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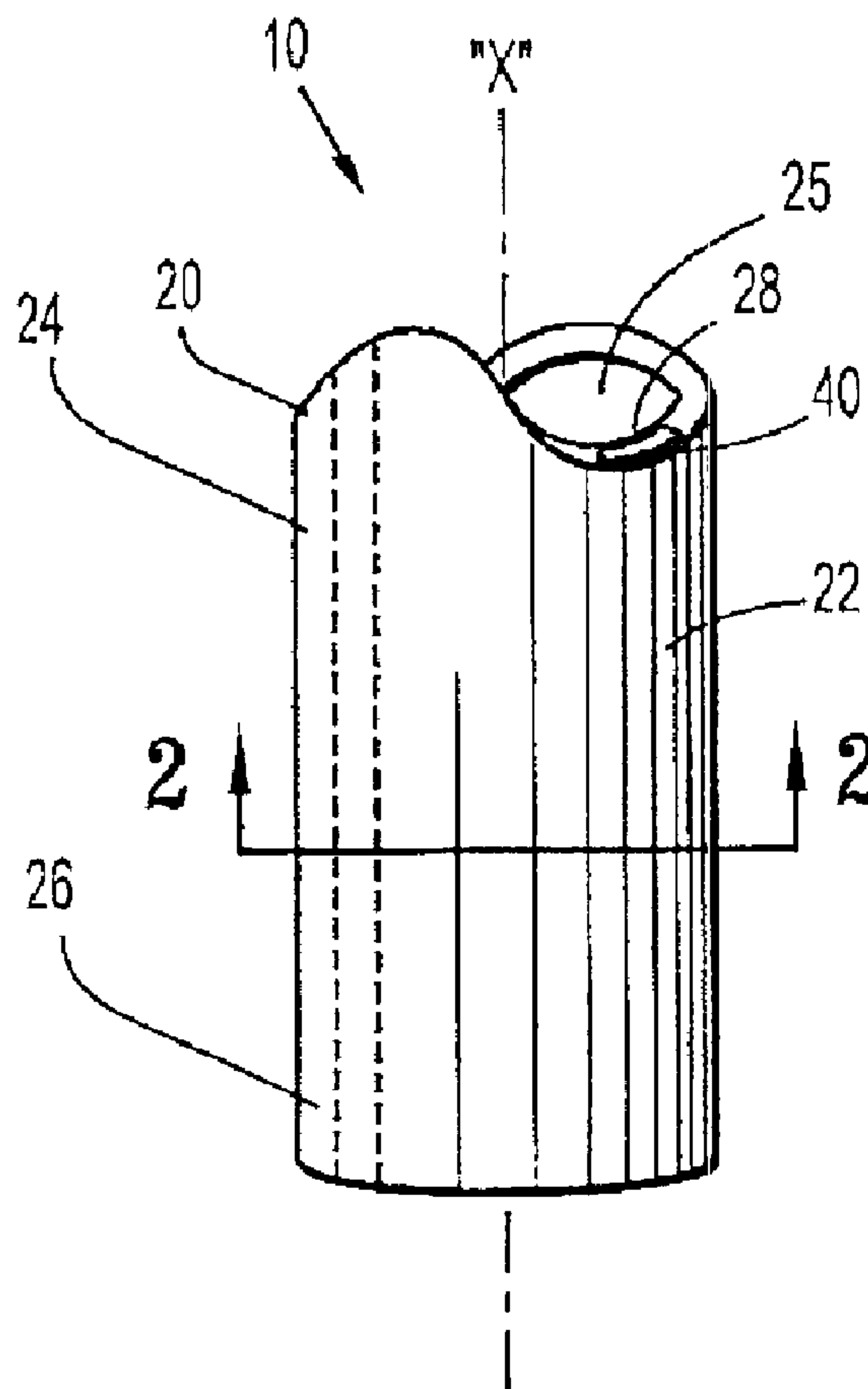

