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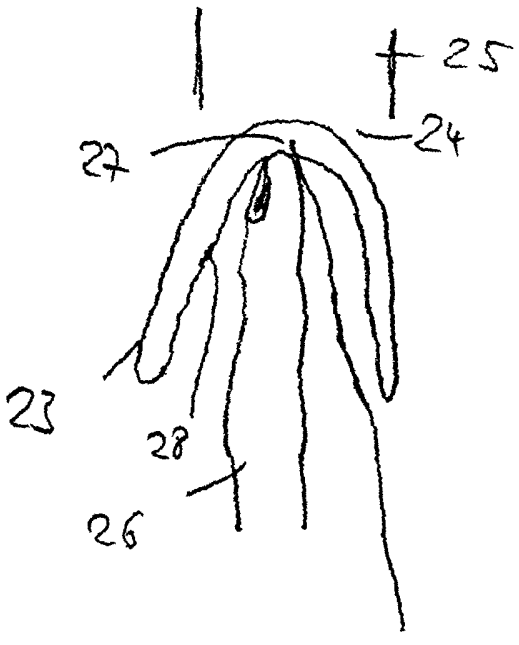
(54) Title: TAMPON, IN PARTICULAR FOR FEMININE HYGIENE OR MEDICAL PURPOSES



(57) Abstract: The invention refers to a tampon, in particular for feminine hygiene or medical purposes, comprising at least one piece of uncompressed or partially compressed absorbent material, wherein said tampon is flexible and substantially flat or sheet-like at least in its center part and is drapeable around a finger using the stiffness of the finger to aid insertion.

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Tampon, in particular for feminine hygiene or medical purposes

Description

The invention relates to a tampon to be inserted into an orifice of a living being, in particular for feminine hygiene or medical purposes. More particularly, this invention relates to an improved tampon, which comprises at least one piece of uncompressed or partially compressed absorbent material, and an at least partially fluid-pervious cover for said absorbent material.

A range of different tampons, like a vaginal tampon, has been developed until now to meet various requirements. Today, highly compressed cylindrical tampons are in general use since this structure provides for a certain level of stiffness and stability necessary for insertion. The size of these compressed tampons has to be small enough to pass through the vaginal orifice without discomfort; as menstrual or bodily fluids are absorbed by the core material, these tampons usually tend to expand toward their previous decompressed size. In order to insert compressed tampons properly and conveniently, various modes have been suggested. Apart from digital insertion the use of an applicator often is recommended. Mainly due to the roughness and dryness of the surface texture of the absorbent core of compressed tampons, it is still suggested to aid insertion by lubricating at least the top of the cylindrically compressed tampon (see US 3,674,029, and US 3,058,469).

To prevent soilage of the hand or fingers used for insertion US 3,058,469 discloses the use of a wrapper as a protective shield which is made from a water-resistant material. No direct contact of the hand with the tampon occurs as the wrapper falls back over the fingers while

the tampon is inserted. The wrapper may be disk-shaped and may have a plurality of radial folds or pleats. According to US 3,058,469 the wrapper material is only loosely attached to the bottom part of the tampon, the region usually held by the fingers during insertion. Similar techniques are also disclosed in US 3,135,262, GB 1,091,156 and DE-AS 1,157,733.

In US 3,674,029 a digital insertion tampon is disclosed onto which a protective wrapper is releasably attached. The wrapper is of fluid-impervious material - a polyethylene tissue laminate - and releasably fastened to the geometric center of the wrapper. Usually a gentle tug on the wrapper shall suffice to separate the wrapper/tampon-bond. However, in order to properly adjust the attachment strength the dwell time of the wrapped tampon on a hot plate as well as the temperature of this hot plate itself have to be properly adjusted. This attachment technique not only is cumbersome but also limits the range of suitable wrapper material suited for attachment. In addition, automated mass production might be difficult to achieve.

In US 2,733,714 a flaring, flexible, disposable skirt in substantially circular form is mounted on a tube, which serves as an applicator for the insertion of a compressed tampon. The skirt is mounted onto the tube applicator by cementing it to its wall or by securing it thereon with an encircling band of rubber or plastic. Tube and skirt portion are made of water-softenable, disposable material.

