

[54] **TAMPON HAVING AN INSERTION END OF LESSER DENSITY THAN THE BODY PORTION**
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[22] Filed: **Dec. 2, 1970**
[21] Appl. No.: **94,552**

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Related U.S. Application Data

[63] Continuation of Ser. No. 696,969, Dec. 26, 1967, abandoned.

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Assistant Examiner—Richard J. Apley

Foreign Application Priority Data

Jan. 13, 1967 Netherlands..... 6700538

[52] **U.S. Cl.**..... **128/285, 128/270**
[51] **Int. Cl.**..... **A61f 13/20**
[58] **Field of Search**..... 128/269, 270, 284, 290, 128/285; 19/144.5

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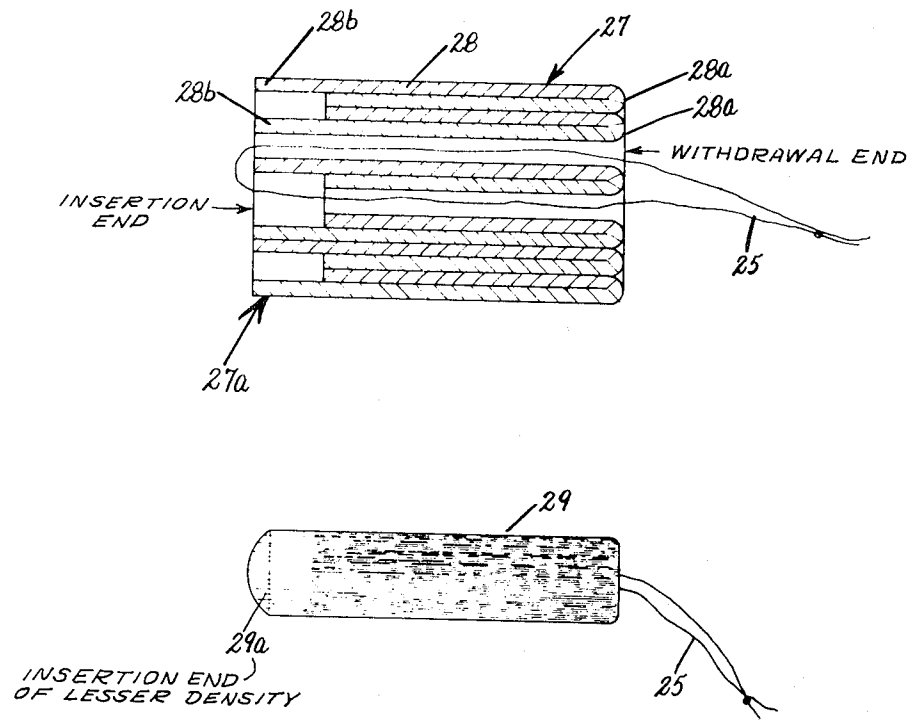
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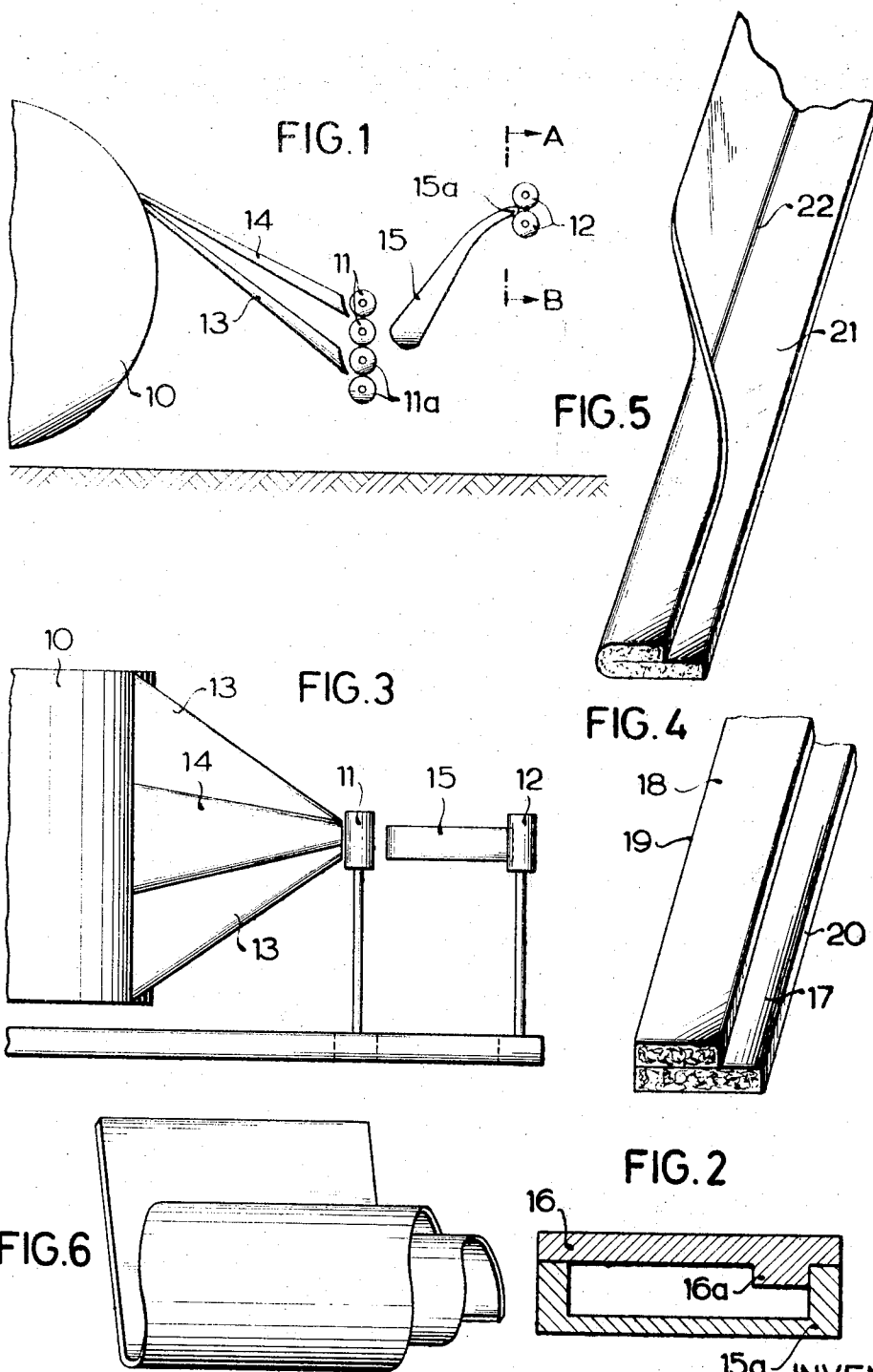
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ABSTRACT

