March 11, 1969 E. H. KRUSKO 3,431,909

UNCOMPRESSED TAMPON AND APPLICATOR

Filed Nov. 4, 1965 Sheet 1 of 2

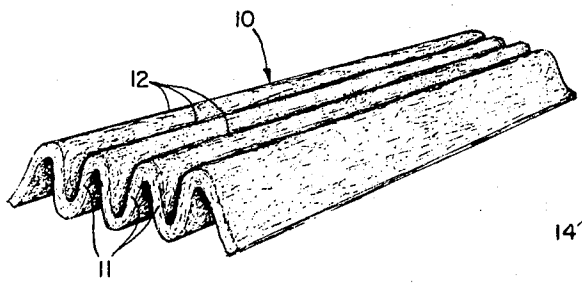

Fig. 1

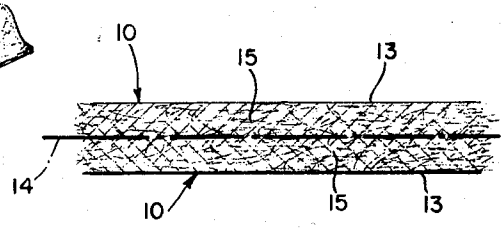

Fig. 2

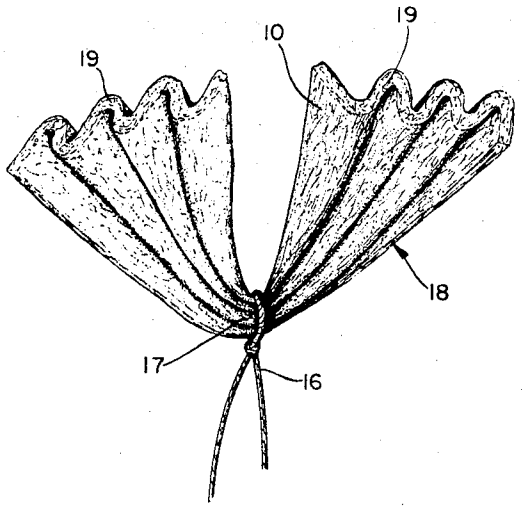

Fig. 3

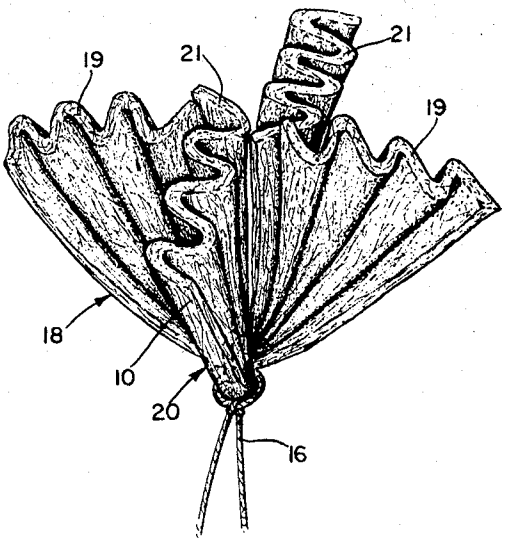

Fig. 4

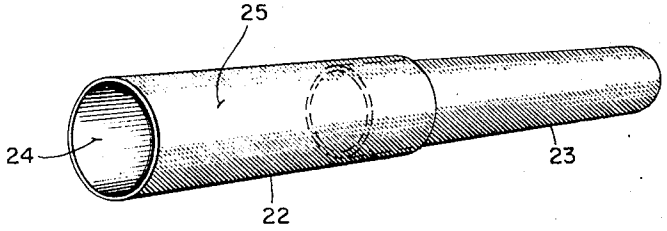

Fig. 5

INVENTOR.
EVELYN H. KRUSKO

BY Stanton T. Hadley

ATTORNEY

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UNCOMPRESSED TAMPON AND APPLICATOR

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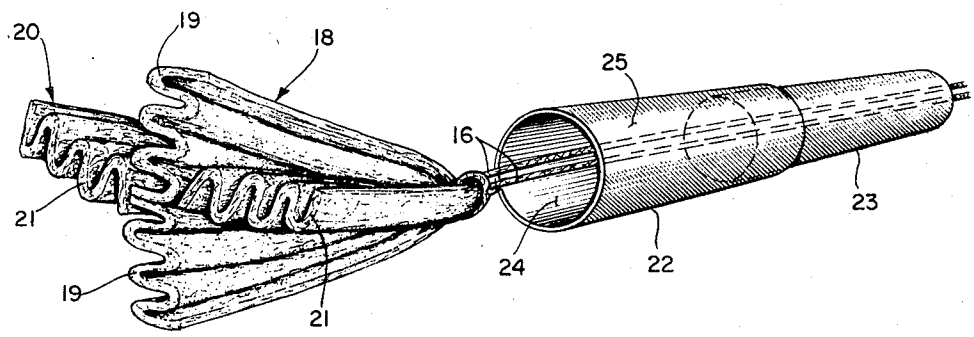


