Aug. 9, 1966 H. A. WHITEHEAD 3,264,691

METHOD OF MAKING TAMPONS

Filed Nov. 24, 1964

Fig. 1.

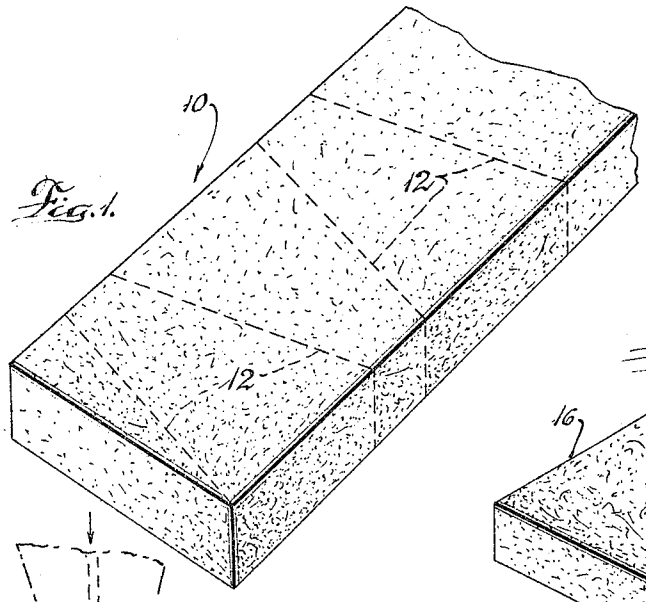



Fig. 2.

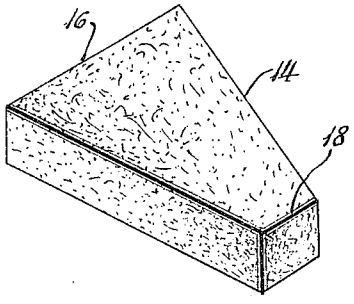



Fig. 5.

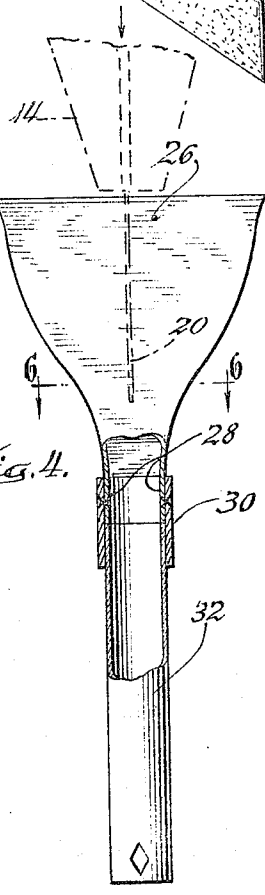



Fig. 4.

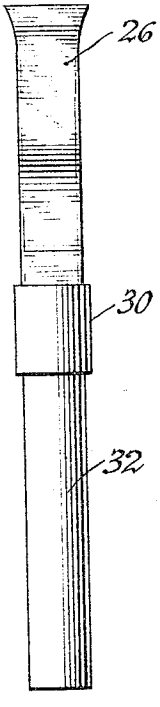
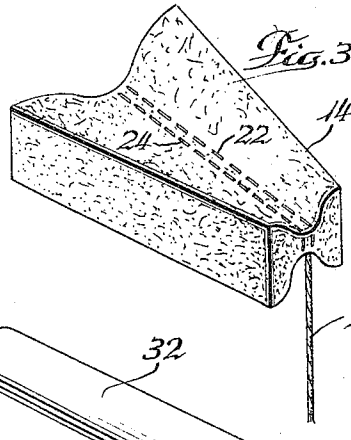



Fig. 3.



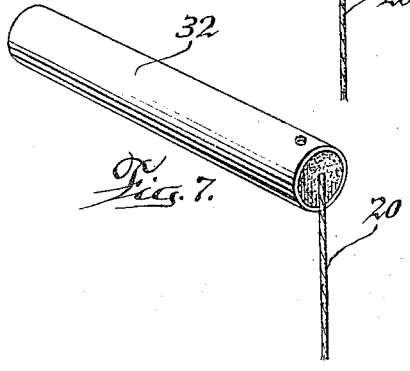
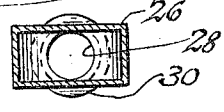




Fig. 7.