(57) Abrégé/Abstract:
A surgical portal device includes a body portion defining a longitudinal axis and having a proximal end, a distal end, and a lumen configured to allow a surgical instrument to pass therethrough. At least one securing member is disposed in mechanical

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(57) Abrégé(suite)/Abstract(continued):
cooperation with the body portion and is longitudinally translatable with respect to the body portion between a first, non-actuated position and a second, actuated position. The one securing mechanism has a fixation segment configured to grasp tissue when the one securing member is in the second, actuated position to facilitate fixation of the body portion within the tissue. The body portion may include a channel. The one securing member may be disposed at least partially within the channel and is longitudinally translatable with respect to the channel.

ABSTRACT

A surgical portal device includes a body portion defining a longitudinal axis and having a proximal end, a distal end, and a lumen configured to allow a surgical instrument to pass therethrough. At least one securing member is disposed in mechanical cooperation with the body portion and is longitudinally translatable with respect to the body portion between a first, non-actuated position and a second, actuated position. The one securing mechanism has a fixation segment configured to grasp tissue when the one securing member is in the second, actuated position to facilitate fixation of the body portion within the tissue. The body portion may include a channel. The one securing member may be disposed at least partially within the channel and is longitudinally translatable with respect to the channel.

PORTAL DEVICE

TECHNICAL FIELD

The present disclosure relates to surgical ports. More particularly, the present disclosure relates to surgical port having port fixation components to secure the device relative to tissue of a patient.

DESCRIPTION OF THE RELATED ART

Surgical ports, such as introducers, trocars, and cannulas, permit the introduction of a variety of surgical instruments into a body cavity or opening within a patient. In procedures, such as endoscopic, laparoscopic or arthroscopic surgeries, a passage is created through tissue to access an underlying surgical site in the body. A port or cannula is positioned within the passage. Surgical instruments are introduced within the cannula to perform a surgical procedure.

It may be advantageous to provide a portal device that can be removably placed within an incision or body opening of a patient to selectively fix the access device therein.

SUMMARY

A surgical portal device includes a body portion defining a longitudinal axis and having a proximal end, a distal end, and a lumen configured to allow a surgical instrument to pass therethrough. At least one securing member is disposed in mechanical cooperation with the body portion and is longitudinally translatable with respect to the body portion between a first, non-actuated position and a second, actuated position. The one securing mechanism has a fixation segment configured to grasp tissue when the one securing member is in the second, actuated position to facilitate fixation of the body portion within the tissue. The body portion may include a channel. The one securing member may be disposed at least partially within the channel and is longitudinally translatable with respect to the channel. The one securing member is dimensioned whereby the fixation segment extends distally beyond the distal end of the body portion when the one securing member is in the second, actuated position. The fixation segment of the one securing member may be adapted to extend radially outwardly relative to the longitudinal axis when the one securing member is in the second, actuated position. The fixation segment of the one securing member may comprise a shape memory alloy. First and second securing members may be provided. The first and second securing members may be at least partially accommodated within respective channels of the body portion. A conformable pad may be mounted to the fixation segment. The conformable pad may comprise an elastomeric material. The fixation segment may define a general needle shape.

A surgical method is also disclosed. The surgical method includes the steps of:

providing a surgical port, including:

a body defining a longitudinal axis;

a lumen extending through the body; and

at least one securing member disposed in mechanical cooperation with the body;

positioning the port at least partially within tissue;

moving the one securing member relative to the body from a non-actuated position to an actuated position such that a fixation segment of the securing member is exposed from the body portion and grasps tissue;

introducing a surgical instrument through the lumen of the body;

performing a surgical procedure with the surgical instrument;

returning the one securing member to the non-actuated position; and

removing the port from the tissue.