In US 5,928,184 a tunnel-shaped cavity loop of non-absorbent material, wherein an absorbent material is retained, is disclosed. The interior of the loop is also covered with said non-absorbent material. The non-absorbent material includes a plurality of apertures. As the shape and construction of this tampon deviates from known compressed tampons as described above, US 5,928,184 also suggests the use of a specially designed applicator.

As the vagina in its normal collapsed state is flacid and has multiple irregular folds and wrinkles compressed tampons sometimes fail to prevent early bypass of menstrual discharges from the cervix since some fluid is required to initiate decompression of the absorbent material.

Even bodily fluids, e.g. mucosal secretion, sometimes cannot be prevented from passing a freshly inserted compressed tampon. Therefore, also expansion activating agents are incorpo-

rated into the absorbent core material. However, these agents may irritate the skin of the vagina walls and may cause allergic reactions. Also, the capacity of compressed tampons to accept exudate is rather limited.

To circumvent these drawbacks US 3,981,305 proposes the use of uncompressed, low density foam material which comprises a plurality of intermeshed loops of thin flat stripes. These loops form an openwork spheroid. A withdrawal string is preferably attached to the cross sectional bottom part of said spheroid. However, a special inserter designed to hold the tampon in resiliently deformed condition for delivery into the vagina is required. In addition, multiple steps are required for the manufacture of such spheroids.

An uncompressed tampon comprising an absorbent body which has a bag-like appearance is disclosed in WO 00/06072. This tampon can be digitally inserted into the vagina. The bag-like conformable absorbent body has an outer and an inner surface, a head and a trailing portion, the head portion of which is closed and the trailing portion defines an opening into said interior of said tampon. The absorbent material has to be selected from the group consisting of rayon, cotton, a superabsorbent material or blends thereof. Although, in WO 00/06072 no compression of the absorbent material is required, this material nevertheless has to be brought into the shape of a bag-like structure, for example either by glueing, stitching, sewing, welding or compression of this material. Therefore, at least one additional process step is necessary, which may hamper automated mass production of such uncompressed tampons in a reproducable manner.

Also, US 3,856,013 relies on a bag-like structure which is made from an uncompressed absorbent material. Hollow tampons, especially conically formed devices, comprising a flexible, resilient, elastic, absorbent cellular material are prepared from flat pieces which are welded or stitched together. Furthermore, the interior surface of these tampons has to exhibit a circumferential compressive stress, while the exterior surface has to exhibit a circumferential tensile stress, whereby a capillary gradient between the exterior and interior surface is established to provide for a sufficient absorbent capacity. Similar to WO 00/06072 the preparation of these bag-like structures may not easily be adopted for mass production as tiny flexible structures

have to be fixed together to end up in a defined geometrical form. Also, slight deviations from this form or leaks in the attached overlapping regions, especially at the top part of the geometrical form, where a withdrawal string usually is located, may severely hamper their use as tampons.

Thus, the problem underlying the present invention is to provide a tampon which is easy to store and to apply, which meets highest hygienic requirements, blocks the discharge of bodily fluids conveniently and effectively without causing discomfort, and which allows for mass production in an easy and reproducable manner.

The present invention relates to a tampon, in particular for feminine hygiene or medical purposes, comprising at least one piece of uncompressed or partially compressed absorbent material, wherein said tampon is flexible and substantially flat or sheet-like at least in its center part and is drapeable around a finger using the stiffness of the finger to aid insertion.

The shape, size and/or composition of the tampon of the invention may be varied to a great extent as long as it fulfills its purpose to be drapeable around a finger using the stiffness of the finger to aid insertion, in particular into the vagina. In general, the shape, size and/or composition of the absorbent material is chosen in such a way that it is able to form an umbrella-, tent- or teepee-like shape around the finger during insertion. The flexibility of the absorbent material is chosen in such a manner that during removal of the tampon, or rather tampon, from the vagina, the tampon turns inside out.

