdrawn from its upper open end. While the clamps 24 hold the extreme upper end of the tubular section 10a, a zone 30 thereof immediately beneath the clamps 24 is sealed. When the tubular member 10 is formed of material which can be heat sealed, a pair of electrically heated members may be clamped about the zone 30 to seal the upper end of the tubular section 10a.

In order to produce the elongated tubular sections 10a, each filled with a body of material 12, the drum 11 may be wound with a flattened elongated flexible-walled tubular member 10 which preferably is formed of thin-walled elastic material, such as polyethylene, for example. The element 18 is inserted into the outer open end 10b of the tubular member 10 and the element 18 is then positioned in the cavity formed between the cooperating members 14a-14b, as shown in FIGS. 1A-1B, to provide the passage 23 therebetween. The upright tube 27 is moved downward until its lower end engages and bears against the top 19 of the element 18 and the rods 26 are moved downward in order that the fingers 25 of clamps 24 can be clamped to the extreme outer end 10b of the tubular member 10. With the parts in the relative position just described, as illustrated in FIGS. 1A-1B, the tubular member 10 is held by the clamps 24 and is freely suspended from the clamps. When the clamps 24 are moved from the position shown in FIGS. 1A-1B to the position shown in FIGS. 2A-2B, a section of the tubular member 10 is moved through the passage 23 between the vertically immovable members 14a-14b,

the tube 27 holding down the element 18 and preventing upward movement thereof.

The cooperating members 14a-14b are now moved toward one another, as illustrated in FIGS. 3A-3B, to firmly anchor the tubular member 10 between the element 18 and the members 14a-14b, after which the tube 27 is raised a short distance. The tubular member 10 is sealed at 28, as by heating in the manner explained above, for example, after which the material 12 is introduced into the tubular member 10 through the tube 27. As the material 12 is being introduced into the tubular member 10, the upright tube 27 is gradually raised so that its lower end desirably is not submerged in the material beneath the surface thereof. After a predetermined quantity of material 12 is introduced into the tubular member 10, the lower end of the tube 27 is withdrawn from the elastic tubular member 10 and the material is no longer fed through the tube 27.

After the desired quantity of material 12 has been introduced into the tubular member 10, or while the material 12 is being introduced into the tubular member, the tubular member is cut by the knife-edged members 29 at a region below the seal 28 and above the element 18. When the tubular member 10 is sealed at the zone 28, the thin-walled tubular member 10 is stretched, as diagrammatically indicated in FIGS. 3A-3B. The thin-walled tubular member 10, at the region below the seal 28, is stretched further when the knife-edged members 29 move toward one another and cut the tubular member 10, as indicated in FIGS. 4A-4B. When the tubular member 10 is cut in this manner, the newly formed end portion 10c seen in FIGS. 5A-5B, due to the aforementioned stretching of the tubular member and its inherent elasticity, springs back to form an opening 10d.

After the tubular member 10 has been cut to provide the tubular section 10a and the tube 27 has been withdrawn from the latter, the upper end of the section 10a is sealed at 30 below the region of the clamps 24, as previously explained. The tubular section 10a and body of material 12 sealed therein is released from the clamps 24 after which the clamps 24 are moved downward to the position shown in FIGS. 1A-1B to be clamped to the newly formed open end portion 10c of the tubular member 10. The tube 27 is moved downward through the opening 10d at the end of the tubular member 10 until its lower end engages the top 19 of element 18, after which the cooperating members 14a-14b are moved apart to form the passage 23 between these members and the element 18. With the parts in the positions just described and illustrated in FIGS. 1A-1B, the above-described operation of the apparatus can be repeated to produce another tubular section 10a having a body of material sealed therein.