The surgical port may include at least two securing members and, wherein during the step of moving, the at least two securing members are moved from the non-actuated position to the actuated position such that the respective fixation segments grasp tissue.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the present disclosure will be better appreciated by reference to the drawings wherein:

FIG. 1 is a perspective view of a portal device in accordance with the present disclosure;

FIG. 2 is a cross-sectional view of the portal device of **FIG. 1** across **2-2**;

FIG.2A is a cross-sectional view of another embodiment of the portal device including a seal assembly therein according to an embodiment of the present disclosure;

FIG. 3 is a perspective view of another embodiment of a portal device of the present disclosure in a retracted position;

FIG. 3A is a perspective view of a portal device of the present disclosure in a deployed position;

FIGS. 4A-4B are side and top views, respectively, of an embodiment of a fastener of the present disclosure having a bull nose configuration;

FIGS. 5A-5B are side and top views, respectively, of an embodiment of a fastener of the present disclosure having a needle-like configuration;

FIGS. 6A-6B are side and top views, respectively, of an embodiment of a fastener of the present disclosure having a pad and foot configuration; and

FIG. 7 is a flow chart illustrating a surgical method incorporating the portal device.

DETAILED DESCRIPTION OF THE EMBODIMENTS

The device according to the present disclosure is suitable for facilitating the introduction of a surgical instrument into a surgical incision for performing endoscopic or laparoscopic procedures. It is envisioned that the device may be used in connection with other surgical procedures utilizing natural or formed openings in a body cavity of a patient. Embodiments of the present disclosure are illustrated in **FIGS. 1-6B**.

In the drawings and description which follows, the term "proximal," as is traditional, refers to the end of the surgical device or instrument of the present disclosure which is closest to the operator, while the term "distal" refers to the end of the device or instrument which is farthest from the operator.

Referring now to the drawings, in which like reference numerals identify identical or substantially similar parts throughout the several views. **FIGS. 1** and **2** illustrate, in perspective and cross-sectional views, respectively, surgical portal device **10** in accordance with the principles of the present disclosure. Portal device 10 includes a body portion or portal body **20** and securing structure **40**. Device **10** may be any device suitable for the intended purpose of accessing a body cavity, such as a trocar or cannula, and typically defines a passageway permitting introduction of surgical instrumentation therethrough. Portal device **10**, therefore, may be integrally formed with a trocar or cannula assembly. In the alternative, a trocar or cannula assembly may be placed through or secured to portal device **10**. Instrumentation includes a variety of surgical devices

utilized through a portal, such as those used during laparoscopic or endoscopic surgery, as is within the purview of those skilled in the art.

Device **10** may be used in a variety of surgical applications and is particularly adapted for use in laparoscopic surgery where the peritoneal cavity is insufflated with a suitable gas, e.g., CO_2, to raise the cavity wall from the internal organs therein. Portal device **10** supports the walls of the opening in an open position so that surgical instruments may be passed therethrough. Device **10** may include a securing structure having fasteners or grips which may be deployed to anchor the device into the surrounding tissue so that the device cannot substantially shift or be inadvertently move and/or removed.

Device **10** is typically used with an obturator assembly (not shown) which may be blunt, a non-bladed, or a sharp pointed instrument positionable within the passageway of device **10**. The obturator assembly is utilized to penetrate the abdominal wall and/or introduce device **10** at least partially through the abdominal wall. The obturator may then subsequently be removed from device **10** to permit introduction of surgical instrumentation utilized to perform the procedure through the passageway.

Portal body **20** may be a single monolithically formed unit or composed of several components connected to each other through conventional means, such as, for example, ultrasonic welding, or any other means envisioned by one skilled in the art. Portal body **20** may be formed of any suitable medical grade material, including metals such as stainless steel, titanium, and aluminum; other rigid materials, including polymeric materials such as polyetheretherketones, polycarbonate, polypropylene, polyethylene, and

composites thereof. Portal body **20** may be manufactured for a single use or can be sterilized and reused.

