Jan. 17, 1967 J. PIRIE 3,298,369

MENSTRUAL DEVICE

Filed June 13, 1963 2 Sheets-Sheet 1

Fig. 1a

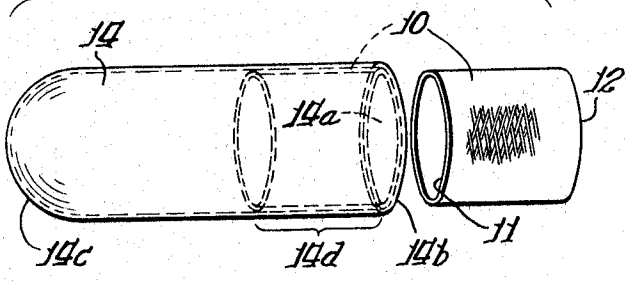


Fig. 1b

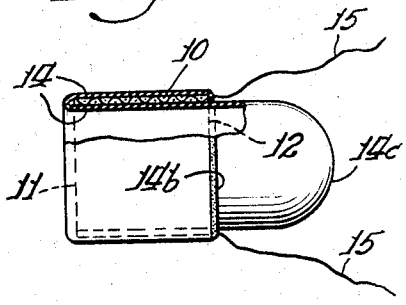


Fig. 1c

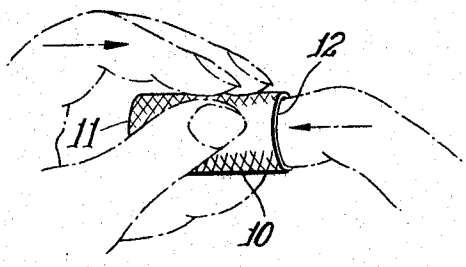


Fig. 1d

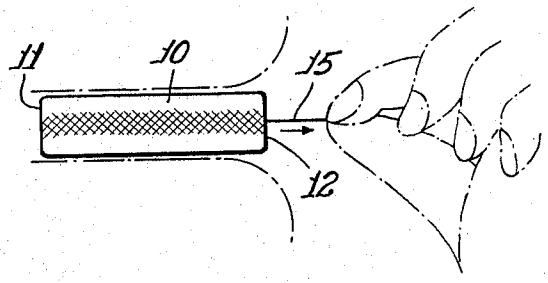


Fig. 2

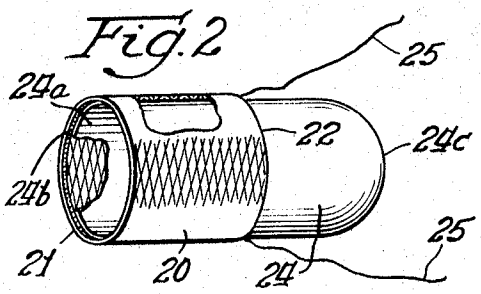


Fig. 3

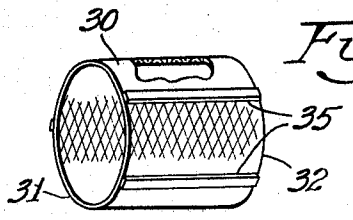


Fig. 4

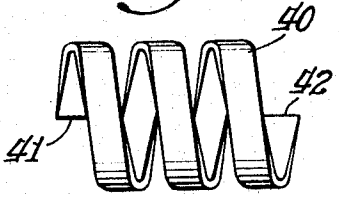
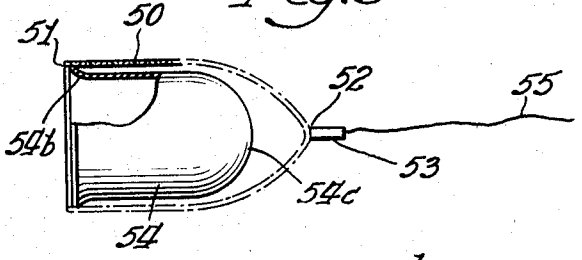