Fig. 6

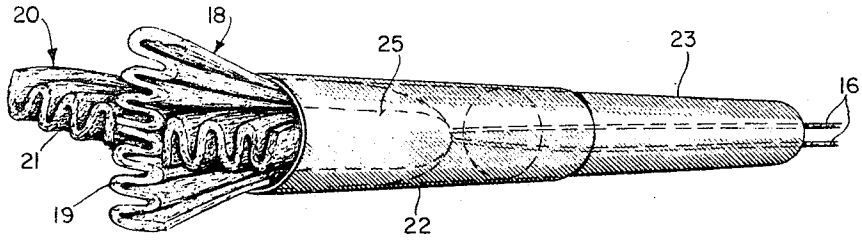
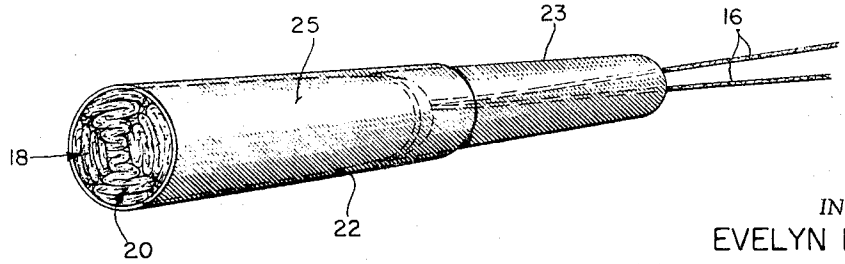


Fig. 7

Fig. 8



INVENTOR.
EVELYN H. KRUSKO

BY

Stanton T. Hadley
ATTORNEY

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3,431,909

UNCOMPRESSED TAMPON AND APPLICATOR

Evelyn H. Krusko, Philadelphia, Pa., assignor to Scott Paper Company, Philadelphia, Pa., a corporation of Pennsylvania

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Int. Cl. A61m 27/00

ABSTRACT OF THE DISCLOSURE

A tampon of the uncompressed type is disclosed, along with a container and applicator therefor. The tampon comprises at least one sheet of soft, absorbent resilient material, preferably a soft, fluffy resilient web of relatively long, natural or synthetic fibers, having substantial thickness and bulk, bonded together by an adhesive spray on one or both surfaces without completely wetting out the web with adhesive so that it retains its bulk, loft and inherent resiliency when compressed. The sheet has a plurality of overlying or adjacent loose pleats or folds parallel to one another and being gathered together at a point central of their ends and folded approximately in half. Some embodiments include one or more additional structures folded in half around the fold area of the first structure. A removal cord is attached to the tampon adjacent the fold area. A container-applicator is disclosed having the surface which contacts the tampon treated to increase its lubricity. In addition, the outside surface of at least a portion of the applicator is made more lubricious and hydrophobic to facilitate insertion.

This invention relates to catamenial appliances of the tampon type and, more particularly, to a new and improved tampon of an uncompressed type of construction and a new and improved container and applicator therefor.

Although tampons constructed in a variety of different ways and of different materials have been employed for many years, they have not been considered entirely satisfactory in use. Most significant among the problems encountered during use has been undesirable leakage especially during the initial, generally profuse, menstrual flow, due partly to the failure of the tampon to completely block the vaginal passage. Another cause of such leakage has been the limited ability to produce a tampon having sufficient absorbency and capacity to retain vaginal fluids issuing during normal use, even when these fluids are moderate in quantity.

In the past, most tampons have been of the compressed type. That is, the material forming the absorbent body of the tampon and designed for insertion into the vaginal passageway has been of a highly-compacted, dense nature and of a fixed shape generally with a circular cross-section which has been found most convenient for insertion through the sphincter, that region surrounding the opening into the vaginal passage. The shape of a compressed tampon does not change much during use since absorption is slow with the material so highly compacted. As a result, the tampon not only is uncomfortable, but also is unable to conform to the shape of the vaginal canal and assume sealing contact with the walls thereof to prevent leakage.

The tampon of the invention is of the uncompressed type and one feature of the invention is a new construction for this type of tampon. Obviously, even a tampon of the uncompressed type must be temporarily at least partially compressed for insertion through the vaginal opening. However, as used hereafter, the term "uncompressed tampon" shall refer to that type of tampon which

is designed to open up and expand into a loose, conforming shape after insertion into the vaginal canal as distinguished from the compressed type having highly compacted, dense structures of a relatively fixed shape and which do not readily expand to a significant extent. More particularly, the expansion of an uncompressed tampon after insertion is due primarily to mechanical forces and inherent resiliency of the material forming it, as distinguished from expansion of a compressed tampon which normally occurs only after absorption of considerable amounts of moisture.