Portal body **20** includes body portion **22** having proximal end **24** and distal end **26**. Body portion **22** defines a longitudinal axis "x" extending along the length of body portion **22** and defines an internal longitudinal passageway or lumen **25** dimensioned to permit passage of surgical instrumentation (not shown). The cross-section of body portion **22**, as shown in **FIG. 2**, is illustrated as a circular ring which forms the longitudinal passageway or lumen **25** whereby other surgical instruments may be placed such that body portion **20** aids in the insertion of instruments, implants, and other surgical related apparatus. Further, the shape of body portion **22** may provide stiffness to body portion **22** so that it will not bend under the counter force of tissue. At least one channel **28** is longitudinally disposed within body portion **22** and may extend from proximal end **24** to distal end **26**. In the illustrated embodiment, channel **28** is substantially parallel to axis "x" of passageway **25**.

In embodiments in which portal body **20** is used with laparoscopic procedures, portal device **10** may also be configured to seal the body opening to maintain the pneumoperitoneum while permitting the introduction of surgical instrumentation. It is envisioned that seal assembly **60**, such as an instrument seal as illustrated in **FIG. 2A**, may be utilized. Seal assembly **60** defines one or more seal assembly openings **62** in general alignment with longitudinal axis "x". Seal assembly opening(s) **62** is configured and dimensioned such that insertion of a surgical instrument therethrough causes the material defining seal assembly opening **62** to engage the outer surface of the instrument

in a substantially fluid-tight manner to minimize the formation of gaps around the surgical instrument and to help prevent fluids, such as gases, from escaping therethrough. An air-tight seal, such as a duck-bill seal, may be used in conjunction with or as an alternative to an instrument seal. The air-tight seal may include a slit which is adapted to close in the absence of a surgical object and/or in response to insufflation gases of the pressurized cavity.

It is envisioned that seal assembly may be fabricated from a relatively rigid material such as medical grade stainless steel or a biocompatible polymeric material, or formed from a resilient and/or flexible material such as a fabric, foam, elastomeric material, or combinations thereof in order to bend or deform about an inserted instrument while absorbing off-axis motion. A suitable seal assembly is dislcosed in commonly assigned U.S. Patent Publication No. **2005/0212221 to Smith et al.**, the entire contents of which are hereby incorporated herein by reference herein.

Channel **28** is a arranged coincident with axis "x" and, as illustrated in **FIGS. 2** and **2A**, channel **28** may be fully or partially enclosed by body portion **22** of portal body **20**. Two and/or four channels are illustrated in the current embodiments, but it is envisioned that any number of channels may be disposed within body portion **22**. Channel(s) **28** may be symmetrically or asymmetrically arranged about axis "x." Symmetry may provide increased stability to portal device **10** when in use. Channel **28** is configured and dimensioned to accommodate securing member **40**. The shape of channel **28** is complementary to the shape of securing member **40**.

Referring now to **FIG. 3**, securing member **40** is longitudinally slidable and/or extendable within channel **28** of portal body **20**. In the illustrated embodiments, securing member **40** includes activation component **46** adjacent proximal end **24** of portal body **20**, fixation segment **50** adjacent distal end **26** of portal body **20**, and actuating member **48** extending along the length of channel **28** and connecting activation component **46** with fixation segment **50**.

The size and dimension of securing member **40** may vary. In embodiments, securing member **40** may be uniform in size and diameter along the length of portal body **20**. In other embodiments, securing member **40** may thicken, widen, and/or split towards distal end **26** of portal body **20**. By increasing the periphery of securing member **40**, more surface area is available for gripping tissue therewith. Accordingly, channel **28** of portal body **20** has a complementary geometry to accommodate securing member **40**. Multiple securing members **40** may be used in conjunction with a single portal to allow tissue grip in multiple directions. In one embodiment, diametrically opposed securing members **40** are at least partially disposed within respective channels **28** of portal body **20**.

