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Simon et al.

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[45] **Dec. 24, 1974**

[54] **SHAPE-RETAINING CLOSURE OF A TUBULAR PACKAGE FOR TAMPONS**

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Related U.S. Application Data

[62] Division of Ser. No. 86,778, Dec. 22, 1970.

[52] **U.S. Cl.** **206/438,** 128/285, 229/62, 150/3

[51] **Int. Cl.** .. **A61f 13/20,** B65d 33/16, B65d 85/54

[58] **Field of Search** ..... 206/63, 2 R; 229/87 R, 229/62; 128/285; 150/3

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Primary Examiner—William T. Dixson, Jr.
Attorney, Agent, or Firm—Jason Lipow

[57] **ABSTRACT**

Process and apparatus for twist closing one end of a tubular wrapping containing a tampon with a rounded head directed toward the end of the wrapper being closed and excess tubular wrapper material extending past the rounded head thereof including axially rotatable gripper means adapted to grip the marginal portions of the excess tubular material; means for maintaining the tampon and wrapper therearound in a substantially stationary condition; means for rotating the gripper means; gripping the excess tubular material, relative to the remainder of the tampon and wrapper thereon to form a twisted end closure and a rosette of twisted excess wrapper material with a periphery directed away from the twist-closed tampon; smoothing means including a depression containing member directed toward the rosette; means for engaging the rosette and of the twist-closed tampon with the depression including means for folding the periphery of excess wrapper upon itself toward said rosette, and means for pressing said rosette toward the rounded end of said tampon.

3 Claims, 13 Drawing Figures

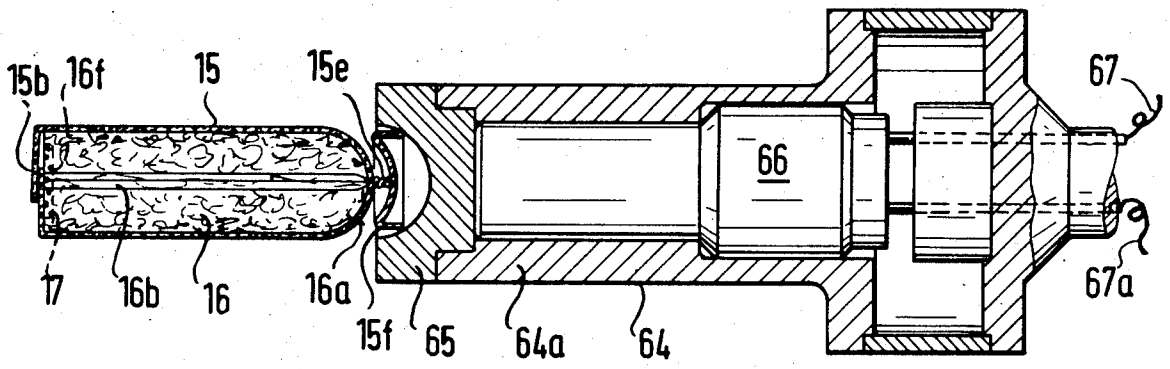

Fig.1

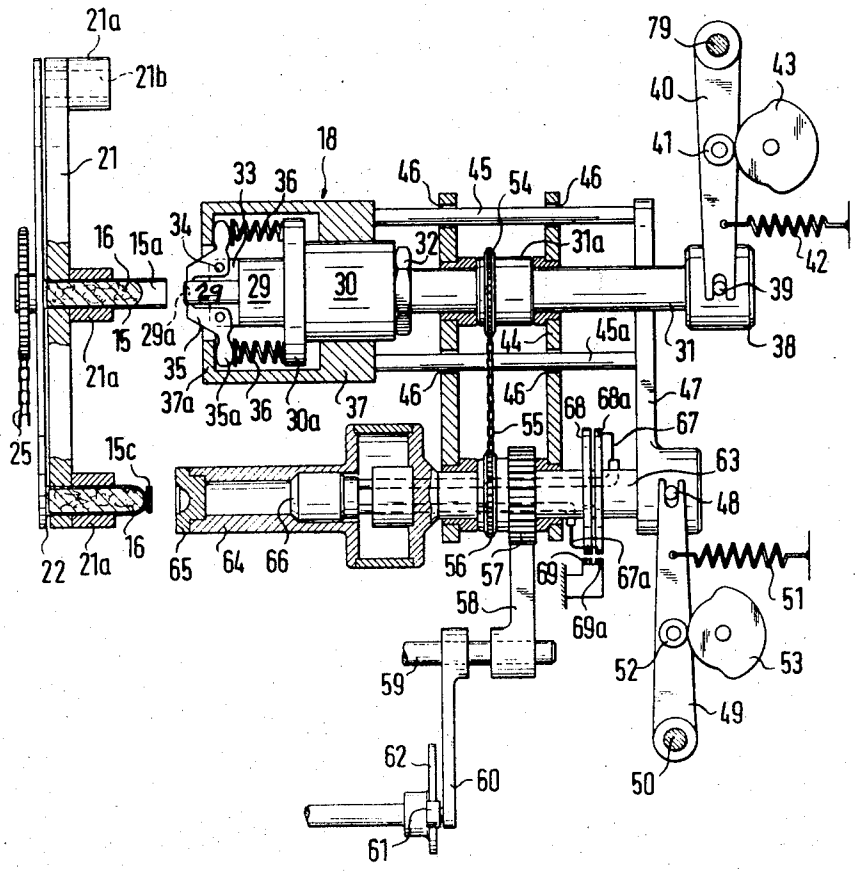
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Fig. 2