Fig. 5



Inventor:
Jean Pirie

Jan. 17, 1967 J. PIRIE 3,298,369

MENSTRUAL DEVICE

Filed June 13, 1963 2 Sheets-Sheet 2

Fig. 6a

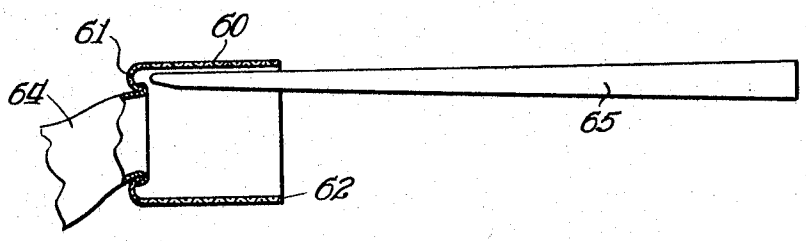


Fig. 6b

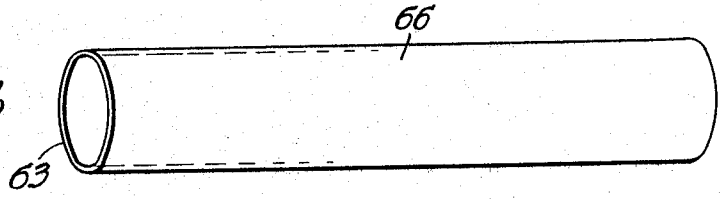


Fig. 7

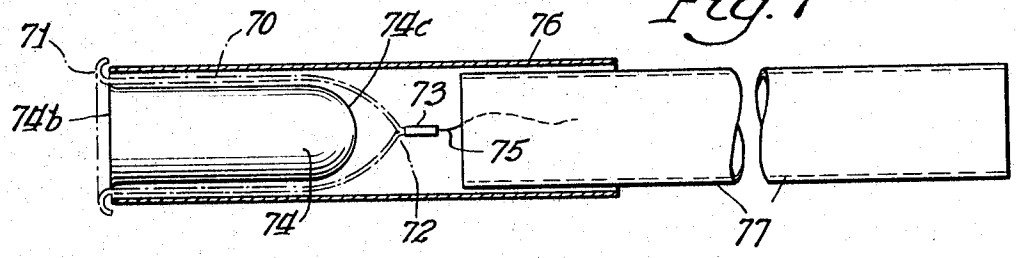


Fig. 8a

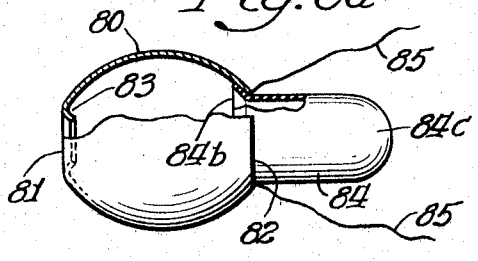


Fig. 8b

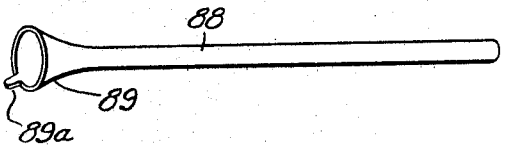
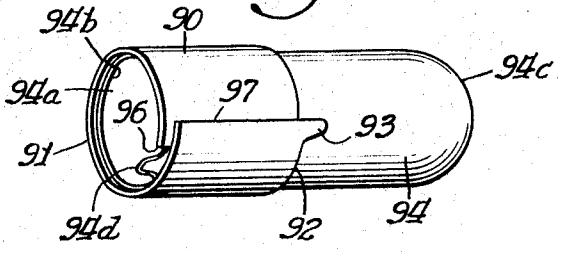


Fig. 9



Inventor:
Jean Pirie

United States Patent Office

3,298,369
Patented Jan. 17, 1967

1

3,298,369

MENSTRUAL DEVICE

Jean Pirie, 1209 N. Astor St., Chicago, Ill. 60612

Filed June 13, 1963, Ser. No. 287,547
12 Claims. (Cl. 128—285)

This invention relates to a menstrual device, and more particularly to an occlusive, intravaginal collecting means for the menstrual product.

Methods of dealing with the problem attendant upon the recurring menses date from antiquity, and are generally well known to those in the art. Despite efforts at other solutions, the various absorptive means remain the conventionally accepted and used ones. These means, however, whether worn externally in the form of pads or internally in the form of tampons are unsatisfactory from a variety of aspects, among them discomfort and trauma, odor, leakage, disposal problems, and a generally unhygienic and unesthetic character.

Retentive means, as contrasted with absorptive, have been proposed in the past, including various intravaginal collecting devices. In practice, these proposals fall into two main classes; devices which are intended to cover or contact the cervix uteri, and devices which are intended to lie in the vaginal canal below the level of the cervix.

Devices of the first class include cervical caps which may consist of a collecting sac on a rigid ring, such as shown in U.S. Patent 1,986,504. U.S. Patent 2,309,868 teaches a similar device with a separate retaining ring to be fitted over the cervix, and U.S. Patents 2,616,426 and 2,613,670 teach other methods of providing cervical ring structures. Such devices have many important disadvantages, not the least of which is that they generally cannot be applied by the wearer but require application by a physician.

The conventional, flexible rimmed, contraceptive diaphragm covers the cervix by lying lengthwise in the vaginal canal, the diaphragm extending from behind the cervix to the symphysis pubis. U.S. Patent 2,195,065 teaches a modification of such a diaphragm adapting it to use as a menstrual device. Such devices must be carefully fitted necessitating at least one consultation with a physician; they cannot easily or conveniently be inserted for proper placement; and the fact that the diaphragm must be made in a variety of sizes to fit different wearers is disadvantageous from the standpoint of simplicity and cost.