Preferred embodiments of the tampon according to the invention are described in the subclaims 2 to 21, with some peculiarities given in the following:

The tampon is essentially composed of one or more pieces of an absorbent core, e.g., a body of non-woven material. Preferably the tampon according to the invention comprises one piece of absorbent material. If two or more pieces are used on one device they can be placed on top of each other to improve the saturation capacity. Alternatively, these pieces can be placed side by side, perhaps separated by pleats as described below, or in such a way that they overlap only partially. Said absorbent material is flexible and substantially flat or sheet-like, at least in

its center part. In one embodiment of the invention, the entire or essentially the entire absorbent material is flat or sheet-like. In another embodiment, the edges of the absorbent body are of greater volume than the sheet-like or flat interior part. The absorbent material used in the tampons according to the invention is uncompressed or only partially compressed. The absorbent material is considered to be partially compressed if the entire piece of absorbent material is partially compressed, the rest being uncompressed. Partially compressed absorbent material has a much smaller density than compressed absorbent material which is customarily used in compressed cylindrical tampons. When brought in contact with fluids, partially compressed absorbent material is expandable to its precompressed size.

If one piece of absorbent material is used the tampon usually corresponds in size and shape to said piece of absorbent material. Said piece of absorbent material may be circular, oval, rectangular, square- or trapez-like, or polygonal in shape. In one preferred embodiment, the absorbent material has a stripe-like shape. The outer edge of one or both ends of the longitudinal stripe may also have a semicircular shape. An especially preferred stripe-like absorbent material shape has a part which is tapered in its middle. One example of such a preferred shape is that of an hourglass.

The flat or sheet-like part of absorbent material in a preferred embodiment extends radially from its center to its outer edges not more than from about 40 mm to about 100 mm. The size of the stripe-like absorbent material usually has a width from about 20 mm to about 90 mm, and a length from about 60 mm to about 120 mm. If a circular-shaped absorbent material is used its radius usually is in the range of from about 40 mm to 90 mm. The thickness of the flat or sheet-like center part of the piece of absorbent material usually is in the range from about 0.5 mm to about 4 mm. Usually, the flat or sheet-like center part of the piece of absorbent material has a smaller thickness than the edges of the piece of absorbent material.

In one preferred embodiment, the absorbent material comprises a fibrous material. A representative, non-limiting list of suitable fibrous materials includes carded fiber fleece, airlaid and wetlaid non-wovens, meltblow non-wovens, spunbonded non-wovens, woven and knit fabrics, and the like. A tampon having an absorbent material which comprises as a fibrous

material carded fiber fleece and/or a spunbonded absorbent structure, e.g., spunbonded non-wovens, is especially preferred. Preferably, the fibers include hydrophilic fibers, and more preferably, the fibers include absorbent fibers, i.e., the individual fibers, themselves, absorb fluid. A useful, non-limiting list of suited fibers includes natural fibers such as cotton, wood pulp, jute, hemp, and the like; and processed fibers such as regenerated cellulose, cellulose nitrate, cellulose acetate, rayon, polyester, polyvinyl alcohol, polyolefin, polyamine, polyamide, polyacrylonitrile, and the like. Other fibers in addition to the above fibers may be included to add desirable characteristics to the absorbent body.

The hydrophobic fibers may be used, for example, to reduce the likelihood that the tampon would dessicate or overly dry vaginal tissue, while the hydrophilic fibers, and especially absorbent fibers, may be used to increase the rate of fluid transport into and throughout the body and to provide the product's absorbent capacity. Suitable fibrous hydrophobic materials include polyolefins, like polyethylene and polypropylene, and also polyesters. The fibers may have any useful cross-section.

Furthermore, foams, e.g., polyurethane and/or polyvinyl acetate foams, can be used as an absorbent material.

In one further embodiment, the absorbent material comprises areas which are completely or at least partially separated by one or more compressed or sealed lines. These sealed or compressed lines usually extend from the geometric center of the piece of absorbent material. For example, if the absorbent material is in the shape of a circular disk the separating lines preferably extend substantially radially from its center, most preferably in such a way that essentially identical angles are formed between adjacent separting lines. On a stripe-like absorbent material the separating lines preferably extend from the center of said material transversely to the main axis of this stripe.

In another embodiment, the tampon according to the invention furthermore comprises a cover from a non-woven sheet and/or a plastic film. Said tampon comprises preferably an at least partially fluid-pervious cover within which the piece or pieces of absorbent material is/are

positioned. Said cover can be made from a top and a bottom surface material of substantially identical shape which are sealed or firmly attached to each other along their overlapping edges. The top and bottom surface of the cover preferably is made from a hydrophobic material. It is also preferred when the fluid-pervious cover part is hydrophobic. In one embodiment, the cover is only partially or discontinually sealed along its outer edges. However, a cover which is essentially sealed along its outer edges is preferred. In one embodiment of the present invention the tampon comprises also a withdrawal string which is preferably attached to said absorbent material and/or to said cover. Optionally, the sealed cover may comprise one, two or more small openings for the withdrawal string.

