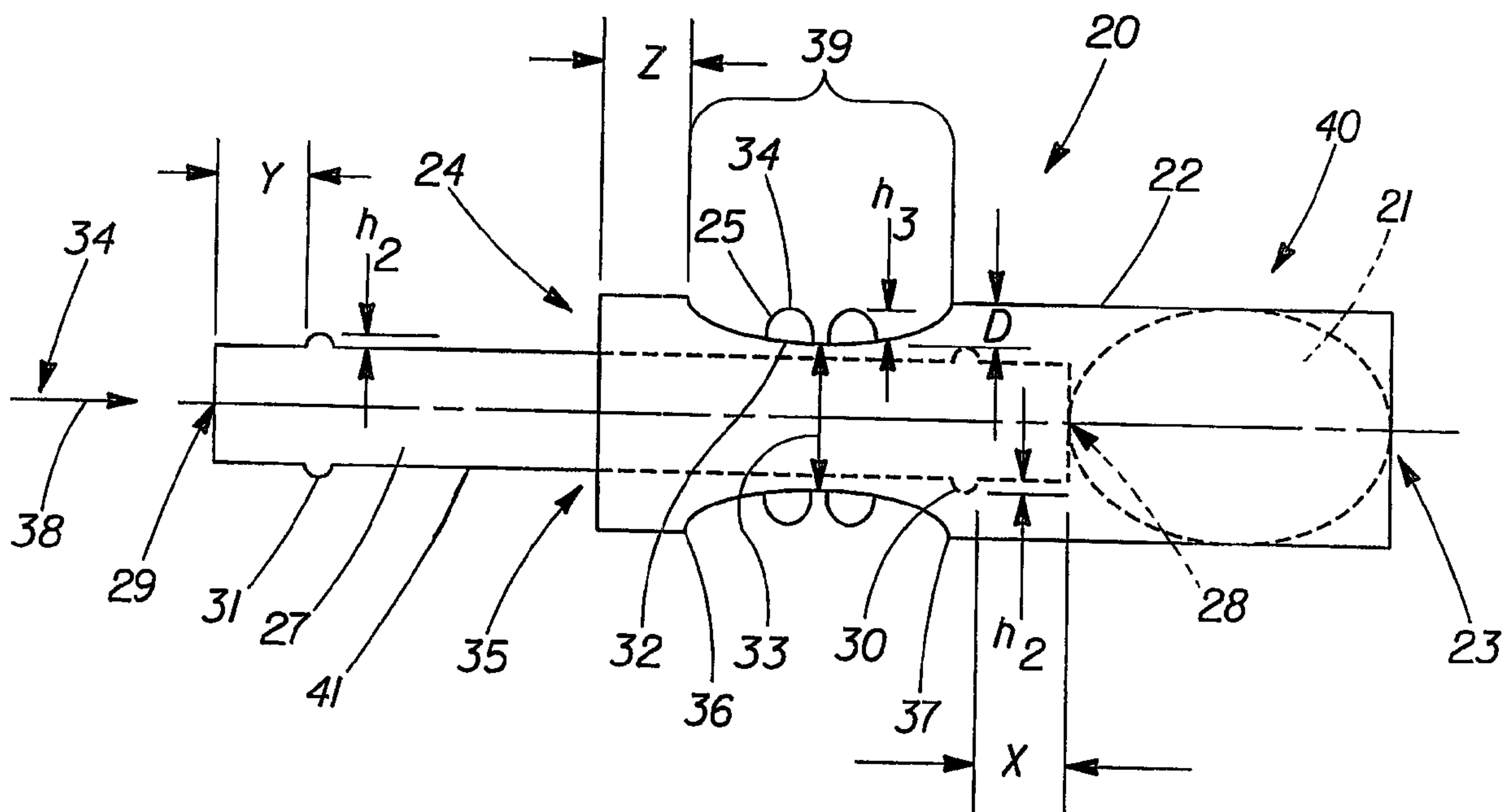




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A tampon applicator having an outer member adapted to house a tampon and receive an inner member. The inner member has a first end and a second end. The first end is spaced a first distance from a first longitudinal protrusion. The second end is spaced a second distance from a second longitudinal protrusion.

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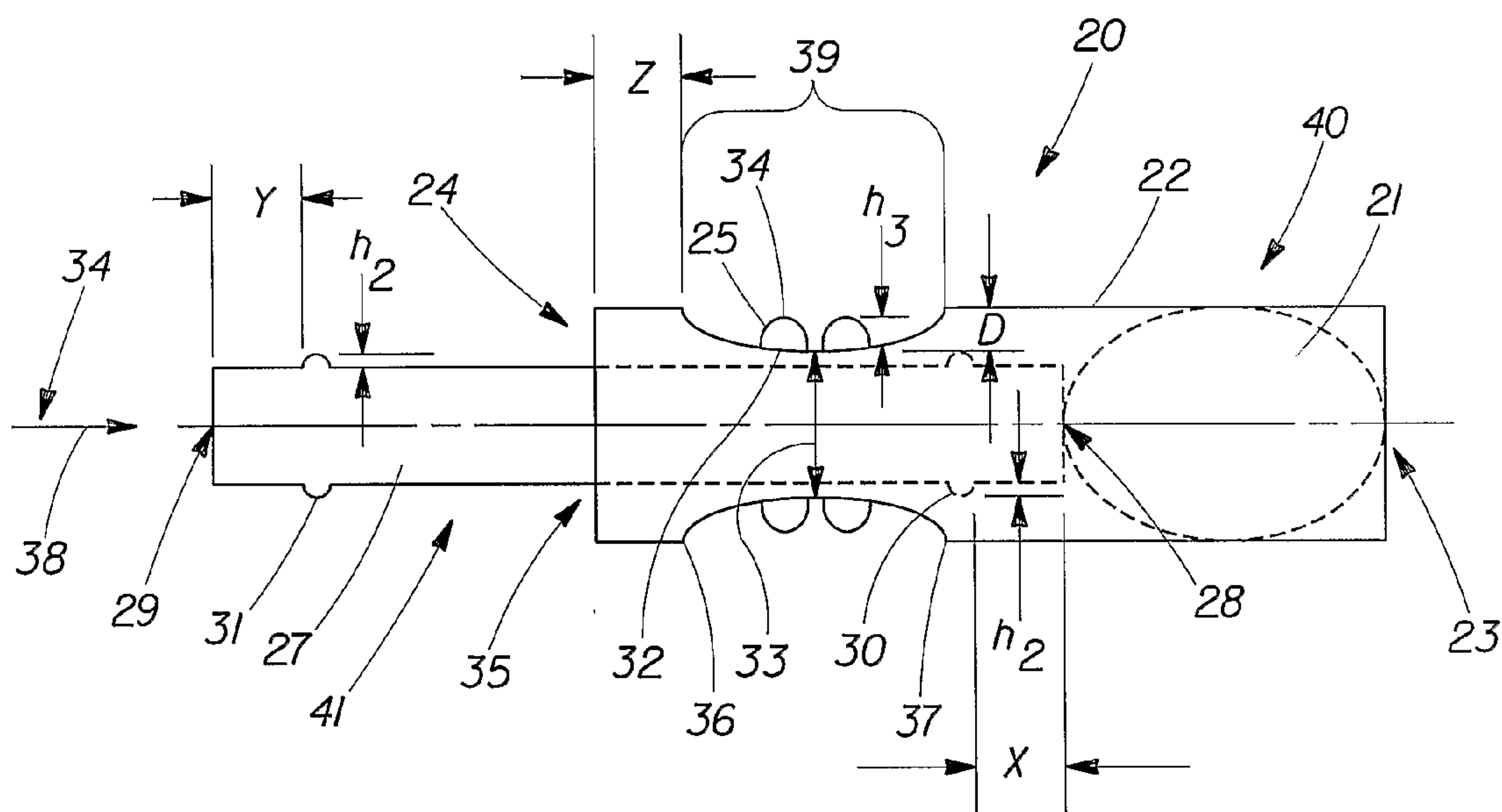
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(57) Abstract: A tampon applicator having an outer member adapted to house a tampon and receive an inner member. The inner member has a first end and a second end. The first end is spaced a first distance from a first longitudinal protrusion. The second end is spaced a second distance from a second longitudinal protrusion.