Fig. 6.



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3,264,691

# METHOD OF MAKING TAMPONS

Howard A. Whitehead, Appleton, Wis., assignor to Kimberly-Clark Corporation, Neenah, Wis., a corporation of Delaware

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1 Claim. (Cl. 19—144.5)

This is a continuation-in-part of application Serial No. 219,395, filed August 27, 1962, now abandoned.

This invention relates to improved techniques for the fabrication of catamenial tampons and to resultant improved products.

A primary object of the invention resides in the provision of an improved method for the preparation and assembly of component portions of applicator enclosed tampons.

A further object is to provide improvements in tampons of the tubular applicator type.

Other objects and advantages of the invention will become apparent to persons skilled in the art upon examination of the drawings and description.

In the drawings, in which like parts are identified by the same reference numeral,

FIG. 1 is a perspective view of a strip of fluid-absorbent base stock prior to being cut into tampon pledgets.

FIG. 2 is a perspective view of a pledget of keystone configuration as cut from the blank of FIG. 1.

FIG. 3 illustrates one manner in which tampon withdrawal strings are fastened to the individual pledgets of FIG. 2.

FIG. 4 illustrates in front elevation a funnel suitable for compressing the batt of FIG. 3.

FIG. 5 is a view in side elevation of the funnel of FIG. 4.

FIG. 6 is a sectional view of the funnel of FIGS. 4 and 5 taken at 6—6, FIG. 4.

FIG. 7 illustrates in perspective a tampon fabricated by the method herein taught.

The concept of employing certain types of sponge materials as the absorbent element in catamential tampons is suggested in the prior art. For example, Crockford Patents Nos. 2,254,272 and 2,458,685 are each directed to the employment in tampons of cellulosic sponge of the type produced from a viscose base. However, both Crockford patents, as well as all prior art teachings known to applicant which teach cutting a batt from sponge-like material, contemplate a material which has been completely dried prior to cutting. Thereafter the dry pledget is compressed into a cylindrical or other desired configuration.

During the more than twenty years which have elapsed since the issuance of the Crockford Patent 2,254,272, such sponge materials have failed, so far as is known, to come into use, at least on a commercial production basis, either in this country or abroad. During that same period tampons consisting either entirely of natural fibers such as cotton fibers or of blends of natural fibers and synthetic fibers, have enjoyed a wide and substantially increasing acceptance in the U.S. and in certain foreign countries. The failure of sponge type materials seriously to compete with fibrous materials is believed based on the somewhat higher cost of sponge materials coupled with the fact that heretofore no marked advantages were evidence to justify the resulting price differential. The invention taught herein permits the fabrication of sponge tampons of greatly improved anatomical design and absorbent capacity, and which may be sold within or only slightly beyond the price range of fibrous batt tampons.

The concept of preforming a tampon batt from slabs or sheets of dry cellulose sponge is disclosed in Crockford Patent 2,458,685. For example, a plurality of batts of "keystone" configuration may be cut from sheet stock,



a withdrawal string applied medially thereto by sewing or the like, and the batt thereafter rolled into somewhat helical configuration and inserted into a cylindrical die or directly into a tubular applicator. The tampon is adapted for insertion into the vaginal canal with the larger end thereof innermost, the cylindrical tampon body being suitably compressed to remain form-sustaining until contacted by fluids with a resultant gradual unwinding of the helical batt. While Crockford states that he positions the larger end of the batt adjacent the uterus where it is most needed, it has since been learned that a keystone configuration best conforms to the vaginal cavity which convergently narrows downwardly from a position adjacent the uterus. It is further known that the collapsed tube forming the cavity is of a generally "dumbbell" configuration in transverse section.

While in theory an unrestricted helically wound batt might unwind, when fluid saturated, back into its initial planar shape, it has been established, as the result of extended research (including X-ray photographs) that pressures exerted by the vaginal tissue folds on a helically wound sponge tampon, as taught by Crockford, are of a magnitude to prevent unwinding of the pledget back into planar configuration. In other words, investigations have shown that the vaginal tract normally is restricted in expansion in the vertical plane both structurally and physiologically by the bladder and the rectum. At the same time, there is virtually no structural or physiological restriction to expansion in the lateral plane. It has been found that a compressed tampon which re-expands primarily in the lateral direction during use provides a better anatomical fit and offers more absorbent protection. A tampon produced by the method herein taught has these improved characteristics.