The sheet-like or flat cover for the tampon according to the invention has at least one surface which is at least partially fluid-pervious. It is also possible to have partially fluid-pervious surfaces on both sides of the cover. Most preferred, a completely fluid-pervious cover face is used on one side of the cover, which in most cases represents the top surface. For example, the fluid-pervious cover can be formed from an essentially open, liquid-permeable net-like structure. Useful net-like structures are known to those of ordinary skill in the art. They may be selected from an outer layer of fibers which are fused together (such as by thermobonding), a woven, knit, or non-woven fabric; an apertured film; a polymeric net; or the like. Preferably, the net-like structure has a hydrophobic finish. In one aspect of the invention, the bottom face of the cover is provided with a sheet which is essentially impervious for body fluids, whereas the top face of the cover is fluid-pervious. Said impervious bottom surface may, for example, comprise a layer of plastic film, e.g. a thermoplastic film like a polyethylene or polypropylene film.

A withdrawal string can be attached to the cover, at the inner surface as well as at the outer surface, or to the absorbent material. For example, the string can be fixed to the surface of the absorbent material, while covered by the surface material of the cover. It is also possible to attach the string to the cover, or to parts of it, and to the absorbent material in a single tampon. The string is sufficiently long to freely extend from the bottom part of the tampon after insertion. In one embodiment, the string is attached to the center part or the geometric center of the tampon, preferably in such a way that it is fastened to the absorbent material and/or the inte-

rior of the top surface of the cover, so that the exterior surface of the top cover face is not destroyed. In one preferred embodiment, the string is partially embedded in the absorbent material itself, i.e. it passes through the core of the uncompressed or only partially compressed material, and at least one loose end of the withdrawal string is projecting freely from the edges of the tampon. Most preferably, when the string is embedded in this core material both ends of the string project freely from the edges or ends of the tampon. For example, the string can extend along the central axis of a stripe-like material, or be embedded along the diameter of a circular or disk-shaped absorbent material. If the piece of absorbent material is irregular in shape, the string is preferably embedded between such points on the edge of the sheet-like or flat cover which are furthest apart from each other. Such a string can be drawn through a portion of the absorbent material via a straight line just by leaving two stitches to the rim of the cover or by enclosing the string tightly in the sealed edges of the cover.

In one aspect of the invention, the embedded withdrawal string with its two loose ends projecting freely from the edges of the tampon form a loop or a loop-like structure. The loop structure of the withdrawal string highly facilitates removal of the tampon after use.

Suitable materials which can be used as a withdrawal string are well known to a person skilled in the art.

The invention further provides for a method of managing bodily fluids during a period of menstruation in line with claim 22.

Other embodiments and advantages of the invention will become apparent by reference to the accompanying drawings and detailed descriptions. In the drawings

Figure 1 is a top plan view of a circular disk-shaped tampon of this invention;

Figure 2 is a top plan view of a tampon as in Fig. 1, additionally showing a plurality of pleated lines;

Figure 3 is a top plan view of a tampon as in Fig. 1, additionally showing a withdrawal string;

Figure 4 is a top plan view of a stripe-like tampon, additionally showing a loop forming withdrawal string;

Figure 5 is a view of the cross section of the tampon as in Fig. 4 along the axis I – II;

Figure 6 is a longitudinal section of a schematical side view of the vagina with a tampon of the invention draped around a finger at the orifice of the vagina; and

Figure 7 is a longitudinal section of a schematic side view of the vagina with a tampon of the invention after having been brought into final position.

As shown in Fig. 1 the sheet-like or flat tampon 1 can be circular in shape with the edges 2 of the top and bottom surface of the cover 3 being attached, e.g., by heat sealing. In Fig. 1 one piece of absorbent material 4 (indicated with the dotted line) is positioned in the cover 3, which more or less resembles the cover in its shape. A withdrawal string (not shown) can be fastened to the center 5 of the disk-shaped device 1.