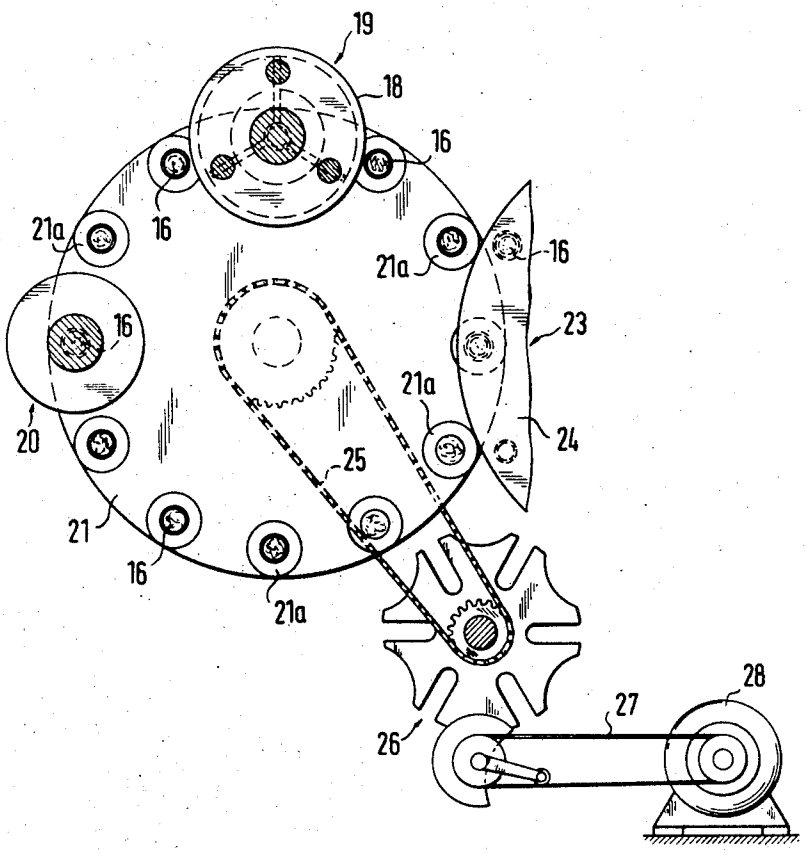


Fig. 3

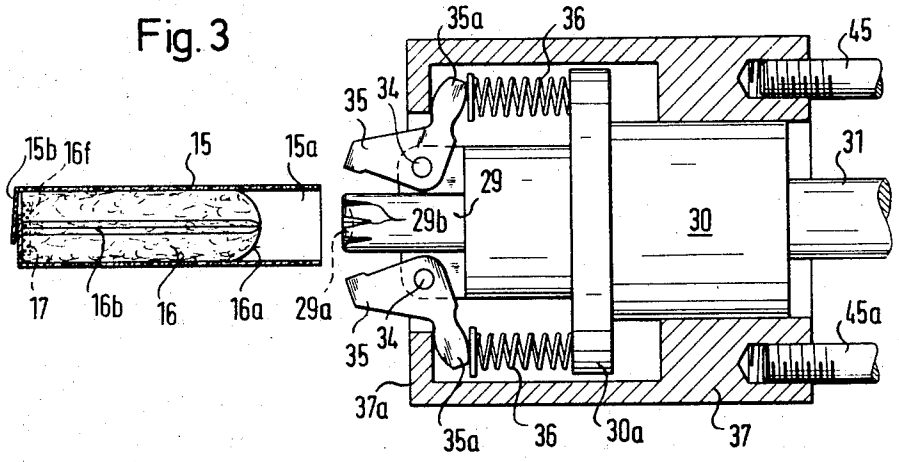


Fig. 4

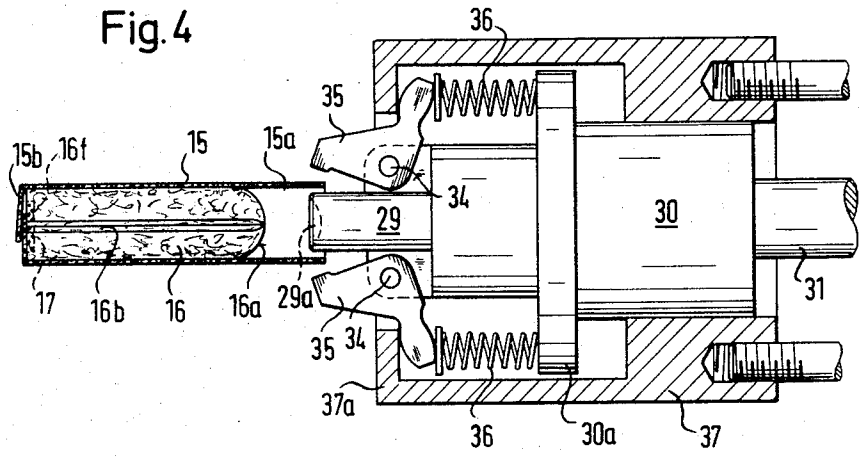
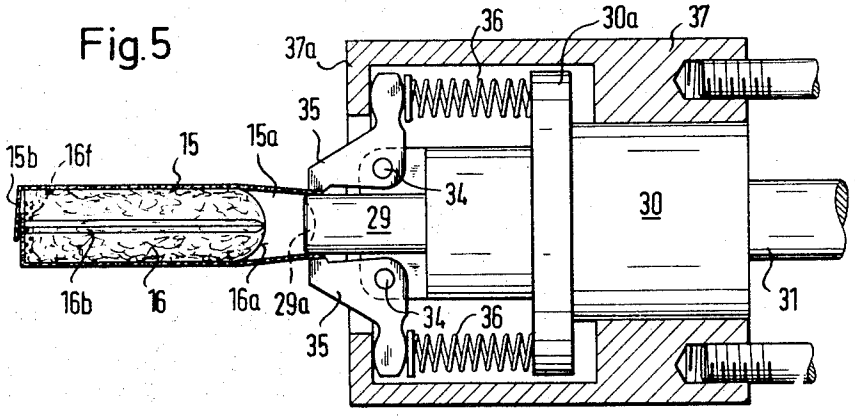


Fig. 5



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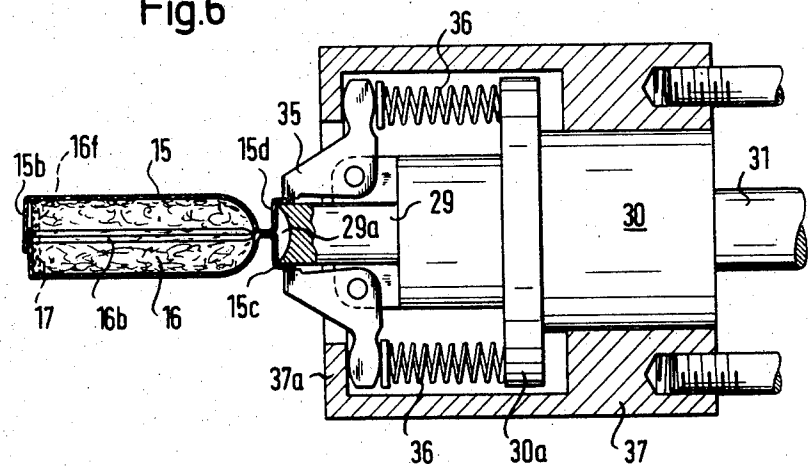
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Fig.7