It is an object of the invention to provide a new and novel tampon construction designed to be uncompressed in use and to be flexible so as to fill the vaginal passage especially at the upstream end without becoming bulky or otherwise uncomfortable to a user.

It is a further object of the invention to provide a new uncompressed tampon which can be temporarily compressed into the form of a cylinder of a constant diameter and inserted into the vaginal passage through the sphincter but which, upon being released from the insertion device, expands in which in a flexible and resilient way to form a soft uncompressed absorbent tampon body which contacts the vaginal walls especially at the upstream end thereof and provides greater protection against leakage than does a commonly used compressed tampon.

These and other objects and advantages are achieved by employing at least one sheet of soft, absorbent, resilient material having a plurality of overlying or adjacent loose pleats or folds parallel to one another, said pleats being gathered together at a point central of their ends and folded approximately in half, being adapted for insertion into the vaginal passage with the uncompressed ends thereof directed toward the upstream end of said passage. The sheet has a series of parallel and successively reversed pleats or folds formed along lines of folding that are parallel to each other to form multiple overlying layers, when partially compressed, having substantially equal widths. In another embodiment, additional structures like the above may be folded in half around the fold area of the first structure so that their uncompressed ends are positioned substantially between the ends of the first structure. A removal cord is secured to the tampon preferably at the downstream end adjacent the transverse folds, for withdrawing the tampon from the vaginal passage after a period of use.

One of the reasons for reluctance to employ an uncompressed tampon in the past has been the difficulty of providing a construction which could be temporarily compressed into a shape capable of being easily and comfortably inserted through the sphincter into the vaginal passage and yet which would readily expand to a sufficient extent to form an effective uncompressed tampon which would prevent leakage and provide absorption. This appears to have been due to faulty tampon design as well as a failure to use the most desirable materials for constructing the tampon from the standpoint of the combination of properties such as softness, resiliency, and absorbency. Previous attempts to use webs of a loose fibrous mesh to obtain resiliency results in a large amount of fiber loss during use and concomitant discomfort and irritation.

A feature of the invention is a new type of material for forming the tampon body and basically is a type of nonwoven structure comprised of relatively long natural or synthetic fibers in a soft fluffy resilient web having substantial thickness and bulk. The fibers in the web are bonded together by an adhesive spray on one or both surfaces without completely wetting out the web with adhesive so that it retains its bulk, loft and inherent resiliency when compressed. The loose fibrous construction can be provided without fiber loss during use if the material is bonded on both surfaces or if two layers of the material

are combined in a manner such that their unbonded surfaces face together.

It is an additional object of the invention to provide an improved, uncompressed tampon which is constructed of a more resilient material, and which is formed so that it can be temporarily compressed without inhibiting subsequent expansion of the tampon when uncompressed.

A further object of the invention is to provide a new absorbent web or sheet construction for use in a tampon wherein a fluffy web of long resilient fibers is held together by a light application of a bonding adhesive on at least one surface thereof.

Another problem encountered in use of the uncompressed tampons previously employed is the ejection of the tampon from its container or applicator when in its temporarily compressed state since considerable frictional force is created between the tampon and the walls of the container or applicator due to the resiliency and inherent expansion tendencies of the temporarily compressed tampon and the roughness and frictional characteristics of the fibrous paperboard tube normally used. There is also a problem in inserting the uncompressed tampon into the vaginal passage. Friction between the container or applicator tube and the vaginal walls causes difficulty and discomfort in penetrating the sphincter with the container so that the tampon may be ejected from the tube into the vaginal passage and the enclosing tube withdrawn. This friction is believed to be due to the excessive dryness of the vaginal walls which is increased in most instances by the absorbent nature of the material forming the normal tampon insertion tube.

The invention provides a surface surrounding the tampon when in its temporarily compressed state, which has a substantially reduced coefficient of friction as compared with the material normally comprising the applicator. This is provided by means of a coating or layer of a different material which is formed into the tube, which coating or layer is comprised of material having the desired lubricious properties. This allows the tampon to slide out from the applicator upon the application of very little force.

In another embodiment, the tampon body itself has a treated outside surface which increases its lubricity and eases its ejection from the container or applicator. In addition, the outside surface of the applicator tube of the invention is made to be more lubricious and hydrophobic than the material comprising the tube by means of an additional coating or layer which facilitates the sliding insertion of the tube into the vaginal orifice.

It is a further object of the invention to provide a new and improved tampon container and applicator which allows an uncompressed tampon while in its temporarily compressed state to be easily ejected from the container or applicator.

A still further object of the invention is to provide an applicator which can easily be inserted at least partially through the sphincter and into the vaginal passage without as much difficulty and discomfort due to friction as has been experienced with previous commonly employed applicators.

These and additional objects and advantages of the present invention will be more apparent from the following detailed description thereof, taken in view of the accompanying drawings, in which:

FIGURE 1 is a perspective view of a sheet of absorbent material having a series of parallel and successively reversed pleats formed therein.

