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(54) Title: METHOD OF ATTACHING A WITHDRAWAL MEMBER TO A PESSARY DEVICE

(57) Abstract: This application relates to a pessary device. More particularly, the present invention relates to a method of attaching a withdrawal member to a pessary device.

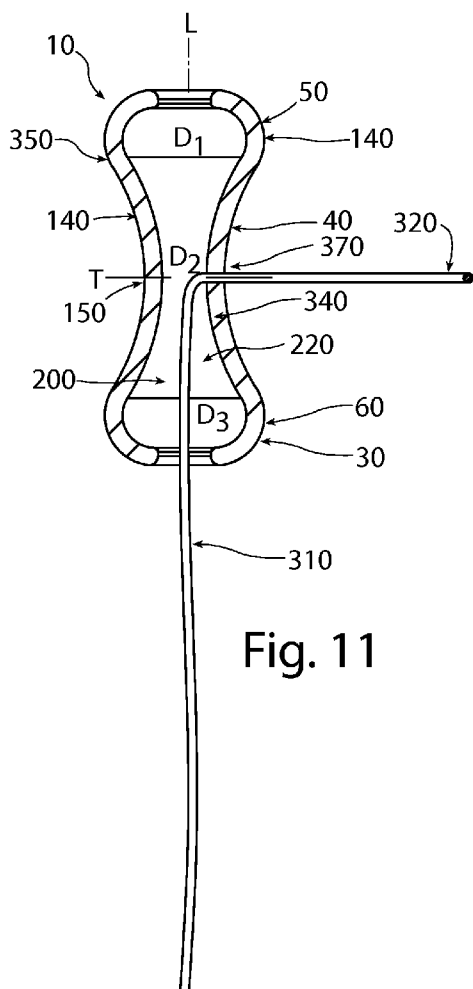


Fig. 11





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METHOD OF ATTACHING A WITHDRAWAL MEMBER TO A PESSARY DEVICE

FIELD OF INVENTION

This application relates to a pessary device. More particularly, the present invention
5 relates to a method of attaching a withdrawal member to the pessary device.

BACKGROUND OF THE INVENTION

Urinary incontinence, in which the ordinary bodily muscle functions fail to prevent
unintended leakage of urine, is a common malady among women, particularly older women. It is
10 estimated that up to 50% of women occasionally leak urine involuntarily, and that approximately
25% of women will seek medical advice at some point in order to deal with the problem. Stress
incontinence, the most common type of urinary incontinence, refers to the involuntary loss of
urine resulting from abdominal pressure rise, occurring during exercise, coughing, sneezing,
laughing, etc. When stress incontinence occurs, it is usually the result of the abnormal descent of
15 the urethra and bladder neck below the level of the pelvic floor. Many women wear sanitary
napkins or diapers in order to deal with incontinence, and some women resort to surgical
procedures.

Pessary devices are known to help relieve involuntary urination in a female. Such
devices are designed for arrangement in the vagina for compressive action on and support of the
20 urethra.

Pessary devices inserted into the vaginal canal must also be easily removed from the
vaginal canal. To increase the ease with which the pessary device is removed, a withdrawal
member is attached to the pessary device. In attaching the withdrawal member, the withdrawal
member must be attached such that it cannot accidentally separate from the pessary device.

25 As such, there remains a need for a pessary device with improved ease of removal. The
pessary device utilizes a withdrawal member for ease of removal. The withdrawal member
should be attached so that it cannot be detached from the pessary device. As such there remains
a need for a method to attach a withdrawal member to a pessary device.

30 SUMMARY OF THE INVENTION

A method of attaching a withdrawal member to a pessary device is provided. The method
includes providing a pessary device comprising a longitudinal axis, an interior surface, an
exterior surface, and an outer profile. The method includes providing a withdrawal member
having a first portion and a second portion at a set distance from each other. The withdrawal
35 member first portion and the withdrawal member second portion pass through the outer profile of

the pessary device wherein the withdrawal member crosses one or more surfaces of the pessary device. The withdrawal member is pulled wherein the withdrawal member is anchored by the pessary device.

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BRIEF DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter of the present invention, it is believed that the invention can be more readily understood from the following description taken in connection with the accompanying drawings, in which:

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FIG. 1A is a side view of a pessary device.

FIG. 1B is a perspective view of the pessary device of FIG. 1A.

FIG. 2A is a side view of a pessary device.

FIG. 2B is a perspective view of the pessary device of FIG. 2A.

FIG. 3 is a cross-section view of a pessary device.

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FIG. 4 is a cross-section view of a pessary device.

FIG. 5 is a cross-section view of a pessary device.

FIG. 6 is a perspective view of a pessary device.

FIG. 7 is a side view of a pessary device.

FIG. 8 is a side view of a pessary applicator, housing the pessary of FIG. 1.

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FIG. 9A is perspective view of a withdrawal member affixing device.

FIG. 9B is a perspective view of a withdrawal member affixing device with a withdrawal member.

FIG. 9C is a perspective view of a withdrawal member affixing device.

FIG. 9D is a perspective view of a withdrawal member affixing device.

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FIG. 10 is a perspective view of the pessary device with the withdrawal member extended forming a loop.

FIG. 11 is a cross-section view of the pessary device of FIG. 10.

FIG. 12 is a perspective view of the pessary device with the withdrawal member anchored to the pessary device.

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FIG. 13 is a flowchart representing the method of attaching a withdrawal member to a pessary device.

DETAILED DESCRIPTION OF THE INVENTION

As used herein, "applicator" refers to a device or implement that facilitates the insertion of the pessary device into an external orifice of a mammal. Exemplary applicators include telescoping, tube and plunger, and compact applicators.

The term "joined" or "attached" as used herein, encompasses configurations in which a first element is directly secured to a second element by affixing the first element directly to the second element, configurations in which the first element is indirectly secured to the second element by affixing the first element to intermediate member(s) which in turn are affixed to the second element, and configurations in which first element is integral with second element, i.e., first element is essentially part of the second element.

As used herein, the term "non-expandable" refers to devices that do not expand prior to or during use, such as, for example, devices that do not increase in size or volume prior to or during use. For example, non-expandable devices have a diameter and/or volume that does not increase. In contrast, "expandable" as used herein, refers to devices that do increase in size or volume prior to or during use, such as, for example, devices that increase in diameter and/or length, absorb fluid into a fibrous or absorbent gelling material structure, or otherwise change from a first size or volume to a second size or volume, such as, for example, by inflation, absorption, mechanically, or by other means. Insubstantial changes to a non-expandable device as a result of any thermal expansion that could occur at body temperatures are not considered "expansion."

A "pessary device" or more particularly an "incontinence pessary device" as used herein refers to devices specifically designed, configured, and/or adapted for placement into a vagina in order to reduce the occurrence and/or severity of female urinary incontinence. A "pessary device" can include any type of substantially non-absorbent structure for the purpose of reducing urine leakage and/or supporting a prolapsed uterus and/or bladder. A pessary device does not include a menstrual tampon.

As used herein, the term "profile" refers to an outline of an object, as a molding.

As used herein, the term "vaginal canal" refers to the internal genitalia of the human female in the pudendal region of the body. The terms "vaginal canal" or "within the vagina" as used herein are intended to refer to the space located between the introitus of the vagina (sometimes referred to as the sphincter of the vagina) and the cervix.

The present invention is directed to a method of attaching a withdrawal member to a pessary device. The pessary device may be wrapped or not wrapped. The withdrawal member can be placed in contact with a withdrawal member affixing device. The withdrawal member affixing device may have straight segments, curved segments, a finite point, a blunt end, and/or a cutting edge. The withdrawal member has a first portion and a second portion at a set distance from each other that pass through the outer profile of the pessary device wherein the withdrawal

member crosses one or more surfaces of the pessary device. The ends of the withdrawal member are then pulled such wherein the withdrawal member is anchored to the pessary device. The withdrawal member may contain a loop tying the two ends together.

The pessary device includes an upper portion, a lower portion, a middle portion, a pressure region of the upper portion, a pressure region of the lower portion, a maximum diameter, a minimum diameter, a slope extending from the upper portion to the middle portion, a slope from the middle portion to the lower portion, a longitudinal axis, and a transverse axis. The pessary device can be symmetric about the longitudinal axis, including for example, wherein the base is circular and symmetric about the longitudinal axis. The pessary device can have outer wall and an interior defined by inner walls that is hollow in region. The hollow region can be provided at one or both ends. In addition, the pessary device can have a portion of the interior that is solid. The pessary device does not change in size during the usage experience, that is, the pessary device is the same size and diameter prior to insertion by the user as well as during use and removal.

The pessary device can be a unitary construction. For example, the pessary device can include a continuous outer shell that defines the entire exterior surface of the pessary device. The outer shell can be smooth or textured. The outer shell may be permeable to fluid, such as, for example, by the inclusion of holes, pores, or other suitable external openings. Alternatively, the outer shell can be impermeable to fluid such that fluid cannot enter the device. In addition, the pessary device can include an external opening in the top, base and/or at any other point in the exterior. The pessary device can include an external opening in the top and/or base and the outer shell is not permeable to fluid such that fluid cannot enter the device except through the external opening in the top and/or base.

The pessary device can include a withdrawal member that can comprise any suitable material, including for example, cotton, cellulose, rayon, polyolefins such as, for example, polyethylene or polypropylene, nylon, silk, polytetrafluoroethylene, wax, Teflon, or any other suitable materials.

The withdrawal member can be formed by any suitable formation method and in any suitable configuration, such as, e.g., one or more cords, strings, finger covers, ribbons, an extension of a material of the device, or combinations thereof. The withdrawal member has a first portion and a second portion at a set distance from each other.

The withdrawal member may be attached to the pessary device by passing the withdrawal member through the interior surface and then through the exterior surface of the pessary device. During attachment, the withdrawal member may pass the interior profile of the pessary device and the outer profile of the pessary device.

The withdrawal member may be extended at the exterior of the pessary device to form a loop. The withdrawal member may be extended to form a loop by any means commonly known, such as, mechanical means, using air, use of other withdrawal member affixing devices, anchoring the loop to a moving device, anchoring the loop to a fixed device, and/or combinations thereof. The loop may cross the longitudinal axis of the pessary device on the exterior surface. The loop may cross the longitudinal axis of the pessary device more than once, such as, two or more times. The loop orientation may be changed between the one or more crossings of the longitudinal axis.