A tampon made of a rolled non-woven fabric having an insertion end and a rolled body portion, the insertion end being compressed to a density less than the density of the rolled body portion, the rolled body portion being radially compressed to a predetermined dense state.

6 Claims, 17 Drawing Figures





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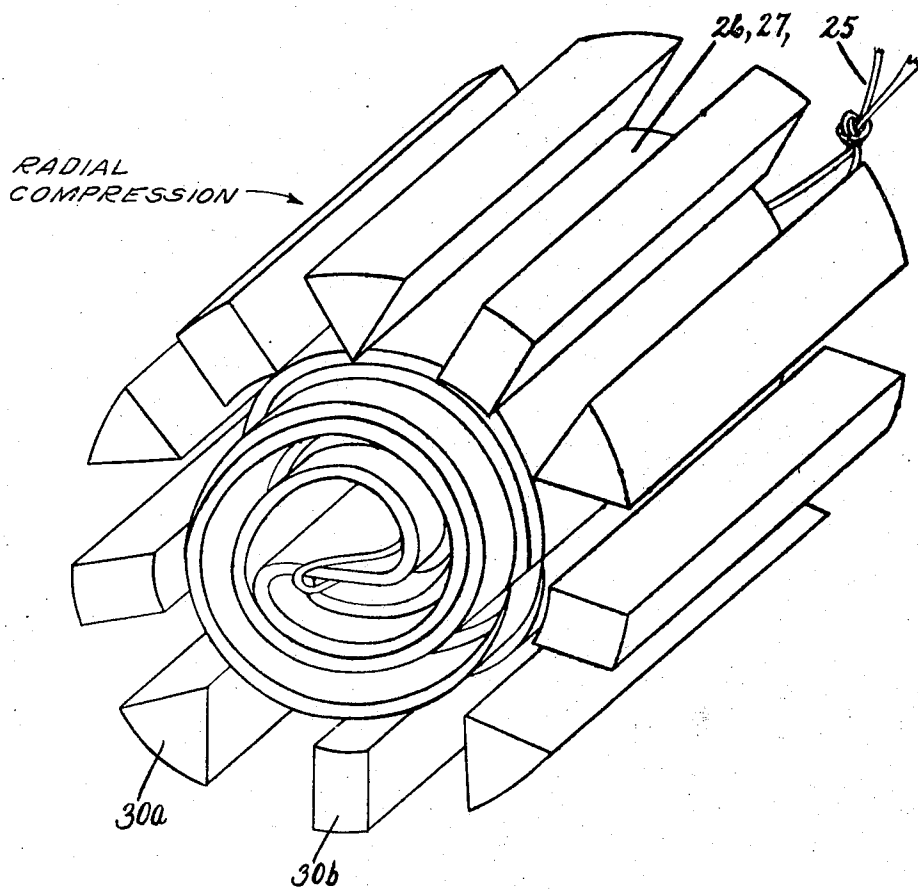