FIGURE 2 is a cross-sectional view of a sheet material employed to form a tampon of the invention having two layers of preferred non-woven fabric with facing unbonded surfaces.

FIGURE 3 is an isometric view of one embodiment of a tampon of the invention.

FIGURE 4 is an isometric view of another embodiment of a tampon of the invention.

FIGURE 5 is an isometric view of another embodiment of a tampon of the invention.

FIGURES 6, 7 and 8 illustrate progressively the manner in which a tampon of the invention is temporarily compressed by insertion into an applicator and container of the invention to form a vaginal tampon product of the invention.

FIGURE 1 illustrates a sheet **10** of soft, absorbent, resilient material which has been loosely pleated or folded, without creasing, a plurality of times in alternately opposite directions to form when compressed a plurality of overlying or adjacent layers or pleats **11** of material. The sheet **10**, when compressed, is loosely folded at lines of folding **12** which are substantially parallel into a series of parallel and successively reversed pleats. When compressed, the resulting elongated layers **11** preferably have a width of from about ¼ inch to about 1 inch. The sheet shown in FIGURE 1 can be stretched out or have its pleats pressed together, in an accordion-like fashion, either all along the sheet or only at portions such as the middle or the ends. The importance of this feature of the construction will be seen subsequently. Obviously, the number of pleated sections **11** will vary.

In order to assure that the resulting tampon product will provide the highest security against leakage and will expand most fully within the vaginal passage, it is preferred that the folds **12** not be permanently creased; that is, the fibers comprising the sheet **10** in the area of the fold lines **12** should not be severely distorted or bent so as to produce permanent deformation but should merely be loosely bent or curved so that their natural resiliency tends to force them to straighten out again. In this regard, rayon fibers have been found to have excellent recovery properties as well as contributing excellent absorbency and softness to the tampon.

Any sheet material having high absorbency may be used in the construction of a tampon of the invention. For example, the material may be either fabric or paper, and of a woven or nonwoven type. The fibers may be any of the hydrophilic fibers commonly employed in absorbent sheet materials such as cellulose, or any other natural or synthetic fibers which can be employed to form a sheet material which will possess absorbency and, preferably, resiliency so that the unfolding action and expansive qualities of the tampon of the invention will be enhanced.

The material preferred for use in constructing the tampon body is a non-woven fibrous fabric in the form of a mesh-like web having high bulk and loft and which is bonded on one or both of its outside surfaces. The fibers are preferably allowed to remain unbonded and free at least in the interior of the web and often on one surface also. This fabric material has a number of advantages over materials previously employed for tampon manufacture. It has greater bulk and absorbency per weight since the loosely bonded fibers present a large surface area and are not compacted together. The unbonded interior of the fluffy fibrous web also serve to enhance the resiliency of the material so that it tends to expand and straighten out quickly after it has been crumpled. Since it is non-woven but rather, resin bonded, it does not tend to lose fibers during use.

In the manufacture of the preferred material of this invention, a fiber such as cotton, rayon, or a combination of both or any other hydrophilic fibers, natural or synthetic, is laid down in the form of a non-woven web which has relatively high bulk, loft and thickness and which can be either carded, wet laid, or air laid as desired. A light spray of adhesive such as polyvinyl alcohol is applied in an amount sufficient to loosely bond together the portions of the fibers exposed to the surface of the fluffy web without substantial amounts penetrating the web. The web is not completely wet out, and retains its bulk and loft. Upon feeding the web through a drying oven and applying heat from the top, the adhesive is

retained on the top surface allowing the fibers to remain free or unbonded in the interior and on the opposite surface. The web could then be similarly treated to effect bonding of the fibers on the opposite surface by reversing the web and applying adhesive and drying in the same manner.

The preferred construction of sheet material for use in a tampon of the invention is shown in FIGURE 2. Two sheets of web material formed as described above with bonding only on one surface **13** thereof are arranged with their unbonded surfaces **14** face-to-face so that fiber loss during use is substantially eliminated. This construction allows the loose ends of the fibers to nest and create a web **15** in the center between the bonded sides of the sheets. When the sheets are folded or pleated, the required resiliency and ability to expand the tampon structure upon insertion into the vaginal passage is provided, with corresponding removal of the confining container and release of the temporary confining force.

Although many different fibers may be employed to form the above sheet, crimped rayon fibers of a type manufactured by American Viscose Company, Marcus Hook, Pa., are excellent for this use. The fibers preferably should have an average length of about 2 inches, with a minimum of 1 inch and a maximum of 3 inches. The thickness of a single mesh-like web is preferably between about 3/16 inch and 5/16 inch, in the uncompressed condition. The web may have its fibers aligned in machine direction, or in cross direction, or it may be a random laid web. The bonding material may be applied as a solution or as a thermoplastic adhesive. Bonding may also be effected by adding to the web a mixture of special thermoplastic fibers which fuse when heated. Other materials might be prepared by utilizing a print bond or overall bonding followed by mechanical or chemical roughening or other treatment to produce a nap on one side of the bonded nonwoven web thus produced. A heavyweight web might be made by lightly bonding the fibers on both side of the web, the web later being separated or pulled apart and each one rolled loosely on separate rolls, a nap being produced as the double web is separated at its center. Alternatively, a nap may be produced by flocking fibers onto a lightweight material.