The element 18 essentially serves as an insert for the elongated flexible-walled tubular member 10 which functions to open the flattened member 10 as it is being unwound from the drum 11. The element 18 also functions to form the opening 10d at the newly formed end portion 10c of the flexible-walled tubular member 10, as illustrated in FIGS. 5A-5B, after the member 10 has been cut below the seal 28. While the element 18 has a fixed shape and is not deformable, it is capable of forming the opening 10d in the newly formed end portion 10c of the tubular member 10 when the latter is formed of an elastic material like thin-walled plastic, such as polyethylene, for example. Hence, the element 18, which may be referred to as a mouthpiece at the newly formed end portion 10c of the tubular member 10, does possess the ability to form an opening at the end portion when the tubular member 10 is formed of material having good elastic properties. As pointed out above, the tubular member 10 is stretched along a region of its length between the seal 28 and the element 18 when the seal is formed. The tubular member 10 is stretched further along this region when the knife-edged members 29 bear against the member 10 below the seal 28. Due to such stretching of a

5

material having good elastic properties, the material possesses sufficient resiliency to spring back after the elongated member 10 has been cut to form the opening 10b even though there is a tendency for the edges of elastic material like polyethylene sheet to stick and adhere to one another when pressed together by the knife-edged members 29.

When the elongated flexible-walled tubular member 10 is formed of material having poor elastic properties and is essentially unelastic, an opening can be formed at the newly formed end portion 10c of the tubular member 10 by providing an element like the element 18 which is distortable and can be compressed and subsequently allowed to expand to form the opening. Such an embodiment is illustrated in FIGS. 6A-6B in which an element 18a includes a non-deformable bottom part 18b like the element 18 in the first-described embodiment and a top part 18c formed of an elastomeric material. The elastomeric material may comprise any suitable resilient substance such as natural or synthetic rubber or other rubber-like plastics. Thus, the term "rubber" as hereinafter used in the specification is intended to include other rubber-like plastics. The top resilient part 18c is in the form of an annulus which, when unstressed, assumes the shape illustrated in FIG. 6B having a well-defined opening therein. The bottom edge of the resilient part 18c is secured to the top wall 19b of the bottom part 18b in any suitable manner.

When the seal 28 is formed in the tubular member 10, at which time the cooperating members 14a and 14b are moved toward one another to anchor the tubular member against the bottom part 18b of the element 18a, the top resilient part 18c is deformed and compressed and assumes the shape illustrated in FIG. 6A. When the tubular member 10 is being cut by the knife-edged members 29, the top resilient part 18c is placed under even greater tension so that, when the elongated member 10 has been cut, the resilient part 18c can spring back to assume its normal shape shown in FIG. 6B to form the opening 10d in the newly formed end portion 10c of the elongated member 10.

Instead of relying entirely upon the compression and subsequent expansion of a resilient part to form an opening in a newly formed end portion of the elongated member 10, as shown in FIGS. 6A and 6B and just described, the resilient part may be distorted by an external force to form the opening. Such an embodiment is illustrated in FIGS. 7A and 7B in which an element 18d includes a non-deformable bottom part 18e like the element 18 in FIGS. 1A-1B and a top deformable part 18f. In FIG. 7A the tubular member 10 is anchored between the bottom element part 18e and the cooperating members 14a and 14b. In FIGS. 7A and 7B the top part 18f, which is secured to the bottom part 18e, is in the form of an annulus and essentially unstressed or only under slight compression. After the tubular member 10 is cut by the knife-edged members 29, a pair of members 31 at opposite sides of the member 10, and about at the level 7B-7B in FIG. 7A, are moved toward one another to distort the top part 18f from its solid to its dotted line shape in FIG. 7B. In this way the normally parallel side walls of the deformable part 18f are bowed outwardly so that the upper portion of the part 18f assumes a cylindrical configuration to form an opening at the newly formed end portion of the tubular member.

The embodiment of FIG. 8 includes the cooperating members 14a-14b which form a cavity to receive an element 18g generally like the element 18 in the first-described embodiment. The shape of the bottom part of the element 18g is similar to the shape of the element 18 and cooperates with the members 14a-14b in the same manner that the element 18 cooperates with these parts in the first-described embodiment.