The withdrawal member may be pulled from one or more points that do not form part of the loop to tighten the loop around the pessary device such that the pessary device anchors the withdrawal member.

The two ends of the withdrawal member may be joined at any point outside of the loop. The withdrawal member ends may be knotted. The two ends may be joined by adhesives, mechanical means, heat, ultrasonics, use of other withdrawal members or strands, and/or combinations thereof.

An exemplary pessary device 10 is shown in Figures 1A and 1B. The pessary device 10 includes an upper portion 20, a lower portion 30, a middle portion 40, a pressure region 50 of the upper portion 20, a pressure region 60 of the lower portion 30, a maximum diameter D_1 , a minimum diameter D_2 , a slope 80 extending from the upper portion 20 to the middle portion 40, a slope 90 from the middle portion 40 to the lower portion 30, a longitudinal axis (L) and a transverse axis (T). As shown in Figures 1A and 1B, the pessary device 10 can have a top 100 that includes a convex portion 110, a base 120 that includes a convex portion 130, and sides 140 that include concave portions 150. The pessary device can be symmetric about the longitudinal axis, including for example, wherein the base is circular and symmetric about the longitudinal axis. The pessary device can include a third diameter D_3 that is greater than minimum diameter D_2 , and convex portion 110 can be aligned with maximum diameter D_1 to provide pressure region 50, and convex portion 130 can be aligned with maximum diameter D_1 to provide pressure region 60. In addition, concave portion 150 can be aligned with minimum diameter D_2 to form flexible region 160.

Figures 2A and 2B show a pessary device 10. The pessary device 10 includes an upper portion 20, a lower portion 30, a middle portion 40, a pressure region 50 of the upper portion 20, a pressure region 60 of the lower portion 30, a maximum diameter D_1 , a minimum diameter D_2 , a slope 80 extending from the upper portion 20 to the middle portion 40, a slope 90 from the

middle portion 40 to the lower portion 30, a longitudinal axis (L) and a transverse axis (T). As shown in Figures 2A and 2B, the pessary device 10 can have a top 100 that includes a convex portion 110, a base 120 that includes a convex portion 130, and sides 140 that include concave portions 150. The pessary device shown in Figures 2A and 2B has an upper slope 80 that is greater than the upper slope 80 of the pessary device shown in Figures 1A and 1B. As shown in
5 Figures 2A and 2B, pessary device 10 can include flexile region 160. In addition, the pessary device shown in Figures 2A and 2B has a lower slope 90 that is greater than the lower slope 90 of the pessary device shown in Figures 1A and 1B.

Figure 3 shows a pessary device 10 take along line 3-3 of Figure 1. The pessary device
10 10 includes an upper portion 20, a lower portion 30, a middle portion 40, a pressure region 50 of the upper portion 20, a pressure region 60 of the lower portion 30, a maximum diameter D_1 , a minimum diameter D_2 , a slope 80 extending from the upper portion 20 to the middle portion 40, a slope 90 from the middle portion 40 to the lower portion 30, and a longitudinal axis (L). As shown in Figure 3, the pessary device 10 can have a top 100 that includes a convex portion 110,
15 a base 120 that includes a convex portion 130, and sides 140 that include concave portions 150. As shown in Figure 3, the pessary device 10 can have outer wall 250 and an interior 200 defined by inner walls 240 that is hollow in region 220. The pessary device can have an interior profile 340 and an outer profile 350. The hollow region 220 can be provided at one or both ends. In addition, the pessary device 10 can have a portion of the interior 200 that is solid.

Figure 4 shows a pessary device 10. The pessary device 10 includes an upper portion 20, a lower portion 30, a middle portion 40, a pressure region 50 of the upper portion 20, a pressure region 60 of the lower portion 30, a maximum diameter D_1 , a minimum diameter D_2 , a slope 80 extending from the upper portion 20 to the middle portion 40, a slope 90 from the middle portion 40 to the lower portion 30, and a longitudinal axis (L) crossing both ends. As shown in Figure 4,
25 the pessary device 10 can have a top 100 that includes a convex portion 110, a base 120 that includes a convex portion 130, and sides 140 that include concave portions 150. As shown in Figure 4, the pessary device 10 can have an interior 200 that is hollow. The pessary device has inner walls 240 that define interior 200 and hollow region 220. The pessary device can have an interior profile 340 and an outer profile 350. In addition, the inner walls 240 can have the same
30 or a similar profile as the outer walls 250.

Figure 5 shows a pessary device 10. The pessary device 10 includes an upper portion 20, a lower portion 30, a middle portion 40, a pressure region 50 of the upper portion 20, a pressure region 60 of the lower portion 30, a maximum diameter D_1 , a minimum diameter D_2 , a slope 80 extending from the upper portion 20 to the middle portion 40, a slope 90 from the middle portion
35 40 to the lower portion 30, and a longitudinal axis (L) crossing both ends. As shown in Figure 5,

the pessary device 10 can have a top 100 that includes a convex portion 110, a base 120 that includes a convex portion 130, and sides 140 that include concave portions 150. As shown in Figure 5, the pessary device 10 has an interior 200 that is hollow. The pessary device has inner walls 240 that define interior 200 and hollow region 220. The hollow region 220 can have a first profile defined by inner walls 240 and a different profile defined by outer walls 250, such as, for example, where the hollow region 220 is in the form of a tube.

Figure 6 shows a pessary device 10. The pessary device 10 includes an upper portion 20, a lower portion 30, a middle portion 40, a pressure region 50 of the upper portion 20, a pressure region 60 of the lower portion 30, a slope 80 extending from the upper portion 20 to the middle portion 40, a slope 90 from the middle portion 40 to the lower portion 30, and a longitudinal axis (L). As shown in Figure 6, the pessary device 10 can have a top 100 that includes a convex portion 110, a base 120 that includes a convex portion 130, and sides 140 that include concave portions 150. The pessary device can also have a flexible region 160. The pessary device 10 can have an interior 200 that is hollow. In addition, as shown in Figure 6, the pessary device 10 can have an opening on one or more of top 100 and/or on base 120.

The pessary device 10 can include an overwrap 300 and/or a withdrawal member 310, such as, for example, as shown in Figure 7. In addition, Figure 7 shows that withdrawal member 310 can be attached to overwrap 300.

The pessary device can be inserted in any suitable manner, such as, for example, using an applicator. Figure 8 shows an applicator 410 that includes an insertion member 420 and a plunger 440. The insertion member 420 has an insertion end 421 and a withdrawal end 422 opposite the insertion end 421. The insertion member 420 also can include a barrel region 450 adapted to contain a pessary device, and a grip region 430 that can be an indentation region 424 provided opposite the insertion end 421, such as, e.g., proximal to the withdrawal end 422. The grip region 430 can include one or more grip elements 423.

Figure 9A to Figure 9D show examples of withdrawal member affixing devices 560. The withdrawal member affixing device 560 may have a gate 580 and a finite point 600. The withdrawal member affixing device 560 may have a curve 590. The withdrawal member affixing device 560 may have a straight segment 570. The withdrawal member affixing device 560 may have a blunt end 530. The withdrawal member affixing device 560 may have a curve 590. The withdrawal member affixing device may have an eyelet 520. Figure 9B has a withdrawal member 310.

Figure 10 is a perspective view of the pessary device 10 with the withdrawal member 310 extended forming a loop 320. The withdrawal member has a first portion 360 and a second portion 370 at a set distance from each other. The pessary device 10 includes an upper portion

20, a lower portion 30, a middle portion 40, a pressure region 50 of the upper portion 20, a pressure region 60 of the lower portion 30, a maximum diameter D_1 , a minimum diameter D_2 , a slope 80 extending from the upper portion 20 to the middle portion 40, a slope 90 from the middle portion 40 to the lower portion 30, a longitudinal axis (L) and a transverse axis (T). As shown in Figures 2A and 2B, the pessary device 10 can have a top 100 that includes a convex portion 110, a base 120 that includes a convex portion 130, and sides 140 that include concave portions 150.

Figure 11 shows a pessary device 10 take along line 10 of Figure 10. The pessary device 10 includes an upper portion 20, a lower portion 30, a middle portion 40, a pressure region 50 of the upper portion 20, a pressure region 60 of the lower portion 30, a maximum diameter D_1 , a minimum diameter D_2 , a slope 80 extending from the upper portion 20 to the middle portion 40, a slope 90 from the middle portion 40 to the lower portion 30, and a longitudinal axis (L). As shown in Figure 3, the pessary device 10 can have a top 100 that includes a convex portion 110, a base 120 that includes a convex portion 130, and sides 140 that include concave portions 150. As shown in Figure 3, the pessary device 10 can have outer wall 250 and an interior 200 defined by inner walls 240 that is hollow in region 220. The hollow region 220 can be provided at one or both ends. The pessary device 10 has an outer profile 350 and an inner profile 340. The pessary device 10 includes a withdrawal member 310 crossing the surface of the pessary device. The withdrawal member has a second portion 370.

Figure 12 is a perspective view of the pessary device 10 with the withdrawal member 310 anchored to the pessary device 10. The pessary device 10 includes an upper portion 20, a lower portion 30, a middle portion 40, a pressure region 50 of the upper portion 20, a pressure region 60 of the lower portion 30, a maximum diameter D_1 , a minimum diameter D_2 , a slope 80 extending from the upper portion 20 to the middle portion 40, a slope 90 from the middle portion 40 to the lower portion 30, a longitudinal axis (L) and a transverse axis (T). As shown in Figures 2A and 2B, the pessary device 10 can have a top 100 that includes a convex portion 110, a base 120 that includes a convex portion 130, and sides 140 that include concave portions 150. The pessary device 10 has a withdrawal member 310 anchored to the pessary device. The withdrawal member may have a knot 330.