Catemenial devices of the second class (i.e. those not coming in contact with the cervix) usually depend on frictional contact with the vaginal walls of a tube having a collecting sac or closure at the lower end. These devices have generally been made of an elastic material such as rubber so they may be folded for introduction into the vagina and released, whereupon they expand to their cylindrical shape and make occlusive contact with the vaginal wall. One such device is shown in U.S. Patent 1,891,761. It was early recognized, however, that such devices generally, and the flexible varieties specifically, tended to create a vacuum intravaginally which make subsequent withdrawal of the implement by the wearer difficult or impossible. Thus, U.S. Patent 1,996,242 teaches a device of this class provided with air vents purported to relieve this undesirable negative pressure. The devices shown in U.S. Patents 2,089,113 and 2,534,900 provide vent-holes or tubes for the same reason. Such devices,

2

however, to remain occlusive to the fluid menstrual discharge, must have either very small holes, or complicated arrangements of flap valves or the like, such as taught in U.S. Patent 1,996,242. It has been found that the necessarily small holes often do not, in practice, allow for equalization of pressure, since moisture, occlusion by the vaginal mucosa or the like, effectively block them. A sufficient number of cases of serious injury to users of devices of this type, attendant upon their inability to remove them atraumatically after use, lead the Federal Food and Drug Administration to prohibit their sale except under a physician's prescription.

Other forms of devices of this general class, wherein prevention of leakage around the device is aided by absorbent means on the outer surface, are shown in U.S. Patent 2,061,384 and, adapted to a specialized tampon, in U.S. Patent 2,845,071.

Substantially all prior devices require the user's manual contact with body parts and fluids, and further require cleaning for reuse of the device. Apart from such considerations of hygiene and aesthetics, an intravaginal device, for proper function per se, must meet several mutually contradictory desiderata, based upon the following facts: (1) The entrance to the vagina is provided with a functional sphincter comprising intrinsic musculature plus the external pubococcygeal and iliococcygeal muscles at the levator ani, and the puborectailis muscles, these latter being the main closures of the vagina. (Grant, Method of Anatomy, 4th Ed., p. 68, p. 359: Eastman, William's Obstetrics, 10th Ed., p. 23–29.) Through their concerted action in the pelvic diaphragm of the perineum these muscles resist distention of the vaginal vestibule, hence, entry to the vagina proper. Consequently, the diameter of any intravaginal device should be small for easy, comfortable, and safe introduction. (2) However, beyond the sphincter, the vagina per se is a flaccid, functionally almost amuscular organ, the walls of which are normally collapsed, touching one another to give a cross section of roughly H-shape and hence capable of relatively great radial distention without appreciable radial resistance. Consequently, and contrary to the first requirement, an intravaginal occlusive device must, for satisfactory occlusion, be of relatively large diameter. (3) Further, once introduced, an intravaginal device of large diameter receives maximum support and stability, and best resists inadvertent expulsion, if it rests upon or contacts closely, the shelf-like internal aspect of the sphincter of the vaginal orifice. (4) Contact of an intravaginal appliance with the cervix uteri is preferably to be avoided; devices depending upon such contact are difficult to introduce and place properly, and usually must be individually measured and fitted. Moreover, they are sources of possible tissue irritation and infection, and there is also medical evidence that undue or prolonged contact of foreign materials with the cervix may be a factor in the etiology of cervical cancer. (5) For safe use, introduction and removal of an intravaginal device must be accomplished without trauma to tissue.

It is, accordingly, the general object of this invention to provide a new and useful menstrual device.

It is a further object of this invention to provide such a device in the form of an intravaginal occlusive device which is easy and atraumatic to introduce into the vagina, which does not require individual fitting or measuring for fitting to a particular user, which remains remote from

the cervix uteri when in position yet makes effective occlusive contact with the vaginal wall, and which is readily and atraumatically withdrawn by the user when desired.

It is another object of the invention to provide a new and useful intravaginal occlusive device having a diameter which is variable, whereby it may be introduced while at a small diameter and may then be expanded to a larger diameter while in position in the vagina.

It is a further object of the invention to provide such a variable diameter device, the diameter of which may be reduced by the user for withdrawal of the device after its use.

Another object of the invention is to provide an intravaginal occlusive menstrual device which may be safely withdrawn without thereby creating traumatic intravaginal negative pressures.

Another object of the invention is to provide a device of this class which is suitably and safely disposable by being flushed down a conventional toilet.

Still another object is to provide a menstrual device of improved daintiness in use, by obviating the necessity of the user's manual contact with the introitus, vagina, or menstrual product.