FIG. 8 is a view similar to FIG. 4B in which the cooperating members 14a-14b have been moved toward one another to firmly anchor the tubular member 10 be-

6

tween the element 18g and the members 14a-14b. All or a part of the material 12 has been introduced into the section of the tubular member 10 above the seal 28 and the cooperating knife-edged members 29 are about to be moved toward one another to cut the tubular member 10 at a region below the seal.

In order to insure that an opening will be formed at the end of the tubular member 10 projecting upward from the element 18g after the tubular member 10 is cut by the knife-edged members 29, the element 18g includes a top cross arm 32 upon which a pair of vertically extending fingers 33 are pivoted at 34 at regions intermediate their ends. The upper pointed ends of the fingers 33 bear against the inner surfaces of the inclined sides of the tubular member 10 at regions of the latter immediately below the seal 28. The fingers 33 are held against the opposing inclined sides of the tubular member 10 by a resilient member, such as a coil spring 35, for example, having its opposite ends connected to the lower ends of the fingers. When the knife-edged members 29 cut the tubular member 10 at a region below the seal 28, the spring 35 becomes effective to move the upper ends of the fingers 33 apart and form an opening at the end of tubular member 10 projecting above the element 18g.

The embodiment of FIG. 9 is like the embodiment of FIG. 8 in that a pair of vertically extending fingers 33a are pivoted at their lower ends at 34a to the element 18h. A coil spring 35a having its opposite ends connected to the fingers 33a functions to move the fingers 33a toward one another. The fingers 33a are formed entirely or partly of magnetic material and arranged to be moved apart by a pair of electromagnets 36 located at opposite sides of the tubular member 10 at the vicinities of the upper ends of the fingers 33a. The electromagnets 36 are adapted to be energized after the tubular member 10 has been cut by the knife-edged members 29, thereby attracting the fingers 33a and moving them apart against the action of the spring 35a to form an opening at the newly formed end of the tubular member 10. After the clamps 24 have been clamped to the open end of the tubular member 10 and the tube 27 has been inserted within the open end against the element 18h, the electromagnets 36 are de-energized and the spring 35a becomes effective to move the upper ends of the fingers 33a toward one another.

The embodiment of FIGS. 10 to 14 is like the embodiment of FIG. 8 in that it is provided with an element 18j having a pair of vertically extending fingers 33b pivoted at 34b at regions intermediate their ends. The upper pointed ends of the fingers 33b are biased toward one another by a coil spring 35b having its opposite ends connected to the fingers 33b at regions above the pivots 34b. A pair of horizontal arms 37, which are located at opposite sides of the element 18j and movable toward and from one another, are arranged to bear against regions of the tubular member 10 and move the lower ends of the fingers 33b toward one another against the action of the spring 35b. In this way the upper ends of the fingers 33a can be moved apart to open the newly formed end portion 10c of the tubular member 10 after the latter has been cut by the knife-edged members 29 at a region below the seal 28. After the clamps 24 have been clamped to the end of the tubular member 10 and the tube 27 is moved downward within the open end of the tubular member 10 against the top of the element 18j, the horizontal arms 37 are moved apart to enable the spring 35b to move the upper ends of the fingers 33b toward one another.

In view of the foregoing, it will now be understood that an improved method has been provided for forming individual tubes from an elongated flexible-walled hollow member and filling each tube with flowable material. The method includes the steps of sealing an end section of the hollow member at a region remote from

the open end thereof, flowing material into such sealed-off end section, cutting the hollow member at a region in back of the seal to form an individual tube and closing the tube at its open end. The improvement comprises inserting an element into the flexible-walled hollow member which functions to open and inflate the hollow member when these parts are intermittently moved relative to one another lengthwise of the hollow member. The element is stopped at the end of each intermittent movement at a position in back of the region at which the hollow member is cut to form an individual tube, and the element is utilized to form an opening at the extreme end of the newly formed end portion of the flexible-walled hollow member each time the hollow member is cut.