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## TAMPON APPLICATOR

## FIELD OF INVENTION

This invention relates to a tampon applicator, particularly, to a tampon applicator  
5 in which the inner tube is moved forward to eject the tampon from the tampon applicator.

## BACKGROUND OF THE INVENTION

Tampon applicators have been used for inserting a tampon into a vaginal cavity to  
prevent leakage of menstrual fluids or other fluids. In the field of tampon applicators,  
"push" type tampon applicators are well known. These applicators generally comprise, in  
10 a simple form, a pair of coaxial hollow cylinders or tubes. The larger outer tube serves as  
a vaginal insertion tube and houses a tampon. The inner tube serves as a plunger which  
ejects the tampon from the outer tube.

It has been recognized that tampon applicators of the type described above have  
certain deficiencies which can be readily apparent to many users of such devices. In  
15 general, the user removes the tampon applicator from the package. During removal,  
however, the outer member may be inadvertently removed from the inner member  
because there is not a lock formed between the outer member and the inner member.

Another deficiency with the tampon applicator occurs during removal of the  
tampon applicator from the vaginal cavity. After insertion of the tampon applicator into  
20 the vaginal cavity, when an axial force is applied along the longitudinal axis to the inner  
member, the inner member slides toward the insertion end of the outer member and bears  
against the rear end of the tampon expelling the tampon from the tampon applicator.  
Unfortunately, the user may plunge the inner member too far inside the outer member  
resulting in the insertion of the inner member into the body cavity. Because the inner  
25 member is inserted into the body cavity, during removal of the tampon applicator from  
the body cavity and there is not a lock to prevent the separation from the inner member  
from the outer member, the body tissues will hold onto the inner member with the vaginal  
tissues and body pressure. Because the body tissues hold onto the inner member which is  
now separated from the outer member, the tampon applicator exits the body cavity  
30 without the inner member, i.e., leaving the inner member behind.

To solve the above problem of the outer member separating from the inner member, it would be beneficial to provide a tampon applicator which provides a locking mechanism to prevent the inner member from separating from the outer member.

#### SUMMARY OF THE INVENTION

5 The present invention encompasses a tampon comprising an outer member adapted to house a tampon and receive an inner member. The outer member comprises an insertion end, a gripper end, and an interior surface. The inner member comprises a first end and a second end. The first end is spaced a first distance from a first longitudinal protrusion. The second end is spaced a second distance from a second longitudinal  
10 protrusion. The first distance is less than about 7 mms. The second distance is less than about 7 mms. In one embodiment, the first distance is at less than about 3 mms and the second distance is less than about 3mms.

In yet another embodiment of the present invention, the outer member further comprises an indentation region. The indentation region has a first end and a second end.  
15 The gripper end is spaced a distance to the first end of the indentation region. The indentation region and the first longitudinal protrusion interlock to resist withdrawal of the inner member from the outer member. In yet another alternative embodiment, the indentation region and the second longitudinal protrusion interlock to resist withdrawal of the inner member from the outer member.

20 In yet another aspect of the present invention, an applicator device is capable of housing an insertable element having an outer member having an insertion end and a gripper end. The inner member may have a first end and a second end. The first end is spaced a first distance from a first raised portion wherein the first raised portion extends radially outward, away from the longitudinal axis of the inner member. The second end  
25 is spaced a second distance from a second raised portion, wherein the second raised portion extends radially outward, away from the longitudinal axis of the inner member. Moreover, the outer member may comprise an indentation region. The indentation region has a first end and a second end. The gripper end is spaced a distance to the first end of the indentation region. In one embodiment, the indentation region and the first raised  
30 portion interlock to resist withdrawal of the inner member from the outer member. In yet another embodiment, the indentation region and the second raised portion interlock to resist withdrawal of the inner member from the outer member.

In accordance with another aspect of the invention, there is provided, a tampon applicator comprising:

- a.) an outer member adapted to house a tampon and receive an inner member;
- b.) characterized in that said inner member comprises a first end and a second end;
  - i. said first end is spaced a first distance from a first longitudinal protrusion, wherein said first distance is less than 7 mms;
  - ii. said second end is spaced a second distance from a second longitudinal protrusion, wherein said second distance is less than 7 mms.

In accordance with another aspect of the invention, there is provided, an applicator device capable of housing an insertable element comprising:

- a.) an outer member comprising an insertion end and a gripper end, said outer member adapted to house a tampon and receive an inner member;
- b.) characterized in that said inner member comprising a first end and a second end;
  - i. said first end is spaced a first distance from a first raised portion wherein said first raised portion extends radially outward, away from the longitudinal axis of said inner member;
  - ii. said second end is spaced a second distance from a second raised portion, wherein said second raised portion extends radially outward, away from the longitudinal axis of said inner member.

In yet another alternative embodiment, a tampon applicator comprises an outer member adapted to house a tampon and receive an inner member. The inner member comprises a first end and a second end. The second end is spaced a distance from a longitudinal protrusion.

5 In yet another alternative embodiment, a tampon applicator comprises an outer member adapted to house a tampon and receive an inner member. The inner member comprises a first end and a second end. The first end is housed within the outer member. The second end is exposed. The second end is spaced a distance from a longitudinal protrusion.

#### 10 BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of a tampon applicator of the present invention.

FIG. 2 is a cross-sectional view of a portion of the tampon applicator illustrative of the present invention.

15 FIG. 3 is a cross-sectional view of a portion of the tampon applicator illustrative of the present invention.

#### DETAILED DESCRIPTION OF THE INVENTION

Section A will provide terms which will assist the reader in best understanding the features of the invention but not to introduce limitations in the terms inconsistent with the context in which they are used in this specification. These definitions are not intended to be limiting. Section B will discuss the tampon applicator of the present invention. Section C will discuss the tampon applicator materials.

