

Sept. 28, 1943.

S. P. BAILEY

2,330,257

PROCESS FOR MAKING TAMPONS

Filed Jan. 14, 1939

2 Sheets-Sheet 1

Fig. 1.

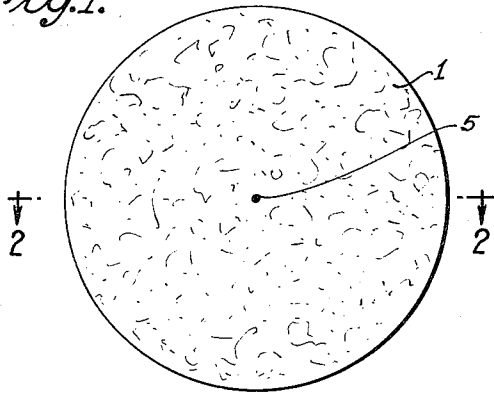


Fig. 8.

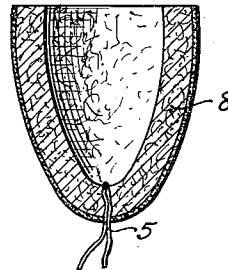


Fig. 9.

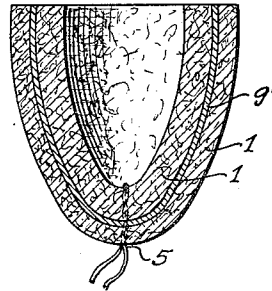


Fig. 2.

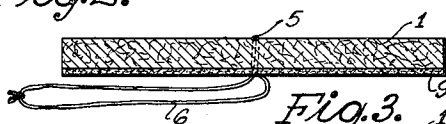


Fig. 3.

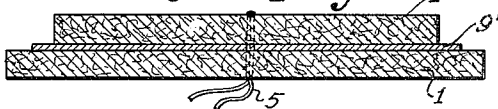


Fig. 4.

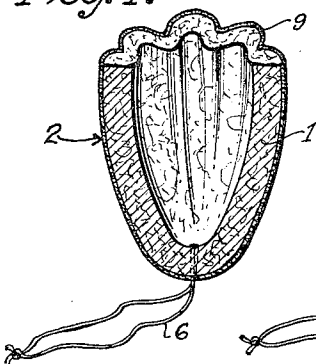


Fig. 5.

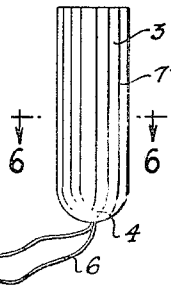


Fig. 6.

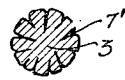


Fig. 7.

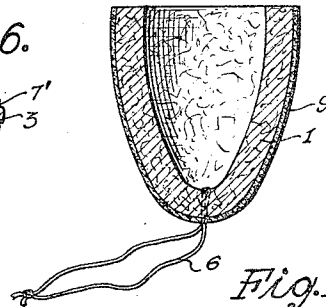
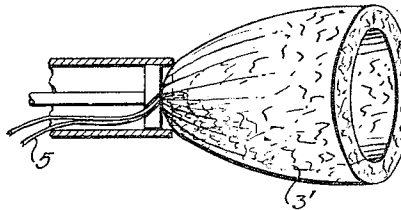
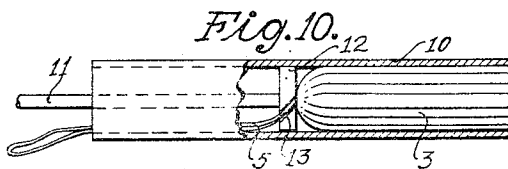


Fig. 11.