The apparatus described above and illustrated in the drawing may be employed for making sausages or similar meat products, in which case the hollow tubular member 10 is formed of sausage casing material. Instead of heat sealing the tubular member 10 at 28 and 30, other suitable sealing provisions may be employed. For example, string or the like may be tied about the tubular member 10 at 28 and 30 to seal these regions. The principles of the invention may also be employed for making collapsible tubes or containers filled with liquid or paste, in which case a manually operable closure member may be substituted for the seal 30. A collapsible tube of this type is disclosed in L. F. S. Lundahl Patent No. 2,773,627, granted December 11, 1956.

Although several embodiments of the invention have been shown and described, it will be apparent to those skilled in the art that various modifications and changes may be made without departing from the spirit and scope of the invention. For example, the element 18 in the embodiment of FIGS. 1A-1B to 5A-5B and the corresponding part in the other embodiments may be formed partly or entirely of magnetic material and suitable electromagnets may be provided exteriorly of the flexible-walled hollow tubular member 10 which can be energized to maintain the element 18 stationary while successive longitudinal sections of the tubular member are being moved with respect to the element 18. It is therefore contemplated to cover all modifications and changes which come within the true scope and spirit of the invention, as pointed out in the following claims.

What is claimed is:

1. In a method of forming individual tube sections from an elongated hollow flexible-walled tubular member and filling each section with flowable material which includes the steps of sealing an end section of the tubular member at a region remote from the open end thereof, flowing material into such sealed-off end section, cutting the tubular member at a region in back of the seal to form an individual tube section, and closing the tube section at its open end, the improvement which comprises inserting an element into the tubular member, intermittently moving the element and tubular member relative to one another lengthwise of the latter in the process of forming successive tube sections, stopping the element at the end of each intermittent movement at a position in back of the region at which the tubular member is cut to form a tube section, utilizing the element to form an opening at the extreme end of the newly formed end portion of the flexible-walled tubular member each time the tubular member is cut, and anchoring the tubular member against the outer surface of the element when the tubular member is being cut.

2. In a method of forming individual tube sections from an elongated hollow flexible-walled tubular member formed of material having elastic properties and filling each section with flowable material which includes the steps of sealing an end section of the tubular member at a region remote from the open end, flowing material into such sealed-off section, cutting the tubular member at a region in back of the seal with the absence of slack in

the tubular member to form an individual tube section, and closing the tube section at its open end, the improvement which comprises inserting an element into the tubular member, intermittently moving the element and tubular member relative to one another lengthwise of the latter in the process of forming successive tube sections, stopping the element at the end of each intermittent movement at a position in back of the region at which the tubular member is cut to form a tube section, utilizing the element to form an opening at the extreme end of the newly formed end portion of the flexible-walled tubular member each time the tubular member is cut responsive to tension developed in the elastic material when the tubular member is sealed and subsequently cut, and anchoring the tubular member against the outer surface of the element when the tubular member is being sealed and cut.

3. In a method of forming individual tubes from an elongated flattened hollow flexible-walled tubular member formed of material possessing elastic properties and filling each tube with flowable material which includes the steps of sealing an end section of the tubular member at a region remote from the open end thereof, flowing material into such sealed-off section, cutting the tubular member at a region in back of the seal to form an individual tube, and closing the tube at its open end, the improvement which comprises inserting an element into the tubular member, intermittently moving the tubular member upward past the element while restraining and holding the element in a fixed vertical position so as to form successive tubes, stopping the tubular member at the end of each intermittent movement to position the element back of the region at which the tubular member is cut to form a tube, and anchoring the tubular member against the outer surface of the element at the aforementioned vertical position to promote the forming of an opening at the extreme end of the newly formed end portion of the flexible-walled tubular member responsive to tension developed in the elastic material when the tubular member is cut.