- Figure 13 is a flowchart representing the method of attaching a withdrawal member to a pessary device 700. The method contains the step of providing a pessary device comprising a longitudinal axis, an interior surface, an exterior surface, and an outer profile 710. The method also contains the step of providing a withdrawal member and providing a withdrawal member affixing device 720. The method also contains the step of contacting the withdrawal member with the withdrawal member affixing device 730. The method also contains the step of passing

the withdrawal member affixing device in contact with the withdrawal member through the outer profile of the pessary device wherein the withdrawal member crosses one or more surfaces of the pessary device 740. The method also contains the step of extending the withdrawal member to form a loop 750. The method also contains the step of crossing the loop through the longitudinal axis of the pessary device one or more times 760. The method also contains the step of pulling the withdrawal member such that the withdrawal member loop is anchored by the pessary device thereby attaching the withdrawal member to the pessary device 770.

Generally, the pessary device does not change in size during the usage experience, that is, the pessary device is the same size and diameter prior to insertion by the user as well as during use and removal. For example, the pessary device is not expandable or inflatable from its original size and the pessary device is not compressed for insertion into the user's body, nor is the pessary device compressed for withdrawal from the user's body. A portion or region of the pessary device can flex or be deformed, such as, for example, in the region having the minimum diameter, but the pessary device does not expand and returns to the original configuration after deformation. As such, the pessary device does not include any mechanical or other means that requires the user to change the size or shape of the pessary device during use, such as, for example, before or after insertion or prior to withdrawal. This provides for a pessary device that has a size upon withdrawal that is the same as the size during use, which can provide for improved comfort during use and withdrawal.

The pessary device can have a pressure region that has the maximum diameter of the pessary, such as, for example, at the base or at the top, that extends between the anterior vaginal wall and the posterior vaginal wall of a consumer to provide pressure on the urethra through the vaginal wall. In addition, the pessary device can have a second pressure region having an increased diameter as compared to the minimum diameter that can provide pressure on the urethra through the vaginal wall at a point apart from the first pressure region. The first pressure region and the second pressure region can be separated by any suitable distance, such as, for example, by at least about 5 mm, at least about 10 mm, at least about 15 mm, at least about 20 mm, at least about 25 mm, at least about 30 mm, at least about 35 mm, at least about 40 mm, at least about 45 mm, at least about 50 mm, or any other suitable distance.

The pessary device can have any suitable number of pressure regions, including for example, two pressure regions, such as, for example, four or fewer pressure regions, three or fewer pressure regions, two or fewer pressure regions, one pressure region, or any other suitable number of pressure regions.

The pressure region or regions can be any suitable shape, such as, for example, a convex shape that provides pressure to the vaginal wall, including, for example, a lobe or other

protuberance. The pressure region or regions can have a substantially circular cross-section. The pessary device also can include a minimum diameter region that is a flexile region that can provide flexibility to the pessary device, such as, for example, by allowing bending or movement at the flexile region. The flexile region can be any suitable shape, such as, for example, concave, 5 indented, or the like, and can have any suitable cross-section, such as, for example, a substantially circular cross-section. The pessary device can include a flexile region provided between two pressure regions.

Maximum pressure to the urethra and maximum urethral closure can be measured using any suitable method, such as, for example, by using the computational model described in U.S. 10 Patent Appln. No. 2007/0027667. For example, a computation model simulating the human internal pelvic environment can be used. In certain embodiments, thirteen nodes on the urethra in the simulation that are both on the back wall toward the vagina and in the middle of the body on the sagittal plane can be chosen. The points should be spread even along the length of the urethra with the first point at the bottom edge of the urethra and the last point at the bladder neck. 15 Node vs. time vs. Von Mises stress should be obtained using a suitable software program, such as, for example, LS-Prepost, for all chosen nodes. The data columns are then matched to determine the y position vs. time vs. Von Mises stress. Generally, only the data that is at the simulation end point should be selected and y-position vs. Von Mises is then plotted.

The flexile region, on the other hand, is more flexible than and provides less resistance 20 than the pressure region. Addition of the flexile region can allow the pessary device to flex in the longitudinal direction as well at the lateral direction. For example, the pessary device can compress more than about 1 cm when measured under 0.5 psi when the force is applied from the top to the base along the longitudinal axis. In addition, or alternatively, the flexile region can provide a bending region that facilitates the pessary device bending from side to side.

25 The pessary device can be a unitary construction. For example, the pessary device can include a continuous outer shell that defines the entire exterior surface of the pessary device. The outer shell can be smooth or textured. The outer shell may be permeable to fluid, such as, for example, by the inclusion of holes, pores, or other suitable openings. Alternatively, the outer shell can be impermeable to fluid such that fluid cannot enter the device. In addition, the pessary 30 device can include an opening in the top and/or base. The pessary device can include an opening in the top and/or base and the outer shell is not permeable to fluid such that fluid cannot enter the device except through the opening in the top and/or base.

Suitable pessary devices can be solid or can have a hollow interior or cavity. For hollow 35 devices, the pessary device can have an outer periphery defining a total area of the device and an inner periphery defining an open area of the device. The open area can be any suitable size, such

as, for example, between about 5% to about 95% of the total area, such as, for example, from about 10% to about 90% of the total area, from about 15% to about 85% of the total area, or from about 20% to about 80% of the total area. In addition, the pessary device also can have a wall thickness that is suitable to maintain the pessary configuration. The wall thickness can be greater than about 0.5 mm, such as for example, about 1mm, about 2 mm, about 3 mm, about 4 mm, about 5 mm, or greater. The wall thickness can be constant or varied along the length of the pessary device and/or around the circumference of the pessary device.

The pessary device can have any suitable shape having a varied diameter along the longitudinal axis, such as, for example, a shape having a varied diameter that is symmetrical with respect to the longitudinal axis, such as, for example, a teardrop, an apple, a pear, an hourglass, a waisted cylinder, a figure-8 shape, a peanut shape, a heart-shape, a light bulb shape, a bottle shape, a vase shape, or any other suitable shape. In addition, the shape can have a varied diameter and can be symmetrical with respect to both the longitudinal and lateral axis, such as, for example, an hourglass, a waisted cylinder, a figure-8 shape, a peanut shape, or any other suitable shape. Alternatively, the pessary device can have an asymmetrical shape, such as, for example, a B-shape or a P-shape. The pessary device can be symmetrical at one region and asymmetrical at another region, such as, for example, where the pessary device has a symmetrical pressure region and an asymmetrical flexile region. Generally, the pessary device can have a varying diameter that can provide varying pressure along the user's urethra. For example, the pessary device can have a convex portion that can correspond to the pressure region. In addition, the pessary device can have a minimum diameter region that can be a concave region. The concave region can correspond to the flexile region.

The pessary device can be hourglass shaped. For example, as shown in Figures 1-2, the pessary device can have upper and lower portions joined together by a waistline portion, with the upper and lower portions having diameters that are both greater than a diameter of the waistline portion such that the pessary device has a generally hourglass configuration. In this configuration, the upper portion of the pessary device can have a top and the lower portion of the pessary device can have a base, and the pessary device can have sloping upper and lower wall sections joining the top and the base with the waistline portion. In addition, the waistline portion can include the minimum diameter of the pessary device. The upper and lower portions can have generally coequal maximum diameters, or the upper and lower portions can have different maximum diameters, such as, for example, where the upper portion has a maximum diameter greater than the lower portion or where the lower portion has a maximum diameter greater than the upper portion.

Generally, the pessary device includes at least one maximum diameter and at least one minimum diameter, where the minimum diameter is smaller than the maximum diameter. The pessary device can include a first portion having a maximum diameter, a second portion having a maximum diameter, and a third portion that has a minimum diameter. The maximum diameter of the first portion and the maximum diameter of the second portion can be separated by a distance that is greater than about 10% of the length of the pessary device, such as, for example, by a distance greater than about 5 mm, greater than about 10 mm, greater than about 15 mm, greater than about 20 mm, greater than about 25 mm, greater than about 30 mm, greater than about 35 mm, greater than about 40 mm, greater than about 45 mm, or more. The pessary device can provide pressure at mid-urethra, the bladder neck, or both. In addition, the pessary device provides higher pressure at the mid-urethra, the bladder neck, or both and provides lower pressure at the area between the mid-urethra and the bladder neck. For example, the pressure region can provide pressure at levels about 25% higher than the pressure provided by the flexile region, such as, for example, at levels about 30% higher, about 35% higher, about 40% higher, about 45% higher, about 50% higher, about 55% higher, about 60% higher, or more.

The pessary device can have a slope from the maximum diameter to the minimum diameter. Any suitable slope can be used, including for example, about 0.25 mm, about 0.5 mm, about 0.75 mm, about 1 mm, about 1.5 mm, about 2 mm, about 2.5 mm, about 3 mm, about 4 mm, about 5 mm, about 6 mm, about 7 mm, about 8 mm, or more, such as, for example, a slope from about 0.25 mm to about 5 mm, or a slope from about 0.5 mm to about 4 mm, or any other suitable range.

Suitable pessary devices are typically smaller in size than conventional pessary devices. For example, the pessary devices have a maximum diameter, a length, and/or a volume that is smaller or less than that of conventional pessary devices.

The pessary devices can have any suitable maximum diameter, such as, for example, a maximum diameter of less than 35 mm, such as, for example, less than 34 mm, less than 33 mm, less than 32 mm, less than 31 mm, less than 30 mm, less than 29 mm, less than 28 mm, less than 27 mm, less than 26 mm, less than 25 mm, less than 24 mm, less than 23 mm, less than 22 mm, less than 21 mm, less than 20 mm, less than 19 mm, less than 18 mm, less than 17 mm, less than 16 mm, less than 15 mm, less than 14 mm, less than 13 mm, less than 12 mm, less than 11 mm, or less than 10 mm, including, for example, a maximum diameter of from about 10 mm to about 35 mm, from about 10 mm to about 25 mm, from about 13 mm to about 25 mm, or from about 15 mm to about 22 mm. The maximum diameter or width is typically measured at the widest portion of the pessary device substantially perpendicular to the longitudinal axis.

The pessary devices can have any suitable minimum diameter that is smaller than the maximum diameter, including, for example, a minimum diameter from about 40% to about 95% of the maximum diameter, from about 40% to about 90% of the maximum diameter, from about 40% to about 85% of the maximum diameter, from about 40% to about 80% of the maximum diameter, from about 45% to about 75% of the maximum diameter, or from about 50% to about 70% of the maximum diameter, such as, for example, about 45% of the maximum diameter, about 50% of the maximum diameter, about 55% of the maximum diameter, about 60% of the maximum diameter, about 65% of the maximum diameter, or about 70% of the maximum diameter.