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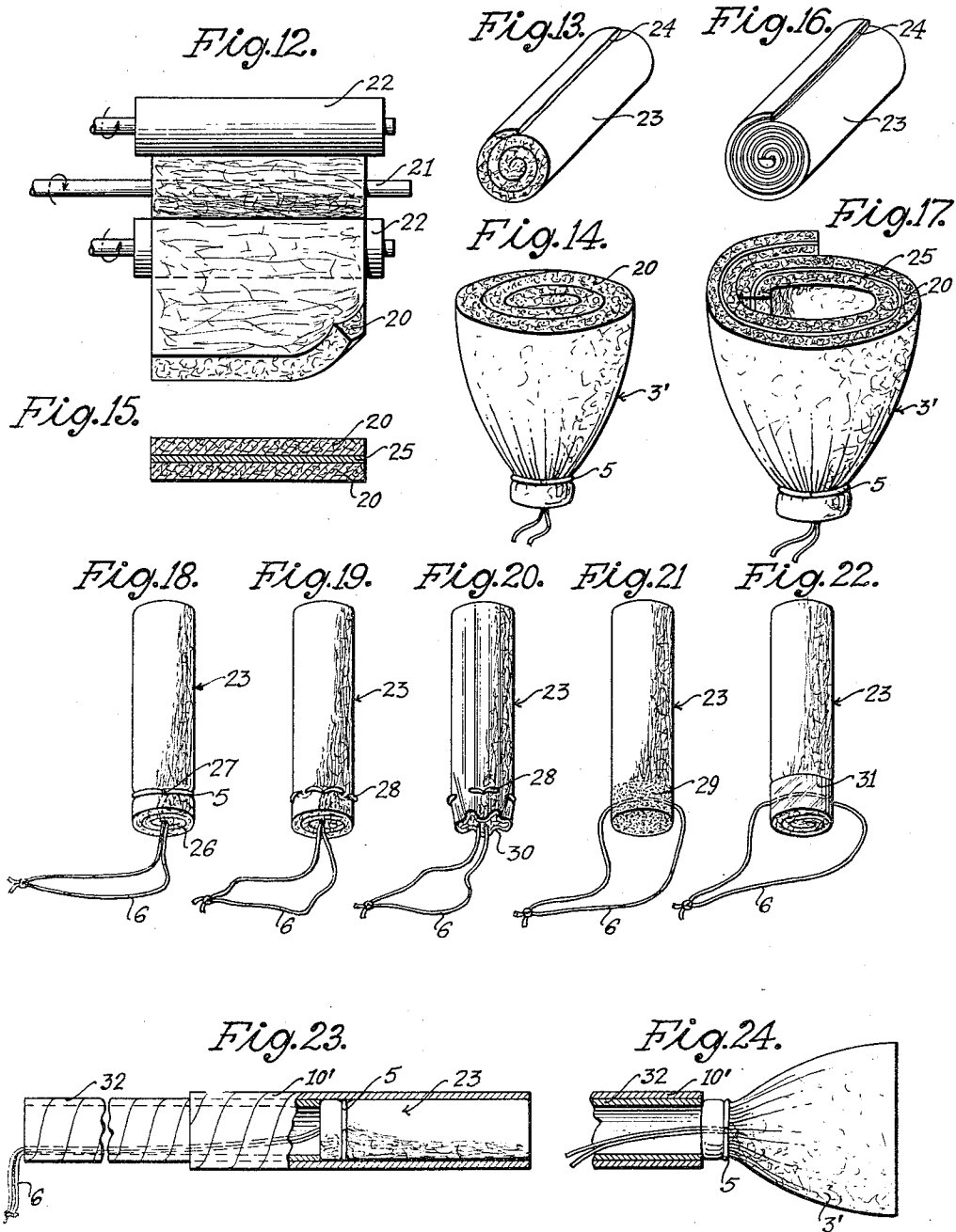
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PROCESS FOR MAKING TAMPONS

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2 Sheets-Sheet 2



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2,330,257

PROCESS FOR MAKING TAMPONS

Stacy P. Bailey, New York, N. Y., assignor, by
mesne assignments, to John F. Wallace, New
York, N. Y.

Application January 14, 1939, Serial No. 250,973

4 Claims. (Cl. 18—55)

This invention relates in general to a process for making tampons and in particular to tampons adapted for insertion into body cavities for the absorption and retention of liquid secretions and to correlated improvements designed to enhance the structure, function and utility of such tampons. Although having other fields of usefulness, the present article probably has its greatest utility as a vaginal tampon for the absorption and retention of menstrual discharges, being used in place of an external sanitary napkin or pad.

The object of the invention is to provide an efficient and practical process for making a tampon which has relatively small initial dimensions for economy in shipment, storage and handling, which is convenient in carrying and inserting, and which is adapted to expand into a relatively large, soft and resilient body to fill the vagina and conform to the shape thereof but which may be readily, conveniently and completely withdrawn from the vagina when required, the process being characterized in initially compressing a substantially circular layer or disc of absorbent fibrous water-impermeable material so that the centre of this layer forms the lower end of the tampon, thereafter gathering the upper portion or edges of this layer inwardly to form a cup shaped body, and subsequently conforming the cup shaped body to a substantially cylindrical body under pressure so that said cylindrical body will hold its cylindrical shape while dry solely as a result of such compression but will expand when wet to form a substantially conical body as a result of the expansion of the previously gathered and compressed upper portion.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

In accordance with the present invention the above mentioned objects are achieved by forming a tampon comprising a layer of fibrous absorbent material compressed into a cylindrical body having a relatively small diameter and which is adapted to expand when the pressure is released into a relatively large and soft conical shaped body having a constricted lower end.