4. In a method of forming individual tube sections from an elongated hollow flexible-walled tubular member and filling each section with flowable material which includes the steps of sealing an end section of the tubular member at a region remote from the open end thereof, flowing material into such seal-off end section, cutting the tubular member at a region in back of the seal to form an individual tube section, and closing the tube section at its open end, the improvement which comprises inserting an element into the tubular member, intermittently moving the element and tubular member relative to one another lengthwise of the latter in the process of forming successive tube sections, stopping the element at the end of each intermittent movement at a position in back of the region at which the tubular member is cut to form a tube section, expanding the element to promote the forming of an opening at the extreme end of the newly formed end portion of the flexible-walled tubular member each time the tubular member is cut, and anchoring the tubular member against the outer surface of the element when the tubular member is being cut.

5. In a method of forming individual tube sections from an elongated hollow flexible-walled tubular member and filling each section with flowable material which includes the steps of sealing an end section of the tubular member at a region remote from the open end thereof, flowing material into such sealed-off end section, cutting the tubular member at a region in back of the seal to form an individual tube section, and closing the tube section at its open end, the improvement which comprises inserting an element into the tubular member, intermittently moving the element and tubular member relative to one another lengthwise of the latter in the process of forming successive tube sections, stopping the element at the end of each intermittent movement at a position in back of the region at which the tubular member is cut to form a

tube section, compressing the element responsive to sealing each end section of the tubular member, and releasing the compressed element to promote the forming of an opening at the extreme end of the newly formed end portion of the flexible-walled tubular member each time the tubular member is cut.

6. In a method of forming individual tube sections from an elongated hollow flexible-walled tubular member and filling each section with flowable material which includes the steps of sealing an end section of the tubular member at a region remote from the open end thereof, flowing material into such sealed-off end section, cutting the tubular member at a region in back of the seal to form an individual tube section, and closing the tube section at its open end, the improvement which comprises inserting an element into the tubular member, intermittently moving the element and tubular member relative to one another lengthwise of the latter in the process of forming successive tube sections, stopping the element at the end of each intermittent movement at a position in back of the region at which the tubular member is cut to form a tube section, applying an external force to the element to expand the latter to promote the forming of an opening at the extreme end of the newly formed end portion of the flexible-walled tubular member each time the tubular member is cut, and anchoring the tubular member against the outer surface of the element when the tubular member is being cut.

7. In a method of forming individual tube sections from an elongated hollow flexible-walled tubular member and filling each section with flowable material which includes the steps of sealing an end section of the tubular member at a region remote from the open end thereof, flowing material into such seal-off end section, cutting the tubular member at a region in back of the seal to form an individual tube section, and closing the tube section at its open end, the improvement which comprises inserting a rubber-like element into the tubular member, intermittently moving the element and tubular member relative to one another lengthwise of the latter in the process of forming successive tube sections, stopping the element at the end of each intermittent movement at a position in back of the region at which the tubular member is cut to form a tube section, and applying an external force to the rubber-like element to distort the latter to promote the forming of an opening at the extreme end of the newly formed portion of the flexible-walled tubular member each time the tubular member is cut.

8. In a method of forming individual tubes from an elongated hollow flexible-walled tubular member and filling each tube with flowable material which includes the steps of sealing an end section of the tubular member at a region remote from the open end thereof, flowing material through a hollow sleeve into such sealed-off section, cutting the tubular member at a region in back of the seal to form an individual tube, and closing the last-mentioned tube at its open end, the improvement which comprises inserting an element into the tubular member, intermittently moving the tubular member upward past the element while the latter is being held in a fixed vertical position with the aid of the hollow sleeve so as to form successive tubes, stopping the tubular member at the end of each intermittent movement to position the element back of the region at which the tubular member is cut to form a tube, utilizing the element to form an opening at the extreme end of the newly formed end portion of the flexible-walled tubular member each time the tubular member is cut to facilitate the insertion of the hollow sleeve into the open end of the tubular member, and anchoring the tubular member against the outer surface of the element when the latter is at the aforementioned vertical position and the tubular member is being cut.