Other objects and advantages will be apparent to those in the art from the following detailed description taken in conjunction with the drawings, wherein:

FIGURE 1*a* is a perspective view of the component parts of a preferred embodiment, shown disassembled;

FIGURE 1*b* shows the preferred embodiment assembled, partially cut away;

FIGURE 1*c* is a perspective view of the embodiment being manually adjusted to a small diameter;

FIGURE 1*d* shows the small diameter configuration of the embodiment of FIGURE 1*c* in place in the vagina while being subjected to longitudinal tension;

FIGURE 2 is a perspective view of another embodiment of the invention;

FIGURE 3 is a perspective view of a modification of the body element of FIGURE 2;

FIGURE 4 is a perspective view of the body element of another embodiment of the invention;

FIGURE 5 is a side view in cross section of still another embodiment of the invention;

FIGURE 6*a* is a sectional view of a modification applicable to the embodiments shown in FIGURES 1, 2 and 3, adapting them to use with an applicator;

FIGURE 6*b* shows another form of applicator;

FIGURE 7 is a sectional view of a modification of the embodiment shown in FIGURE 5 adapting it to use with an applicator;

FIGURE 8*a* is a plan view partially in section of another embodiment of the invention;

FIGURE 8*b* illustrates an applicator adapted for use with the embodiment of FIGURE 8*a*; and

FIGURE 9 is a perspective view of another embodiment of the invention.

Referring to FIGURES 1*a* and 1*b*, a preferred embodiment of the invention is provided by a semi-rigid, tubular body member **10** having opposed open ends **11** and **12**. Body **10** is woven or braided or otherwise composed of crosswise-arranged semiflexible or resilient strands, including woven strands, monofilaments, or strips of material, such as nylon, hair, cellulose acetate, or other material arranged in such a way that body **10** forms a conduit, the diameter of which may be varied by movement of ends **11** and **12** toward or away from one another. Collecting sac **14**, having an open end **14***a* defined by edge **14***b*, and a closed end **14***c*, is made of flexible elastic material such as rubber, and preferably is chosen to have a resting, that is, unstretched, diameter somewhat greater than that of an undistended vaginal canal.

In the assembled unit, body **10** lies inside sac **14**, and occupies approximately the area indicated by **14***d* in FIGURE 1*a*; and **14***b* of sac **14** may be flush with end **12** of body **10**, or alternatively, may extend beyond it. Sac **14** is secured, as by adhesive or stitching, to body **10** at or near end **12**, and the remaining portion of sac **14** is directed back through body **10** from end **11**, in the manner of turning the finger of a glove inside out. The portion of sac **14** lining body **10** may be again secured internally to body **10** at or near end **12** as shown, or, alternatively, if edge **14***b* has been arranged to extend beyond body end **12**, may be secured to the projecting portion.

Body **10** is thus encased in an inner and outer layer formed by the sac **14**, and is thereby maintained at the relatively large resting diameter of unstretched sac **14**. The closed end **14***c* of the sac **14** may extend beyond the end **12**. Optionally, one or more strings or cords **15** may be attached to body **10**. As shown, these extend past end **12** and beyond sac end **14***c*.

Alternatively, the sac may be placed inside body **10** and folded back on the outside.

In use, the assembled unit may be held in one hand as shown in FIGURE 1*c*, and the forefinger of the other hand introduced at end **12**. Forward motion of the forefinger pushes end **14***c* inside body **10**, but this motion is limited by the attachment of sac **14** to body **10**, so that the unit may be "milked down" along the forefinger, as by pulling on end **12**, elongating body **10** and thereby concurrently decreasing its diameter, whereupon it may be safely and easily introduced into the vagina by means of the forefinger. It will be seen that the fingers at no time contact any part of the anatomy. In introducing the device, after forward end **11** has passed the vaginal sphincter, its further forward progress is somewhat resisted by the cylindrical vaginal wall. The continued application of longitudinal force on the portion of the device still outside of vagina causes the device further to enter the vagina, but in so doing both the compressive force resulting from the forward progress of the device, and the compressive elastic urging of the rubber sac, cause the device to shorten, hence to assume its maximum diameter when entirely intravaginal. It will thus be seen that, while introduction through the introitus takes place at small diameter, final positioning within the vagina alters the device to a larger diameter, the particular diameter being determined by the initial size of body **10**, size and elasticity of sac **14**, and the resistance of the vaginal walls. Further, it will be seen that the elasticity of sac **14** serves to urge the unit when in small diameter configuration to large diameter configuration, and thus to maintain the large diameter configuration when the device is in position. Fluid entering the sac-lined conduit of body **10** at end **11** accumulates within the sac, causing end **14***c* to assume again the external position shown in FIGURE 1*b*.

When it is desired to remove the appliance of my invention from the vagina, end **14***c* of sac **14** is accessible to be grasped, or, alternatively, one or more strings **15** may be provided to be grasped by the fingers. It is contemplated that end **14***c* and/or strings **15** remain outside of the introitus during use, hence are always readily accessible. As shown in FIGURE 1*d*, wherein the vagina is represented schematically in cross section, longitudinal traction, as on string **15**, causes the device to elongate, and thus to assume a small diameter. Continued traction and consequent continued decrease in the device's diameter leads finally to its easy and atraumatic withdrawal from the vagina, following which it may be immediately disposed of in the toilet bowl along with the contained menstrual discharge.