##### A. TERMS

25 As used herein, the term “tampon” refers to any type of absorbent structure that can be inserted into the vaginal cavity or other body cavities for the absorption of fluid therefrom or for the delivery of active materials, such as medicaments or moisture. A tampon can be straight or non-linear in shape, such as curved along the longitudinal axis.

30 Generally, there are two types of tampons. The first type of tampon is a self-sustaining tampon. Tampons are generally “self-sustaining” in that they will tend to retain their general shape and size before use. A typical self-sustaining tampon is 35 - 60 millimeters long, the length measured from the top of the tampon to the base of the tampon along a longitudinal axis. The measurement to the base of the tampon does not include any overwrap, secondary absorbent member, or withdrawal cord which extends

beyond the tampon's main absorbent material. A typical self-sustaining tampon is 5 - 20 millimeters wide corresponding to the largest cylindrical cross section. The width can vary along the length of the self-sustaining tampon.

The second type of tampon is an easily "**deformable, fluid-permeable bag tampon**". The deformable, fluid-permeable bag tampon consists of pieces such as absorbent chips, spheres, or fibers such that the fluid permeable bag tampon is readily deformable with a force of less than about 3 psi.

As used herein, the terms "**vaginal cavity**" and "**within the vagina**" refer to the internal genitalia of the human female in the pudendal region of the body.

The term "**interlock**," as used herein, is meant the interference fit between the indentation region of the outer member and the first longitudinal protrusion and/or the second longitudinal protrusion. The interference fit between the longitudinal protrusions and the indentation region is about .5 – .6 mm. It is preferred that the interference fit be adequate to provide a disassembly force of at least 100 grams, more preferably greater than 300 grams measured by a Dillon Force Gauge.

The term "**spaced from**," as used herein, is meant the distance from the absolute end of the outer or inner member to the first portion of the longitudinal protrusion or indentation region.

The term "**diameter**," as used herein, means a chord passing through the center of a figure or body; the length of a straight line through the center of an object.

The term "**exposed**," as used in herein, means any portion of the inner member which is not contained in the outer member before expulsion of the tampon from the tampon applicator.

#### B. TAMPON APPLICATOR OF THE PRESENT INVENTION

Referring to **FIG. 1**, the tampon applicator **20** includes an outer member **22** and an inner member **27**. The outer member **22** retains tampon **21**. Moreover, the outer member **22** comprises an outer surface **40**, an insertion end **23** and a gripper end **24** opposed to the insertion end **23**. The insertion end **23** is a portion of the outer member **22** in which the tampon applicator **20** is first inserted into the vaginal cavity and it is the end from the tampon **21** is expelled. During insertion of the tampon applicator **20** into the body of a wearer, the gripper end **24** can be used to hold the outer member **22** during insertion. The insertion end **23** of outer member **22** can include a plurality of petals (not shown).

Preferably, the plurality of petals (not shown) are collectively shaped to form a dome or any shape in general which facilitates insertion.

In addition, the outer member **22** can contain a fingergrip region **39** disposed about outer surface **40**. The fingergrip region **39** comprises an indentation region **33**.  
5 The indentation region **33** is located adjacent to the gripper end **24** of the outer member **22**. The indentation region **33** has a first end **36** and a second end **37**. The indentation region **33** projects into the hollow interior portion **35** of the outer member **22**. The first end **36** of the indentation region **33** is spaced a distance **z** from the gripper end **24**.

The inner member **27** is dimensioned to slidably move within the hollow interior  
10 portion **35** of the outer member **22**, with minimal clearance therebetween. Inner member **27** is adapted to slideably engage the outer member **22** and to contact tampon **21** to expel the tampon **21** through the insertion end **23**. The inner member **27** has a first end **28** and a second end **29** opposed to the first end **28**. The first end **28** is the most proximal end of the inner member **27** to the insertion end **23** of the outer member **22** along the  
15 longitudinal axis **34**. The first end **28** provides the necessary axial force **38** to expel the tampon **21**. The second end **29** is the portion of the inner member **27** in which an axial force **38** along the longitudinal axis **34** is applied to expel the tampon **21** through the insertion end **23** of the outer member **22**.

The inner member **27** can have longitudinal protrusion(s) **30, 31**. The longitudinal  
20 protrusion(s) **30, 31** project beyond the outer surface **41** of the inner member **27**. The inner member **27** has a longitudinal protrusion **31** spaced a distance **y** from the second end **29** of the inner member **27**. In addition, the inner member **27** can have an additional longitudinal protrusion **30** spaced a distance **x** from the first end **28** of the inner member **27**.

25 To use the tampon applicator **20** of the present invention, the user will typically hold the indentation region **33** located adjacent to the gripper end **24** of the outer member **22** with the wearer's thumb and index finger. While holding the indentation region **33**, the user can insert the outer member **22** of the tampon applicator **20** into the vaginal cavity and apply an axial force **38** sufficient enough to push the inner member **27** into the  
30 outer member **22**. When the tampon **21** begins to be pushed out of the insertion end **23** of the outer member **22** with the axial force **38** applied along the longitudinal axis **34**, petals (not shown), if included, begin to open.

In addition to delivering menstrual tampons into the vaginal cavity, it should be noted that the tampon applicator of the present invention can be used to deliver any other type of absorbent or nonabsorbent object to any suitable cavity. For example, the tampon applicator of the present invention could be used to insert incontinence inserts. An  
5 “**incontinence insert**,” 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. While incontinence inserts are typically made of non-absorbent materials, at least partially absorbent materials may also be used. However, because there is no intent to absorb bodily fluids, and because the incontinence  
10 inserts are adapted and configured to provide structural support to the musculature and body tissues located near the urethra-vaginal myofascial area, incontinence inserts are readily distinguishable from tampons.

Below will provide more detail of each component of the tampon applicator of the present invention.

15 *i. Outer Member*

Referring to **FIG. 1**, typically, the outer member **22** can be used to handle or grip the tampon applicator **20** during the insertion into the vaginal cavity. The outer member **22** is external to the inner member **27**. The outer member **22** has a hollow interior **35**, an insertion end **23**, and a gripper end **24** opposed to the insertion end **23**. The insertion end  
20 **23** is a portion of the outer member **22** in which the tampon applicator **20** is first inserted into the vaginal cavity and it is the end from the tampon **21** is expelled. The gripper end **24** is opposed to the insertion end **23**. At least a portion of the hollow interior **35** of the outer member **22** can engage with at least a portion of the inner member **27**.

The outer member **22** has an outer surface **40** and a fingergrasp region **39** disposed  
25 about the outer surface **40**. The fingergrasp region **39** comprises an indentation region **33**. The indentation region **33** has a first end **36** and a second end **37**. The indentation region **33** projects into the hollow interior **35** and the first end **36** is spaced a distance **z** from the gripper end **24** of the outer member **22**. When the indentation region **33** interlocks with the longitudinal protrusion(s) **30, 31** located on the inner member **27**, a secure hold is  
30 created between the outer member **22** and the inner member **27**. Interlocking could be provided by an interference fit between the longitudinal protrusions **30, 31** and the indentation region **33** which would cause longitudinal protrusion **30, 31** to interlock

therewith. The indentation region **33** interlocks with the longitudinal protrusions **30**, **31** to resist inadvertent separation from the inner member **27**.