According to Fig. 2 pleated lines 6 radially extend from the center 5 of the disk-shaped tampon 1. These lines 6 can be formed by known methods, e.g., via heat and/or compression, either on the absorbent material 4 as such, or on the cover material 3 after the absorbent material 4 has been placed in the cover 3.

In Fig. 3 a withdrawal string 7 is drawn through the tampon 1, thus furnishing a string 7 embedded in the absorbent material 4, which extends along the diameter 8 of the disk shaped tampon 1. Usually, only two stitches 9, 10 are afforded in the rim or edge of the cover 3 to allow the loose ends of the string 11, 12 to project freely over the edges of the tampon. Of course, the string may also be sealed or glued in the edge seam of the tampon.

Fig. 4 depicts a stripe-like tampon 13 in the form of an hourglass, the absorbent core material 14 in general having the shape of the cover 15. The withdrawal string 16 is drawn along the longitudinal axis 17 of the stripe-like device 13, its freely projecting ends forming a loop 18.

In Fig. 5 a cross section along the axis I – II of the device in Fig. 4 is shown. The top surface cover material 21 is of a net-like structure allowing for an easy access of body fluids to the absorbent material 14. Top and bottom surfaces or sheets 21, 22 of the cover 15 are welded together at their overlapping regions to form a continuously sealed rim (apart from two stitches 19, 20). The absorbent material 14 is uncompressed, however, due to its non-woven character it is heavily intermeshed, and therefore difficult to be torn apart. The withdrawal string 16 is safely embedded in the center of the absorbent material. No further means for fixing the string 16 usually is required.

Fig. 6 schematically shows a tampon 23 of the invention at the orifice 24 of the vagina or rather vaginal canal 25, which is draped around the finger 26. The flexible, sheet-like structure of the tampon 23 drapes around the finger 26 like a tent or a teepee, protecting the finger 26 and the hand from soilage. In addition, because of the use of uncompressed material for the tampon 23 according to the invention it can be conveniently inserted without disturbing or hurting the walls of the vagina. In one embodiment, the area covering the finger tip 27 can be reinforced, for example in such a manner that the absorbent material is thicker than in the outer regions of this material, or that the bottom surface cover material 28 exhibits a greater tearing strength, e.g. is of thermoplastic material.

According to Fig. 7 the tampon 23 when brought into its final position in the vaginal canal 25 neatly adopts to the shape of the vaginal canal 25 thereby blocking even minor folds and passages. The withdrawal string 29 can be fastened to the center 30 of the tampon 23. It can also be drawn through the absorbent material projecting from the edges of the cover material 28 towards the orifice 24 of the vaginal canal 25. It is also possible to simultaneously use a string fastened to the center of the tampon and another string which is drawn through the absorbent material as described above. In general, the tampon is that flexible that during removal of the device from the body cavity it turns inside out.

One tampon according to the invention can be used to manage bodily fluids, for example during a period of menstruation, by applying the following steps:

a) draping a substantially flat, drapeable tampon 1, 13, 23 over a user's finger 26;
b) inserting the finger 26 covered by the tampon 1, 13, 23 into the user's vaginal canal 25;
c) maintaining the tampon 1, 13, 23 in the vagina canal 25 for preventing passage of the bodily fluids out from the vagina for a duration of at least about 2 hours; and
d) removing the tampon 1, 13, 23 from the vaginal canal 25.

The tampon according to the invention is, irrespective of its size and shape, easy to manufacture affording only little and inexpansive process steps. It is easy and convenient to apply, does not require the use of any lubricants, and allows for a clean insertion and a sanitary handling, thereby fulfilling medical hygiene standards. Furthermore, a withdrawal string can be attached to the tampon without the use of glues or other additional fastening means, just by embedding it in the absorbent material and/or stitching it through the cover material. Also, the tampon is very light, does not require much space and is therefore easy to store. In addition, while the top surface of the cover generally is fluid-pervious, the bottom surface of the cover can be made from an impervious material, which even enhances the effect as a tampon.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention.