The pessary devices can have a minimum diameter from about 4 mm to about 28 mm, about 5 mm to about 20 mm, about 8 mm to about 20 mm, from about 8 mm to about 18 mm, or from about 8 mm to about 15 mm, such as, for example, about 8 mm, about 8.5 mm, about 9 mm, about 9.5 mm, about 10 mm, about 10.5 mm, about 11 mm, about 11.5 mm, about 12 mm, about 12.5 mm, about 13 mm, about 13.5 mm, about 14 mm, about 14.5 mm, about 15 mm, about 15.5 mm, about 16 mm, about 16.5 mm, about 17 mm, about 17.5 mm, about 18 mm, about 18.5 mm, about 19 mm, about 19.5 mm, or about 20 mm, or any other suitable minimum diameter. The minimum diameter or width is typically measured at the narrowest portion of the pessary device substantially perpendicular to the longitudinal axis.

The maximum diameter and the minimum diameter can be separated by any suitable distance, such as, for example, by about 5 mm, about 10 mm, about 15 mm, about 20 mm, about 25 mm, about 30 mm, about 35 mm, about 40 mm, about 45 mm, about 50 mm, or any other suitable distance.

The pessary devices can have any suitable length, such as, for example, a length from about 35 mm to about 60 mm, about 40 mm to about 55 mm, or about 40 mm to about 50 mm, such as, for example, a length about 35 mm, about 36 mm, about 37 mm, about 38 mm, about 39 mm, about 40 mm, about 41 mm, about 42 mm, about 43 mm, about 44 mm, about 45 mm, about 46 mm, about 47 mm, about 48 mm, about 49 mm, or about 50 mm. The length is typically measured substantially parallel to the longitudinal axis of the pessary device.

Generally, the pessary device can have a weight of less than about 10 grams, less than about 9 grams, less than about 8 grams, less than about 7 grams, less than about 6 grams, less than about 5 grams, less than about 4 grams, less than about 3 grams, less than about 2 grams, or about 1 gram, including for example, a weight of from about 1 gram to about 7 grams, or from about 2 grams to about 6 grams, or from about 3 grams to about 5 grams.

Pessary devices can be fabricated using any suitable materials and methods. For example, pessaries can be formed from polymeric materials, such as, for example, polycarbonate,

polyester, polyethylene, polyacrylamide, polyformaldehyde, polymethylmethacrylate, polypropylene, polytetrafluoroethylene, polytrifluorochlorethylene, polyvinylchloride, polyurethane, nylon, silicone, or mixtures or blends thereof, or metallic materials.

5 Pessary devices can be formed in any suitable manner, such as, for example, using injection molding or other suitable methods of forming the pessary device.

The pessary device can include a withdrawal member that can comprise any suitable material, including for example, cotton, cellulose, rayon, polyolefins such as, for example, polyethylene or polypropylene, nylon, silk, polytetrafluoroethylene, wax, Teflon, or any other suitable materials.

10 The withdrawal member can be formed by any suitable formation method and in any suitable configuration, such as, e.g., one or more cords, strings, finger covers, ribbons, an extension of a material of the device, or combinations thereof.

The withdrawal member can be any suitable length, such as, for example, a length from about 100 mm to about 500 mm, about 200 mm to about 400 mm, such as, for example, about
15 150 mm, about 175 mm, about 200 mm, about 225 mm, about 250 mm, about 275 mm, about 300 mm, about 325 mm, about 350 mm, about 375 mm, about 400 mm, about 425 mm, about 450 mm, about 475 mm, or about 500 mm.

The withdrawal member can have a first portion and a second portion that are a set distance apart. The set distance between the withdrawal member first portion and the withdrawal
20 member second portion can be any suitable length, such as, for example, a length from about 13 mm to about 500 mm, about 26 mm to about 400 mm, such as, for example, about 15 mm, about 16 mm, about 20 mm, about 25 mm, about 30 mm, about 35 mm, about 40 mm, about 50 mm, about 60 mm, about 65 mm, about 70 mm.

The withdrawal member can be any suitable length that allows either end of the
25 withdrawal member to extend from the outer profile of the pessary device by about 10 mm to about 200 mm, about 70 mm to about 120 mm, such as, for example., about 20 mm, about 30 mm, about 40 mm, about 50 mm, about 60 mm, about 70 mm, about 80 mm, about 90 mm, about 100 mm, about 110 mm, about 120 mm, about 130 mm, about 140 mm, about 150 mm, about 160 mm, about 170 mm, about 180 mm, about 190 mm, or about 200 mm.

30 The withdrawal member may be attached to the pessary device by passing the withdrawal member through the interior surface and then through the exterior surface of the pessary device. During attachment, the withdrawal member may pass the interior profile of the pessary device

and the outer profile of the pessary device. During attachment, the withdrawal member first portion and the withdrawal member second portion pass through the outer profile of the pessary device.

5 A withdrawal member affixing device may be used to pass the withdrawal member through the interior surface and then through the exterior surface of the pessary device. The pessary device may be bent when passing the withdrawal member through the interior surface and then through the exterior surface to allow the withdrawal member to be perpendicular or near perpendicular to the longitudinal axis of the pessary device. The withdrawal member affixing device may be used to pass the withdrawal member through the exterior surface and then through
10 the interior surface of the pessary device.

The withdrawal member affixing device may comprise one or more straight segments, a curve, a finite point, a blunt end, and/or a cutting edge. The withdrawal member affixing device may comprise an eyelet. The withdrawal member affixing device may comprise one or more prongs. The prongs may be different lengths or of equal length. One or more prongs may consist
15 of a hinged gate. The withdrawal member affixing device may be a needle.

The withdrawal member may be held by the withdrawal member affixing device through pressure, friction, and/or gravity. The withdrawal member may be held by the withdrawal member affixing device by any known mechanical means. The withdrawal member affixing device may pass through the interior surface to the exterior surface of the pessary device with the
20 withdrawal member. The withdrawal member affixing device may pass through the exterior surface to the interior surface of the pessary device with the withdrawal member. The withdrawal member affixing device may pass through an exterior surface of the pessary device, through an interior surface of the pessary device, through a second interior surface of the pessary device, and then through a second exterior surface of the device thereby passing both the outer
25 and inner profiles of the pessary device two times each.

The withdrawal member may be extended at the exterior of the pessary device to form a loop. The withdrawal member may be extended to form a loop by any means commonly known, such as, mechanical means, using air, use of other withdrawal member affixing devices, anchoring the loop to a moving device, anchoring the loop to a fixed device, and/or combinations
30 thereof. The loop may cross the longitudinal axis of the pessary device on the exterior surface. The loop may cross the longitudinal axis of the pessary device more than once, such as, two or

more times. The loop orientation may be changed between the one or more crossings of the longitudinal axis.

During attachment, the withdrawal member can be looped around the pessary device and then made to cross the outer profile of the pessary device to the inner profile of the pessary device. During attachment, the withdrawal member first portion and the withdrawal member second portion pass through the outer profile of the pessary device.

The withdrawal member may be pulled from one or more points that do not form part of the loop to tighten the loop around the pessary device such that the pessary device anchors the withdrawal member.

The two ends of the withdrawal member may be joined at any point outside of the loop. The withdrawal member ends may be knotted. The two ends may be joined by adhesives, mechanical means, heat, ultrasonics, use of other withdrawal members or strands, and/or combinations thereof.

Applicants have surprisingly found that by attaching the withdrawal member through the method described, the withdrawal member becomes anchored by the pessary device. This eliminates the possibility of having the withdrawal member accidentally detach from the pessary device.

Applicants have also found that by attaching the withdrawal member through the method described, the withdrawal member can be used to create a waist around the pessary device. The attachment of the withdrawal member through the method described may also be used to secure an overwrap to the pessary device.

The pessary device can be covered by an overwrap. The overwrap can be non-absorbent or absorbent and can include any suitable material, such as, for example, a fibrous nonwoven material comprising natural, synthetic, or a blend of natural and synthetic fibers. Suitable synthetic fibers can include, e.g., fibers such as polyester, polyolefin, nylon, polypropylene, polyethylene, polyacrylic, cellulose acetate, polyhydroxyalkanoates, aliphatic ester polycondensates, bicomponent fibers and/or mixtures thereof. Natural fibers can include, e.g., rayon and those commonly known to be non-synthetic and of natural origin such as cotton. The fibers can have any suitable cross-sectional shape, such as, e.g., round, tri-lobal, multi-lobal, delta, hollow, ribbon-shaped, and/or any other suitable shape, or mixtures thereof. Fibers with any suitable diameter can be used, such as, e.g., from about 0.5 to about 50 microns, such as,

e.g., from about 1 to about 30 microns, such as, e.g., from about 10 to about 25 microns. Fiber diameter can be determined using any suitable means; however, for non-round fibers, diameter can typically be determined by reference to the diameter of a fiber with the same cross-sectional area as the non-round fiber.

5 The overwrap can be made by any number of suitable techniques and can have any suitable basis weight. Suitable techniques include, for example, carding, meltblowing, spunbonding, spunlacing, air laying, and the like. For example, the overwrap can be formed using bonding methods, such as, e.g., thermal, ultrasonic, resin, through-air bonding, hydroentangling, and/or needling. The basis weight of the overwrap can be any suitable weight, 10 such as, e.g., from about 10 to about 60 grams per square meter (gsm), such as, e.g., from about 15 to about 30 gsm. In addition, the overwrap can be hydrophilic or hydrophobic. The overwrap may be elastic. The overwrap may be shrinkable when exposed to heat or infrared.

 The overwrap can be joined to the pessary device by any variety of means. The overwrap can be joined to itself or to the pessary device. For example, one portion of overwrap can be 15 joined to an opposed portion of the overwrap or to the pessary device using any suitable adhesive or heat pressure bonding means. Such adhesive can extend continuously along the length of attachment or it can be applied in a non-continuous fashion at discrete intervals. Heat bonding includes thermally bonding, fusion bonding, or any other suitable means for joining such materials.