It will be further seen that, unlike conventional absorptive tampons, the external surfaces of sac end **14***c* and strings **15** are not contaminated with the menstrual discharge, and further, unlike prior occlusive collecting devices, the character and lightness of my device permits its disposal simultaneously with its removal, thus obviating the need for emptying and cleaning for reuse. There is thus provided a daintiness in use heretofore not possible.

As an alternative method of construction, the mesh

body **10** may be thinly coated, as by dipping, with an elastic material in order to achieve the elasticity desired. Sac **14** may be attached by an adhesive, or other means as by molding during the dipping of body **10**. If the dipping process is used to close the mesh interstices, making body **10** impervious to fluid, separate sac **14** may be short, and need extend only from end **12** of body **10** to a position indicated by **14***c*, since the dipped coating is then in effect a continuation of sac **14**. If only the mesh elements and crossings are coated, the interstices being left open, sac **14** should extend from end **11** through end **12**. This modified form of construction serves to maintain the interrelationships of the mesh elements with minimal added wall thickness of body **10**, and the relatively coarser weave texture remaining on the outer side of body **10** serves further to minimize displacement of the device when it is in position.

Referring to FIGURE 2 of the drawing, an alternative embodiment of the invention is provided in a body member **20**, comparable in construction to body **10**, and having opposed open ends **21** and **22**. Mounted within body portion **20** is an elongated sac or bag **24**, comparable in construction to sac **14**, the mouth **24***a* of the sac being attached at its periphery **24***b* to end **21**. The length of sac **24** with reference to body **20** is selected so that the closed base **24***c* extends outside of body **20** beyond end **22**, when the device is at its large diameter. A portion of body **20** and sac **24** have been shown cut away in FIGURE 2 to illustrate these features. Sac **24** is secured at least to both ends of body **20**, the elastic sac thus serving to provide a compressive or contractive force tending normally to urge body **20** back to a large diameter configuration after it has been extended into elongated, small diameter configuration.

Alternatively, sac **24** may be arranged outside body **20**. One or more strings **25** may be secured to body **20** to facilitate removal of the device.

The manner of use of this embodiment is in all respects similar to that described with reference to the embodiment of FIGURE 1.

Where the sac itself is not used normally to urge the device to large diameter, added elastic or other means, such as dipping or coating hereinabove referred to, may advantageously be used. For example, as shown in FIGURE 3, body **30**, which is similar to body **10** or body **20**, is provided with elastic strips **35** secured at their ends to opposite ends **31** and **32** of body **30**. The unstretched or normal length of these strips with reference to body **30** is selected so that these strips are under tension when body **30** is elongated and thus tend to shorten it and thereby urge it to a large diameter.

This embodiment of the body element is particularly adapted to a form of the invention characterized by a disposable sac detachably secured to a re-usable body. Thus, for example, referring to FIGURE 1*b*, body **10** may be replaced by body **30**, in which case the body element's self-contained elastic means obviate the necessity of fastening sac **14** to the body to achieve the elastic force. In this case sac **14** need merely be folded over the body element as shown, but need be nowhere fastened to the body. In introducing the device into the vagina, the thumb, in conjunction with the introducing forefinger, by pressing the sac edge to the body element, prevents dislodging the body element from its position within the sac. Optionally, the free edge of the sac, that is edge **14***b*, may extend beyond end **12** of the body, to ensure coverage of the body element by the sac. In withdrawing the device from the vagina after use, longitudinal tension on strings **15** will remove the body element, and, if the sac portion should remain in place it may then be removed separately, and discarded, by pulling upon end **14***c*. Body **30** may then be placed within a fresh sac, for re-use. It is obvious that this embodiment of the invention is not restricted to use with body **30**, but is applicable to any body element having elastic means inherent in the body per se and distinct from the sac.

For example, other means such as one or more spiral springs as indicated in FIGURE 4, wherein body **40** has opposite ends **41** and **42** and is composed of metallic or rubber or plastic materials and having a set at a large diameter, may be incorporated in a body such as **10**, **20** or **30**. Alternatively, one or more strands of a body such as **10**, **20** or **30** may be of spring-like or sufficiently resilient material to provide a tension coil spring effect normally urging the tubular body to large diameter configuration but capable of elongation and concurrent decrease in diameter.

The above described embodiments thus provide a hollow body member having an opening at one end, an axial passage continuous through to the other end which is occluded by a sac either at or external to said other end. The body member is accessible from the occluded end for increasing and/or decreasing the diameter of the device. Reduction in diameter may be achieved by external manipulation (pulling the ends apart) before introduction of the device into the vagina and, upon introduction, the device may be reexpanded to large diameter position.