The indentation region has a depth dimension **D** as measured from the outer surface **40** of the outer member **22** to the lowest point of the indentation region **33**. In some 5 embodiments, the depth dimension **D** may range from about 1 mm to about 10 mm as measured from the outer surface **40** of the outer member **22** to the lowest point of the indentation region **33**. In some embodiments, the depth dimension **D** may range from about 2 mm to about 5 mm as measured from the outer surface **40** of the inner member **22** to the lowest point of the indentation region **33**. In other embodiments, the depth dimension **D** 10 may range from about .25 mm to about .381 mm as measured from the outer surface **40** of the inner member **20** to the lowest point of the indentation region **33**.

Referring again to **FIG. 1**, the indentation region **33** can provide for secure handling of the outer member **22**. Furthermore, it is preferable that the indentation region **33** be of sufficient dimension to substantially provide a comfortable grip for the user. As 15 used in the specification, the term “**user’s grip**” means any way of holding the tampon applicator **20** in a hand, e.g., between a thumb and a finger. The indentation region **33** need not necessarily extend completely around the perimeter of the outer member **22**. For example, a space can be provided for a decorative marking or a Trademark character.

The indentation region **33** may have a raised surface **25** above or below the plane 20 of the outer member **22**. The raised portions **25** may range from 1 to 200 depending on the size of the outer member **22** and the indentation region **33**. The raised surface **25** has a height dimension  $h_3$  as measured from the base **32** to the highest point **34** of the individual raised portion. In some embodiments, the height dimension  $h_3$  ranges from about 0.1 mm to about 10 mm as measured from the base **32** to the highest point **34** of the 25 individual raised portion. In some embodiments, the height dimension  $h_3$  ranges from about 0.2 mm to about 5 mm as measured from the base **32** to the highest point **34** of the individual raised portion. In other embodiments, the height dimension  $h_3$  ranges from about 0.5 mm to about 2.5 mm as measured from the base **32** to the highest point **34** of the individual raised portion.

30 The individual raised portions **25** may be formed to have essentially identical size and shape as compared to other individual raised portions **25**. Alternatively, the individual raised portions **25** may be formed to have various sizes and shapes as

compared to other individual raised portions **25**. The raised portions **25** may be arranged randomly or in a pattern. For example, the raised portions **25** can be arranged to form any three-dimensional geometric pattern known including but not limited to flowers, ovals, circles, rectangles, trapezoids, triangles, cones, alphabet letters, and mixtures thereof.

5 Alternatively, these raised portions **25** may be randomly arranged so that the multiplicity of the molded or attached dimples may comprise merely a surface roughness in no apparent pattern. In addition, raised portions **25** may be arranged such that the areas between the raised portions **25** may form any geometric pattern known including but not limited to flowers, ovals, circles, rectangles, trapezoids, triangles, cones, alphabet letters,  
10 and mixtures thereof.

The indentation region **33** can be any number, shape, or size. Any number of indentation regions **33** may be utilized. The indentation region **33** can be circular, square, rectangular, triangular, arced, curved, or any other conceivable shape possible as long as the indentation region **33** is able to interlock with the longitudinal protrusion(s) **30, 31**.  
15 Moreover, the indentation region **33** can be any size as long as the indentation region **33** is able to interlock with longitudinal protrusion **30, 31**.

The perimeter of the indentation region **33** can take essentially any desired shape, including oval, circular, and various other geometric forms. The indentation region **33** can be defined by outward protrusions or raised surfaces **25**, created by impressing or  
20 compressing the surfaces. The indentation region **33** is substantially circularly shaped, but it can also take on more angular formations such as squared. The surface of the indentation region **33** can be any kind of surface known in the art. This surface can provide a desired frictional resistance for the fingers during the insertion of the tampon applicator **20** into the body.

25 The indentation region **33** can be joined to the outer member **22** or formed in the outer member **22** in any way known in the art. The indentation region **33** can also be monolithic with the outer member **22**, for example, by molding the indentation region **33** and the outer member **27** as one piece. In one non-limiting example, the indentation region **33** can be joined to the outer member **22** by friction fitting that snaps parts  
30 together, gluing, and/or melting.

Indentation region **33** is typically formed inherently by the embossing process. While any conventional embossing technique can be utilized, a preferred method is to

support the outer member on a central mandrel having circumferential ridges in its surface, and contact the surface of the outer member with a set of dies having indentations corresponding in shape to the ridges on the mandrel. It is also preferred that heat be employed during the embossing process to enhance the formability of the paper.

5           The manufacturer of the tampon applicator **20** can vary the size of the outer member **22**. The inner diameter of the outer member **22** is typically just greater than the diameter of the tampon **21** that is to be accommodated therein. The size of the outer member **22** can be determined primarily by the dimensions of the tampon **21**. Specifically, the diameter of the outer member **22** can be varied to accommodate different  
10   absorbency tampons **21**. Generally, the outer member **22** can include an inner diameter of from about 6 millimeters to about 20 millimeters and a wall thickness of from about 0.4 millimeter to about 2.0 millimeters. Generally, the inner diameter of the outer member **22** should be suitably greater than the diameter of the tampon **21** to prevent the outer member **22** from interfering with the expulsion of the tampon **21** from the outer member  
15   **22**. Moreover, the inner diameter of the outer member **22** can have varying diameters and shapes to conform to the profiled shape of the enclosed tampon **21**.

Also, the manufacturer of the tampon applicator **20** can vary the length of the outer member **22**. Generally, the outer member **22** should be of a sufficient length to house at least a portion of the tampon **21** prior to the expulsion of the tampon **21** from the  
20   tampon applicator **20** into the vaginal cavity.

In addition, the manufacturer of the tampon applicator **20** can vary the shape of the outer member **22**. It is further noted herein that the shape of the outer member **22** can vary as long as a portion of the inner member **27** can be slideable within the outer member **22**. Moreover, the outer member **22** is in no way limited by the shape that it can  
25   assume except that the shape should not hinder directional expulsion of the tampon **21**. One skilled in the art can imagine that the outer member **22** might be cylindrical or curved like a banana or any other suitable shape as long as any such shape would work effectively to expel tampon **21** from the tampon applicator **20**, and comfortably insert the tampon **21** into the vaginal cavity. The outer member **22** can be of any suitable cross-  
30   sectional shape. For example, suitable cross-sectional shapes can include, but are not limited to, circular, oval, flattened circular, elliptical, and any combination thereof.

*ii. Inner Member*

Referring to **FIG. 1**, the inner member **27** has a first end **28** and a second end **29** opposed to the first end **28**. The first end **28** is the most proximal end of the inner member **27** to the insertion end **23** of the outer member **22** along the longitudinal axis **34**. The first end **28** provides the necessary force to expel the tampon **21**. The second end **29** is the portion of the inner member **27** in which an axial force **38** along the longitudinal axis **34** is applied to expel the tampon **21** through the insertion end **23** of the outer member **22**. Longitudinal protrusion **30** is located a distance  $x$  spaced from the first end **28**. Likewise, longitudinal protrusion **31** is located a distance  $y$  spaced from the second end **29** of the inner member **27**. Longitudinal protrusion **30**, **31** are described in more detail below.