20 The overwrap may be joined to itself to form a hollow structure. The hollow structure may be in the form of any multi-dimensional geometric structure such as, for example, a cylinder, tunnel, tube, cube, and/or a pyramid.

 At least a portion of the pessary device may be placed inside the overwrap hollow structure. The overwrap hollow structure may enrobe the pessary device. The overwrap can 25 enrobe the pessary device by wrapping the pessary device along the longitudinal axis of the pessary device. The overwrap may enrobe the pessary device by rolling the pessary device along the longitudinal axis when placed inside the overwrap hollow structure. The overwrap may enrobe the pessary device by moving the pessary device along the longitudinal axis of the overwrap hollow structure. The overwrap may enrobe the pessary device by moving the 30 overwrap hollow structure along the longitudinal axis of the pessary device.

 The overwrap hollow structure may exceed the pessary device at either end in the longitudinal direction from about 0.5 mm to about 100 mm to form an overwrap excess, such as, for example, by about 0.5 mm, about 1 mm, about 1.5 mm, about 2 mm, about 2.5 mm, about 3 mm, about 3.5 mm, about 4 mm, about 4.5 mm, about 5 mm, about 5.5 mm, about 6 mm, about 35 6.5 mm, about 7 mm, about 7.5 mm, about 8 mm, about 8.5 mm, about 9 mm, about 9.5 mm,

about 10 mm, about 10.5 mm, about 11 mm, about 11.5 mm, about 12 mm, about 12.5 mm, about 13 mm, about 13.5 mm, about 14 mm, about 14.5 mm, about 15 mm, about 15.5 mm, about 16 mm, about 16.5 mm, about 17 mm, about 17.5 mm, about 18 mm, about 18.5 mm, about 19 mm, about 19.5 mm, or about 20 mm, about 20.5 mm, about 21 mm, about 21.5 mm, about 22 mm, about 22.5 mm, about 23 mm, about 23.5 mm, about 24 mm, about 24.5 mm, about 25 mm, about 30 mm, about 40 mm, about 50 mm, about 60 mm, about 70 mm, about 80 mm, about 90 mm, and up to 100 mm. The overwrap hollow structure may exceed the pessary device in the transverse axis by about 1 mm to 200 mm from the exterior surface, such as, for example 1 mm, 10 mm, 20 mm, 30 mm, 40 mm, 50 mm, 60 mm, 70 mm, 80 mm, 90 mm, 100 mm.

The overwrap hollow structure excess may be positioned inside the pessary device internal cavity. The overwrap hollow structure excess may be positioned inside the pessary device cavity using any means commonly known but not limited to, heat, vacuum, air, adhesives, mechanical means and/or combinations thereof.

The overwrap may be manipulated to conform to the pessary device. Manipulation of the overwrap may occur using one or more strands around the transverse and/or longitudinal axis of the pessary device. The strands may be tied to the pessary device. The strands may be sewn to the overwrap and/or pessary device.

The overwrap may be manipulated while covering the pessary device by anchoring at least one of the ends of the overwrap and manipulating the overwrap by rotating the device along the longitudinal axis. The overwrap may be anchored by friction, the use of adhesives, the use of heat, and/or combinations thereof.

The overwrap may be manipulated by stretching the overwrap hollow structure enrobing the pessary device and allowing it to contract to the shape of the pessary device. The overwrap may be manipulated to deform the overwrap hollow structure to match the shape of the enrobed pessary device. Manipulation of the overwrap may occur by any means commonly known, such as, mechanical means, force, heat, infrared, microwave, radar, ultrasound, steam, chemical reactions, and/or combinations thereof.

The overwrap may be manipulated to conform to the pessary device by creating one or more attachment points. The attachment points may be created by heat and/or adhesives. The attachment points may be located at any portion of the pessary device including the ends, along the longitudinal axis, and along a transverse axis. The attachment points may form quadrants, triangles, or any other known pattern.

The pessary device can be inserted without the use of an applicator. The pessary device can be inserted digitally using one or more of the user's fingers.

The pessary device can be inserted using an applicator that can include an insertion member and a plunger. The insertion member can have an insertion end and a withdrawal end opposite the insertion end. The insertion member also can include a barrel region adapted to contain the pessary device, and a grip region that can be an indentation region provided opposite
5 the insertion end, such as, e.g., proximal to the withdrawal end.

The insertion member and/or plunger can be constructed from any suitable material. Suitable materials include, for example, paper, paperboard, cardboard, cellulose, such as, e.g., molded cellulose, or any combinations thereof, polyethylene, polypropylene, polybutylene, polystyrene, polyvinylchloride, polyacrylate, polymethacrylate, polyacrylonitrile,
10 polyacrylamide, polyamide, nylon, polyimide, polyester, polycarbonate, polylactic acid, polyhydroxyalkanoate, ethylene vinyl acetate, polyurethane, silicone, derivatives thereof, copolymers thereof, mixtures thereof, or any suitable smooth plastic material. Examples of suitable materials are disclosed in, e.g., U.S. Pat. Nos. 5,346,468 and 5,558,631. Additives can be included in the material to alter or enhance certain material properties. Suitable additives
15 include, for example, mold release agents, slip agents, surface energy modifiers, pearlescent agents, and/or any other suitable additives. The insertion member also or alternatively can be coated with a substance to give it a high slip characteristic, such as, e.g., with wax, polyethylene, a combination of wax and polyethylene, cellophane, clay, mica, and other lubricants that can facilitate comfortable insertion. Alternatively, or in addition, the insertion member can include a
20 textured surface. Texture can be provided in any suitable manner, such as, e.g., by designing texture into or adding texture to the insertion member.

The insertion member can include a grip region, such as, for example, an indentation region. The grip region can have a plurality of three-dimensional surface elements, such as, e.g., projections, rings, ridges, ribs, embossments, depressions, grooves, and/or other gripping
25 structures. The three-dimensional surface elements can be provided in any suitable manner, such as, e.g., by the addition of material, and/or by impressing, such as, e.g., by embossing, or compressing the surfaces. For example, the indentation region can include one or more flattened sides and/or one or more spaces for a decorative marking or a character, such as, e.g., an embossed and/or printed marking or character. In addition, or alternatively, the surfaces of the
30 indentation region can include a material that can provide a frictional resistance for the user's fingers during the insertion of the applicator into the body. Suitable materials that can provide friction include, for example, abrasive materials, high wet coefficient of friction materials, pressure sensitive adhesives, or any combinations thereof.

The pessary device can be used daily. For example, a user can insert the pessary device, wear the pessary device for a suitable wear time, such as, for example, up to 4 hours, up to 5 hours, up to 6 hours, up to 7 hours, up to 8 hours, up to 9 hours, up to 10 hours, up to 11 hours, up to 12 hours, or up to 16 hours, or more, remove the pessary device, dispose of the pessary device, and insert a new pessary device.

The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value. For example, a dimension disclosed as “40 mm” is intended to mean “about 40 mm.”

All documents cited in the Detailed Description of the Invention are, in relevant part, incorporated herein by reference; the citation of any document is not to be construed as an admission that it is prior art with respect to the present invention. To the extent that any meaning or definition of a term in this document conflicts with any meaning or definition of the same term in a document incorporated by reference, the meaning or definition assigned to that term in this document shall govern.

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. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

CLAIMS

WHAT IS CLAIMED IS:

1. A method of attaching a withdrawal member to a pessary device, the method comprising:
 - a. providing a pessary device comprising a longitudinal axis, an interior surface, an exterior surface, and an outer profile;
 - b. providing a withdrawal member comprising a first portion and a second portion at a set
5 distance from each other;
 - c. passing the withdrawal member first portion and the withdrawal member second portion through the outer profile of the pessary device wherein the withdrawal member crosses one or more surfaces of the pessary device; and
 - d. pulling the withdrawal member such that the withdrawal member is anchored by the
10 pessary device.
2. The method of claim 1, wherein the method further comprises knotting the two exterior ends of the withdrawal member.
- 15 3. The method of any one of the preceding claims, wherein the withdrawal member crosses the interior surface to the exterior surface of the pessary device and/or the exterior surface to the interior surface of the pessary device.
4. The method of any one of the preceding claims, wherein the withdrawal member extends to
20 form a loop.
5. The method of any one of the preceding claims, wherein the method further comprises providing a withdrawal member affixing device and contacting the withdrawal member with the withdrawal member affixing device.
25
6. The method of claim 5, wherein the withdrawal member affixing device comprises one or more straight segments and/or curve segments.
7. The method of any one of claims 5 to 6, wherein the withdrawal member affixing device is a
30 needle.
8. The method of any one of claims 5 to 7, wherein the withdrawal member affixing device comprises a finite point, a blunt end, and/or a cutting edge.
- 35 9. The method of any one of claims 5 to 8, wherein the withdrawal member is held by pressure to the withdrawal member affixing device.

10. The method of any one of claims 5 to 9, wherein the withdrawal member affixing device comprises an eyelet; and wherein the withdrawal member crosses through the eyelet of the withdrawal member affixing device.
- 5 11. The method of any one of claims 4 to 10, wherein the step of extending the withdrawal member forming a loop comprises a second withdrawal member affixing device.
12. The method of any one of claims 4 to 11, wherein the loop crosses the longitudinal axis two or more times.
- 10 13. The method of claim 12, wherein the orientation of the withdrawal member is changed between the crossings of the longitudinal axis.