In any case, preferably the finished web is bonded only on one side so that the fibers are allowed to remain free generally on one end. This sheet material has a number of advantages over materials previously employed for tampon manufacture. It has greater bulk and absorbency per weight since the attached but free-ended fibers present a large surface area and are not compacted together. The free ends of the fibers also serve to enhance the resiliency of the material so that it tends to expand and straighten out quickly after it has been crumpled. Since it is a bonded non-woven, it does not tend to lose fibers during use.

FIGURE 3 shows one embodiment of a tampon structure **18** formed in accordance with the invention. The multiple-loosely-folded sheet **10** of FIGURE 1 is encircled by a draw string or removal cord **16** about its center portion **17**. This tightens the folds in the center **17** of the pleated structure **18** and leaves the two opposite end portions **19, 19** loosely pleated and unrestricted. Obviously, other means of securing draw string **16** to structure **18** could be satisfactorily employed, such as by puncturing the structure and passing cord **16** through and around. To complete the formation of this embodiment, the pleated structure **18** is then folded transversely at a point **17** central of the ends **19, 19** of the structure resulting in a relatively compacted area in the central fold portion **17** of the tampon where the removal cord **16** is attached which is the outer or downstream end of the tampon when in use. The opposite ends **19, 19** of the pleated structure **18** are brought together and form the upstream end or inner portion of the tampon.

Significantly, these ends **19, 19** are free to open up in an accordion-like fashion and to spread or fan out into sealing absorbent contact with the vaginal walls to prevent leakage while remaining soft and not bulky. The very fan-like shape of the tampon may be likened to a funnel which sweepingly catches all in its upstream, broadened, absorbent end and channels it down to a relatively compacted mass which is in the area of the fold **17**. This portion **17** or downstream end of the tampon serves as a form of plug and provides an area of fluid retention which prevents the permeation of menstrual fluid through the tampon even after a relatively long period of use.

FIGURE 4 illustrates another embodiment of the tampon of the invention which is desirable when greater bulk and absorbency are required. This tampon involves a second structure **20** in combination with the structure **18** shown in FIGURE 3 and comprises a second pleated sheet **10** formed in the same manner as structure **18** and folded around the center fold **17** of the first structure **18** with its loosely pleated ends **21, 21** positioned between the loosely pleated ends **19, 19** of the first structure **18**. As shown in FIGURE 4, structure **20** will be withdrawn by draw string **16** pulling along structure **20**.

It can readily be seen that a tampon constructed according to FIGURE 4 will have much greater absorbency and capacity and provide much longer protection than that shown in FIGURE 3 in all respects. Thus, much greater absorption capacity is provided at the upstream end of the tampon due to the tendency of the four ends, **19, 19, 21, 21**, to spread out in radial directions and to contact more completely the vaginal walls. It is also apparent that increased plugging abiilty is provided bv the two folded areas at the downstream end without increasing the width of the structure unduly due to the axial displacement of the fold area of one structure relative to the fold area of the other structure.

In this regard, it should be noted that the number of plies of material employed as well as the type of material and the thickness of each ply will be very dependent upon the type of construction selected. Care must be taken to allow sufficient room within the area of the vagina for expansion of the tampon into contact with the vaginal walls as well as allowing the vaginal walls to press in on the soft tampon to get complete and close contact after the applicator is withdrawn.

The embodiment shown in FIGURE 4 is preferably constructed of from two to twelve two-ply sheets of a lightly bonded, lightweight, non-woven rayon fabric of the preferred type described above having a sheet size of approximately 4½ inches by 12 inches in size, which is loosely pleated to a width of approximately ½ inch. Obviously, a greater number of sheets must be employed in the embodiment shown in FIGURE 3 to get the equivalent capacity and protection.

The tampon applicator illustrated in FIGURE 5 is of conventional form and basically comprises an outer tube **22**, and an inner tube **23** somewhat longer than tube **22** and having a minor portion of its length at one slideably inserted into one end of outer tube **22** and the major portion of its length disposed outside of outer tube **22** and in axial alignment therewith. Tubes **22** and **23** are arranged to cooperate telescopically so that inner tube **23** can be slideably moved through outer tube **22**.