Reference Signs

1	tampon
2	edge
3	cover
4	piece of absorbent material
5	center
6	pleated line
7	withdrawal string
8	diameter
9	stitch
10	stitch
11	string end
12	string end
13	tampon
14	absorbent material
15	cover
16	withdrawal string
17	longitudinal axis
18	loop
19	stitch
20	stitch
21	top surface
22	bottom surface
23	tampon
24	orifice
25	vaginal canal
26	finger
27	finger tip
28	cover material
29	withdrawal string
30	center

Claims

1. A tampon (1, 13, 23), in particular for feminine hygiene or medical purposes, comprising at least one piece of uncompressed or partially compressed absorbent material (4, 14), wherein said tampon (1, 13, 23) is flexible and substantially flat or sheet-like at least in its center part and is drapeable around a finger (26) using the stiffness of the finger (26) to aid insertion.

2. The tampon according to claim 1, said piece of absorbent material (4, 14) having a circular, oval, rectangular, polygonal, square,- trapeze- or stripe-like shape and/or the shape of an hourglass.

3. The tampon according to claim 1 or 2, wherein said absorbent material (4, 14) is a foam, is of at least partially hydrophilic nature and/or comprises a fibrous material.

4. The tampon according to claim 3, wherein said fibrous material comprises a carded fiber fleece.

5. The tampon according to claim 3, wherein said fibrous material comprises a spunbonded absorbent structure.

6. The tampon according to one of the preceding claims, wherein said piece of absorbent material (4) comprises areas which are completely or partially separated by one or more compressed, pleated and/or sealed line(s) (6).

7. The tampon according to claim 6, wherein at least one of said lines (6) extends substantially radially from one geometric center (5) of the piece of absorbent material (4).

8. The tampon according to one of the preceding claims, said tampon (1, 13, 23) having an at least partially fluid-pervious cover (3, 15, 28), preferably with a top surface (21) and a bottom surface (22), between which the absorbent material (14) is positioned.

9. The tampon according to claim 8, wherein said cover (3, 15) comprises a top and a bottom surface (21, 22) of substantially identical shape, within which said piece or pieces of absorbent material (4, 14) are positioned, and which are at least partially sealed along their overlapping edges (2).

10. The tampon according to claim 8 or 9, wherein said cover (3, 15, 28) comprises a non-woven sheet and/or plastic film.

11. The tampon according to one of the claims 8 to 10, wherein the top surface (21) of said cover is fluid-previous and/or the bottom surface (22) of said cover is fluid-impervious.

12. The tampon according to one of the claims 8 to 11, wherein the fluid-pervious cover part is hydrophobic.

13. The tampon according to one of the preceding claims, wherein said tampon comprises a withdrawal string (7, 16, 29).

14. The tampon according to claim 13, wherein said withdrawal string (7, 16, 29) is attached to or partially embedded in said piece or pieces of absorbent material (14) and/or said cover, preferably partially covered by the cover.

15. The tampon according to claim 14, wherein said withdrawal string (7, 16, 29) is attached to or embedded in the tampon (1, 13, 23) at the geometric center (5) of the tampon (1, 23) or along the longitudinal axis (17) of the tampon (13) or along the diameter of the tampon.

16. The tampon according to one of the claims 13 to 15, wherein at least one, preferably two, loose end(s) (11, 12) of said withdrawal string (7, 16) is/are projecting freely from the edges (2) of the piece (4) and/or cover (3), in particular the bottom surface (22) thereof.

17. The tampon according to claim 16, wherein said two loose ends form a loop (18) or a loop-like structure, of which a portion preferably being drawn through a substantially central longitudinal section of the piece of absorbent material (4, 14) and/or cover (3, 15),

in particular fixed by at least two stitches (9, 10, 19, 20) such that the string portion is positioned on a substantially central longitudinal section of the outer surface of the piece of absorbent material.

18. The tampon according to one of the preceding claims, wherein the flat or sheet-like piece of the absorbent material extends radially from a center to its outer edges from about 40 to 100 mm.

19. The tampon of one of the claims 2 to 17, wherein the strip-like piece of absorbent material has a width from about 20 to 90 mm and/or a length from about 60 to 120 mm.

20. The tampon according to one of the claims 2 to 17, wherein the circular shaped piece of absorbent material has a radius from about 40 to 90 mm.

21. The tampon according to one of the preceding claims, wherein the flat or sheet-like center part of the piece of absorbent material has a smaller thickness than the edges of the piece of absorbent material, and/or the thickness of the flat or sheet-like center part of the piece of absorbent material is from about 0.5 to 4 mm.