As shown in FIGS. 2 and 3 of Crockford, the relatively thin dry sheet sponge is formed into a comparatively wide pledget to permit helical wind-up as shown in FIG. 8. Crockford's major pledget base **5** is of greater dimension than his pledget axis along which thread **7** is sewn at **6**. In marked contrast to the Crockford teaching, applicant's pledget, as shown in FIGS. 2 and 3, is of a length substantially greater than the width of the major base thereof. Assuming the same amount of sponge material employed to produce each type tampon, Crockford starts with an initially thin pledget whereas applicant starts with a much thicker pledget which is also substantially narrower than the Crockford pledget even though the two pledgets may contain the same amount of material. The length may actually be the same (say, for example, two inches) but in that instance Crockford's major base dimension may be greater than two inches, and perhaps two and one-half inches; whereas applicant's major base dimension is less than two inches and, for example, one and one-half inches.

As shown in FIG. 1, an elongate strip **10** of wet sponge-like material such as viscose sponge is cut along dotted lines **12** to form a keystone-shaped pledget **14**. Pledget **14** preferably is cut from a relatively thick strip of wet sponge, for example from a strip two inches wide and from one-half to one inch in thickness, and preferably at least about ¾ inch thick. The resulting pledgets of two-inch length may, for example, have a major base **16** approximately one and one-half inches wide and a minor base **18** approximately two-thirds of an inch wide. Pledget **14** is next provided with a withdrawal string **20**, FIG. 3, which preferably is sewn thereto along either a single line or the pair of spaced lines **22**, **24** as shown. String **20** may consist of one or more twisted threads with the resulting string extending beyond minor base **18** a desired amount as hereinafter described. While parallel lines of stitching are shown, they need not be parallel, and may converge from the major to the minor base in

V configuration, the purpose being to obtain a pledget of a definite dumbell shape in transverse section to conform to the known contour of the vaginal canal. If more than one line of stitching is employed, the individual threads are twisted to form a unitary withdrawal string **20**.

FIGS. 4, 5 and 6 illustrate the manner in which the pledget of FIG. 3 is compressed into cylindrical configuration by being drawn through a "flattened" funnel **26**. The mouth of funnel **26** is of generally rectangular cross-sectional configuration and leads into a cylindrical terminal portion **28**. A tubular connector **30** is employed to effect abutment between cylindrical funnel portion **28** and a tubular applicator **32** into which pledget **14** is ultimately deposited. The interior diameter of applicator **32** is substantially equal to or slightly greater than the interior diameter of cylindrical portion **28** of funnel **26**.

Withdrawal string **20**, FIG. 3, is of sufficient length to permit extension thereof through both funnel **26** and the attached applicator **32**, FIGS. 4 and 5, and beyond the lower end of applicator **32** sufficiently to permit manual grasping thereof with minor base **18** positioned immediately above the mouth of funnel **26**. Withdrawal string **20** may, if desired, be fed through both funnel **26** and applicator **32** by application of suction to the lower end of the applicator. String **20** is of sufficient strength to permit employment in pulling pledget **14** through funnel **26** to effect shaping thereof into cylindrical form and transfer to applicator **32**.