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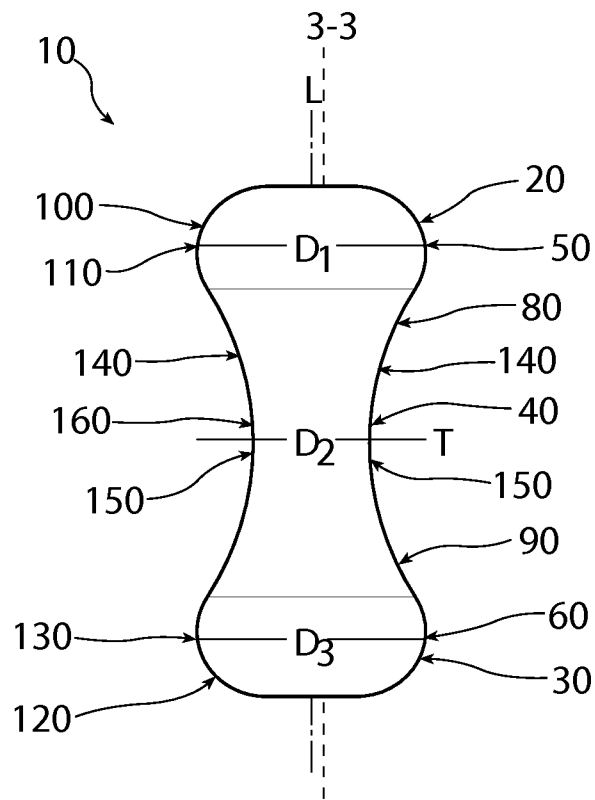


Fig. 1A

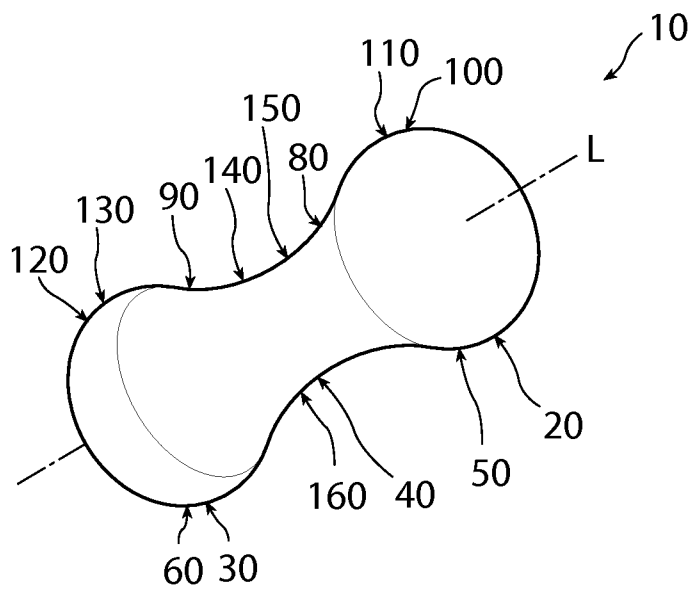


Fig. 1B

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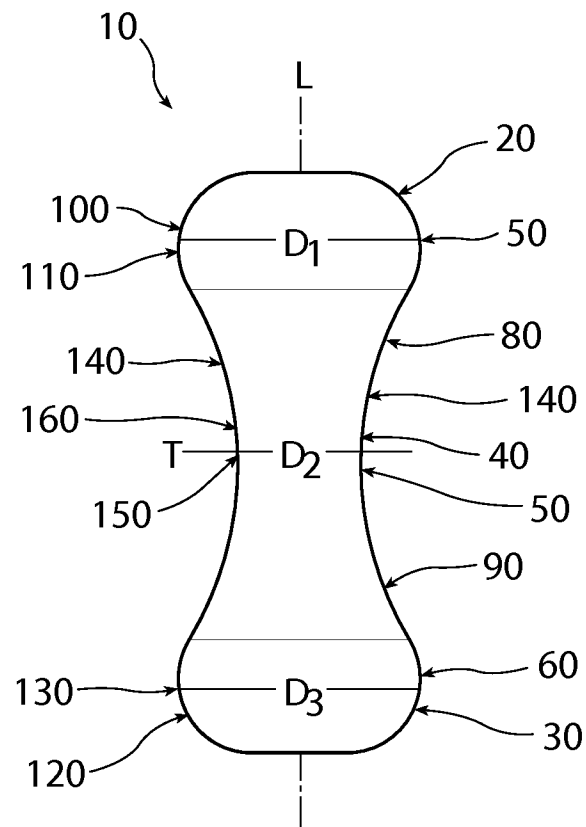


Fig. 2A

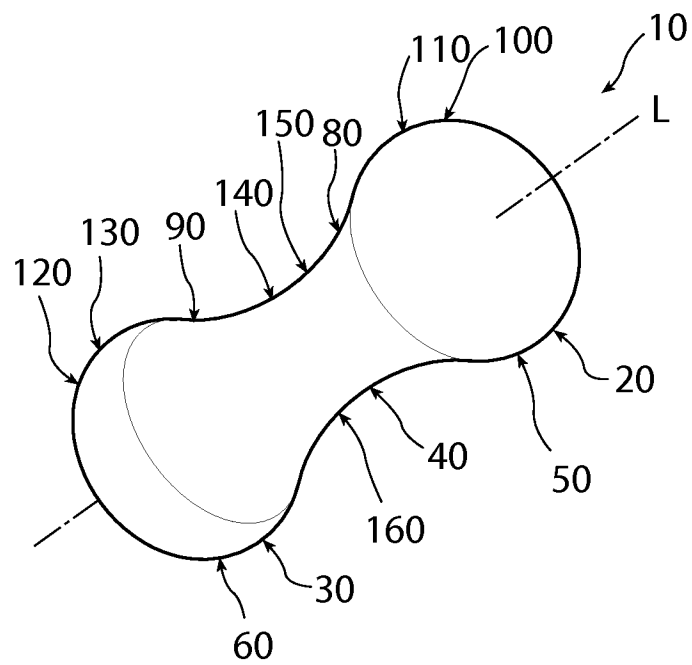


Fig. 2B

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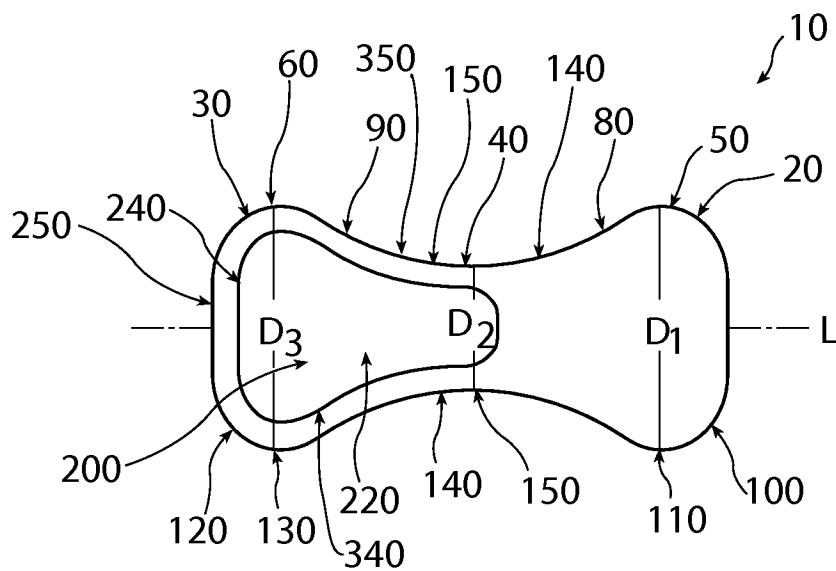


Fig. 3

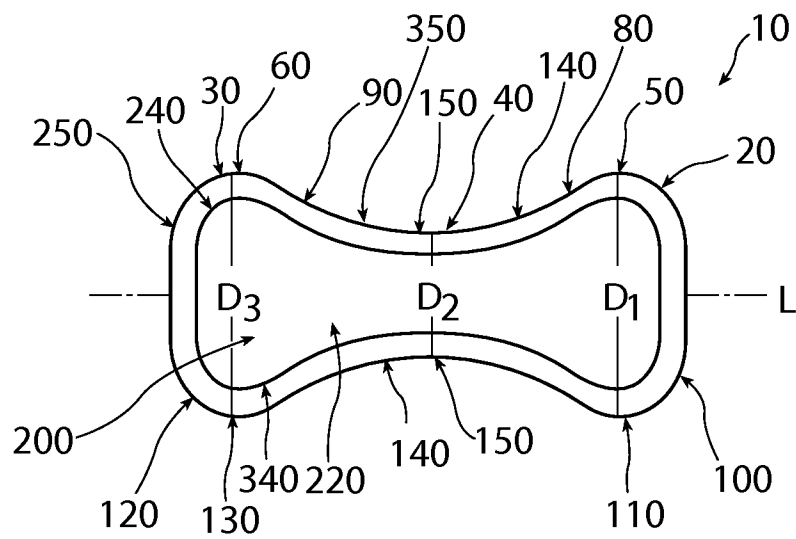


Fig. 4

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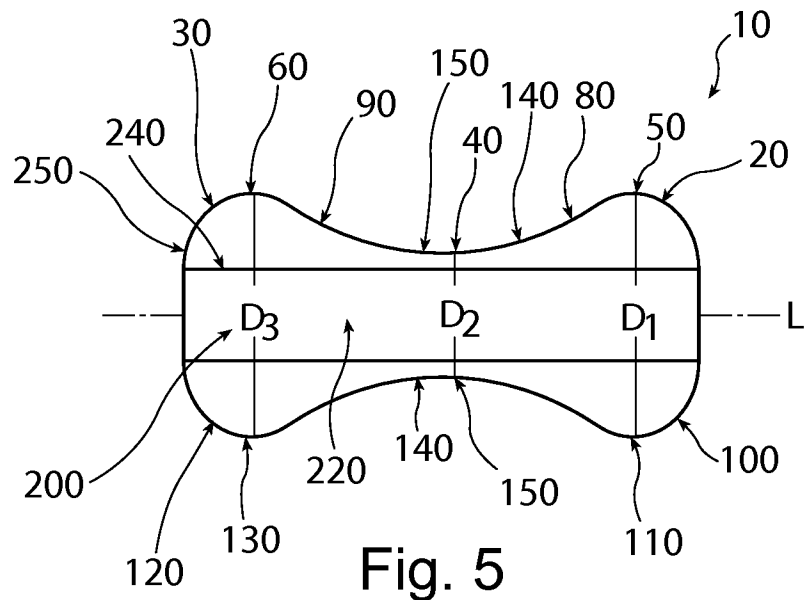