I have found that the firm dense structure, the relatively small diameter and the cylindrical shape of the present tampon facilitates its insertion in a body cavity such as the vagina. After insertion the tampon expands to a relatively large and soft conical shaped body which fills the vaginal cavity so that there is no danger of leakage of the secretions around the sides of

the tampon. However, the constricted lower end facilitates the withdrawal without irritation.

The invention accordingly comprises an article having the elements and relation of elements one to another and a process having the steps and the relation of steps to one another all as described in the following detailed description and the scope of the application of which is indicated in the claims.

For a more complete understanding of the nature and of the objects of the invention reference should be had to the accompanying drawings in which:

Fig. 1 represents a top plan view of a material from which one embodiment of the tampon of the invention may be produced;

Fig. 2 is a view in section of the material of Fig. 1 taken along the line 2—2 thereof;

Fig. 3 is a view in section of another embodiment of the material for forming the present article;

Figs. 4 and 5 illustrate two steps in a process of forming one embodiment of the present tampon;

Fig. 6 is a view in section of the article of Fig. 5 taken along the line 6—6 thereof;

Fig. 7 is a side elevation in section of the tampon of Fig. 5 after expansion thereof;

Fig. 8 is a partly finished tampon formed from the material shown in Fig. 3;

Fig. 9 is a view of a material from which one embodiment of the tampon can be formed;

Figs. 10 and 11 are views partly in section of one embodiment of the tampon package of the invention;

Fig. 12 illustrates one stage in a method of forming a second embodiment of the tampon of the invention;

Figs. 13 and 14 are views in section of a tampon formed in the device shown in Fig. 12 before and after expansion, respectively;

Fig. 15 is a view in section of another material from which the second embodiment of the tampon may be formed;

Figs. 16 and 17 are views in section of a tampon formed from the material shown in Fig. 15 before and after expansion respectively;

Figs. 18, 19, 20, 21 and 22 represent as many views of the second embodiment of the tampon;

Figs. 23 and 24 represent two views partly in section of another embodiment of the tampon package of the invention.

According to the present invention there is provided a tampon comprising an absorbent

material temporarily compressed into a cylindrical body which is adapted to expand into a conical shaped body when the pressure is released. By way of illustrating, but not by way of limiting the scope of the invention, such a tampon will be illustrated by a description of two specific embodiments thereof. For convenience in reference these embodiments will be designated in terms of their manufacture. That embodiment illustrated in Figs. 1 to 11 will be hereinafter designated the "molded" tampon and the embodiment illustrated in Figs. 12 and 23 will be hereinafter referred to as the "spirally wound" tampon. It is to be understood, however, that other embodiments of the tampon may be formed having the same general shape and function as the two embodiments herein described and illustrated.

The absorbent material employed in the present tampon may comprise any suitable vegetable fibre, such for example as cotton, flax, wood, and the like and silk, wool, hair, moss, either singly or in admixture and in the form of loose fibres or in the form of fabric or felted layer.

Referring to Figs. 1 to 11, inclusive, the molded tampon may be considered as comprising a layer 1 of absorbent fibrous material having the edges gathered toward the center to form a substantially cup-shaped body 2 and thereafter compressed to a substantially cylindrical body 3 having a closed end 4 at the bottom and having a withdrawing means attached to the lower end. The tampon is compressed temporarily so that it expands when the pressure is released to a conical shaped body. The expression "conical" is intended to include frusto-conical and ovate shapes.