Activation component **46** of securing member **40** is operably connected to actuating member **48** and accessible to the operator as it is located on proximal end **24** of portal body **20**. Activation component **46** and actuating member **48** may be monolithically formed or connected by means within the purview of those skilled in the art as described above. Activation component **46** may be a button, plunger, tab, trigger, or other activation component within the purview of those skilled in the art to help

distally and/or proximally translate actuating member **48** with respect to portal body **20**. It is also envisioned that actuating member **48** may be translated without the assistance of activation component **46**, for instance, remotely or by extending the length of actuating member **48** proximally beyond the length of channel **28**. In an embodiment with multiple securing members **40**, actuation component **46** may be operatively connected to each member **40** to simultaneously deploy the members **40**. in the alternative, each securing member **40** may be individually deployed.

Fixation segment **50** of securing member **40** is operably connected to or integral with actuating member **48** and maintained within channel **28** of portal body **20** in a pre-deployment, or retracted state. Fixation segment **50** and actuating member **48** may be monolithically formed or connected by means within the purview of those skilled in the art. Fixation segment **50** may be bull nose (**FIGS.** 4A-4B), needle shaped (**FIGS.** 5A-5B), or have a pad and foot configuration (**FIGS.** 6A-6B). Pad **52** may be mounted to fixation segment **50** and may comprise a compressible material such as an elastomeric material to conform to the tissue surfaces it engages to minimize trauma to the tissue. Fixation segment **50** may also be circular, oval, oblong, square, rectangular, or other regular or irregular shapes within the purview of those skilled in the art. Fixation segment **50** is dimensioned to emerge from distal end **26** of portal body **20** upon movement of actuating member **48** as illustrated in **FIG. 3A**.

Securing member **40** may be formed of spring steel. Spring steel has a very high resistance to creep under normal loads. Carbon or low-alloy steel may be processed to give it the hardness and yield strength needed in springs so that the steel

may return to its original shape after bending, twisting, or other deformation. In embodiments, actuating member **48** is formed from spring steel so that upon actuation of activation component **46**, actuating member **48** elongates to drive fixation segment **50** out of distal end **26** of portal body **20** and into surrounding tissue. In embodiments, fixation segment **50** may deflect in a radial outward direction relative to the longituidnal axis. Thus, with two opposed fixation segments **50**, positive grasping with the tissue surrounding the passage is achieved. Fixation segments **50** may be dimensioned to embed within the tissue or engage an underlying tissue lining, e.g., the abdominal lining.

It is also envisioned that any portion or all portions of securing member **40** may be made of a material that expands with temperature or stress-induced conditions, such as shape memory alloys or polymers. Shape memory alloys (SMAs) are a family of alloys having anthropomorphic qualities of memory and trainability and are particularly well suited for use with medical instruments. One of the most common SMAs is Nitinol which can retain shape memories for two different physical configurations and changes shape as a function of temperature. Recently, other SMAs have been developed based on copper, zinc and aluminum and have similar shape memory retaining features.

SMAs undergo a crystalline phase transition upon applied temperature and/or stress variations. A particularly useful attribute of SMAs is that after it is deformed by temperature/stress, it can completely recover its original shape on being returned to the original temperature. The ability of an alloy to possess shape memory is a result of the fact that the alloy undergoes a reversible transformation from an austenite

state to a martensite state with a change in temperature or stress-induced condition. This transformation is referred to as a thermoelastic martensite transformation.

Under normal conditions, the thermoelastic martensite transformation occurs over a temperature range which varies with the composition of the alloy, itself, and the type of thermal-mechanical processing by which it was manufactured. In other words, the temperature at which a shape is "memorized" by an SMA is a function of the temperature at which the martensite and austenite crystals form in that particular alloy. For example, Nitinol alloys can be fabricated so that the shape memory effect will occur over a wide range of temperatures, e.g., **-270**° to +**100**° Celsius.