Fig. 5

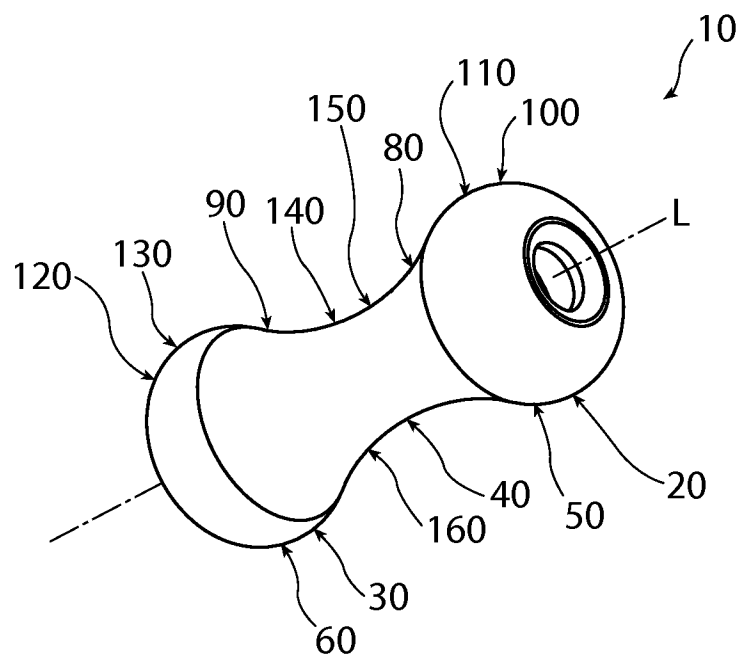


Fig. 6

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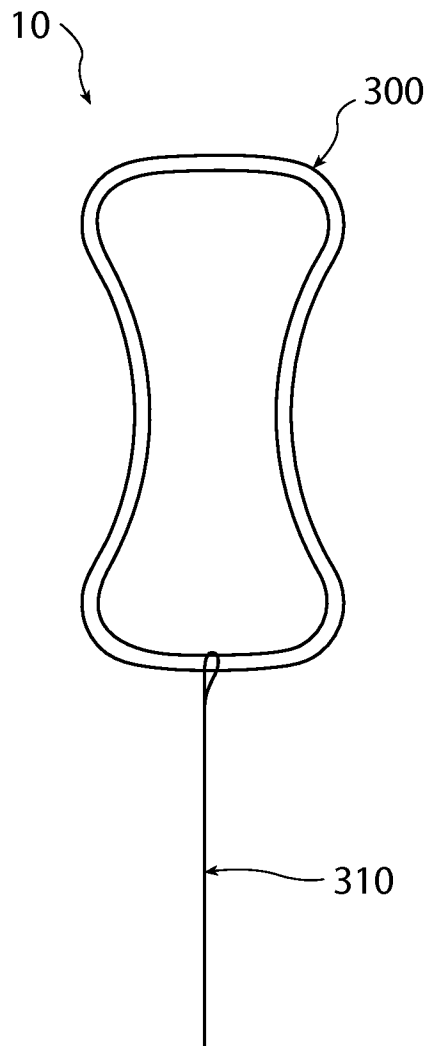


Fig. 7

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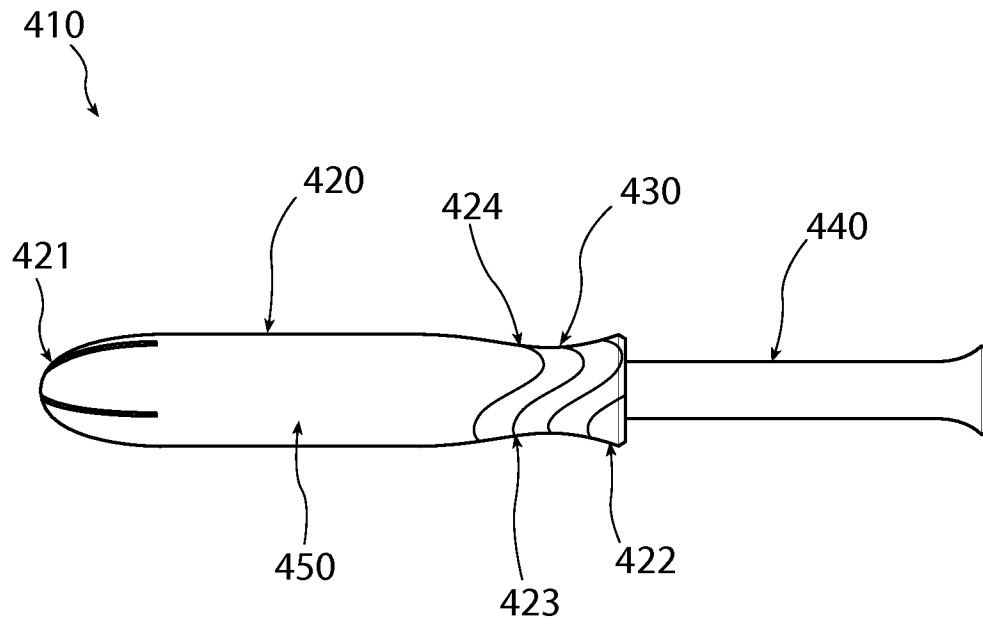
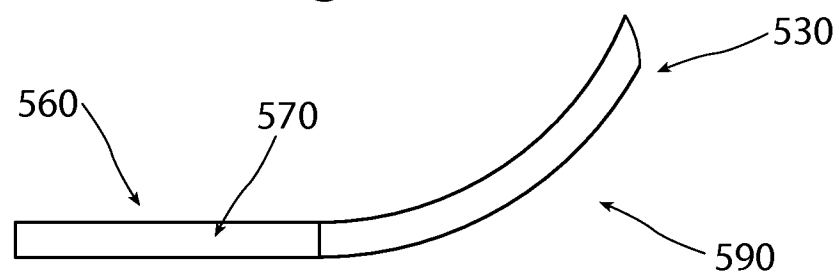
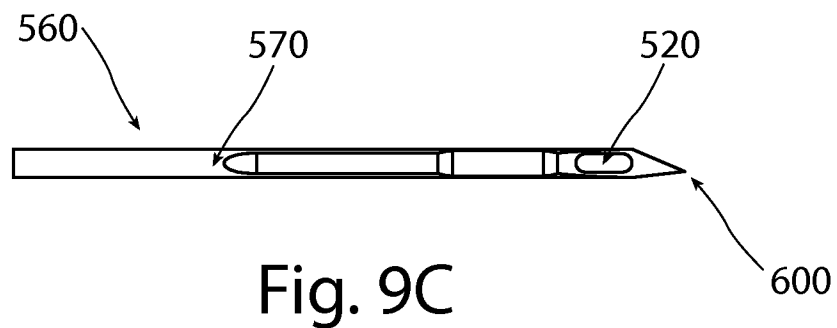
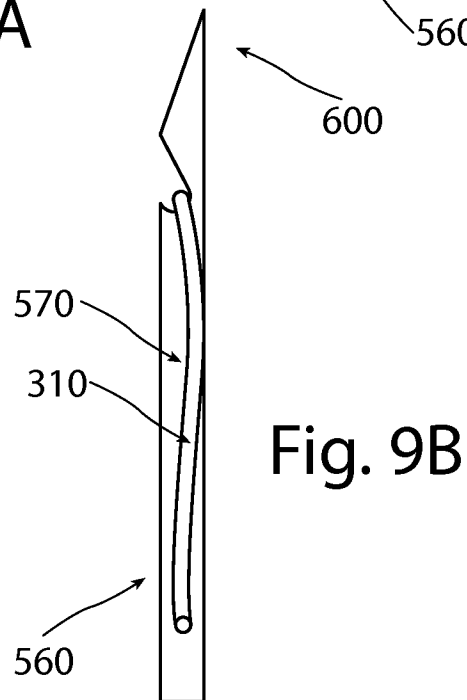
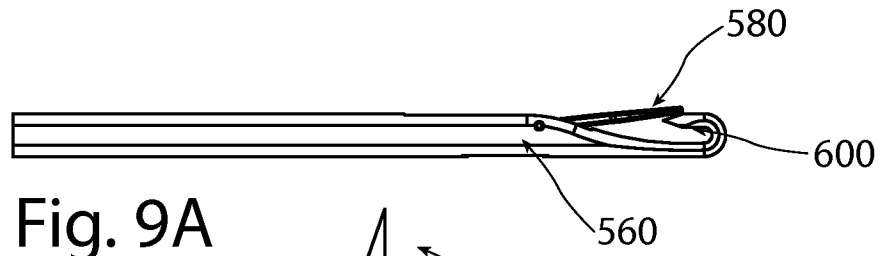


Fig. 8

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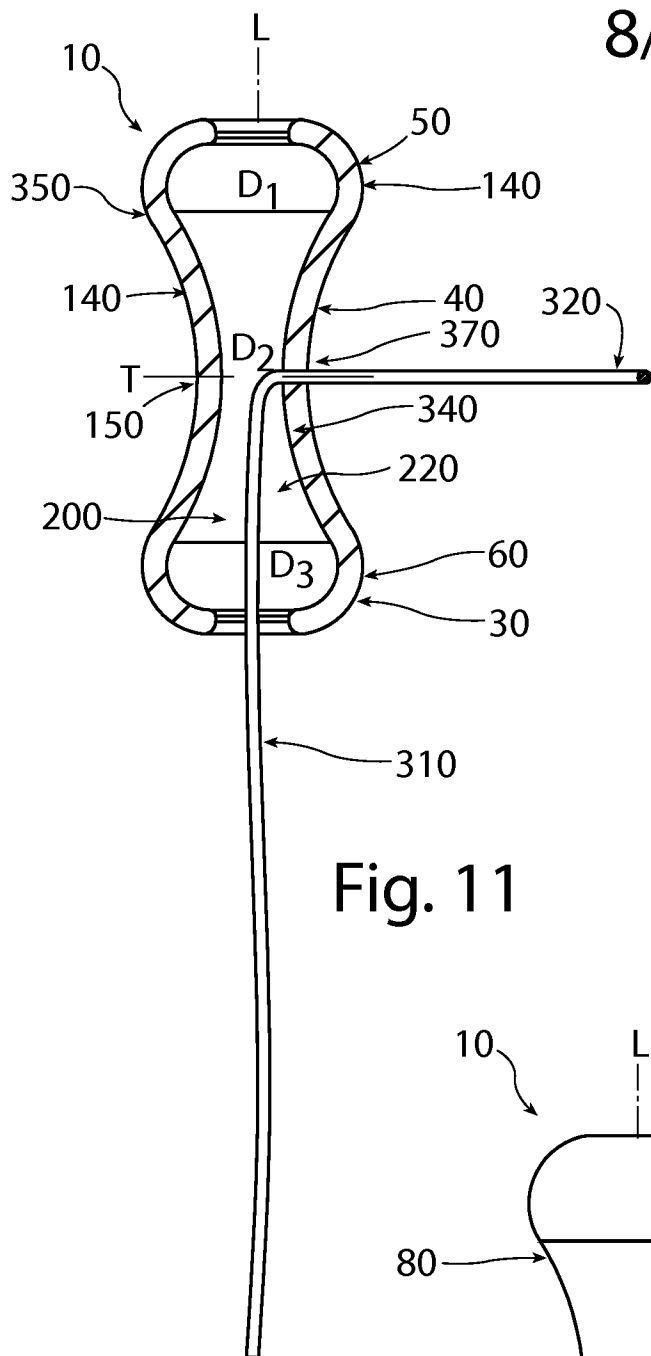