In its simplest form the molded tampon may be formed from a single layer, preferably a disc, of absorbent material such as cotton as shown in Figs. 1 and 2 or from a plurality of layers of such material as shown in Fig. 3. A withdrawing means, such as a cord 5, is affixed to the center as by sewing it through the layer 1, the ends of the cord extending therefrom forming a loop 6. The layer 1 is shaped by suitable means so as to depress the center to form a tapered closed bottom and to gather the sides upward to form a cup-shaped hollow body 2 as illustrated in Fig. 4. This cup-shaped body is subjected to lateral compression sufficient to form a substantially cylindrical tampon 3 as shown in Fig. 5. When formed from a flat disc of material the gathering of the sides will form folds 7 as shown in Fig. 4, which folds are pressed together to form the longitudinal pleats 7' in the finished tampon shown in Figs. 5 and 6. The finished tampon has, in its compressed condition, a dense firm structure, a smooth surface and a small diameter so that it may be readily inserted in the vagina by hand or by means of a suitable applicator.

Instead of employing a layer of absorbent material and depressing the center thereof to form the cup-shaped body illustrated in Fig. 4, the cup-shaped body may be produced directly by spinning loose absorbent fibres in a known manner to form the molded hollow body 8 illustrated in Fig. 8 which is then compressed laterally to produce a cylindrically shaped tampon of the type illustrated in Figs. 5 and 6.

In the now preferred embodiment of the molded tampon, generally illustrated in Figs. 1 to 11, the tampon comprises in addition to the absorbent layer, a layer 9 of a water-impermeable

material. When the tampon is formed from a single layer of absorbent material as shown in Fig. 2, the water-impermeable layer is disposed on that side which will be on the outside of the finished tampon as shown in Fig. 7. When the tampon is formed from a plurality of layers of absorbent material, the water-impermeable layer is either on the outermost surface or next the outermost layer of absorbent material as shown in Fig. 9.

Referring to Fig. 2, the water-impermeable layer 9 may comprise a portion of the layer 1 of absorbent material which has been rendered impermeable to water by coating or impregnating it in a plane extending throughout the layer 1 with a waterproofing substance such for example as a wax, a resin, rubber latex, a cellulose derivative and the like or a mixture thereof. Alternatively, the water impermeable layer may comprise a sheet or film 9' of waterproof material separate from the absorbent layer and laminated thereto with a suitable adhesive or disposed with or without adhesion between two or more absorbent layers 1 as shown in Fig. 3. The sheet or film 9' may comprise, for example, metal foil, paper or a film formed of rubber, a cellulose derivative, insoluble gelatine, a synthetic resin and like film-forming materials. However produced, the layer of water-impermeable material is made thin or is plasticized to render it sufficiently flexible to enable the absorbent material with which it is combined to be compressed to form a substantially cylindrical tampon without breaking or cracking the water-impermeable layer.

The cylindrical shape of the tampon may be temporarily maintained by compressing it to a cylindrical body under such pressure that the tampon will not expand until wetted. Preferably, the tampon is compressed to less than the limit of the compressibility of the absorbent material to prevent loss of absorptivity. A suitable process and apparatus for compressing the present tampon is described in my copending application Serial No. 250,974 filed Jan. 14, 1939.

Alternatively, the expansion of the compressed cylindrical body may be restrained by inserting the compressed tampon in an expansion-limiting member such for example as a tube or cylinder.

A preferred embodiment of the expansion limiting tube is a cylinder 10 open at both ends and having an internal diameter just sufficient to accommodate the cylindrical tampon in its initially compressed condition as illustrated in Fig. 10. Advantageously, this tube may serve not only to maintain the tampon in the form of a compressed cylindrical body, but also as an applicator tube to facilitate insertion of the tampon into a body cavity. For such dual use the tampon 3 is forced into one end of the cylinder 10 to the position shown in Fig. 10. A suitable ejector such, for example, as the rod 11 shown in Fig. 10 is disposed within the tube with the end 12 adjacent the lower end of the tampon so that when the rod 11 is forced through the tube, the tampon 3 will be ejected therefrom. The end 12 is preferably provided with a slot 13 through which the withdrawing cord 6 may pass so that it extends lengthwise of the tube 10 as shown. If the tampon has not been subjected to sufficient pressure to prevent its expansion until wetted, it will expand immediately upon being ejected from the tube 10 to form a conical shaped hollow tampon 3' as illustrated in Fig. 11. If the tampon 3 has been compressed under such pressure that it does

not expand until wetted, the tampon as ejected will remain in a substantially cylindrical form until it has been moistened by the body secretions whereupon it will expand substantially to the conical shape of the hollow body 3' as shown in Fig. 7.