FIG. 7

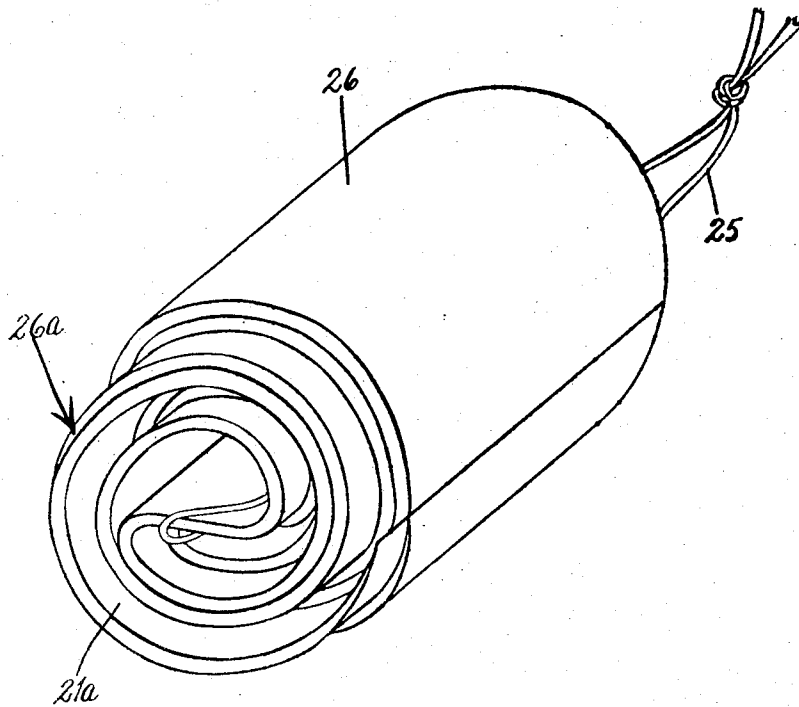


FIG. 8

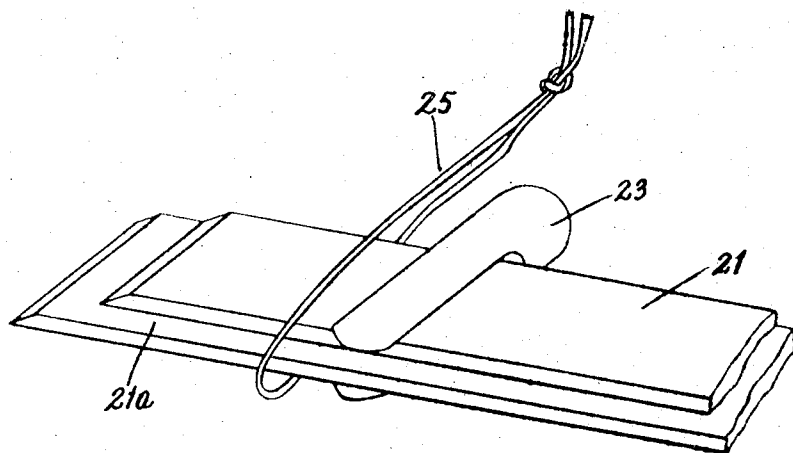


FIG. 9

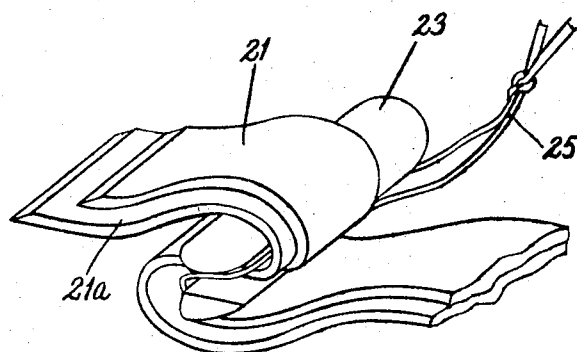