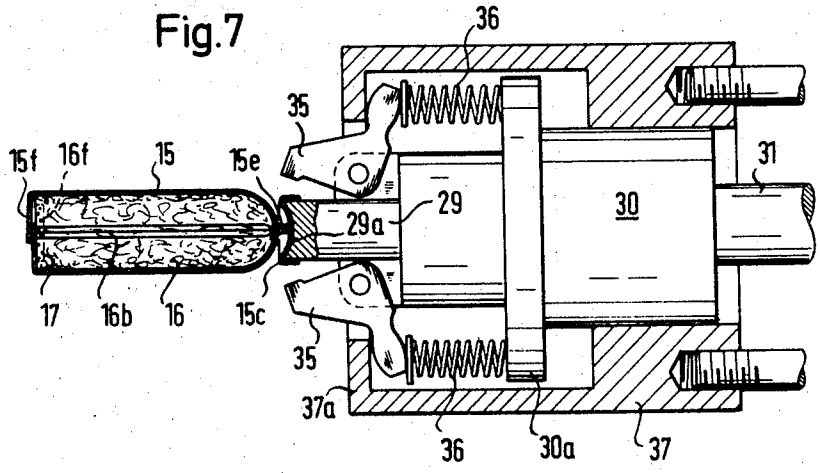
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Fig.8

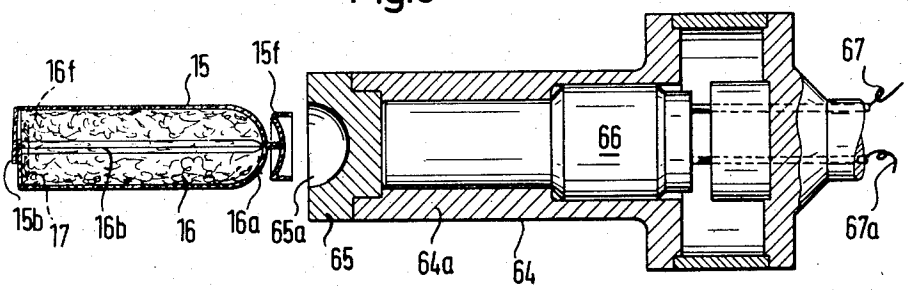

Fig.9

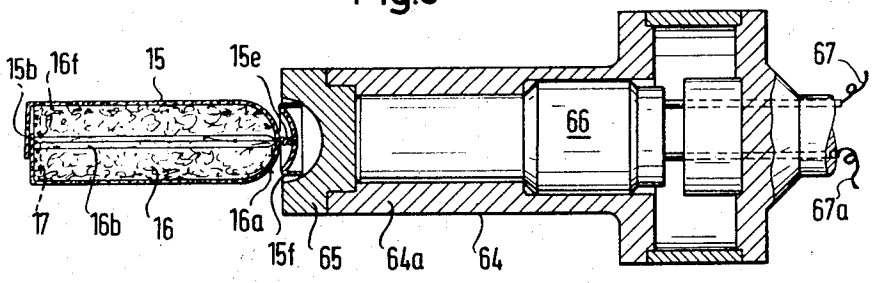

Fig.10

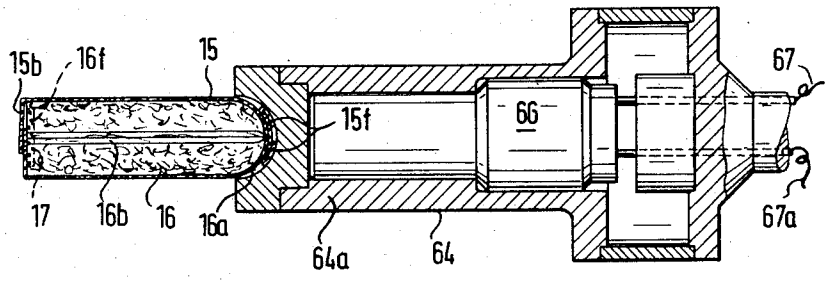

Fig.11

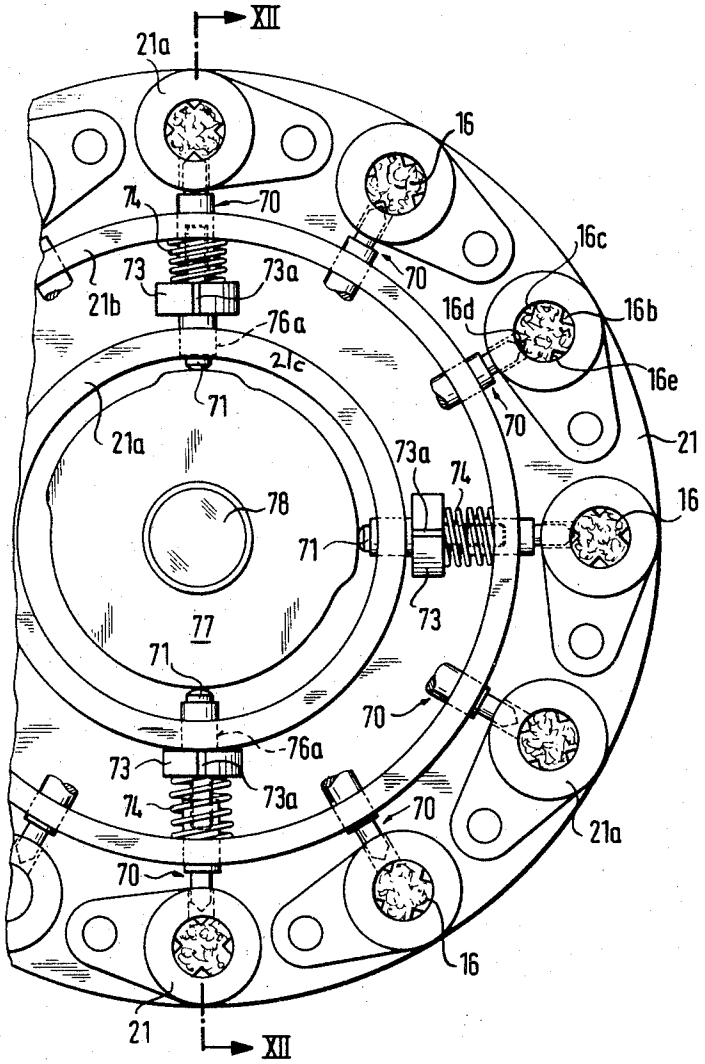
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Fig.12