FIGURE 5 illustrates another embodiment of the invention wherein a body **50** having an axial opening at one end **51** is tapered to a closure at the opposite end **52**. Body **50** is otherwise analogous in construction to the above described embodiments. A sac **54** open at one end, and closed at end **54***c* lies within body **50**, and may be attached at its open end at end **51**, and also inwardly of the open end to provide an elastic force urging body **50** toward large diameter configuration. Alternatively, other elastic means, such as one of those described herein with reference to other embodiments may be used. Tapered closure of end **52** is preferably achieved by bringing together the ends of the strands or strips making up body **50**, e.g. as by decreasing the weave mesh spacing and fastening the ends of the strands at **53** by means of adhesive, or other suitable means, such as a clip, wrap, heat seal, or the like. Secured to closure **53** is a flexible cord or string **55**, or a prolongation of one or more of the strands or strips held by **53**. The device may be withdrawn by pulling cord **55** after use without the necessity of grasping body **50**.

This embodiment is used in much the same manner as those previously described, but since closed end **52** prevents introduction of the forefinger into the device, it is manually drawn to a small diameter and held externally by thumb and forefinger for introduction into the vagina. Thereupon, release of body **50** and final longitudinal pressure on end **52** allow it to regain its large diameter position, in which form it is retained in place intravaginally. Withdrawal is accomplished by pulling on cord **55**, which causes body **50** to elongate and hence to assume a small diameter configuration.

The embodiment of FIGURE 5 thus provides a hollow tubular member or conduit having an axial opening at one end and an axial passage therefrom terminating at a closed end, said conduit defining a closed chamber open at one end. The closed end is accessible with the device inserted for use, for increasing or decreasing the diameter of the body member.

For reasons of aesthetics and hygiene, it may be desirable also to provide applicator means for introducing devices of this invention. A modification applicable to the embodiments shown in FIGURES 1–4 is illustrated in FIGURE 6*a*, wherein the entering end is provided with at least one inwardly projecting tab **61**, which may be provided by an inwardly rolled flange portion **61** of body **60**. A simple stick-like applicator **65** may be introduced from end **62** to engage tab/flange **61**. In this embodiment sac **64** inside body **60** is attached only at end **61**, so it may be pushed ahead of applicator **65** without harm. A user thus can push the device into the vagina while keeping the

fingers remote from the introitus. Alternatively, as shown in FIGURE 6*b*, an applicator **66** having, for example, a hollow engaging end **63**, may be used.

When an applicator cannot be positioned inside the device of the invention, as is the case with the embodiment in FIGURE 5, an external applicator may be used, as shown in FIGURE 7. Here, optional flange **71** may be provided on body **70**; in other respects the construction is the same as in FIGURE 5, and the reference numerals are analogous. The diameter of applicator tube **76** is such as to maintain the device at its small diameter, elongated configuration. In use, the applicator is introduced into the vagina, and a forefinger, or optionally, applicator **77**, is then used to push the device out of applicator tube **76**, leaving the device in place intravaginally, and permitting the withdrawal of the applicator **76** along with the finger or applicator **77**. The act of pushing the device out from within applicator tube **76** enables the elastic force of the rubber sac or other elastic means to act to restore the device to its large diameter configuration intravaginally. While pusher **77** is shown as hollow, it may alternatively be solid or solid with a recessed end.

Another embodiment is shown in FIGURE 8*a*, comprising a tubular member **80** of barrel-like configuration formed of rubber or other elastic material, the member **80** having an open entering end **81**, and an inwardly directed flange **83** at said open end. The other end **82**, which may have a larger diameter opening than **81**, is closed off by a collecting sac **84** attached to body **80** at its open end **84***b*. The base **84***c* of the sac is located outside member **80**. Applicator **88**, shown in FIGURE 8*b*, is hornlike in appearance and has a conically recessed end **89** of a size suitable to engage flange **83** when the applicator is inserted in body **80** from end **82**. Sac **84** is of suitable length and/or flexibility to permit its being pushed ahead of the applicator **88** when the applicator is applied from end **82**. By this means body **80** is elongated and the central portion conveniently assumes a smaller diameter; subsequent withdrawal of applicator **88** permits body **80**, by virtue of its elasticity, to resume a large diameter. The use of one or more tabs **89***a* on applicator end **89** permits the engagement of flange **83** by the applicator while body **80** is at its large diameter, thus facilitating preparation of the device for introduction. One or more cords or strings **85** may be provided to permit withdrawal without requiring introduction of the fingers for such purpose if end **84***c* of sac **84** is not readily accessible.

Thus, in use, the devices of FIGURES 1–8 are elongated to achieve a small diameter for introduction into the vagina, the forward, open end being the end first introduced. With the release of the longitudinal elongating force as the device is pushed into the vagina, the elasticity of the device, which is sufficient to overcome the slight resistance of the flaccid vaginal wall, causes the distance between the occluded trailing end of the appliance and the forward open end to be reduced, thereby causing the diameter of the device to increase, and thus bear more strongly against the vaginal wall. Introduction is completed by pushing the trailing end beyond the vaginal vestibule, whereby the sphincter action of the vagina serves further to maintain the device in place. By proper choice of diameter of the device, in its expanded, large diameter, configuration, relative to vaginal wall diameter, secure fixation is achieved. Withdrawal of the device may be accomplished by applying a longitudinal tension on the trailing end, e.g., by pulling upon the closed end of the collecting sac, or upon cords, which extend through the vaginal introitus for exterior accessibility. Longitudinal tension on the accessible trailing end causes the device to assume a smaller diameter, facilitating its ready and atraumatic withdrawal.