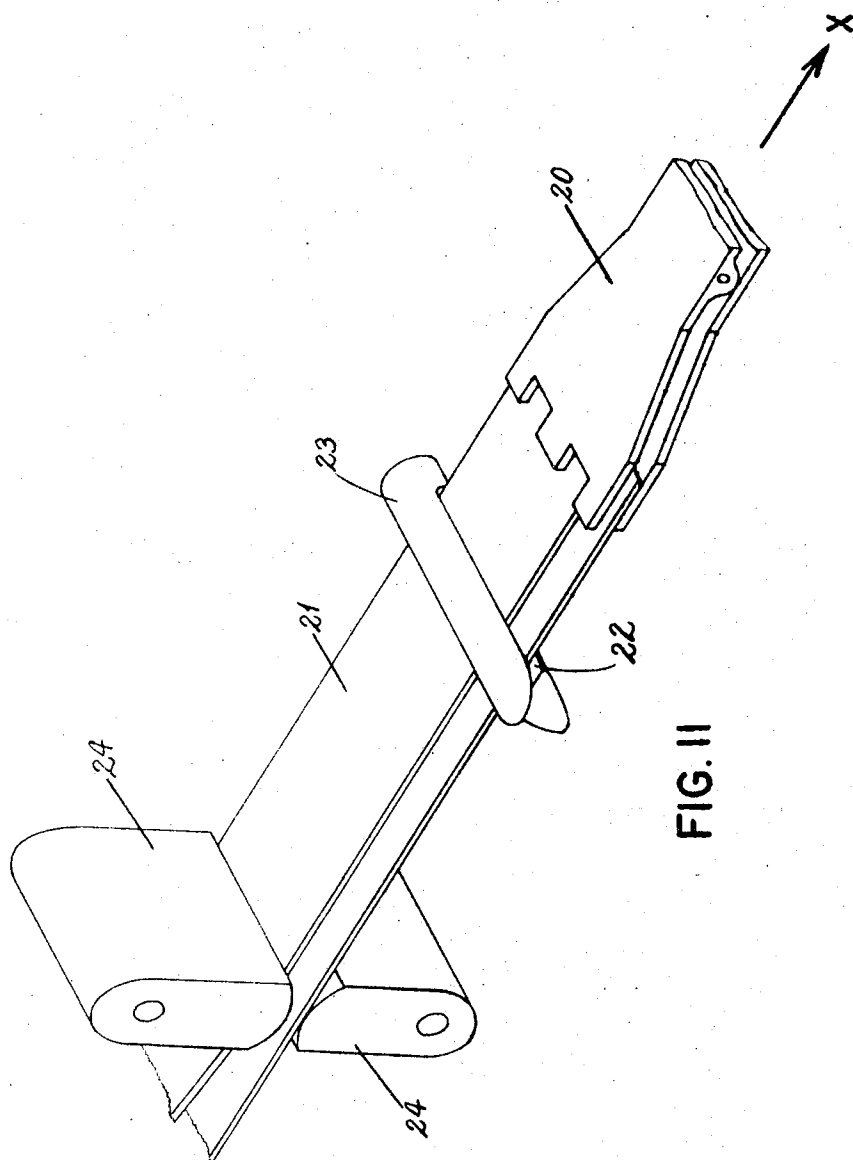
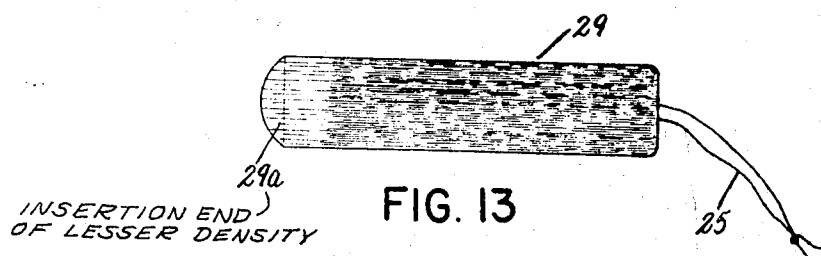
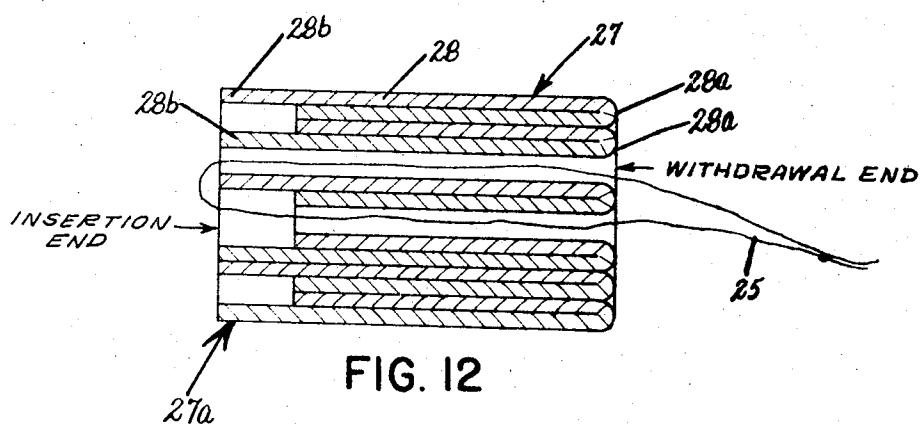