As previously mentioned, pledget **14** is cut from a strip **10** of wet sponge-like material such as viscose sponge. The term "wet" as employed herein means that the sponge has not been fully dried after its initial formation. Pledget **14** remains wet throughout withdrawal string attachment and the compression thereof resulting from the pledget **14** being shaped as it is pulled by withdrawal string **20** through funnel **26**. As best shown in FIGS. 5 and 6, the narrow funnel **26** has a minor dimension equal to the diameter of cylindrical portion **28**. Applicator tube **32** is approximately equal to the thickness of pledget **14**. Thus, as pletget **14** is drawn through funnel **26**, compressive forces are applied primarily across the major plane of the pledget. The "flattened" configuration of the mouth and neck of funnel **26** prevents relative rotational movement of pledget **14** therein, the pledget being dimensioned to be snugly received therein, hence as the pledget is string drawn through the funnel, it is subjected primarily to compression forces resulting in width rather than thickness reduction. The resulting compressed tampon is thus asymmetrical with respect to the direction and the degree of compression. Since more material is present in the plane corresponding to the transverse axis of the uncompressed tampon, re-expansion forces are primarily lateral. Also, since the original tampon pledget is keystone-shaped, the forward portion of the compressed tampon, as inserted, is much denser and capable of greater expansion than is the anterior portion. Thus, the structure of the finished tampon is such that in the dry state the cells are more highly compacted in the forepart thereof and become gradually less compacted toward the anterior. The compaction in the finished tampon is also substantially transverse or diametric, as opposed to the radial or circumferential compaction found in ordinary tampons, and, as a result, the tampon, in use, is adapted to expand to its original planar keystone shape to provide a better anatomical fit and an attendant improvement in absorptive protection.

Also, since the fibers in wet cellulose sponge are maintained therein both somewhat swollen and plasticized, they are in a condition to absorb the stresses of compression without being broken or otherwise damaged as when in a dry state.

While pledget **14** is preferably formed of viscose type sponge, the invention is not so limited and contemplates other suitable materials which may include certain materials in the foam category as well as those normally referred to as sponge. Regardless of whether the material of pledget **14** is of the "foam" or the "sponge" type, compression into cylindrical configuration while wet followed by drying results in superior fluid-induced re-expansion during use to its original keystone configuration. The improved results thus obtained are believed due, at least in part, to the plasticizing effect of moisture when present during the compression stage. Such plasticizing can be readily demonstrated by applying severe mechanical impact to fibers in which swelling has been prevented by cross-linking. The treated fibers rapidly reduce to powder while the control fiber, soft and plasticized by swelling with water, suffers little damage under the same conditions. Thus by compressing wet, rather than dry, pledget material, the water present both swells and plasticizes the fiber-like material to render it capable of absorbing substantial mechanical stress without sustaining the substantial damage which results from the compression of the same material while in a dry state.



A like phenomena may be demonstrated by comparing the wet and dry tensile strengths of a twisted cotton yarn. Wet cotton yarn exhibits a higher strength, attributed to its more swollen and plasticized condition, enabling it to better equalize stress concentrations to which the yarn might be subsequently subjected. In the same manner a wet sponge material such as cellulosic sponge is capable of distributing local stresses without failure of either fiber or regenerated cellulosic membrane. Thus, a pledget of viscose type cellulosic sponge or the like compressed into cylindrical configuration in accordance with the above teaching may re-expand, when fluid saturated, fully back into its initially uncompressed configuration. However, the same pledget, if compressed while dry, can at best only partially re-expand towards its initial configuration.

Since pledget **14** is compressed in the wet state, the invention contemplates employment of an applicator of plastic or the like which is not affected by moisture.

After compression, the applicator-enclosed tampon, FIG. 7, may be dried by dielectric heating or the like during which the tampon contracts somewhat to its final self-sustaining form, permitting easy ejection by a suitable plunger while retaining enough resistance to prevent rotation within the applicator.

What is claimed is:

The method of making tampons comprising the steps of cutting an elongate and relatively thick slab of a wet sponge-like absorbent material into a plurality of keystone-shaped pledgets, each of said pledgets having a length substantially greater than the widest dimension thereof, sewing a withdrawal string along substantially the longitudinal center line of said pledget and completely through the material thereof to draw inwardly a central portion of each pledget sufficiently to effect a generally "dumbbell" configuration in cross section, drawing the narrow end of said wet pledget by said withdrawal string into a cylindrical applicator casing through an inwardly tapering guide member having the general configuration of a flattened funnel whereby said pledget is constrained against relative rotational movement with respect to said casing while being compressed substantially only transversely of the major plane thereof into the cylindrical shape of said applicator casing, and thereafter drying said casing-enclosed pledget.


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ROBERT R. MACKEY, *Primary Examiner.*

RICHARD A. GAUDET, *Examiner.*

C. F. ROSENBAUM, D. NEWTON, *Assistant Examiners.*