22. A method of managing bodily fluids during a period of menstruation, comprising the steps of:

a) draping a flexible, substantially flat or sheet-like, drapeable, first tampon (1, 13, 23) according to one of the preceding claims over a user's finger (26);
b) inserting the finger (26) covered by the tampon (1, 13, 23) into the user's vaginal canal (25);
c) maintaining the tampon (1, 13, 23) in the vaginal canal (25) for preventing passage of the bodily fluids out from the vagina for a duration of at least about 2 hours;
d) removing the tampon (1, 13, 23) from the vaginal canal (25); and

e) repeating steps (a) through (d) as needed during the menstrual period with further flexible, substantially flat or sheet-like, drapeable, tampons.

Fig. 1

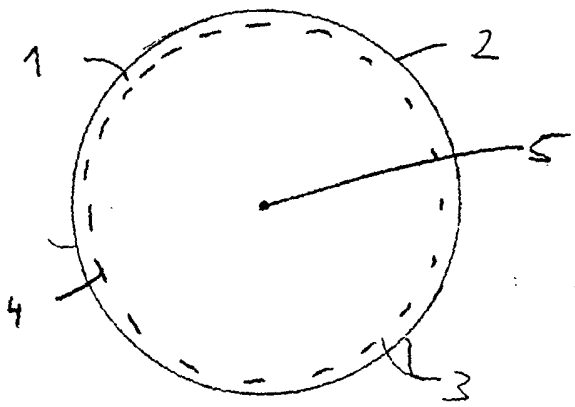


Fig. 2

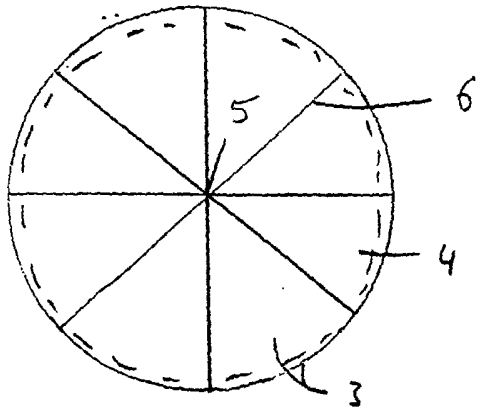


Fig. 3

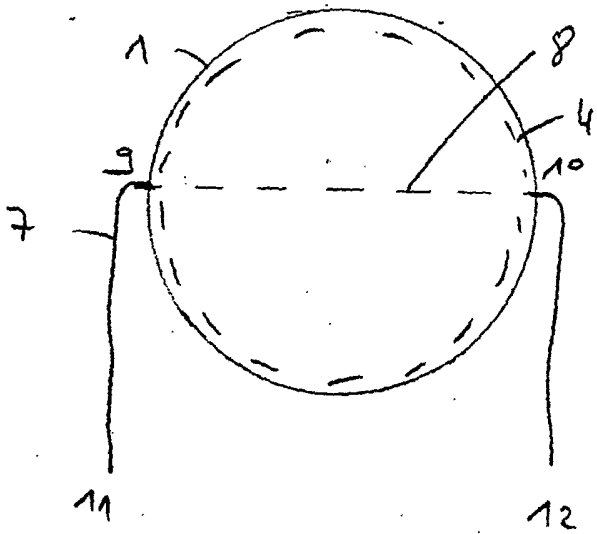


Fig. 4

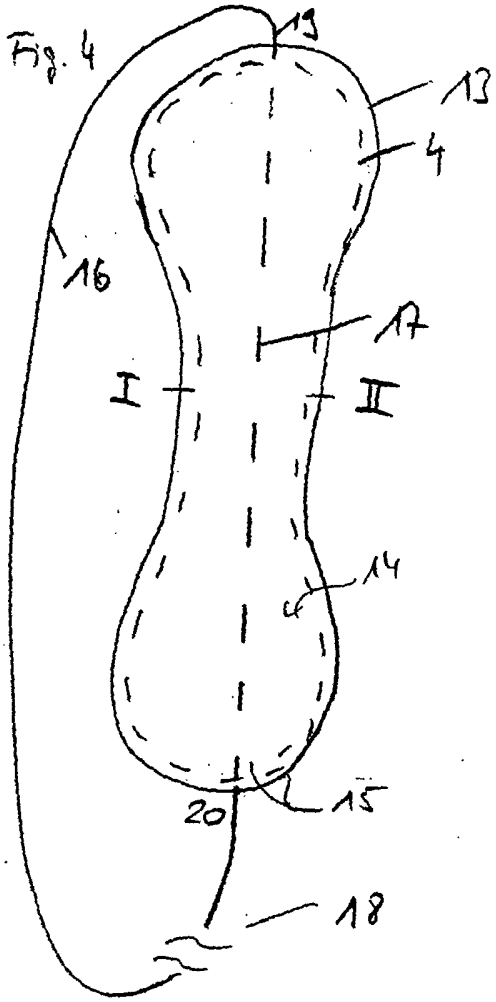


Fig. 5

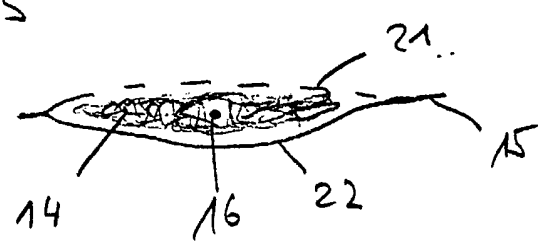


Fig. 6

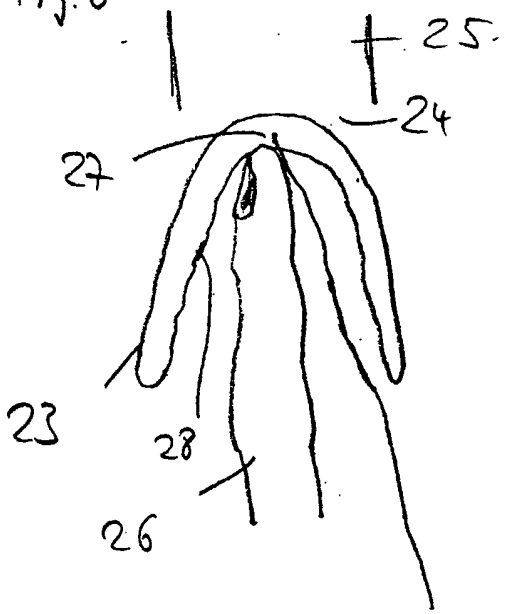
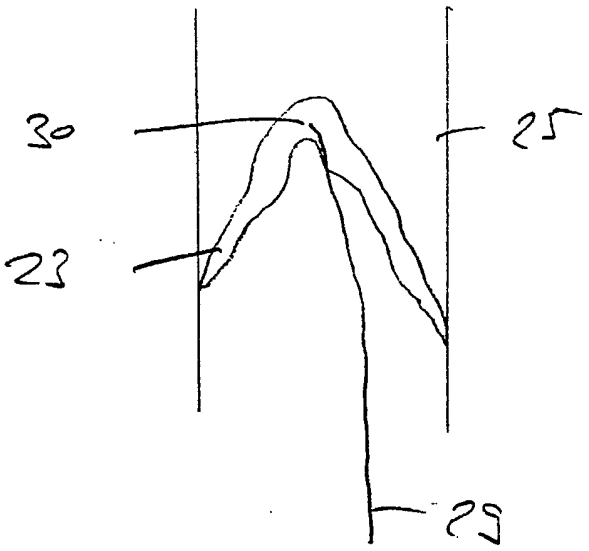


Fig. 7



INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 02/14346

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61F13/20 A61F13/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	US 2002/082580 A1 (BENNETT JOSEPH H) 27 June 2002 (2002-06-27) abstract paragraph '0036! - paragraph '0037! paragraph '0053!; figures	
X	EP 0 548 039 A (LEGRAND MARIE THERESE) 23 June 1993 (1993-06-23) the whole document	1,2,8,9, 13-16, 18,20-22
A	US 4 595 392 A (JOHNSON RUSSELL L ET AL) 17 June 1986 (1986-06-17) column 2, line 31-59; figures	
A	US 5 417 224 A (PETRUS EDWARD J ET AL) 23 May 1995 (1995-05-23) column 7, line 25-54; figures	

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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'&' document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
8 April 2003	24/04/2003

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Seabra, L

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 02/14346

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 4 212 301 A (JOHNSON RUSSELL L) 15 July 1980 (1980-07-15) abstract; figures	1,22
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