Generally speaking the spirally wound tampon of the invention is similar in structure and function to the molded tampon above described in that it comprises a mass of absorbent material compressed to a cylindrical body which is adapted to expand to a conical shaped body. This embodiment of the tampon may be readily produced by taking a narrow elongated strip of fibrous absorbent material 20 as shown in Fig. 12 and spirally winding or rolling this strip upon itself or upon a mandrel 21 under suitable pressure which may be applied by means of a pair of compression rollers 22 which are positively driven. The cylindrical body 23' thus produced has the cross section while compressed as shown in Fig. 13 and after the pressure has been released the cross section as shown in Fig. 14. Alternately, this embodiment of the tampon may be produced from a plurality of superimposed layers of absorbent material 20 as shown in Fig. 15 wound simultaneously under pressure into a cylindrical body as in the case of a single layer. The layer may be wound into a cylindrical body without pressure and the larger roll so produced may then be compressed laterally into a body of smaller diameter. If desired the edge 24 of the strip 20 may be left free or fastened to the body of the tampon after compression by use of a suitable water-soluble adhesive such as dextrine, gelatine, methyl cellulose or the like. In the vagina the secretions will dissolve the adhesive thus breaking the seal and permitting the tampon to expand. Preferably, the spirally wound tampon may comprise in addition to the absorbent layer a water-impermeable layer which may comprise a coating or flexible sheet material as above described associated with the absorbent layer so that the impermeable layer is preferably disposed on the outside or adjacent the outside of the finished tampon. For example, in Fig. 15 there is illustrated in section two layers of absorbent material 20 enclosing a coating or flexible sheet of water-impermeable material 24. When this material is wound spirally under pressure into a cylindrical body, the body has a cross section while compressed as shown in Fig. 16 and a cross section after the pressure is released as illustrated in Fig. 17. When the layer of water-impermeable material is a sheet material having a high degree of resiliency such for example as a relatively thick sheet of a cellulose derivative or of stiff paper, the coiled sheet material will tend to uncoil and thus expand the tampon when the pressure is released forming a tampon having a hollow interior as illustrated in Fig. 17. This expanded hollow tampon shown in Figs. 17 and 23 functions in a manner identical with the hollow molded tampon illustrated in Figs. 7 and 11 of the embodiment above described.

In order to insure that the spirally wound tampon will form a conical shaped body after expansion, the present invention provides that the lower end is permanently restrained from expanding as by constricting this end by means of a band, cord or wire which may also serve as the withdrawing means and/or by sizing the lower end sufficiently to prevent full expansion thereof. The lower end of the cylindrical body

is constricted while it is compressed so that this end will not expand when the pressure is released or will expand to less extent than the remaining portions of the tampon.

For example there are illustrated in Figs. 18 and 19 two ways to constrict the lower end by means of a cord 5. As shown in Fig. 18 the withdrawing cord is passed upward through the lower end 26 of the tampon and out through a hole 27 in the covering and around the outside of the tampon and back through the hole 27, down through the center, the free ends being tied in a loop 6. When the loop thus formed is drawn upon, the cord will tend to constrict the lower end of the tampon and will insure that all of the material thereof will be withdrawn. Alternatively, as shown in Fig. 19 the cord 5 is passed through the lower end 26 of the tampon shown in Fig. 18 and out through a hole 27 in the covering, then continues in the form of short loops 28 inwardly through and out of the covering layer and thus around the tampon back through the opening 27 and down through the center, the free ends being tied to form a loop 6. When the loop is drawn upon it will tend to gather the end of the tampon into folds 30 as illustrated in Fig. 20, thus constricting the lower end of the tampon and greatly facilitating its removal. The lower end may be sized with a water-insoluble binder such as glue, gelatine, a cellulose derivative and the like over the area 29 as shown in Fig. 21, the binder being applied and dried before the pressure is released. Alternatively, the lower end may be bound by a band 31 as shown in Fig. 22, the band being made of a suitable insoluble sheet material such for example as metal, a cellulose derivative, foil, waterproof paper, and the like.

When any of the tampons illustrated in Figs. 18 to 20 are allowed to expand, they will form a conical shaped body which may be substantially solid throughout as shown in Fig. 14 or have a hollow interior and open upper end as shown in Fig. 17 according to the nature of the material from which they are formed.