The manufacturer of the tampon applicator **20** can vary the shape of the inner member **27**. One skilled in the art can imagine other shapes of the inner member **27**, for example, cylindrical or curved like a banana or any other suitable shape possible. The inner member **27** can be of any suitable cross-sectional shape including, but are not limited to, circular, oval, flattened circular, elliptical, and any combinations thereof.

The size of the inner member **27** can be determined primarily by the dimensions of outer member **22**. The diameter of the inner member **27** is typically just smaller than the diameter of the outer member **22**. Specifically, the diameter of the inner member **27** can be varied to accommodate the diameters of different outer members **22**. For example, higher absorbency tampons can have larger diameters resulting in the outer member **22** diameter having a larger diameter to house the higher absorbent tampon. Because the outer member **22** diameter is larger, the inner member **27** diameter will also be larger. In addition, the inner member **27** diameter can have varying diameters and shapes to conform to the profiled shape of the outer member **22**.

The length of the inner member **27** can also vary. Generally, the inner member **27** should be of a sufficient length to properly expel tampon **21** from the tampon applicator **20**. For example, the length of the inner member **27** can be from about 43 millimeters to about 90 millimeters.

#### Longitudinal Protrusion(s)

Referring to **FIG. 1**, inner member **27** comprises longitudinal protrusions **30**, **31**, which interlock with the indentation region **33** to resist inadvertent separation of the inner member **27** from the outer member **22**. The longitudinal protrusions **30**, **31** can be

adapted to interlock with the indentation region **33** which projects into the hollow interior portion **35** of outer member **22**. Thus, the engagement of the longitudinal protrusions **30**, **31** and the indentation region **33** serves to secure the outer member **22** and the inner member **27** in place.

5           a.       Inner Member Having One Longitudinal Protrusion

In one embodiment, a longitudinal protrusion **31** may be placed on the inner member **27**. Referring to **FIG. 1**, the inner member **27** has a longitudinal protrusion **31** spaced a distance  $y$  from the second end **29** of the inner member **27**. When the longitudinal protrusion **31** engages with the indentation region **33**, the longitudinal protrusion **31** acts  
10 as a stop and a signal to the user that the contents of the tampon **21** have been fully expelled. In addition, longitudinal protrusion **31** provides resistance to the separation of the inner member **27** from the outer member **24**. By increasing the resistance between the outer member **24** and the inner member **27**, the separation of the outer member **24** and the inner member **27**, and as a result, the risk of inserting the inner member **27** into the vagina  
15 itself and possibly being left behind in the body cavity are minimized. Additionally, the longitudinal protrusion **31** provides a user with greater resistance thereat, increasing her confidence in using the tampon applicator **20**.

The longitudinal protrusion **31** is located at a distance  $y$  from the second end **29** of inner member **27**. Generally, the longitudinal protrusion **31** of the inner member **27** can  
20 be spaced from about 1 millimeters to about 7 millimeters along the longitudinal axis **34**. The distance  $y$  can be spaced preferably from about 2 mm to about 5 mm, more preferably from about 2 mm to about 4 mm.

b.       Inner Member Having Two Longitudinal Protrusions

In another embodiment, in addition to the longitudinal protrusion **31** discussed in  
25 the afore-mentioned section, the inner member **27** can have an additional longitudinal protrusion **30** spaced a distance  $x$  from the first end **28** of the inner member **27**. Ultimately, longitudinal protrusion **30** prevents the inner member **27** from too easily being separated from the outer member **22** should the tampon applicator **20** be mishandled before the use thereof. Specifically, when the longitudinal protrusion **30**  
30 interlocks with the indentation region **33**, the inner member **27** is prevented from being inadvertently separated from the outer member **22**.

The longitudinal protrusion **30** is located at a distance  $x$  from the first end **28** of inner member **27**. Generally, the longitudinal protrusion **30** of the outer member **22** can be spaced from about 1 millimeters to about 7 millimeters along the longitudinal axis **34**. The distance can be spaced preferably from about 2 mm to about 5 mm, more preferably from about 2 mm to about 4 mm.

c. Longitudinal Protrusions

Referring to **FIG. 2**, this section will provide more detail of the longitudinal protrusions **30, 31**. The longitudinal protrusions **30, 31** are adapted to engage with the indentation region **33** with a depth dimension **D** located on the hollow interior portion **35** of the outer member **22**.

The longitudinal protrusion **30** has a height dimension  $h_1$  as measured from the outer surface **41** of the inner member **27** to the highest point **42** of the longitudinal protrusion **30**. The height dimension  $h_1$  of the longitudinal protrusion **30** is preferably at least about .5 mm and more preferably at least about .6 mm.

The longitudinal protrusion **31** has a height dimension  $h_2$  as measured from the outer surface **41** of the inner member **27** to the highest point **43** of the longitudinal protrusion **31**. The height of the longitudinal protrusion  $h_2$  is preferably at least about .25 mm, and more preferably at least about .381 mm and more preferably at least about .6 mm.

Interlocking is assisted by the interference fit between the longitudinal protrusions **30,31** and the indentation region **33**. The interference fit between the longitudinal protrusions **30, 31** and the indentation region **33** is about .1 mm or preferred at about 3 mm. Referring to **FIG. 3**, an example of the use of a longitudinal protrusion **30** interlocking with an indentation region **33** is illustrated. Longitudinal protrusion **31** can also interlock with indentation region **33** in the same way as illustrated in **FIG. 3**. It is preferred that the interference fit be adequate to provide a disassembly force of at least 100 grams, more preferably greater than 300 grams as measured by a Dillon Force Gauge.

Referring again to **FIG. 1**, this interference can be accomplished in any numbers of ways. Preferably, the interference is accomplished by configuring the longitudinal protrusions **30,31** such that at least a portion of the longitudinal protrusions **30,31** must project beyond an area defined by the inner dimensions of the inner member **27**. Preferably, the outer diameter of the inner member **27** is slightly greater than the inner

diameter of the indentation region **33**. While the inner member **27** is being pushed inside of the hollow interior portion **35** of outer member **22**, the longitudinal protrusions **30,31** project beyond the outer surface **41** of the inner member **27** to interfere with the indentation region **33** on the hollow interior portion **35** of the outer member **22**.

5           In one non-limiting example, interference can be accomplished by forming the longitudinal protrusions **30, 31** by puncturing through the inner member **27**. Puncturing of the inner member **27** is accomplished without removing any material from the inner member **27**. The material is at least partially displaced by puncturing. Interference can be created when the displaced material which forms longitudinal protrusion **31** bears  
10           against the outer member **22** so as to prevent manual movement of the inner member **27** into the outer member **22**. Moreover, in addition to the longitudinal protrusion **31** another longitudinal protrusion **30** can be formed in the inner member **27**, interference can be created when the displaced material which forms longitudinal protrusion **30** bears against the indentation region **33** so as to prevent manual movement of the inner member **27** from  
15           the outer member **22**.