This structure which is in common use has been modified in accordance with the invention to achieve a number of the aforementioned unique advantages. These tubes **22** and **23** are normally constructed of a heavy cellulosic fiber paper product such as pasteboard or cardboard. In the past, tampons of both the compressed and the uncompressed type have been dispensed from this type of container. The inner surface of tube **22**, surrounding the space where the tampon product is lodged prior to its insertion into the vaginal passage, normally possesses a high coefficient of friction as would be expected from its fibrous nature. This requires that considerable pressure be exerted upon the tampon to force it from the tube

22. Even greater pressure is required in the case of an uncompressed tampon since its inherent resiliency forces it into pressure contact with the walls of tube 22. In order to be inserted, all tampons whether compressed or uncompressed, must be reduced to a diameter of about 0.63 inch in diameter or less to allow for insertion into the vaginal opening. An uncompressed tampon is temporarily compressed for this purpose.

In accordance with the invention, the inner surface 24 of tube 22 is treated or coated or lined in one of a variety of ways to reduce the coefficient of friction thereof and enable the tampon to be pushed from the container tube 22 with relative ease. One means for accomplishing this has been to line the inner surface 24 of tube 22 with a paper coated with an organosilicon compound such as dimethylsiloxane polymer which is available as silicone DC–23 manufactured by Dow Corning Corporation of Midland, Mich. Other similar surface or saturation treatments may be used such as by coating, or spraying or dipping the tube or constituents of the tube using the organosilicon compounds in fluid, resin or emulsion form. The use of any other physical or chemical or electrical means of applying a dry or wet lubricant of this nature on the inner surface of the insertion tube is also contemplated. Alternatively, the exterior of the tampon structure may be treated to increase its lubricity so as to reduce the force required to remove the tampon from the container. This may be done by applying a compound such as the above dimethyl siloxane polymer to the outside surface of an assembled tampon structure as by spraying. Other materials which have been employed successfully as coatings or liners for the surface 24 of tube 22 include the following:

Release parchments and release papers such as the Patapar brand manufactured by the Patterson Parchment Paper Company, Bristol, Pa.; Tetrafluoroethylene polymer solids in dispersion such as Fluorocarbon Spray S–122 manufactured by Miller-Stephenson Chemical Company of Chicago, Ill.; Cut-Rite waxed paper manufactured by Scott Paper Company of Delaware County, Pa., and food grade and all-purpose silicones.

Obviously, a large number of other materials could be employed with equal success for the same purpose, it being realized that it is desirable to provide a coating having a lower coefficient of friction than the normally employed paperboard or similar material used to form the tube 22. Thus, the coating should provide a reduced frictional force between the tampon and the wall 24 of tube 22 than there is between the tampon and the normal paperboard tube when the tampon is urged axially along tube during insertion and prior to ejection from the container.

Table 1 illustrates the range of kinetic and static coefficients of friction obtained for various materials tested on the G.C.M.I. (Glass Containers Manufacturers Institute) Friction Tester.

The friction tester consists of a hydraulically driven table which carries one specimen of the material to be tested and a slider which carries another specimen of the material. The slider is kept from following the motion of the table by a simply supported beam, the deflection of which determines the force necessary to hold the slider stationary, thus sliding the top specimen over the bottom one. This measured force divided by the weight of the slider is defined as the coefficient of friction.

In general, there are two different coefficients of friction. One of which pertains to the starting motion (μ_s—static coefficient of friction) and the other, smaller one, which pertains to the sliding process itself (μ_k—kinetic coefficient of friction).

In preparation for the testing, eight materials were selected. Each material was tested against itself (two tests) and with the untreated side against the treated side (two tests). All samples were cut and tested in machine direction. Table velocity was equal to 0.1 inch per second. Calculation of coefficients of friction (with 2.0 lb. wt.) was done according to the following formulae.

$$\mu_s = F_s/2.0$$

$$\mu_k = F_k/2.0$$

Materials having the desired low coefficient of friction are exemplified by the Patapar brand papers and the Daubert Chemical Company coated with Dow Corning DC–23 polymer.

TABLE I.—FRICTION COEFFICIENTS

Sample [1]	Coefficient of friction	
	Kinetic	Static
Kromekote brand paper	0.47	0.51
Waxed paper (Marathon Supertex)	0.28	0.26
Patapar 50#-303	0.06	0.06
Daubert Chemical Co. 1-50BC1F	0.061	0.055
Patapar 27-197TS	0.053	0.055
Patapar 50-303-1	0.054	0.046
Patapar L2171 60#	0.045	0.045
Patapar 60-301S-1	0.038	0.038

[1] Sample Information:
Kromekote is a clay-coated paper made by Champion Paper Company of Knightsbridge, Hamilton, Ohio.
Waxed paper is a transparent commercial waxed paper made by the Marathon Company (a division of American Can Company), Neenah, Wis.
Patapar papers are a brand of releasing parchments and papers made by the Patterson Parchment Paper Company, Bristol, Pa.
#50-303-1 and #50-303 are smooth, lightweight strong kraft papers with a release coating on one side.
#60-301S-1 is a medium weight bleached kraft paper with a release coating on one side.
#27-197TS is a lightweight, inexpensive, translucent parchment with a release coating designed for use where paper weight or strength are not critical.
Daubert Chemical Company 1-50BC1F is a #50 sheet of Kromekote brand paper treated on one side with Dow Corning DC-23 (Dimethyl iloxane polymer).