Another form of the invention is shown in FIGURE 9. Body **90** is formed of a flat coil of suitable resilient material such as polystyrene or polyethylene, having a set tending to urge it to unwind toward a large diameter configuration. Edges **96** and **97** are thus circumferentially movable with respect to each other to move tube **90** between larger and smaller diameter positions; an intermediate position is shown. End **91** is open and is the forward end, and end **92** is the trailing accessible end on which is mounted a tab **93** for manual adjustment of body diameter. Sac **94**, open at **94***a* and closed at **94***c*, is attached or secured to body **90** along margin **94***b*. It will be seen that sac **94** should have a diameter, or be extendible to a diameter, at the line of attachment, at least as large as the maximum diameter to be achieved by body **90**. For this reason, a fold or slack portion **94***d* is shown in the drawing. In use, sac **94** may be flexible but inelastic, to limit the expansion of body **90** to maximum diameter and thereby insure that fluid entering at end **91** will enter sac **94** without leakage between sac **94** and the inner wall of body **90**. For introduction, the device may be manually rolled to small diameter; for withdrawal, tab **93** may be grasped by the fingers to twist or roll body **90** to small diameter configuration.

It will be seen that this embodiment may also be used with applicators for insertion, such as those applicators discussed hereinabove, for some of which a tab or flange may be provided at end **91**; withdrawal after use is accomplished by use of tab **93** to wind the coil to a small diameter.

This embodiment, therefore, illustrates a form of the invention in which the diameter is variable while maintaining the length fixed.

In the light of considerations hereinabove discussed, such as vaginal anatomy and physiology, requirements for safety and avoidance of tissue damage, and desirable features of hygiene and simplicity of use and disposal, it will accordingly be seen that the present invention offers important advantages over existing catamenial devices of both the absorptive and occlusive classes.

It is suited to general use without the need for exacting preliminary measuring or fitting; it may be quickly, simply and safely applied by a wearer, and without need for the user's hands or fingers to come in contact with the introitus or the menstrual product; the device is introduced at a configuration which specifically minimizes risk of tissue damage, and introduction simultaneously alters the configuration to one insuring adequate occlusion after introduction; while in situ the device is remote from the cervix uteri; in withdrawing the device, the fingers are again protected from contact with the genitalia or the menstrual product; moreover, in withdrawing the device, internal negative pressures will not only not unduly inhibit or prevent withdrawal, but such pressures are reduced and relieved entirely by application of the withdrawing force at the accessible end of the device, so that removal is thus accomplished atraumatically as well as readily; disposal of the used device is normally accomplished by dropping it and its contents in a toilet bowl simultaneously with removal, thus further minimizing handling.

There is thus provided a device of improved safety and utility, and also one of a daintiness suited to the most delicate sensibilities of a user.

What is claimed is:

1. A menstrual device which comprises a generally tubular member, an opening in at least one end of said tubular member for passage of fluid into said tubular member, a portion of said tubular member being adapted to hold said tubular member in a vagina, said portion of said tubular member being radially adjustable toward and away from the axis thereof between a smaller diameter and a larger diameter, respectively, in response to longitudinal force, while in smaller diameter position said tubular member being insertable with said open end as the leading end through the orifice formed by a vaginal sphincter, said tubular member while in its larger diameter being of sufficient diameter to be retained against passage through the orifice of a vaginal sphincter,

means normally applying a longitudinal force to said portion of said tubular member to urge said portion of said tubular member to its larger diameter position, said portion of said tubular member being adapted to move to its smaller diameter position by elongation thereof, and a flexible fluid-collecting membrane secured to said tubular member and disposed to collect fluid which enters said opening.

2. A menstrual device comprising a generally tubular conduit formed of a flexible material so arranged that the diameter of said conduit may be reduced substantially throughout its length by longitudinal tension applied to the opposed ends thereof and an elongated sac attached adjacent its open end to one end of said conduit and attached also to said conduit at a point remote from said open end, said sac being formed of a resilient material and the second point of attachment selected so that said sac applies a longitudinal compressive force to said conduit.

3. A menstrual device which comprises a generally tubular member, said tubular member comprising a cylindrical body of woven material of semiflexible strands, said strands being spaced from each other and helically disposed throughout a portion of said body, said material being of a two directional weave with alternate crossing strands having a similar helical angle in a different direction from a plane perpendicular to the axis of said cylindrical body, annular frame means securing ends of said strands adjacent one end of said tubular member to define an opening for passage of fluid into the tubular member, said tubular member being radially adjustable toward and away from the axis thereof between a smaller diameter position and a larger diameter position respectively; and fluid-collection means mounted across the flow path from said opening in said tubular member and disposed to collect fluid which enters said opening.