          In reference to the tampon applicator **20** comprising a pair of cylindrical tubular members (outer member **22** and inner member **27**), it is preferred that the longitudinal protrusions **30,31** on the inner member **27** has a maximum outside diameter that is greater than the minimum inner diameter of the outer member **22**. Alternatively, in a pair of  
20           tubular members in which the inner member **27** is cylindrical and the inner member **27** has a polygonal cross-section, the longitudinal protrusions **30,31** of the inner member **27** should have a maximum outside diameter that is greater than the minimum inner dimension of the inner member **27** passing through a central axis thereof. In yet another alternative embodiment, in which the inner member **27** has a rectangular cross-section  
25           and the inner member **27** is cylindrical, the maximum length of a side of the longitudinal protrusions **30,31** is greater than a corresponding chord of the circle defined by the inner diameter of the inner member **27**. More preferably, the maximum outside diameter of the longitudinal protrusions **30,31** is targeted to at least equal to the inside diameter of the indentation region **33**. This allows for variability inherent in manufacturing processes to  
30           ensure that interference will occur between the indentation region **33** and longitudinal protrusions **30, 31** located on the inner member **27**.

The longitudinal protrusion(s) **30, 31** may encompass the entire perimeter or may encompass part of the perimeter of the inner member **27**. In one non-limiting example, the longitudinal protrusions **30, 31** are spaced discontinuously around the perimeter of the inner member **27**.

5           The longitudinal protrusions **30, 31** can be of any number, shape, or size as long as the longitudinal protrusions **30, 31** are able to engage with the indentation region **33**. Any number of longitudinal protrusions **30, 31** may be utilized. In one non-limiting example, the inner member **27** may comprise two or more longitudinal protrusions **30, 31**. The longitudinal protrusion(s) **30, 31** can be any shape as long as such shape would work  
10           effectively to interlock with the indentation region **33** located on the hollow interior portion **35** of the outer member **22**. While longitudinal protrusion **30, 31** is shown, these could be replaced by raised areas of any desired shape provided that there is interlocking between the indentation region **33** and the longitudinal protrusions **30, 31**. Longitudinal protrusion **30, 31** features may take the form of bumps, pyramids, rings, and the like.  
15           Moreover, longitudinal protrusions **30, 31** may form any pattern. In one non-limiting example, the longitudinal protrusions **30, 31** may form the pattern of two rows. Preferably, the longitudinal protrusions **30, 31** projects radially outward from the inner member **27** by at least about 0.1 mm, and more preferably, by at least about 1 mm, and most preferably, by at least about 3 mm.

20           The longitudinal protrusions **30, 31** can be joined to the inner member **27** or formed in the inner member **27** in any way known in the art. The longitudinal protrusions **30, 31** can also be monolithic with the inner member **27**, for example, by molding the longitudinal protrusions **30, 31** and the inner member **27** as one piece. In one non-limiting example, the longitudinal protrusions **30, 31** can be joined to the outer member  
25           **22** by friction fitting that snaps parts together, gluing, and/or melting.

          Longitudinal protrusions **30, 31** are typically formed inherently by the embossing process. While any conventional embossing technique can be utilized, a preferred method is to support the inner **27** member on a central mandrel having circumferential ridges in its surface, and contact the surface of the inner member **27** with a set of rolling  
30           dies having indentations corresponding in shape to the ridges on the mandrel. It is also preferred that heat be employed during the embossing process to enhance the formability of the paper.

### C. TAMPON APPLICATOR MATERIALS

Different tampon applicator parts can be constructed from different materials and processes. The tampon applicator or any part of the tampon applicator can be formed of a spirally wound, convolutedly wound, or longitudinally seamed hollow tube that is formed  
5 from paper, paperboard, cardboard, or any combinations thereof. The tampon applicator or any part of the tampon applicator can also be injection molded, extruded, or formed from flexible plastic, such as thermoformed from plastic sheet or folded or wound from plastic film.

The tampon applicator or any part of the tampon applicator can be constructed  
10 from a single ply of material or be formed from two or more plies that are bonded together to form a laminate. The use of two or more plies or layers is preferred for it enables the manufacturer to use certain materials in the various layers that can enhance the performance of the tampon applicator or any part of the tampon applicator. When two or more plies are utilized, all the plies can be spirally wound, convolutedly wound, or  
15 longitudinally seamed to form an elongated cylinder. The tampon applicator or any part of the tampon applicator can be constructed using a smooth thin ply of material on the outside or exterior surface that surrounds a coarser and possibly thicker ply. When the tampon applicator or any part of the tampon applicator contains at least three plies, the middle ply can be the thicker ply, and the interior and exterior plies can be smooth and/or  
20 slippery to facilitate the expulsion of the tampon and to facilitate the insertion of the tampon applicator or any part of the tampon applicator into a woman's vagina. By sandwiching a thick, coarser ply of material between two thin, smooth plies, a tampon applicator or any part of the tampon applicator can be provided which is very functional. The tampon applicator or any part of the tampon applicator should contain one to four  
25 plies, although more plies can be utilized if desired.

The plies forming the tampon applicator or any part of the tampon applicator can be held together by an adhesive, such as glue, heat, pressure, ultrasonic, or any combinations thereof. The adhesive can be either water-soluble or water-insoluble. A water-soluble adhesive is preferred for environmental reasons in that the tampon  
30 applicator or any part of the tampon applicator will quickly break apart when it is immersed in water. Such immersion will occur should the tampon applicator or any part of the tampon applicator be disposed of by flushing it down a toilet. Exposure of the

tampon applicator or any part of the tampon applicator to a municipal's waste treatment plant wherein soaking in water, interaction with chemicals, and agitation all occur, will cause the tampon applicator or any part of the tampon applicator to break apart and evenly disperse in a relatively short period of time.

5           The tampon applicator is preferably constructed from 1 to 4 plies of paper, preferably three plies, and has a thickness of from about .127 mm to .559 mm, more preferably about .254 mm. The outer surface of the inner member **27** is preferably spaced from the inner surface of the outer member **22** by about .1 mm to 4 mm.

#### EXAMPLES

10           The following is a listing of examples illustrating various embodiments of the present invention. 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.

15           Example 1: The tampon applicator of the present invention can comprise the outer member of the length of 70 millimeters, an inner member of the length of 73 millimeters, and a tampon of the length of 42 millimeters.

          The outer member includes an indentation region located 10 millimeters from the gripper end along the longitudinal axis. The indentation region has a depth of .3 millimeters.

20           The inner member includes a longitudinal protrusion located 5 millimeters from the first end of the inner member along the longitudinal axis. This longitudinal protrusion has a height of .3 millimeters. Another longitudinal protrusion is located 3 millimeters from the second end of the inner member along the longitudinal axis. This longitudinal protrusion has height of .3 millimeters.