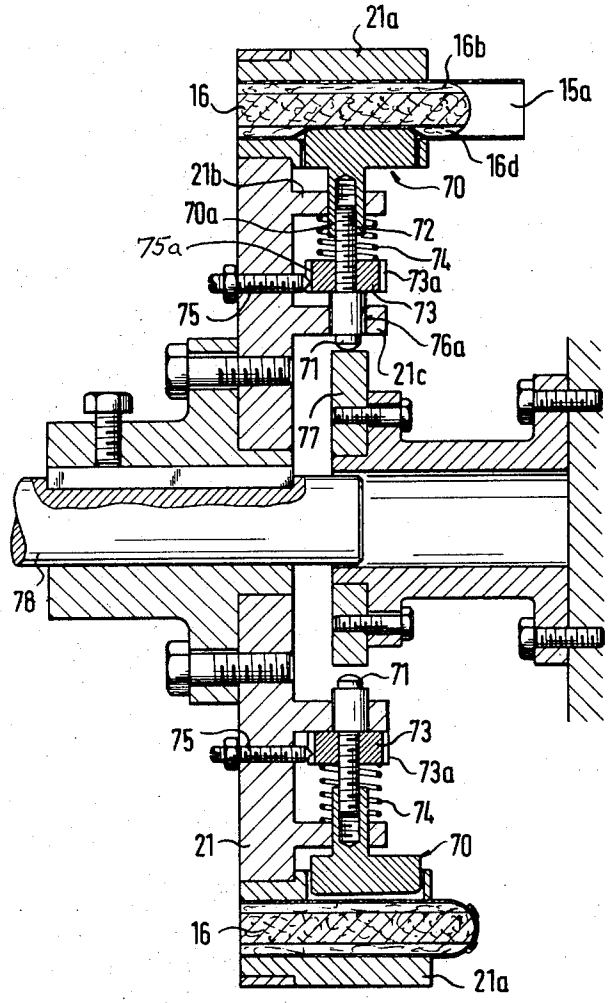
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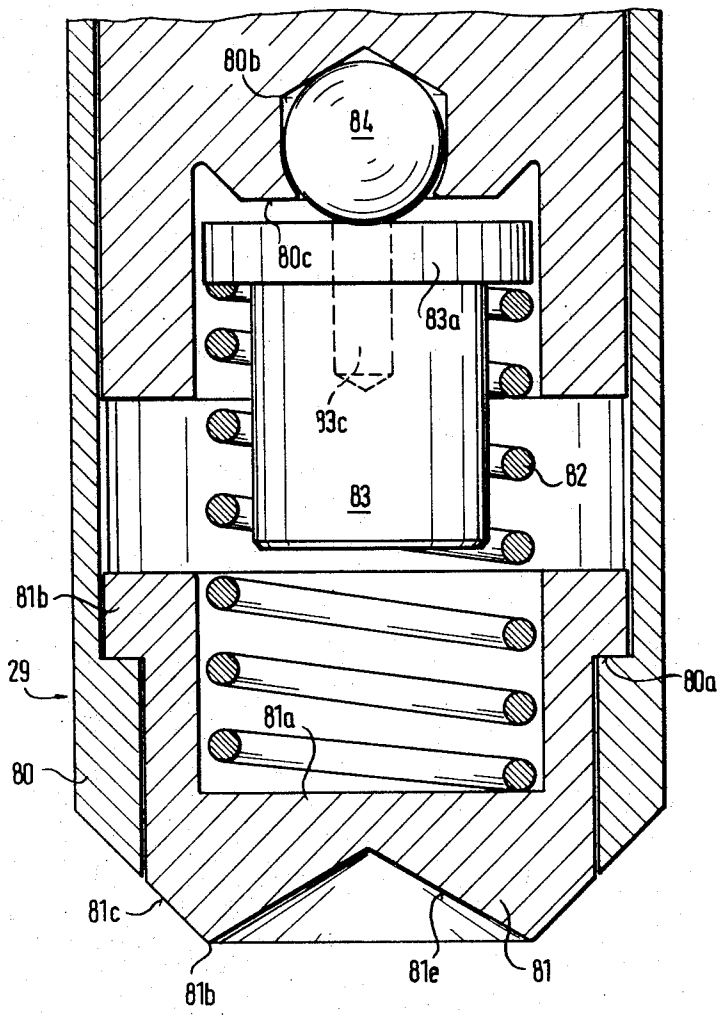
Fig. 13



SHAPE-RETAINING CLOSURE OF A TUBULAR PACKAGE FOR TAMPONS

This is a division, of application Ser. No. 86,778 filed Dec. 22, 1970.

This invention relates to tampons. It more particularly refers to tubular enclosures for tampons and still more specifically to end closures therefor.

It is known to use tubular wrapping material for encasing a tampon. It is known to use a tubular wrapper of pliable, tear-resistant material, such as cellophane, or other plastic films, to envelope a tampon. One end of these tubular wraps, the rear end, suitably has a folded closure.

Difficulties have been encountered however in forming a suitable closure for the rounded head end of a tampon, particularly a tampon which is relatively elastic and has a tendency to expand and in which the tubular wrapper extends and projects an open extremity thereof beyond the rounded head of the tampon.

The invention is addressed to the problem of creating a closure of the open extremity of a tubular wrapper for elastic products having a tendency to expand axially and at the extremities, and in some cases in all axial directions, preferably tampons of pressed fiber material for feminine hygiene, the end closure must, due to its special folding geometry, be tight and stable in shape. Such products require a prescribed shaping of the wrapping material as it is turned in or twisted, in order to prevent unsightly wrinkles that might emboss the product, and to insure that the closure will provide the best possible seal.

Accordingly, one aspect of this invention resides in a process of forming a twisted end closure of a tubular wrapping sleeve containing a tampon with its rounded head directed toward an open end of the wrapping sleeve from which the end closure is to be made, which process comprises holding the tampon and the sleeve directly in contact therewith in a relatively fixed position; gripping the open end of the tubular material, which extends out from the tampon head a given predetermined amount, with a rotatable and axially movable, relative to the tampon and sleeve thereon, gripping means; rotating the gripping means and that portion of the tubular material gripped thereby relative to the tampon and to the remainder of the tubular sleeve material in contact with the tampon, whereby to twist the open end of the tubular material into a twist closure close about the tampon head, to form a rosette of the remaining tubular material on the side of the twist closure away from the tampon head and to form a periphery of untwisted tubular material extending away from the tampon and the twist closure; engaging the untwisted periphery of the tubular material, rosette and twist closure with an axially displaceable, possibly heating, smoothing means having a recess which substantially matches the tampon head; axially moving the smoothing means toward the tampon whereby inwardly folding the periphery of tubular material and the rosette toward the tampon head while crushing the twist closure; and fixing such in said position.

The projecting open extremity of the sleeve-like tubular wrapper is seized at the inside and outside of its outer margin with the substantial retention of its diameter, and is then shaped by a rotation coaxial to the long axis of the wrapper into a twisted constriction, while its outer extremity is shaped into a flat rosette. By shaping

the outer extremity of the wrapper into a flat rosette a certain self-locking is achieved in regard to the twisted constriction because the folds that develop are pressed against one another and crimped together to a certain extent. In this manner an unitentional undesired rotation of the rosette by unwinding to cause an opening of the twisted constriction is prevented. On the other hand, the flat rosette offers a good grip for the easy opening and removal of the product by the ultimate user without damage thereto. This advantage is particularly important in the case of a menstruation tampon that is provided with a round head end, for example.

This invention provides that, as the resistance which the twisted constriction, as it forms, offers to the further twisting of the extremity of the wrapper increases, the wrapper extremity is drawn toward the tampon, approximately coaxially to the constriction, and at the same time the bottom of the rosette that is forming is stretched radially from the constriction.