Another desirable characteristic exidenced by the silicone-coated paper and release-coated parchment is the constancy of static and kinetic coefficients of friction. By comparison, untreated Kromekote brand paper has a relatively high coefficient of static (beginning) friction and a kinetic (moving) friction reduced by approximately 8%; waxed paper, on the other hand, has a static friction coefficient about half that of untreated Kromekote, and, unlike the Kromekote sample, a kinetic friction coefficient increased by approximately 8% over its static friction coefficient. The high coefficients of friction for the Kromekote and increasing kinetic friction for waxed paper make these materials less desirable as coatings on the inner surface of the tampon tube. On the other hand, kinetic and static coefficients of friction for the papers treated with organosilicon compounds remain unchanged or vary only slightly, and tend to be very low, a distinguishing feature of these materials and a characteristic which is an important feature of this invention.

The tube 22 is normally partially inserted into the vaginal orifice prior to expulsion of the tampon from the tube 22 into the vaginal cavity. The outer surface 25 of the tube 22 on cardboard applicators often causes discomfort and difficulty when this is attempted, due to the friction between the outer surface 25 of the tube 22 and the vaginal walls. It has been found that by treating the outer surface 25 of tube 22 with a dry or wet lubricating material or a more hydrophobic material, this friction is reduced since the surface is more lubricious and not as much moisture is absorbed from the vagina by the tube. This may comprise any of the above-mentioned materials used to treat, coat or form the interior layer 24 of tube 22. The same result may be achieved by utilizing cylindrical tubes fabricated from materials which naturally possess the low coefficient of friction desired. Some examples of these are plastic and vinyl materials, or water soluble resin materials may be used to from the tube. One example of this kind of material is ethylene oxide polymer which is available as Polyox water soluble resin manufactured by Union Carbide Corporation, New York, N.Y.

FIGURES 6, 7 and 8 illustrate in progressive steps the method in which a tampon product of the invention is assembled for use. The tampon structure shown in FIG-

URE 4 is positioned in axial alignment with its downstream end adjacent an open end of outer tube **22** of the container. The draw string or removal cord **16** is stretched through outer tube **22** and through inner tube **23** and may be used as shown in FIGURE 7 to draw the tampon structure into the outer tube **22**. Other means could be used to push or draw the tampon into the tube **22**. FIGURE 8 shows the relative position of the tampon in its temporarily compressed state within the tube **22**.

From the above description it will be apparent that various modifications can be made in the structures described therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A vaginal tampon product comprised of an outer tube, an inner tube having a minor portion of its length at one end slidably inserted into one end of said outer tube and the major portion of its length disposed outside of said outer tube and in axial alignment therewith, a vaginal tampon of the uncompressed type disposed within the major portion of the length of said outer tube and ejectable therefrom by moving said inner tube towards said tampon, said tampon comprising at least one sheet of resilient absorbent material loosely folded at lines of folding which are substantially parallel into a series of parallel and successively reversed pleats, said pleat being of a substantially uniform width of from about ¼ inch to about 1 inch and being gathered together and compressed and folded approximately in half at a point central of the ends of said sheet, leaving its ends loosely pleated and substantially uncompressed, said sheet comprising a mesh-like web of fibers which has high bulk and being bonded on at least one of its outside surfaces, said fibers being substantially unbonded and free in the interior of said web, and a removal cord attached to said tampon, said removal cord being attached to said sheet adjacent the fold point central of the ends of said sheet, and extending from said sheet through said outer tube and through said inner tube, respectively, the inner surface of said outer tube having a coating which reduces the frictional force between said tampon and said inner surface as compared to that between the tampon and the material comprising said tube, when said tampon is moved axially within said outer tube prior to being rejected.

2. A vaginal tampon product comprised of an outer tube, an inner tube having a minor portion of its length at one end slidably inserted into one end of said outer tube and the major portion of its length disposed outside of said outer tube and in axial alignment therewith; a vaginal tampon of the uncompressed type disposed within the major portion of the length of said outer tube in temporarily compressed condition and ejectable therefrom by moving said inner tube toward said tampon, said tampon comprising a first structure of a plurality of sheets of resilient absorbent material, said sheets forming a composite layer and beisg loosely folded at lines of folding which are substantially parallel into a series of parallel and successively reversed pleats, said pleats being gathered together and compressed at a point central of the ends of said composite layer intersected by said pleats and folded approximately in half, leaving its ends loosely pleated and substantially uncompressed, a second structure contructed according to said first structure and folded in half around the fold point of said first structure and having its uncompressed pleated ends positioned substantially between the ends of said first structure, and a removal cord attached to said tampon adjacent the fold points of said first and second structures; the end of said tampon having said uncompressed pleated ends of said first and second structures being positioned adjacent to and directed toward the end of said outer tube most remote from said inner tube so as to enter the vaginal cavity first upon ejection from said tube, the inner surface of said outer tube having a coating which reduces the frictional force between said tampon and said inner surface compared to that between said tampon and the material comprising said tube, when said tampon is moved axially within said outer tube prior to being ejected, and the outer surface of said outer tube being treated to increase its lubricity so as to facilitate the sliding insertion of said outer tube into the vaginal orifice.