Fig. 11

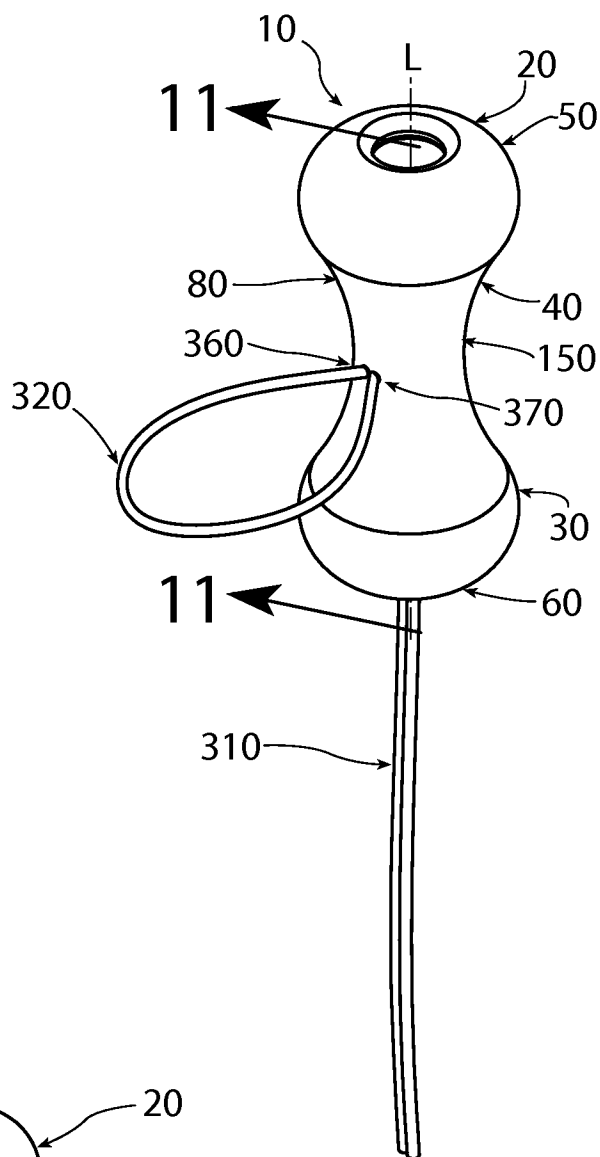


Fig. 10

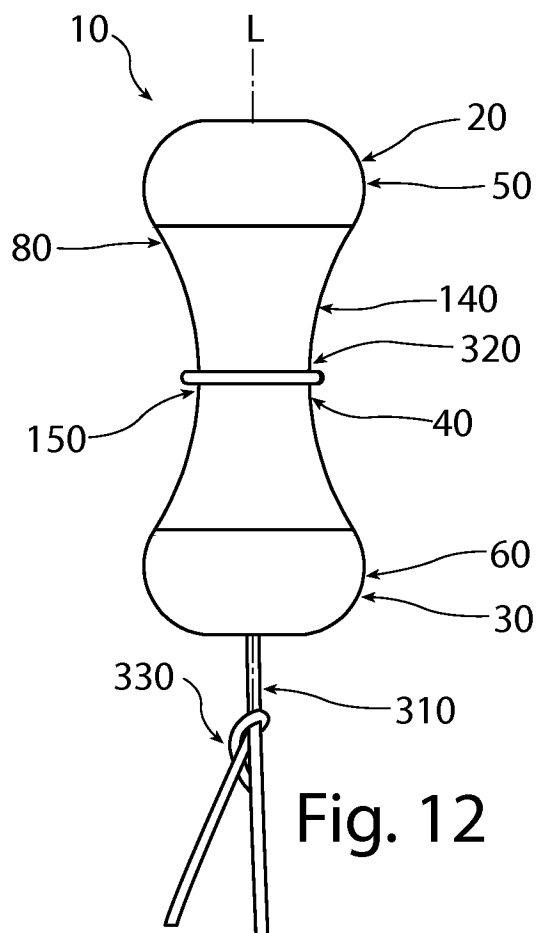
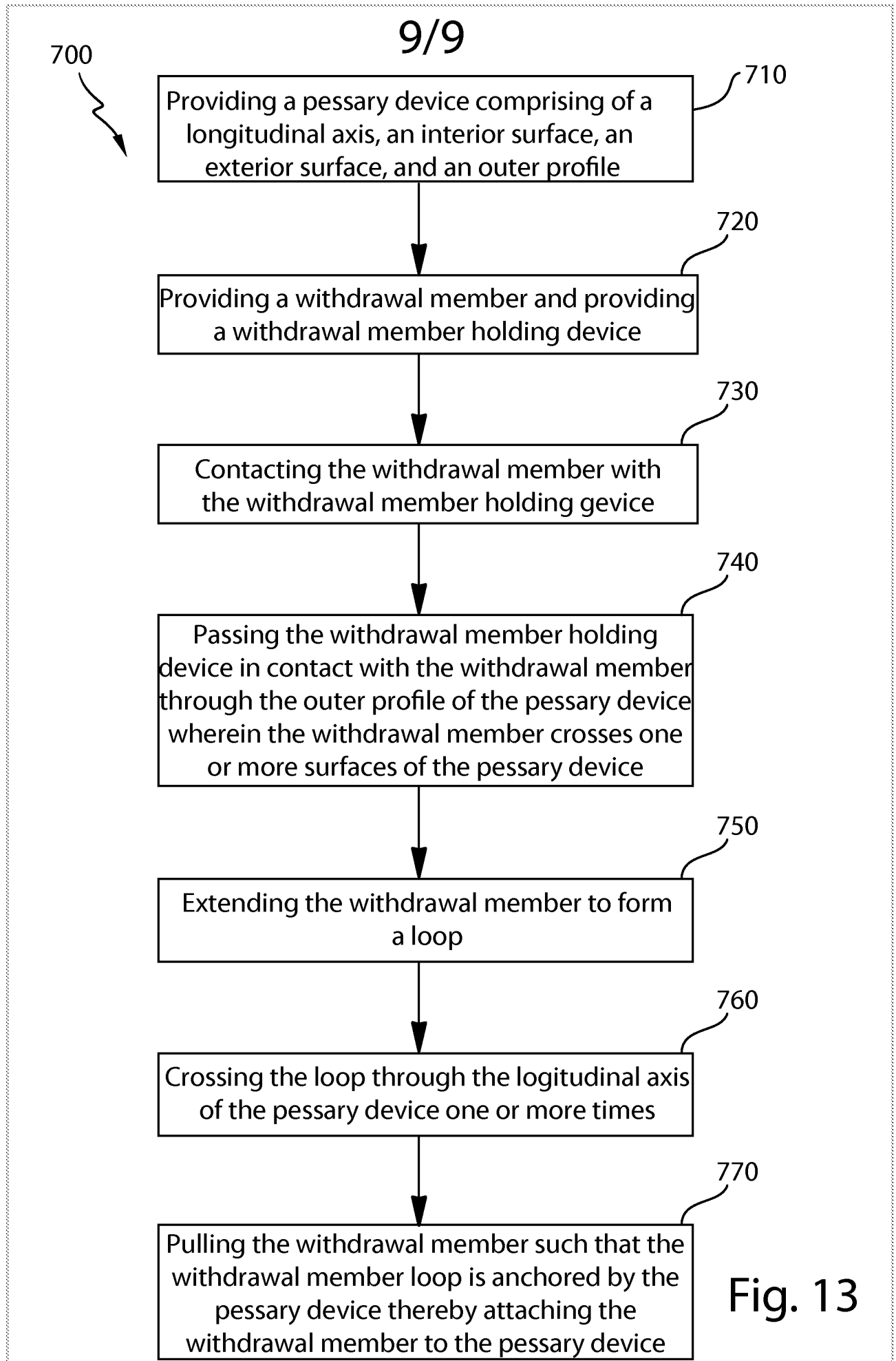


Fig. 12



INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/048150

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61F2/00
ADD.

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)
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 practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 679 831 B1 (ZUNKER MARYANN [US] ET AL) 20 January 2004 (2004-01-20)	1-4
Y	paragraph [0054] - paragraph [0055]; figures 10-16 paragraph [0068] - paragraph [0072] -----	5-13
Y	US 2012/109095 A1 (MIDDELBEEK HANS ALMER [NL] ET AL) 3 May 2012 (2012-05-03) paragraph [0006] paragraph [0031] - paragraph [0043]; figures 1-16 -----	5-13
X	US 2003/125603 A1 (ZUNKER MARYANN [US] ET AL) 3 July 2003 (2003-07-03) the whole document -----	1-4
A	US 2003/131456 A1 (RAJALA GREGORY J [US] ET AL) 17 July 2003 (2003-07-17) the whole document -----	1-13



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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"&" document member of the same patent family

Date of the actual completion of the international search

9 September 2013

Date of mailing of the international search report

18/09/2013

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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			WO 2010130746 A1 18-11-2010
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