A further aspect of this invention consists in reflexing the flat bottom of the rosette as formed, prior to the end of the twisting process, so that it extends partially back over the constriction toward the tampon's rounded head. This substantially improves the cross-shrinkage of the creases that form in the bottom of the rosette and the self-locking action produced thereby.

Depending on the wrapping material used and on the dimensions of the product, a further improvement can be achieved according to this invention, by pressing a central portion of the reflexed rosette bottom, whose diameter is smaller in size than that of the tubular wrapper together with the twisted constriction, against the product in the wrapper, that is the tampon. The wrapper periphery is shortened by further turning of the gripped outer margin of the wrapper in relation to the outer margin of the center portion of the rosette bottom which is pressed against the product, for the purpose of forming a cylindrically projecting margin on the rosette. In this manner only the margin of the rosette bottom that is outside of the pressed center portion of the rosette bottom that is outside of the pressed center portion is subjected to tensile stress, and at the same time, the constriction is protected.

During the twisting of the open end of the wrapper, it is desirable to hold the wrapper and the tampon contained therein securely against rotation and axial displacement.

Another important improvement according to this invention can be achieved if the cylindrical, projecting margin of the rosette is folded down onto the outer surface of the rosette bottom facing away from the constriction, and is smoothed together with the rosette bottom and the twisted constriction against the portion of the wrapper than envelops the extremity of the product in a tightly form-fitting manner. This can be done with the application of heat in order to fix the end closure shape to the shape of the tampon head. When the rosette is smoothed against the corresponding extremity of the product, it is desirable to hold the wrapper and product so that they will not rotate, but to give them a slight axial displacement. In this manner slight differences in the length of the product can be accommodated.

It is advantageous to use a wrapper whose open extremity projects beyond the corresponding extremity of the product by a length corresponding to about 90 to

140% of the greatest diameter of the tubular wrapper.

The invention furthermore provides for an apparatus for the performance of the above-named process, which is characterized in that an axially reciprocatable and rotatable twisting device is composed of at least one clamping member and a mandrel whose end face configuration and recess is made to match the shape of the extremity of the product that it faces, and whose cross-sectional dimensions are somewhat smaller than the greatest diameter of the tubular wrapper. The clamping member is designed to be movable by means of a controlling device in relation to the peripheral surface of the mandrel disposed coaxially to the axis of rotation of the twisting device.

For adaptation to the thickness of the wrapping material and to the forces required for the production of the twisted constriction, provision can furthermore be made so that the clamping force of the clamping member is variable and is of such magnitude that, with the increase of the resistance of the tubular wrapper resulting from the leverage ratio between the radius of the twisted constriction and the radius of the mandrel, the open extremity of the wrapper can be partially withdrawn axially from the position in which it is clamped.

An additional measure that is important in the packaging of mass goods is that, during the rotating movement of the twisting device, its positively controlled axial advancing movement in the direction of the product in the tubular wrapper is of a magnitude that is proportional to the shortening of the projecting end of the wrapper brought about by the formation of the twisted constriction.

The measure is of substantial assistance in assuring that the twisted constriction is always formed under uniform tension of the wrapping material with its adjoining flat rosette.

Since a uniform geometry is important to the twisted constriction closure of the invention, it is possible according to a further embodiment of the invention to provide the periphery of the head end of the mandrel with grooves extending in its lengthwise direction. In this manner, creases are formed in the tampon and wrapper where the grooves are located on the mandrel. It is particularly advantageous and preferred if the number of grooves corresponds to the number of millimeters in the radius of the tubular wrapper.

A still further improvement can be achieved if a pressing means in the form of an annular ridge, whose diameter is smaller than that of the entire end face of the mandrel, projects axially from the said end face. In this manner it can be brought about that during or after the formation of the twisted constriction, the wrapping material extending from the mandrel to the twisted constriction is relieved of tension since only the wrapping material that is outside of the annular ridge is subjected to the forming action in the final phase of the production of the twist closure with the flat rosette.

It is desirable for a larger, central portion of the end face of the mandrel to form a pressing member which is desposed so that it can be pushed coaxially back into the mandrel sleeve against the action of a compression spring to a limited degree and is freely rotatable in relation to the mandrel sleeve. This makes it possible to compensate for tolerable differences in the position of the product within the tubular wrapper so that the quality of the twisted closure with its flat rosette will always be uniform regardless reasonable variations in the length of the open end of the tubular wrapper projecting beyond the corresponding end of the product.

In this embodiment, the recessed portion of the pressing member normally projects from the mandrel sleeve, and it has an annular shoulder that is urged by the compression spring against an internal annular shoulder on the mandrel sleeve. One end of the said compression spring bears against the pressing member and the other end encompasses a guiding stud inside of the mandrel and bears against an annular shoulder on the said stud. This guiding stud is preferably guided axially and freely rotatably within the mandrel sleeve. It is urged by the compression spring against a ball engaging its center, which ball partially protrudes from a central recess provided in the corresponding end of the mandrel.

When the pressing member is in the normal position, its end face and the end face of the mandrel sleeve together form the mantle surface of an obtuse circular cone, a champfer. Advantageously, the pressing ridge mentioned above is formed by the line at which the circular conical surface of the pressing member meets an obtuse circular conical recess in the end face of the pressing member. The circular conical surface on the extremity of the mandrel thus aids the slipping of the wrapping material from the mandrel and at the same time makes it possible to form the pressing ridge in a simple manner.

In a further development of the invention, it is desirable to construct the controlling means for the twist closure and rosette forming means in the form of a control cylinder which coaxially partially envelops the twisting device and is axially displaceable with respect to the twisting shaft under the control of a cam. The lever arms of a plurality of grippers are held in engagement with an annular shoulder on the control cylinder by the action of springs, while the pivot points of the said lever arms are arrayed at equal circumferential distances in a common plane normal to the twister shaft on a portion of the twister shaft.

A smoother shaft can be and preferably is mounted at a distance from and parallel to the twister shaft on the same overall machine frame. The said smoother shaft has a heatable smoothing station on the indexing wheel for smoothing and folding down the tubular wrapper. This arrangement makes it possible to provide a common advancing apparatus both for the control cylinder for the twisting shaft and for the smoothing head, by means of which the axial reciprocation of these members towards and away from the wrapper can be derived. Furthermore, it is possible in this manner to provide a common rotatory drive for the twister shaft and the smoother shaft.

The delivery of the tubular wrappers containing the product can be accomplished by means of an indexing wheel which is rotatably mounted in a plane perpendicular to the twister shaft and to the smoothing shaft. The indexing wheel is provided with receivers for the tampons and wrappers thereon at equal intervals on its periphery, one receiver being provided at each index position of the indexing wheel: one in a position in which the tubular wrappers are fed in, one coaxial with the mandrel of the twisting device, and one coaxial with the smoothing shaft.