FIG. 10





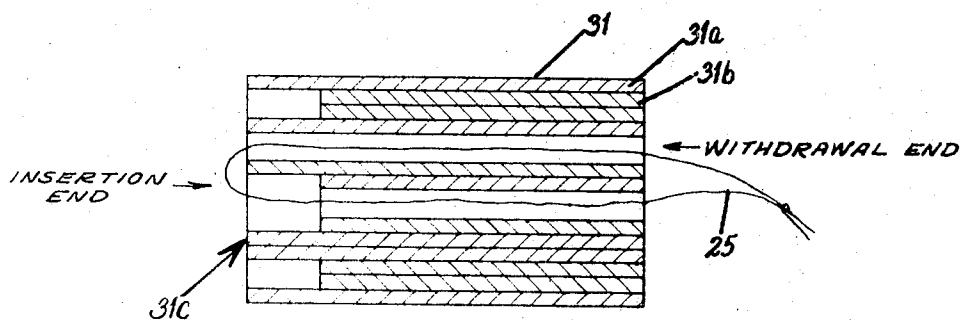


FIG. 14

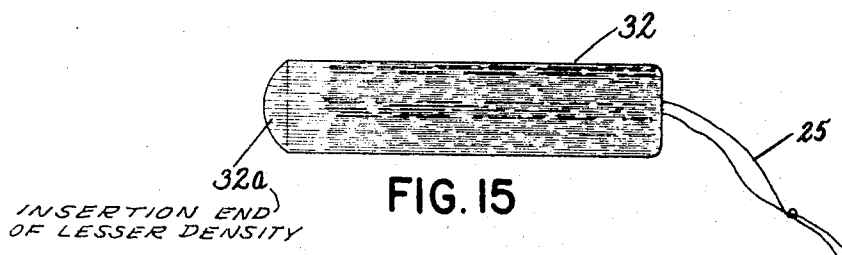


FIG. 15

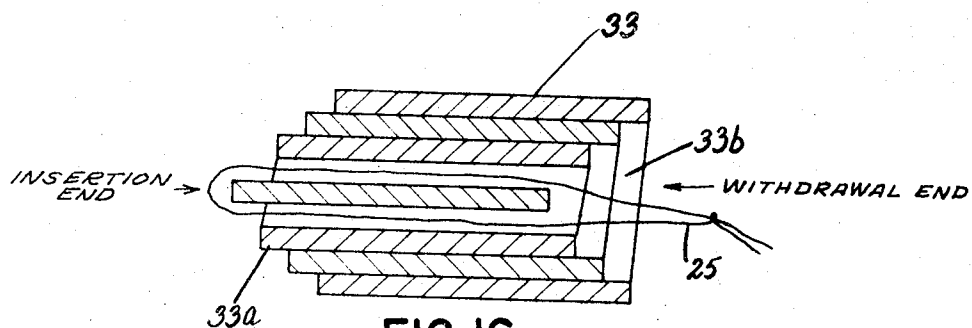


FIG. 16

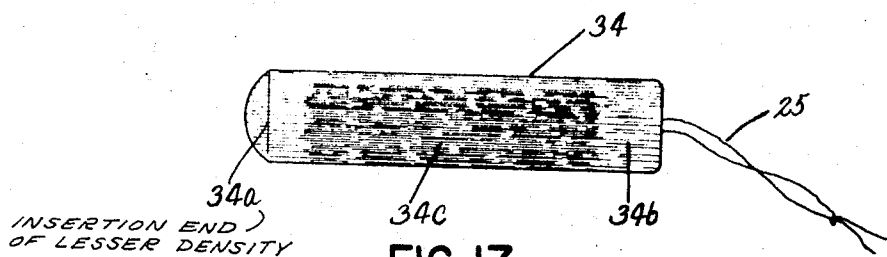


FIG. 17

TAMPON HAVING AN INSERTION END OF LESSER DENSITY THAN THE BODY PORTION

This application is a Continuation of application Ser. No. 696,969, filed Dec. 26, 1967 and now abandoned.

The present invention relates to a tampon, particularly for feminine hygiene. It more particularly refers to a tampon having better absorption characteristics.

The object of the present invention is to improve the absorption power of a tampon of the aforementioned known type so that the tampon, while retaining the strength necessary for dependable introduction into the cavity and a high power of absorption, assures the immediate and complete absorption of even large quantities of menstrual fluid which is sporadically discharged.