As in the case of the molded tampon, the spirally wound tampon may be compressed sufficiently to maintain it in a compressed cylindrical shape until wetted or it may be compressed to a lesser extent and placed within an expansion limiting member 10' as shown in Fig. 23. Thus the tampon 3' may be disposed within a limiting tube 10' to the position shown in Fig. 22 and this tube may serve as both a container and applicator as above described. If employed as an applicator, the tube is provided with a pusher rod 11 as shown in Fig. 10 or with a concentric enclosed tube 32 having one end resting against the lower end of the tampon and the other end extending from the end of the expansion limiting tube 10'. When the tube 32 is pressed inwardly, the tampon 23 is ejected, the ejected tampon expanding to a conical shaped body 31 as shown in Fig. 24. The ejected tampon 31 will be solid or hollow depending upon the method of construction as above described. For example, if the tampon is formed from a material comprising a layer of absorbent material 20 and a flexible sheet of resilient water-impermeable material 25, the withdrawing cord 5 will maintain the lower end in a constricted condition and prevent expansion, whereas the sheet material will expand the other portion of the tampon to form a conical shaped hollow body as shown in Fig. 17.

The expansion limiting tube and the ejector tube are preferably formed by molding or shaping

the tube of a material which will disintegrate in water, such for example as gelatine, water-soluble cellulose ethers and water-soluble resins, whereby the tubes may be readily disposed of by disintegration in water.

It is to be understood that various embodiments may be made in the article and process of the invention. For example, in making the molded hollow tampon, instead of shaping a layer of absorbent material one may spin a cup-shaped body in a known manner from a mass of fibres and the cup-shaped body so produced provided with a coating or casing of water-impermeable material of similar shape, the composite cup-shaped body then being compressed laterally as above described. Superior results are obtained if the absorbent material used in the present tampon is formed of fibres which are heterogeneously arranged and not aligned parallel whereby the strength of the absorbent material is substantially uniform in all directions and the absorptivity likewise uniform. The absorbent layer and/or the finished tampon may be provided with a suitable sizing for temporarily retaining the form after compression, such sizing comprising preferably a water soluble non-toxic material such for example as gelatine, gum, agar agar, dextrine, starch, water-soluble cellulose ethers and the like, and/or the tampon may be combined with a medicinal substance for deodorizing or medicating it and/or with a coating for lubricating it comprising for example glycerine, grease, petrolatum, cocoa butter and the like.

When the compressed cylindrical tampon of the invention is inserted in a body cavity it expands to form a conical shaped body substantially as shown in Fig. 8, thus closing completely the cavity and providing an absorbent inner layer for absorbing secretions. When the expanded tampon is hollow and cup-shaped it retains excess liquid over that capable of being absorbed, such liquid being prevented from escaping due to the water impermeable layer 2. The expanded tampon may be easily withdrawn by means of the cord because it is conical in shape with the constricted end at the bottom. Accordingly there is provided by the present invention a tampon characterized by having a minimum of size with a maximum capacity for absorbing and holding liquid, and a maximum useful life without leakage, a smooth outer surface and with a shape

permitting both an easy and convenient insertion and a complete withdrawal without irritation.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A process of producing a tampon comprising compressing a substantially circular layer of absorbent, fibrous material so that the center of said circular layer forms the lower end of the tampon, gathering the edges of said layer to form a cup-shaped body and compressing said body transversely to a cylindrical body under such pressure that the cylindrical body will hold its cylindrical shape while dry solely as a result of said compression, but will expand when wet to form a conical shaped body as a result of the expansion of the gathered and compressed edges.

2. A process for making a tampon comprising shaping a disc formed of a layer of absorbent, fibrous material and a layer of water-impermeable material into a cup-shaped body by depressing the center of said disc, gathering the edges and compressing said body transversely to a cylindrical body under such pressure that the cylindrical body will hold its cylindrical shape while dry solely as a result of said compression, but will expand when wet to form a conical shaped body as a result of the expansion of the gathered and compressed edges.

3. A process of forming a tampon comprising cutting a disc from a layer of absorbent, fibrous material, depressing the center of said disc to form the lower end of said tampon, gathering the edges of said disc to form a cup-shaped body, and compressing said body transversely to a cylindrical body under such pressure that the cylindrical body will hold its cylindrical shape while dry solely as a result of said compression, but will expand when wet to form a conical shaped body as a result of the expansion of the gathered and compressed edges.

4. A process for forming a tampon according to claim 3, in which the compression of said body is accomplished by drawing the bottom end of the tampon into a constricting tube which holds the tampon compressed in the form of a cylindrical body, which body will expand to a conical shaped body when it is ejected from said tube.

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