It is at the same time desirable to associate with each receiver a gripping plunger which is adjustably joined to a cam follower, each gripping plunger being movable radially outward by a stationary cam into the receiver against the force of a spring, when the indexing wheel is rotated. In this manner, each wrapper with the product it contains can be held substantially in the desired position during the twisting and smoothing processes. It is desirable to design the cam in such a manner that, during the twisting process, the wrapper that is in the twisting station and the product which it contains are not either axially or radially movable in the receiver or twistable, of the indexing wheel, and the one that is in the smoothing station is movable only axially.

Understanding of this invention will be facilitated by reference to the accompanying drawing in which:

FIG. 1 Is a partially sectioned elevation of the apparatus hereof, which has an indexing wheel bearing receivers for tubular wrappers.

FIG. 2 Is a side view with parts in section of the indexing wheel of FIG. 1 with its drive means and the indication of a twisting device.

FIG. 3 Shows a schematic view of the twisting device of this invention with the grippers thereof opened and a tubular wrapper placed coaxially opposite them partially in section.

FIG. 4 Shows the twisting device partially in section of FIG. 3 in an advanced position in which the grippers and mandrel are about to engage the open end of the tubular wrapper.

FIG. 5 Shows the twisting device partially in section of FIG. 4 with the tubular wrapper engaged by the grippers and mandrel.

FIG. 6 Shows the twisting device partially in section of FIG. 5 advanced in the process to where a twisted rosette has been made from the end of the tubular wrapper.

FIG. 7 Shows the twisting device partially in section FIG. 6 after the pressing motion of the mandrel in the direction of the tubular wrapper and after the opening of the grippers.

FIG. 8 Shows a smoothing head partially in section opposite a package bearing a twisted rosette, in its starting position after leaving the operation shown in FIG. 7

FIG. 9 Shows the smoothing head partially in section of FIG. 8 before the beginning of the smoothing of the twisted rosette.

FIG. 10 Shows the smoothing head partially in section of FIG. 9 with the twisted rosette smoothed against the packaged product.

FIG. 11 Shows the indexing wheel of FIGS. 1 and 2 partially in section in a partially cut-away view.

FIG. 12 Is a vertical section taken along line XII—XII of FIG. 11 looking in the direction of the arrows.

FIG. 13 Is a longitudinal cross-section of another embodiment of a mandrel according to this invention.

The drawings represent an apparatus for the shape-retaining closure of the open extremity **15***a* of a tubular wrapper **15** of formable, tear-resistant material, such as cellophane, enveloping a product in the form of a tampon **16** for feminine hygiene. The open extremity **15** a of the tubular wrapper extends beyond the head end of the tampon for a length amounting to about 90 to 140 percent of the greatest diameter of the tubular wrapper. The tubular wrapper is already closed at its rear end, at **15***b* (FIG. 3), by folds made perpendicularly to its long axis. The tampon consists of a fiber batting which is wound on itself and is compressed radially to the desired final diameter of the tampon. The head end **16***a* of the tampon is rounded. The tampon is provided with longitudinal indentations **16***b*, **16***c*, **16***d*, **16***e*, preferably located at equal intervals around its circumference (FIG. **11**). At the rear end the tampon is equipped with a recess **16***f* in whose plane at right angles to the long axis of the tampon a removing string **17** is lodged in the form of a flat spiral.

The margin of the open extremity, **15***a* of the tubular wrapper **15** is gripped inside and outside by a twisting means **18** while substantially retaining its diameter, and then it is formed, by rotation coaxial to the long axis of the wrapper, into a construction **15***e*, and at its outer extremity, into a flat rosette **15***c* (FIGS. **1, 6,** and **7**). While the twisted rosette **15***c* is being released by the twisting means **18,** the latter presses the rosette in the direction of the rounded head **16***a* of the tampon, as shown in FIGS. **6** and **7.** By this action, as shown in FIG. **6,** the at first flat bottom **15***d* of the twisted rosette is reflexed over the twisted neck **15***e*. During the twisting of the open end of the rubular wrapper, the latter and the tampon it contains are fixedly held unrotatably and axially undisplaceably in position. Then the outer extremity of the tubular wrapper, which forms the twisted rosette **15***c*, is smoothed against the rounded head **16***a* preferably with the application of heat, and is fitted to the shape of the rounded head (FIGS. **8** to **10**). The outer, approximately cylindrical margin **15***f* (FIGS. **8** and **9**) of the twisted rosette **15***c* is folded inwardly upon itself (FIG. **10**) approximately concentrically with the long axis of the tubular wrapper when the rosette is being smoothed against the rounded head of the tampon. The tubular wrapper **15** with the tampon is held during this latter operation so that it will not rotate, but is displaced axially to a slight extent, so that the absorbent fiber material of the tampon will preserve its prescribed density in the area of its rounded head. The tension with which the wrapper is applied to the tampon after the twisting of its open extremity can be controlled to a great extent by the number of rotations of the twisting device, so that the quality of the tampon is preserved even when the open end of the tubular wrapper is twisted.

The tubular wrappers **15** with the tampons **16** are delivered to a twisting station **19** and a smoothing station **20** (FIG. **2**) by means of an indexing wheel **21** which is provided with receivers **21***a* which are positioned with their axis parallel to the axis of rotation of the indexing wheel and are spaced at equal intervals about the circular wheel. The receivers **21***a* are provided with apertures **21***b* (FIG. **1**) whose cross-section corresponds approximately to the cross-section of the tubular wrappers with the tampons contained therein. On the side of the receivers directed away from the twisting device **18,** there is provided a stop plate **22** spaced a short distance from the indexing wheel, in a plane parallel to the latter. This stop plate **22** must be provided at least at the twisting station and at a feeding station **23** (FIG. **2**) in which a tubular wrapper **15** with tampon **16** therein is fed to the indexing wheel by means of a feed wheel **24** (shown partially cut away in the drawing) via axial insertion thereof into an appropriate receiver **21***a*.

The indexing wheel **21** is stepwisedly advanced one position at a time, corresponding to the number of re-

ceivers 21*a*, through a drive means 25, preferably a chain drive which is driven from a cam 26, preferably a Maltese cross cam, which cam 26 is itself driven by a motor means 28 through a suitable conventional driving means 27, such as an endless belt.

A mandrel 29 (FIG. 1) of the twisting device 18 is positioned coaxially to and at a distance from the receiver 21*a* that is situated at the twisting station 19 (FIG. 2). The mandrel has a diameter that is slightly less than the inside diameter of the open extremity 15*a* of the tubular wrapper 15. The end of the mandrel 29 directed toward the receiver 21*a* has an arcuate socket-like recess 29*a* which substantially matches the rounded head 16*a* of the tampon 16.