The solution achieved by the invention consists in the fact that in the vicinity of the introduction end, a lower density of the fibrous material is provided than over the rest of the length. The lower density of the fibrous material at the introduction end results, upon contact with the menstrual fluid, in a rapid expansion of the compressed fibers and thus in a rapid absorption of the fluid. The rapidly expanding fibrous material of low degree of compression present in the introduction end tends to bring the more strongly compressed fibrous material, which expands more slowly upon contact with the moist fluid, more rapidly to the intended expanded diameter. In this way, the greater inertia of expansion of the denser fibrous material is partially counteracted. The fluid absorbed by the introduction end is transferred better into the more highly compressed parts of the tampon. This transfer of the fluid into the more highly compressed parts of the tampon is furthermore promoted by the greater capillary action of the denser fibrous material. Since the more highly compressed material has a greater force of expansion inherent in it, the fibers tend to expand the less compressed fibers to the dimensions of the more strongly compressed material. The tampon therefore expands uniformly over its entire cross-section with such a high pressure that it substantially fills the cross-section of the vagina and even in the case of an increase in the vaginal back-pressure, for instance, upon sudden physical effort on the part of the woman wearing same, opposes reasonable resistance to a change in volume or in cross-section and thus counteracts the danger of leakage.

Another feature of the present invention refers to the fact that the quantity of material of that longitudinal side of the nonwoven fiber which is associated the introduction end is less than the quantity of material of the nonwoven fibers measured over the rest of its width. This result can be obtained, on the one hand, by folding the web around a line parallel to its longitudinal axis, the longitudinal fold being associated with the withdrawal end in such a manner that the longitudinal side of the web associated with the introduction end is formed by only one layer of the web.

A further possible embodiment resides in the fiber web consisting of at least two independent layers of fiber of different width which overlap each other only towards the longitudinal side associated with the withdrawal end of the tampon.

Another possible embodiment of the invention is characterized by the fact that the nonwoven fiber web of the tampon is wound at an acute angle to the longitudi-

dinal axis. In this connection, the inner axially protruding end of the spirally wound web can be associated with the introduction end or the withdrawal end, so that in the latter case the introduction end is made of funnel shape.

An apparatus for manufacturing the tampon of the invention can advantageously be developed in the manner that behind a doffer roller of a carding machine there are arranged in a plane one above the other two pairs of fluted calender rolls, behind which and at a distance therefrom two smooth calender rolls are provided, there being provided between the fluted calender rolls and the smooth calender rolls a calender mouthpiece which is of U-shaped cross-section and terminates in front of the smooth calender rolls in a closed mouthpiece having a free cross-section which corresponds to the cross-section of the nonwoven fiber web,

As a further development of this apparatus, it can be provided that in the region of the longitudinal side of the calendered fiber web which has the smaller quantity of material, a guide shoulder extends from the top of the rectangular cross-section of the mouthpiece downward into the approximately rectangular free cross-section of the mouthpiece.

Another embodiment of an apparatus for producing the tampon of the invention is characterized by the fact that between the doffer roller of a carding machine and the fluted calender rolls there extends an upper guide plate of U-shaped cross-section which leads to the upper pair of rolls and the width of which in front of the calender rolls is less than the length of the lap, while a sheet leading to the two lower fluted calender rolls extends over the entire width of the doffer roller and has on the outlet side in front of the two lower fluted calender rolls a width which corresponds to the length of the uncompressed tampon lap.

In the case of the two apparatus described for the manufacture of the tampon of this invention, it is advisable if the lower rolls of the two pairs of fluted calender rolls arranged one above the other only are connected to a rotary drive, while the upper rolls of the two pairs of rolls are supported for free rotation and vertical translation.

The invention is described in further detail below with reference to the drawings in which:

FIG. 1 shows an apparatus for the manufacture of wadding web for tampons in side elevation, shown schematically;

FIG. 2 is a section along the line A-B of FIG. 1;

FIG. 3 shows another embodiment of an apparatus for manufacturing wadding web for tampons;

FIG. 4 is a fiber web formed of two strips of different width for the manufacture of the tampon of the invention;

FIG. 5 is a web folded around a line extending parallel to the longitudinal axis of the web for the production of the tampon of the invention;

FIG. 6 shows a wadding web being obliquely wound;

FIGS. 7-10 show the tampon or a non-woven batting which forms the tampon in the various stages en route to its final formation;

FIG. 11 shows the disposition of a winding mandrel over a non-woven fibrous mat which has been folded over upon itself lengthwise so that an edge of the non-woven fibrous web on the top sides does not meet and

coincide with the corresponding edge disposed therebeneath;

FIGS. 12 and 13 show diagrammatically and in section how the material of the tampon exists in its various compressed states;

FIGS. 14 and 15 also show the tampon in cross section and as a side view; and

FIGS. 16 and 17 show another embodiment of the tampon having regions of less compression at the insertion and withdrawal end when compared with the main body portion.