3. An uncompressed vaginal tampon comprising at least one sheet of resilient absorbent material loosely folded at lines of folding which are substantially parallel into a series of parallel and successively reversed pleats, said pleats being of a substantially uniform width of from about ¼ inch to about 1 inch and being gathered together and compressed and folded approximately in half at a point central of the ends of said sheet, leaving its ends loosely pleated and substantially uncompressed, and a removal cord attached to said sheet adjacent the fold point central of its ends, said sheet of resilient absorbent material comprising a nonwoven rayon fabric having one surface containing resinous bonding material and another surface substantially free from any bonding material.

4. An uncompressed vaginal tampon comprising a plurality of structures, each being formed from at least one sheet of resilient absorbent material loosely folded at lines of folding which are substantially parallel into a series of parallel and successively reversed pleats, said pleats being of a substantially uniform width of from about ¼ inch to about 1 inch and being gathered together and compressed and folded approximately in half at a point central of the ends of said sheet leaving its ends loosely pleated and substantially uncompressed, said successive ones of said plurality of structures being folded in half around the fold point of a first one of said structures and having their uncompressed pleated ends positioned substantially between the ends of said first structure, said resilient absorbent sheet material comprising a nonwoven rayon fabric having one surface containing resinous bonding material and another surface substantially free from any bonding material, and a removal cord attached to said tampon adjacent the fold points central of the ends of said sheets.

5. An uncompressed vaginal tampon according to claim **4**, wherein said resilient, absorbent sheet material comprises a fluffy nonwoven layer of rayon fibers having a length of between about 1 inch and 3 inches, said layer having high bulk and loft characteristics and having bonding adhesive on portions of at least one surface thereof, said adhesive being present in an amount sufficient to bond the fibers together at the surface leaving the interior of said layer free from bonding.

6. An uncompressed vaginal tampon comprising at least one sheet of resilient absorbent material forming a first structure loosely folded at lines of folding which are substantially parallel into a series of parallel and successively reversed pleats, said pleats being of a substantially uniform width of from about ¼ inch to about 1 inch and being gathered together and compressed and folded approximately in half at a point central of the ends of said sheet, leaving its ends loosely pleated and substantially uncompressed, said resilient, absorbent sheet material comprising a nonwoven rayon fabric having one surface containing resinous bonding material and another surface substantially free from any bonding material, a second structure formed according to said first structure and folded in half about the fold point of said first structure and having its uncompressed pleated ends positioned substantially between the ends of said first structure, and a removal cord attached to said tampon adjacent the fold points central of the ends of said sheets.

7. An uncompressed vaginal tampon comprising at least one sheet of resilient absorbent material forming a first structure loosely folded at lines of folding which are substantially parallel into a series of parallel and successively reversed pleats, said pleats being of a substantially uniform width of from about ¼ inch to about 1 inch and being gathered together and compressed and

folded approximately in half at a point central of the ends of said sheet, leaving its ends loosely pleated and substantially uncompressed, said resilient, absorbent sheet material comprising a fluffy nonwoven layer of rayon fibers having a length of between about 1 inch and 3 inches, said layer having high bulk and loft characteristics and having bonding adhesive on portions of at least one surface thereof, said adhesive being present in an amount sufficient to bond the fibers together at the surface leaving the interior of said layer free from bonding, a second structure formed according to said first structure and folded in half about the fold point of said first structure and having its uncompressed pleated ends positioned substantially between the ends of said first structure, and a removal cord attached to said tampon adjacent the fold points central of the ends of said sheets.

8. An uncompressed vaginal tampon comprising at least one sheet of resilient absorbent material loosely folded at lines of folding which are substantially parallel into a series of parallel and successively reversed pleats, said pleats being of a substantially uniform width of from about ¼ inch to about 1 inch and being gathered together and compressed and folded approximately in half at a point central of the ends of said sheet, leaving its ends loosely pleated and substantially uncompressed, and a removal cord attached to said sheet adjacent the fold point central of its ends, said sheet of resilient absorbent material comprising a fluffy nonwoven layer of rayon fibers having a length of between about 1 inch and 3 inches, said layer having high bulk and loft characteristics and having bonding adhesive on portions of at least one surface thereof, said adhesive being present in an amount sufficient to bond the fibers together at the surface leaving the interior of said layer free from bonding.

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CHARLES F. ROSENBAUM, *Primary Examiner.*