9. Apparatus of the character described for forming a

number of individual tubes from successive end sections of an elongated flexible-walled hollow member, each end section being adapted to be sealed at a zone remote from the open end thereof and closed at the vicinity of its open end, after material has been introduced into each sealed-off end section, means for cutting the hollow member at regions in back of each sealing zone, means for opening successive longitudinal portions of the hollow flexible-walled member comprising an element in the path of movement of the hollow member and over which the hollow member is adapted to pass, means for intermittently positioning the element within successive end sections of the hollow member in back of the region at which each end section is cut by said cutting means, so that a longitudinally extending portion of the hollow member will always project in front of the element to the open end of the hollow member at the region at which cutting of each successive end section is effected by said cutting means, and means for anchoring the hollow member against the element when the hollow member is being cut by the cutting means.

10. Apparatus as set forth in claim 9 in which said means for intermittently positioning the element within successive end sections of the hollow member includes structure for holding the element while the hollow member is moved over the element.

11. Apparatus as set forth in claim 9 in which said means for intermittently positioning the element within successive end sections of the hollow member includes structure for gripping and holding the open end of the hollow member and provisions for moving said structure to pull the hollow member over the element, and means for holding the element stationary while the hollow member is being pulled over it.

12. Apparatus as set forth in claim 9 in which the element is expandable.

13. Apparatus as set forth in claim 9 in which the element is compressed responsive to cutting of the hollow member by said cutting means and expands after cutting of the hollow member is completed.

14. Apparatus as set forth in claim 9 in which the element includes at least a pair of movable arms mounted thereon, said arms normally being ineffective to inflate the hollow member, and means external of the hollow member operable to impart movement to said arms to inflate the hollow member and open the newly formed outer end of the flexible-walled hollow member after cutting thereof is effected by said cutting means.

15. Apparatus of the character described for forming a number of individual tubes from successive end sections of an elongated hollow flexible-walled member, each end section being adapted to be sealed at a zone remote from the open end thereof and closed at the vicinity of its open end, means for introducing material into each sealed-off end section prior to closing the section at its open end, means for cutting the hollow member at regions in back of each sealing zone, means for opening successive longitudinal portions of the hollow flexible-walled member comprising an element in the path of movement of the hollow member and over which the hollow member is adapted to pass, means for intermittently moving the element and hollow member relative to one another lengthwise of the latter to position the element within successive end sections of the hollow member in back of the region at which each end section is cut by said cutting means, so that a longitudinally extending portion of the hollow member will always project in front of the element to the open end of the hollow member at the region at which cutting of each successive end section is effected by said cutting means, and means for anchoring the hollow member against the element when the hollow member is being cut by the cutting means.

16. Apparatus as set forth in claim 15 in which said moving means includes a part acting on the element.

17. Apparatus as set forth in claim 16 in which said

part is stationary and develops a reaction force while the element and the hollow member are moved relative to one another by said moving means.

18. Apparatus as set forth in claim 15 in which at least a portion of the element is formed of magnetic material, and magnetic means disposed exteriorly of the hollow member for maintaining the element stationary while the hollow member is being moved relative thereto by said moving means.