In FIGS. 1 and 3, 10 is a doffer roller of a carding machine adjoining which, in the direction of passage of the fibrous web, are two pairs of fluted calender rolls 11, 11a arranged in a vertical plane one above the other. Behind the pairs of fluted calender rolls are two smooth calender rolls 12. Between the doffer roller 10 and the fluted calender rolls 11, 11a there extends a lower plate 13 which, at the outlet side of the doffer roller, has a width equal to the width of the latter and tapers down in the direction towards the fluted calender rolls to a width which corresponds to the width intended for the fiber web. Over the plate 13 there is arranged a guide plate 14, the inlet side of which lies at the doffer roller 10 approximately in the same plane as the inlet side of the lower plate 13, but, in contradistinction to the lower plate which extends to the lower pair of fluted calender rolls 11a, is directed towards the upper pair of fluted calender rolls 11. The inlet width of the upper plate 14 corresponds approximately to $\frac{1}{2}$ the width of the doffer roller 10, while the outlet width of the upper plate 14 amounts, for instance, to about $\frac{2}{3}$ of the width of the outlet side of the lower plate 13. In this connection, the discharge end of the upper plate 14 is arranged on one side directly above the discharge end of the lower plate 13, while the other side of the discharge end, as seen in plan view, is spaced from the corresponding longitudinal side of the discharge end of the plate 13. Between the two pairs of fluted calender rolls 11, 11a and the pair of smooth calender rolls 12 there extends a trough-shaped or U-shaped calender mouthpiece 15 which at the inlet end has relatively high side walls and corresponds approximately to the width of the calendered web.

The outlet end of the calender mouthpiece 15 is closed at 15a and has a free cross-section such as shown in FIG. 2. The mouthpiece can be closed in simple manner by the placing on of a lid 16 which on one side, while forming a longitudinally extending guide ledge 16a, is thicker so that the ledge reduces the free substantially rectangular cross-section of the calender mouthpiece. The ledge fills up the free rectangular space of the fiber web passed through the calender mouthpiece at that place where the fiber web consists only of one layer of web. Through the calender mouthpiece, the two web tapes are brought as close as possible to the nip of the following smooth calender 12.

The machine shown in FIGS. 1 to 3 operates approximately as follows. The web coming from the carding machine is divided in the manner that thin, narrow steel bands known per se, which are not shown in the drawing, are maintained between the main drum and the doffer roller in such a manner that no transfer of material onto the doffer roller can take place at these points. The web which is thus divided is puckered in two planes to form web strips of different width by the plates 13, 14.

Fiber webs which are suitable for passage through the calender mouthpiece 15a are shown in FIGS. 4 and 5. FIG. 4 shows a layer of web 17 whose width corresponds approximately to the length of the finished tampon and on which there is arranged another layer of web 18 the width of which is about $\frac{2}{3}$ of the layer of web 17. The layer of web 18 covers the one longitudinal side of the layer of web 17, these two layers of web having a common longitudinal side which is designated 19 and which is to form the withdrawal end of the tampon. The web shown in FIG. 4 is divided into individual longitudinal sections which are thereupon rolled into a lap by a winding mandril which extends beyond the web and which is thereupon pressed, in a press under considerable pressure by pressing jaws which act radially on the lap, to approximately the final cylindrical size and possibly thereupon also subjected to a slight axial pressure in order thereby to round off with the use of a heated rotary piston the introduction end of the tampon which is formed only by the other longitudinal side 20 of the lower fiber web 17.

In the embodiment shown in FIG. 5, there is used a fiber web 21 consisting of a single piece which is folded by means of a known folding plate (not shown) around a fold 22 lying parallel to its longitudinal axis in such a manner that, as shown in the embodiment of FIG. 4, one longitudinal side of the web is formed only by the lower layer thereof while the fold 22 represents the withdrawal end of the tampon. When a single piece of folded fiber web is used, the blade 14 of the apparatus shown in FIGS. 1 and 3 is omitted. The aforementioned folding plate is inserted between the fluted and smooth calenders.

In the embodiment according to FIG. 6, there is used a web consisting of a single piece which is wound obliquely so that the one end of the tampon has a funnel shaped depression while the other end is conical. The conical end serves as introduction end of the tampon and is subjected to only an extremely slight axial pressing pressure if any after the cylindrical pressing of the blank so that the entrance end also in the case of this tampon has a lower compression of the fiber material than the zones of the tampon adjoining same. Differing from this embodiment the funnel-shaped recessed end of the lap shown to the left in FIG. 6 can also form the introduction end of the tampon which in the same way, after the exerting of an axial compressing pressure and a rounding which is preferably combined therewith has lesser density of the fibrous material than the zone of the tampon adjoining same.