The peripheral surface of the receiver directed end of mandrel 29 has grooves 29*b*, (shown in FIG. 1 but omitted from the other Figures for purposes of clarity and simplicity) extending longitudinally thereon from the receiver directed end thereof. It is prefetted to relate the number of grooves 29*b* to the radius of the tubular wrapper 15; for example, six grooves 29*b* are provided in a mandrel used in conjunction with a tubular wrapper having a radius of 6 mm, eight grooves 29*b* are provided in a mandrel used in connection with a tubular wrapper having a radius of 8 mm, etc.

One particular embodiment of a mandrel 29 which has been found to be especially well suited to this invention in shown in FIG. 13. This mandrel has a spring-leaded 82 central portion 81 containing a conical recess 81*e*. The tampon directed end of the central portion 81 has a pressing ridge 81*b* which is formed between the recess 81*e* and a champfer 81*c* about the periphery of the mandrel. The mandrel central portion 81 is in turn surrounded by a mandrel sleeve 80 whose tampon directed end is champfered to correspond to and mate with the champfer 81*c*. The mandrel central portion 81 and the mandrel sleeve 80 have abutting surfaces 80*a* and 81*d* which bear against each other by reason of the spring loading on the mandrel central portion. A compression spring 82 is provided within the mandrel bearing upon the surface 81*a* of the mandrel central portion directed away from the tampon and bearing upon a tampon directed annular surface 83*a* of a guiding stud 83 mounted within a recess in the mandrel. The guiding stud forms a core or shaft within the coils of the compression spring 82 and is itself compression mounted to the mandrel through a ball 84 which sits in a recess 80*b* in the tampon directed end of the mandrel. A blind hole 83*c* in the stud 83 serves to mount the ball 84 such that the stud 83 if freely rotatable.

The mandrel 29 is shown in FIG. 1 and is housed in a control cylinder 37 which is coaxially fastened at its rear extremity to a cylindrical member 30 which is itself coaxially affixed to one end of a shaft means 31 through a nut 32 (FIG. 1). Recesses 33 extend radially from the mandrel 29 at equal peripheral intervals. There are disposed in such recesses 33, in a plane normal to the shaft 31, fulcrum pins 34 on which outer wrapper grippers 35 are pivotably mounted. These grippers are mounted to pivot in generally radial planes.

The wrapper grippers 35 have lever arms 35*a* extending radially outward by therefrom approximately in the plane of the fulcrum pins 34. The gripper edges directed towards the tubular wrapper are urged against an inner annular shoulder 37*a* of the control cylinder 37 by the pressure of springs 36. The wrapper grippers 35 are pressed against the tubular wrapper 15 and mandrel 29 with a constant pressure determined by the characteristic of the springs 36. When a wrapper 15 is held by the mandrel, there is a slight gap between the gripper lever arms 35*a* and the control cylinder shoulder 37*a* during the twisting process.

The shaft which provides the twisting operation of this apparatus, shaft 31, is provided at its end opposite to the mandrel containing end, with an axially non-displaceable but freely rotatable collar 38 which has two diametrically opposity pins, one of which can be seen in FIG. 1 and is identified as 39. These pins are engaged by the forked ends of lever means 40 rotatable about an axle 79, which lever means is provided with a cam follower 41 which, under the action of a tension spring 42, rolls on a cam 43. The twister shaft 31 is positioned within a sprocket wheel 54 with the hub 31*a* disposed rotatably but axially non-displaceably within a frame 44. The twister shaft 31 is axially displaceable within hub 31*a* and sprocket wheel 54.

The frame 44 has apertures 46 therein through which guide rods 45 and 45*a* extend freely. These guide rods join the control cylinder 37 to a plate 47 disposed on the side of the frame directed away from the index wheel 21. The plate 47 is longer than the space between the guide rods 45 and 45*a* and extends past such rods into the vacinity of a shaft 63 to which it is also attached. There are provided at the end of the plate 47 near the shaft 63 two diametrically opposed pins 48 (only one is shown in FIG. 1) which engage a forked operating lever 49 which is pivotable about an axle 50. The operating lever 49 is biased by a tension spring 54 to bring a cam follower 52 into engagement with a rotatable cam 53 whereby to move the plate in such a manner that the rods 45 and 45*a* and the shaft 63 move axially.

The twister shaft sprocket 54 is connected by a chain 55 to another sprocket 56 attached to a pinion 57 which meshes with a toothed segment 58. The toothed segment 58 is pivotable about an axle 59 on which a lever 60 is fastened, which by means of a cam follower 61 follows a cam 62.

The sprocket 56 and the pinion 57 are disposed in the frame 44 so as to be rotatable but axially non-displaceable. The shaft 63, which is mounted in the frame 44 and is axially displaceable within pinion 57 through the bore of the sprocket 56, is provided with a smoothing head 64 on its index wheel directed end.

The smoothing head 64 as shown in FIGS. 1 and 8 through 10 has, at its tampon divided end, a shaft 64*a* terminated by a forming member 65, which can be heated by an electrical resistance heating element 66, contained in the shaft 64*a*. The heating element 66 is connected by electrical conductors 67, 67*a*, inside of the hollow shaft 63 to slip rings 68, 68*a* affixed to the shaft 63 which are in turn connected through conventional carbon brushes 69, 69*a*, to a direct-current source of electricity. The forming member 65 is provided in its tampon directed end face with an arcuate recess 65*a*, which is somewhat larger in diameter than the end of the tubular wrapper 15 which it faces, and is of substantially the same shape as the tampon the tampon end to which it is directed. The movement of the operating lever 49 thus makes it possible, by means of the plate 47, to produce a common axial movement

of the control cylinder **37** and the smoothing head **64**, controlled by the cyclic movement of the cam **53**.

As shown in FIGS. **11** and **12**, radially extending tampon grippers **70** are associated with each receiver **21***a* in the indexing wheel **21**, and are operatively engaged in each case with a cam follower **71** in such a manner as to be adjustable in length. This adjustment is performed by means of a screw-threaded joining means **72** between the gripper and the cam follower. An adjusting nut **73** is affixed rotationally to the cam follower and is biased by a compression spring **74**. The other end of the compression spring **74** bears upon an external annular support collar **21***b* of the indexing wheel. The adjusting nut **73** can be locked in its rotational position by a set screw **75** which conventionally engages in recesses **75***a* provided on the external periphery of the adjusting nut **73**. An internally threaded shank **70***a* of the tampon gripper **70** passes through the annular support **21***b* into engagement with the adjusting nut **73** and each cam follower **71** passes through an aperture in an inner annular support **21***c* and into engagement with a stationary cam **77** which is affixed to the machine housing coaxially to a drive shaft **78**. In the upper portion of FIG. **12**, the cam follower **71** is urged radially outward by the cam **77** against the action of the compression spring **74**, in such a manner that the tampon gripper **70** engages in a longitudinal embossed groove **16***d* in the tampon **16** while simultaneously deforming the wrapper **15** to conform to this groove. The face of the tampon gripper **70** is wedge-shaped to match the cross-sectional shape of the embossed grove **16***d*. The shape of the cam **77** is so designed that during the twisting procedure at twisting station **19** (FIG. **2**) the tubular wrapper with the tampon therein can be moved neither radially nor axially, and at the smoothing station **20** it can be moved only radially.