19. In a method of forming individual tubes from an elongated hollow flexible-walled tubular member and filling each tube with flowable material which includes the steps of sealing an end section of the tubular member at a region remote from the open end thereof, flowing material through a hollow sleeve into such sealed-off section, cutting the tubular member at a region in back of the seal to form an individual tube, and closing the last-mentioned tube at its open end, the improvement which comprises inserting an element into the tubular member, intermittently moving the element and tubular member relative to one another lengthwise of the latter in the process of forming successive tubes, stopping the element at the end of each intermittent movement at a position in back of the region at which the tubular member is cut to form a tube, and utilizing the element to form an opening at the extreme end of the newly formed end portion of the flexible-walled tubular member each time the tubular member is cut to facilitate the insertion of the hollow sleeve into the open end of the tubular member, the elongated hollow tubular member being formed of thin-walled plastic having good elastic properties and in which the tubular member is anchored against the element so as to develop stresses in the thin-walled plastic responsive to cutting of the tubular member at the region in back of the seal to promote the forming of an opening at the extreme end of the newly formed end portion of the flexible-walled tubular member each time the latter is cut.

20. In a method of forming individual tubes from an elongated hollow flexible-walled tubular member and filling each tube with flowable material which includes the steps of sealing an end section of the tubular member at a region remote from the open end thereof, flowing material through a hollow sleeve into such sealed-off section, cutting the tubular member at a region in back of the seal to form an individual tube, and closing the last-mentioned tube at its open end, the improvement which comprises inserting an element into the tubular member, intermittently moving the element and tubular member relative to one another lengthwise of the latter in the process of forming successive tubes, stopping the element at the end of each intermittent movement at a position in back of the region at which the tubular member is cut to form a tube, and utilizing the element to form an opening at the extreme end of the newly formed end portion of the flexible-walled tubular member each time the tubular member is cut to facilitate the insertion of the hollow sleeve into the open end of the tubular member, the hollow tubular member being anchored against the element at the end of each intermittent movement and the element undergoing a change in physical state responsive to the application of an external force to promote the forming of an opening at the extreme end of the newly formed end portion of the flexible-walled tubular member each time the latter is cut.

21. Apparatus of the character described for forming a number of individual tubes from successive end sections of an elongated flexible-walled hollow member, each end section being adapted to be sealed at a zone remote from the open end thereof and closed at the vicinity of its open end, means for introducing material into each sealed-off end section prior to closing the section at its open end, means for cutting the hollow member at regions in back of each sealing zone, means for opening successive longitudinal portions of the hollow flexible-walled member comprising an element in the path of movement of the hollow member and over which the hollow member is adapted to pass, and means for intermittently positioning the element within successive end sections of the hollow member in back of the region at which each end section is cut by said cutting means, so that a longitudinally extending portion of the hollow member will always project in front of the element to the open end of the hollow member at the region at which cutting of each successive end section is effected by said cutting means, the element being formed of an elastomeric material.

22. Apparatus of the character described for forming a number of individual tubes from successive end sections of an elongated flexible-walled hollow member, each end section being adapted to be sealed at a zone remote from the open end thereof and closed at the vicinity of its open end after material has been introduced into each sealed-off end section, means for cutting the hollow member at regions in back of each sealing zone, means for opening successive longitudinal portions of the hollow flexible-walled member comprising an element in the path of movement of the hollow member and over which the hollow member is adapted to pass, means for intermittently positioning the element within successive end sections of the hollow member in back of the region at which each end section is cut by said cutting means, so that a longitudinally extending portion of the hollow member will always project in front of the element to the open end of the hollow member at the region at which cutting of each successive end section is effected by said cutting means, said means for intermittently positioning the element within successive end sections of the hollow member including structure for gripping and holding the open end of the hollow member and provisions for moving said structure to pull the hollow member over the element, and means for holding the element stationary while the hollow member is being pulled over it, said holding means comprising a part extending within the hollow member from its open end to the element.

23. Apparatus as set forth in claim 22, in which said part comprises a hollow tube, and means including said hollow tube for introducing material into each sealed-off end section.

References Cited in the file of this patent

UNITED STATES PATENTS

2,847,806 Wang _____ Aug. 19, 1958

FOREIGN PATENTS

1,184,321 France _____ July 20, 1959