The non-woven fabric used in this invention does not itself constitute a part hereof. It may be of any make or design suited to use in tampons. Similarly, the fiber content of the nonwoven fabric is conventional in every respect with all of the fibers known to be useful in the tampon arts being useful in the practice of this invention.

As FIG. 11 shows, a clamp 20 draws a fleece 21 in the direction of the arrow x within a gap 21 of a winding mandrel 23. The fleece will be cut by means of a pair of cutting jaws 24.

FIG. 9 shows the condition of the cut fleece section 21 and a winding mandrel 23 and further a withdrawal cord 25 surrounding the fleece across to its length direction and showing the further step of processing of the fleece material.

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FIG. 10 shows the winding mandrel and the fleece after a half revolution.

FIG. 8 shows the finished winding roll 26 with a part 26a protruding from the introduction end of the roll being formed by one layer 21a of the fleece. This protruding part of the introduction end of the winding roll thus contains less material than the main part of the winding roll.

FIGS. 12, 14 and 16 show longitudinal sections through winding rolls according to the three embodiments of the invention:

FIG. 12 shows the winding roll 27 comprising a fleece 28 which is folded lengthwise at 28a in such a way, that one layer 28b of the fleece forms the protruding part 27a.

FIG. 13 shows a tampon 29, which is made by radially pressing of the winding roll 27 according to FIG. 12 by means of the pressure jaws 30a and 30b in FIG. 7. The introduction end 29a in FIG. 10 of a tampon contains less material than the rest of the tampon 29.

FIG. 14 shows a winding roll 31, consisting of two layers 31a, 31b of different width, whereby the sheet 31a is broader than the layer 31b at the introduction end 31c of the winding roll, so that after compression of this winding roll by means of the pressure jaws 30a, 30b according to FIG. 7, a tampon 32 will be formed, which, as FIG. 15 shows, has again an introduction end 32a of less material than the rest of the tampon.

According to FIG. 16 a winding roll 33 is formed by winding of a fleece by means of a winding mandrel, the axis of it forms an angle to the lengthwise direction of the fleece, which is different from a right angle. Thus, a winding roll 33 has at its introduction end 33a a protruding part, which is conical and contains less material than the cross section of the winding roll behind said introduction end. Upon radial pressing of this winding roll by means of the presser jaws 30a, 30b, according to FIG. 7, there is formed a tampon 34, which has again an introduction end 34a containing less material than the backward part of the tampon. In contrast to the other embodiments of the invention, the tampon has in view of the conical deepening 33b in FIG. 16 also a

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withdrawal end 34b of less material than the greater middle part 34c of the tampon 34.

I claim:

1. A rolled tampon having an insertion end and a withdrawal end, said tampon being made from a continuous non-woven fabric which is rolled about its longitudinal axis thereby forming a rolled body portion, said rolled body portion being radially compressed to a predetermined dense state, said insertion end having a non-woven fibrous portion protruding from said rolled body portion, the material of said insertion end being axially compressed, said axial compression being of such amount that the material of said insertion end has a density less than the density of the material of said rolled body portion, thereby increasing the rate of absorption of said tampon.

2. A rolled tampon according to claim 1 made of a continuous sheet of non-woven fiber, said rolled body portion comprising a plurality of axially rolled layers at least one layer having a greater longitudinal dimension than another layer of said rolled body portion and protruding toward said insertion end, said insertion end comprising the protruding portion from a layer, at least two adjacent layers of said rolled body portion being joined together at the withdrawal end to form at the juncture a continuous curved sheet.

3. Tampon according to claim 1, wherein said continuous non-woven fabric comprises at least two fabric layers of different widths which are independent of each other and are partially superposed such that one longitudinal side of each mate, and constitutes said withdrawal end of said tampon and the other longitudinal side constitutes said insertion end.

4. Tampon according to claim 1, wherein said continuous non-woven fabric is transversely rolled up at an acute angle to the longitudinal axis of the tampon.

5. Tampon according to claim 1, having been additionally slightly pressed in a direction substantially parallel to its axis.

6. A rolled tampon according to claim 1 having an integral withdrawal tape connected to said withdrawal end.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,854,481

Dated December 17, 1974

Inventor(s) Bernd Messing

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

Column 1, line 51, after the word "associated" and
before the word "the", insert the word -- with --.

Column 2, line 17, "fiber web," should read -- fiber web. --

Column 6, line 33, "withdral" should read -- withdrawal --.

Signed and sealed this 8th day of April 1975.

(SEAL)

Attest:

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Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
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