25           Example 2: The tampon applicator of the present invention can comprise the outer member of the length of 70 millimeters, an inner member of the length of 73 millimeters, and a tampon of the length of 50 millimeters.

30           The outer member includes an indentation region located 5 millimeters from the gripper end along the longitudinal axis. The indentation region has a depth of .5 millimeters.

          The inner member includes a longitudinal protrusion located 5 millimeters from the first end of the inner member along the longitudinal axis. This longitudinal protrusion

has a height of .5 millimeters. Another longitudinal protrusion is located 3 millimeters from the second end of the inner member along the longitudinal axis. This longitudinal protrusion has a height of .5 millimeters.

Example 3: The tampon applicator of the present invention can comprise the  
5 outer member of the length of 67.7 millimeters, an inner member of the length of 66.7 millimeters, and a tampon of the length of 46 millimeters.

The outer member includes an indentation region located 15 millimeters from the gripper end along the longitudinal axis. The indentation region has a depth of .8 millimeters.

10 The inner member includes a longitudinal protrusion located 5 millimeters from the first end of the inner member along the longitudinal axis. This longitudinal protrusion has a height of .8 millimeters. Another longitudinal protrusion is located 3 millimeters from the second end of the inner member along the longitudinal axis. This longitudinal protrusion has a height of .8 millimeters.

15 Example 4: The tampon applicator of the present invention can comprise the outer member of the length of 70 millimeters, an inner member of the length of 73 millimeters, and a tampon of the length of 48 millimeters.

The outer member includes an indentation region located 25 millimeters from the gripper end along the longitudinal axis. The indentation region has a depth of .7  
20 millimeters.

The inner member includes a longitudinal protrusion located 5 millimeters from the first end of the inner member along the longitudinal axis. This longitudinal protrusion has a height of .7 millimeters. Another longitudinal protrusion is located 3 millimeters from the second end of the inner member along the longitudinal axis. This longitudinal  
25 protrusion has a height of .7 millimeters.

Example 5: The tampon applicator of the present invention can comprise the outer member of the length of 70 millimeters, an inner member of the length of 73 millimeters, and a tampon of the length of 45 millimeters.

The outer member includes an indentation region located 20 millimeters from the  
30 gripper end along the longitudinal axis. The indentation region has a depth of .6 millimeters.

The inner member includes a longitudinal protrusion located 5 millimeters from the first end of the inner member along the longitudinal axis. This longitudinal protrusion has a height of .6 millimeters. Another longitudinal protrusion is located 3 millimeters from the second end of the inner member along the longitudinal axis. This longitudinal protrusion has a height of .6 millimeters.

The citation of any document is not to be construed as an admission that it is prior art with respect to the present invention.

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.

**THE EMBODIMENTS OF THE INVENTION FOR WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:**

1. A tampon applicator comprising:
  - a.) an outer member adapted to house a tampon;
  - b.) an inner member adapted to be received by the outer member and comprising a first end having a diameter and a second end having a diameter;
    - i. said first end is spaced a first distance from a first longitudinal protrusion, said first longitudinal protrusion having a diameter greater than the diameter of said first end, wherein said first distance is from about 1 mm to 7 mms;
    - ii. said second end is spaced a second distance from a second longitudinal protrusion, said second longitudinal protrusion having a diameter greater than the diameter of said second end, wherein said second distance is from about 1 mm to about 7 mms.
2. The tampon applicator of Claim 1 wherein said outer member comprises an insertion end, a gripper end, and an interior surface.
3. The tampon applicator of Claim 1 or 2 wherein said first distance is less than 5 mms.
4. The tampon applicator of Claim 1 or 2 wherein said first distance is less than 3 mms.
5. The tampon applicator of any one of Claims 1 to 4 wherein said second distance is less than 5 mms.
6. The tampon applicator of any one of Claims 1 to 4 wherein said second distance is less than 3 mms.

7. The tampon applicator of Claim 1 wherein said first distance is less than 5 mms and said second distance is less than 5 mms.
8. The tampon applicator of Claim 1 wherein said first distance is less than 3 mms and said second distance is less than 5 mms.
9. The tampon applicator according to any one of Claims 1 to 8 wherein the tampon applicator is comprised of plastic.
10. The tampon applicator according to any one of Claims 1 to 8 wherein the tampon applicator is comprised of cardboard.
11. The tampon applicator of any one of Claims 2 to 10 wherein said outer member further comprises an indentation region comprising a depth dimension  $D$ , wherein said gripper end is spaced a distance to said indentation region.
12. The tampon applicator of Claim 11 wherein said depth dimension  $D$  is from about 2.5 mm to about 3.5 mm.
13. The tampon applicator of Claim 11 or 12 wherein said indentation region and said first longitudinal protrusion interlock to resist withdrawal of said inner member from said outer member.
14. The tampon applicator of Claim 11 or 12 wherein said indentation region and said second longitudinal protrusion interlock to resist withdrawal of said inner member from said outer member.
15. An applicator device capable of housing an insertable element comprising:
  - a.) an outer member comprising an insertion end and a gripper end;

- b.) an inner member adapted to be received by the outer member, said inner member comprising a first end having a diameter and a second end having a diameter, and having a longitudinal axis;
  - i. said first end is spaced a first distance from a first raised portion wherein said first raised portion extends radially outward, away from the longitudinal axis of said inner member, said first raised portion having a diameter greater than the diameter of said first end;
  - ii. said second end is spaced a second distance from a second raised portion, wherein said second raised portion extends radially outward, away from the longitudinal axis of said inner member, said second raised portion having a diameter greater than the diameter of said second end.
- 16. The tampon applicator of Claim 15 further comprising an indentation region, wherein said gripper end is spaced a distance to said indentation region on an interior surface of said gripper end.
- 17. The applicator device of Claim 16 wherein said indentation region and said first raised portion interlock to resist withdrawal of said inner member from said outer member.
- 18. The applicator device of Claim 16 wherein said indentation region and said second raised portion interlock to resist withdrawal of said inner member from said outer member.
- 19. A tampon applicator comprising:
  - a.) an outer member adapted to house a tampon;
  - b.) an inner member adapted to be received by the outer member and comprising a first end and a second end, wherein said second end has a diameter, and is spaced a distance from a longitudinal protrusion having

a diameter, wherein the diameter of said longitudinal protrusion is greater than the diameter of said second end.

20. A tampon applicator comprising:
- a.) an outer member adapted to house a tampon;
  - b.) an inner member adapted to be received by the outer member and comprising a first end and a second end, wherein said first end is housed within said outer member, wherein said second end has a diameter and is exposed, said second end is spaced a distance from a longitudinal protrusion having a diameter, wherein the diameter of said longitudinal protrusion is greater than the diameter of said second end.