The operation of the above-described apparatus is substantially as follows:

At the beginning of an operation or a complete segment of a continuous operation, the action of the cam **43** pivots the lever **40** about axle **79** and thereby advances the mandrel **29** with the wrapper grippers **35** axially towards the open extremity **15***a* of the tubular wrapper **15**. Since at this moment the control cylinder **37** is stationary, the wrapper grippers **35** are opened against the action of compression springs **36** by this advancing movement. The control cylinder **37** remains in its starting position until the open grippers have reached the position shown in FIG. **3** at a given predetermined distance from the open end **15***a* of the tubular wrapper **15**.

The control cylinder **37** is advanced toward the index wheel **21** by the action of the cam **53** on the operating lever **49** through the cam follower **52** to the plate **47** initiates. The control cylinder **37** advances at a rate which is substantially the same as the rate of advance of the twister shaft **31** by reason of the action of the cam **43** as aforesaid. As a result, after an initial movement of the twisting means **18**, it and the control cylinder **37** are advanced together towards the tubular wrapper. The movement of the twister shaft and twisting device by cam **43** is concluded as soon as the mandrel **29** has been introduced to a predetermined depth about 3 mm, into the open end of the wrapper **15** (FIG. **4**). Then the control cylinder is further advanced by the action of the cam **53** until the wrapper grippers **35** apply their gripping surfaces to and grip the outer margin of the open end **15***a* of the wrapper **15** and clamp such against the cylindrical periphery of the mandrel **29** (see FIG. **5**).

The cam **62** then immediately initiates the rotatory movement of the twister shaft **31** and twisting device through the lever **60**, toothed segment **58**, pinion **57** and chain **55**. During this rotation the open end **15***a* of the tubular wrapper **15** is closed by twisting (see FIG. **6**). In order to compensate for the amount by which the open end of the tubular wrapper is shortened by the twisting process, the twister shaft **31** and twister are advanced together with the control cylinder **37** during the twisting process in a positive manner according to the design of the cams **43** and **53**, so that the extremity of the wrapper **15***a* which is gripped between the mandrel **29** and the gripping surfaces of the wrapper grippers **35** cannot escape therefrom (FIG. **6**). The control cylinder **37** is held in the position which it has by this time assumed by the cam **53**, while the cam **43**, by means of the twister shaft **31**, moves the mandrel **29** and wrapper grippers **35** a little further towards the tubular wrapped and now closed tampon **16**. In this manner the wrapper grippers **35** are opened against the action of the compression springs **36**, while at the same time the slight forward movement of mandrel **29** reflexes the twisted rosette **15***c* that has formed by the twisting, bending its bottom **15***d* towards the rounded head **16***a* of the tampon (FIG. **7**).

The twister shaft **31** together with the mandrel **29** and the wrapper grippers **35** are then moved back along with the control cylinder **37** to the starting position shown in FIG. **1**. The control cylinder **37** comes to a stop shortly before the twister shaft **31** with the cylindrical member **30** and mandrel **29**, so that the wrapper grippers **35** close again. After this the indexing wheel **21** advances one step, whereupon the next twisting process can begin. The tampon containing wrapper **16***a*, now provided with the twisted rosette and closure **15***c* transferred from the twisting station **19** to yhe smoothing station **20** (FIGS. **1**, **2**, **8** and **9**). In this smoothing station **20** the smoothing head **64** is pressed, by the action of the cam **53**, in synchronis action with the movement of the control cylinder **37**, against the twisted rosette **15***c*, and is simultaneously rotated; as a result, the cylindrical outer margin **15***f* of the twisted rosette is folded inwardly, and the rosette together with the twisted constriction **15***e* is smoothed into a formfitting configuration around the head **16***a* of the tampon as a result of the heating action (FIG. **10**).

Another twisting process of another wrapped tampon is being carried out in the twisting station **19** at the same time as this described smoothing operation is being carried out.

The operation of the mandrel **29** in the embodiment shown in FIG. **13** differs from that described above with respect to a mandrel with a non-spring loaded central portion in that, as soon as the pressing ridge **81***b* presses the bottom of the rosette **15***d* (FIG. **6**) against that portion of the material covering the rounded head **16***a* of the tampon, the folding geometry is created again radially outside of this pressing ridge **81***b*. Since the radius of the pressing ridge **81***b* is substantially greater than that of the twisted constriction, the leverage ratio that is operative in the twisting action is diminished, so that the pulling of the rosette from the mandrel is accelerated. At the same time the folds that are formed are secured against one another by the

pressing ridge in the shape in which they are formed, so that a mutual interlocking of the folds is also achieved in the area of the pressing ridge. It is particularly important that, after the rosette bottom has been secured by the pressing ridge **81***b*, the continued twisting forces no longer affect the interlocking of the folds running into the twisted constriction, so that the axial advancement of the mandrel secures them together in the folding geometry which they already have, or they are firmly interlocked with one another by the reflexing of the rosette bottom. At the same time, the embodiment of the mandrel shown in FIG. **13** makes possible compensation for differences in the length of the open open extremity **15***a* of the tubular wrapping projecting beyond the head of the tampon caused by acceptable variations in manufacturing.

It can be seen that in this manner a shape-retaining and stable twisted closure adapted to the deformability or delicacy of the product can be achieved, along with a pressing and smoothing action. Under certain circumstances the heating of the smoothing head can be dispensed with.

What is claimed is:

1. A wrapped tampon comprising a tampon with a substantially rounded head end and a string containing rear end and a sleeve of substantially tear resistant material therearound wherein the end of said sleeve corresponding to the rear end of said tampon is folded over the rear end of said tampon and wherein the end of said sleeve corresponding to the head end of said tampon extends beyond the head of said tampon has a twist closure therein forward of the head of said tampon and terminates in a forwardly directed rosette having a periphery which is inwardly folded upon the forwardly directed face of said rosette, said rosette with said inwardly folded periphery reflexed toward the head of the wrapped tampon and substantially conforming to the shape of the head of said tampon.

2. A wrapped tampon as claimed in claim **1** wherein said twist closure, rosette and inwardly folded periphery are heat set in such position.

3. A wrapped tampon as claimed in claim **1**, having longitudinal depressions therein.

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