4. A menstrual device which comprises a generally tubular member, having open ends, said tubular member comprising a cylindrical body of woven material of semiflexible strands, said strands being spaced from each other and helically disposed throughout said body, said material being of a two-directional weave with alternate crossing strands having a similar helical angle in a different direction from a plane perpendicular to the axis of said cylindrical body, and at least one of said open ends providing a passage for fluid entering the tubular member; said tubular member being radially adjustable toward and away from the axis thereof between a smaller diameter position and a larger diameter position respectively; and fluid-collection means secured to said tubular member and disposed to collect fluid which enters said opening.

5. The device of claim 4, wherein said tubular member is provided with elastic tension means tending to urge together the opposite ends of said member along a longitudinal axis of said member.

6. A menstrual device which comprises a generally tubular rubbery solid member, an opening in each end thereof for passage of fluid into the tubular member, said tubular member being normally in a larger diameter position and being longitudinally extensible and radially compressible to an axially elongated and smaller diameter position whereby the length of said tubular member is extended and said opening is reduced releasable means for extending the length and thereby decreasing the diameter of said member, and fluid-collection means secured to said tubular member and disposed to collect fluid which enters one of said openings.

7. A device for collecting menstrual effluvium which comprises a generally tubular member having a diameter variable substantially throughout its length between a small diameter position and a larger diameter position in response to longitudinal force, an axial opening and passage into said tubular member, and a sac member secured to said tubular member, said sac member disposed across said passage and adapted to collect fluids which may enter said passage through said axial opening, said tubular member being adapted in small diameter position to be introduced through the sphincter-like vaginal orifice, the end of said tubular member opposite said axial opening being accessible and adapted for moving said tubular member in response to longitudinal force to larger diameter position to contact or rest upon the internal surface of the vaginal wall, said tubular member in large diameter position being adapted to be in spaced relation with respect to the cervix uteri and disposed to receive menstrual effluvium therefrom, said accessible end being adapted for moving said tubular member to small diameter position, said small diameter position being sufficiently small for introduction and removal of the tubular member through the vaginal orifice substantially without trauma to tissue.

8. A menstrual device comprising an elongated, generally tubular body section adapted to hold said menstrual device in a vagina, said body section contracting diametrally in response to a longitudinal force extending the length of said body section, said body section expanding diametrally in response to a longitudinal force reducing the length of said body section, means for supplying a longitudinal force to said body section to reduce the length of said body section, and means associated with said body section for receiving and collecting fluid.

9. A menstrual device comprising an elongated, generally tubular body section adapted to hold said menstrual device in a vagina, said body section contracting diametrally in response to a longitudinal force extending the length of said body section, said body section expanding diametrally in response to a longitudinal force reducing the length of said body section, said body section comprising strands arranged helically, alternating rows of said strands being disposed at substantially different helical angles and crossing each other, said strands disposed in each helical direction being spaced from each other, said strands contacting each other at their crossings and being movable with respect to each other, and means associated with said body section for receiving and collecting fluid.

10. A menstrual device comprising an elongated generally tubular body section adapted to hold said menstrual device in a vagina, said body section contracting diametrally in response to a longitudinal force extending the length of said body section, said body section expanding diametrally in response to a longitudinal force reducing the length of said body section, said body section normally being expanded diametrally and having reduced length, said body section having an inwardly extending annular flange, means for cooperating with said flange to supply a longitudinal force to said body section to increase the length of said body section, and means associated with said body section for receiving and collecting fluid.

11. A menstrual device which comprises a generally tubular member adapted to hold said menstrual device in a vagina, said tubular member comprising strands of resilient material arranged helically in the form of a cylinder forming at least a portion of said tubular member, alternating rows of said strands being disposed at substantially different helical angles and crossing each other, the strands disposed in each helical direction being spaced from each other, said strands slidably contacting each other at their crossings and movable with respect to each other, an opening in at least one end of said tubular member for passage of fluid into said tubular member, said tubular member and said opening being radially adjustable toward and away from the axis thereof between a smaller diameter and a larger diameter, respectively, said tubular member being elongated while in said smaller diameter position and being shortened while in said larger diameter position, while elongated and in said smaller position said tubular member being insertable through the orifice of a vaginal sphincter and when in shortened and said larger diameter position being restrained from

withdrawal through said orifice, means normally urging said tubular member to shortened length and larger diameter position, and a flexible fluid-collecting membrane secured to said tubular member and disposed to collect fluid which enters said opening.

12. The menstrual device of claim **11** wherein the spacing between said strands in each helical direction gradually decreases at one end of the cylindrical form to form a closure at one end of said tubular member.

References Cited by the Examiner

UNITED STATES PATENTS

3,102,541 9/1963 Adams ..... 128—285

RICHARD A. GAUDET, *Primary Examiner.*

C. F. ROSENBAUM, *Assistant Examiner.*