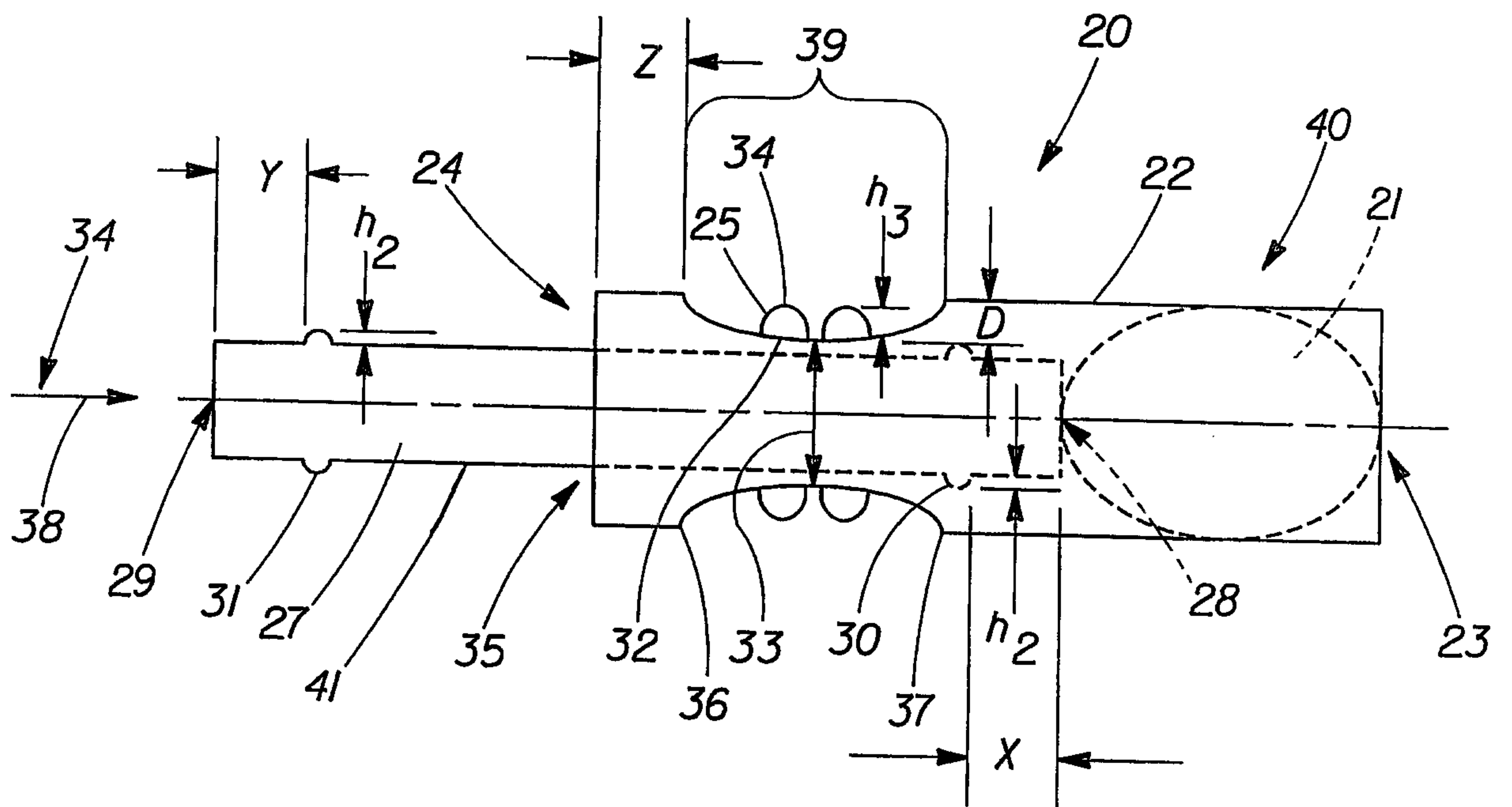


Fig. 1

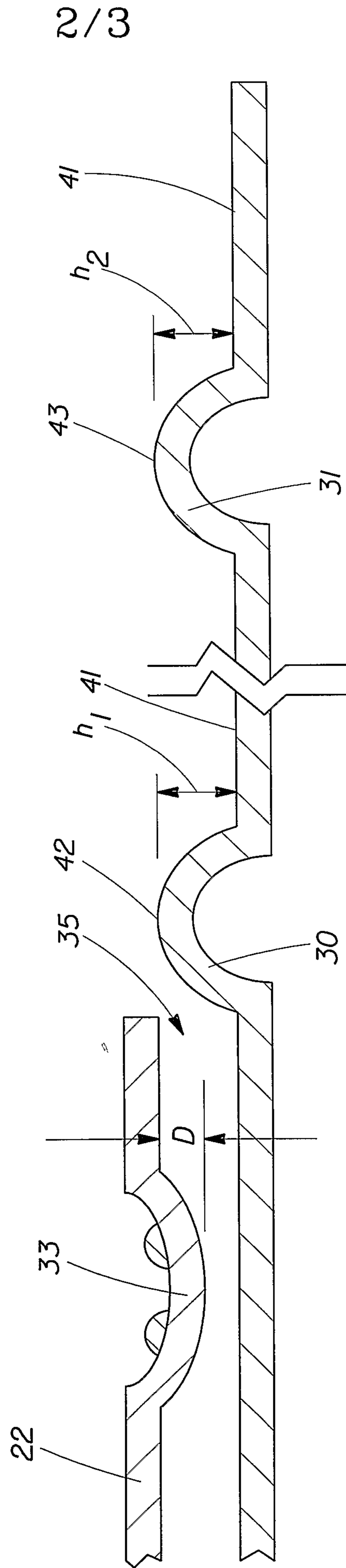


Fig. 2

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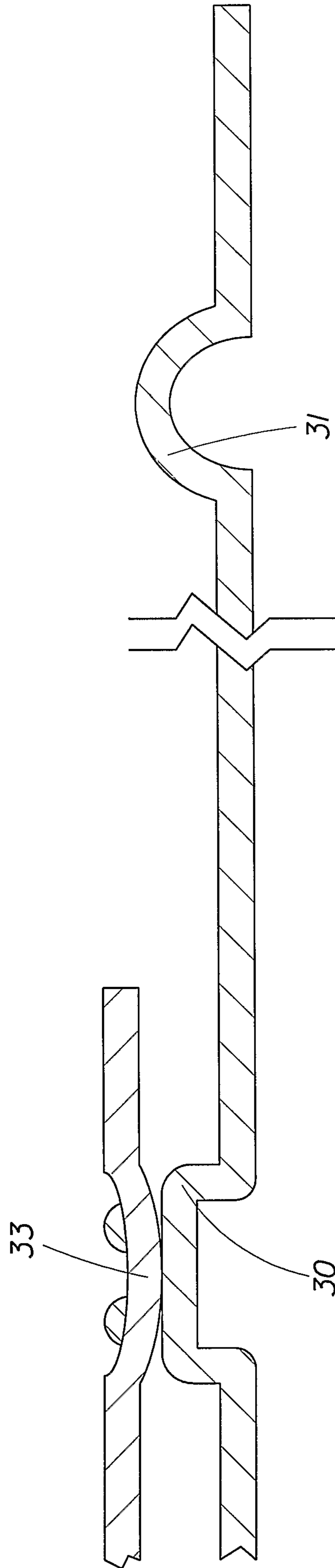


Fig. 3