Shape memory polymers (SMPs) may be used instead of, or may augment the use of, SMAs. SMPs are generally characterized as phase segregated linear block co-polymers having a hard segment and a soft segment. The hard segment is typically crystalline, with a defined melting point, and the soft segment is typically amorphous, with a defined glass transition temperature. In embodiments, however, the hard segment may be amorphous and have a glass transition temperature and the soft segment may be crystalline and have a melting point. The melting point or glass transition temperature of the soft segment is substantially less than the melting point or glass transition temperature of the hard segment.

When the SMP is heated above the melting point of the hard segment the material can be shaped. This shape can be memorized by cooling the SMP below the melting point of the hard segment. When the shaped SMP is cooled below the glass transition temperature of the soft segment while the shape is deformed, a new temporary

shape can be set. The original shape can be recovered by heating the material above the glass transition temperature of the soft segment but below the melting point of the hard segment. The recovery of the original shape, which is induced by an increase in temperature, is called the thermal shape memory effect.

In embodiments where actuating member **48** is formed of shape memory alloys or polymers, it is envisioned that actuation of activation component **46** causes actuating member **48** to elongate to drive fixation segment **50** out of distal end **26** of portal body **20** and into and/or around surrounding tissue. In embodiments, fixation segment **50** is formed of shape memory materials such that the fixation segment **50** curls or turns out as illustrated in **FIG. 3A**, or otherwise deviates from longitudinal axis "x" upon deployment in order to grip or pierce tissue.

FIG. 7 is a flow chart illustrating a method of use of the portal device **10**. In accordance with the method **100**, the portal device **10** is presented to the surgical environment. (STEP **102**). The portal device **10** is at least partially within tissue to provide access (STEP **104**) to an underlying targeted body organ or tissue. The securing members which are initially disposed within the channels of the port, i.e., in a retracted or non actuated position, are moved relative to the body from the non-actuated position to an actuated position such that a fixation segment of the securing member is exposed from the body portion and grasps tissue. (STEP **106**). This may be achieved, by depressing activation component **46** or otherwise causing actuating member **48** to longitudinally slide towards distal end **26** of portal body **20**. Movement of actuating member **48** in turn, causes fixation segment **50** to emerge from distal end **26** of portal body **20** to grip, pierce

or otherwise grasp surrounding tissue. Portal device **10**, in a deployed position, is securely attached to the surgical port within the opening of the patient. A surgical instrument is introduced through the lumen of the body (STEP **108**) followed by performance of a surgical procedure with the surgical instrument. (STEP **110**) Upon completion, the operator may press or lift activation component **48** to return the port access device **10** back to the retracted position or non-actuated position. (STEP **112**). The portal device may be removed from the tissue. (STEP **114**)

It will be understood that various modifications may be made to the embodiments disclosed herein. Therefore, the above description should not be construed as limiting, but merely as an exemplification of preferred embodiments. Those skilled in the art will envision other modifications within the scope and spirit of the present disclosure. Such modifications and variations are intended to come within the scope of the following claims.

WHAT IS CLAIMED IS:

1. A surgical portal device, comprising:

a body portion defining a longitudinal axis and having a proximal end, a distal end, and a lumen configured to allow a surgical instrument to pass therethrough; and

at least one securing member disposed in mechanical cooperation with the body portion and being longitudinally translatable with respect to the body portion between a first, non-actuated position and a second, actuated position, the one securing mechanism having a fixation segment configured to grasp tissue when the one securing member is in the second, actuated position to facilitate fixation of the body portion within the tissue.

2. The device of claim **1**, wherein the body portion includes a channel.

3. The device of claim **2**, wherein the one securing member is disposed at least partially within the channel and is longitudinally translatable with respect to the channel.

4. The device of claim **3**, wherein the one securing member is dimensioned whereby the fixation segment extends distally beyond the distal end of the body portion when the one securing member is in the second, actuated position.

5. The device of claim **4**, wherein the fixation segment of the one securing member is adapted to extend radially outwardly relative to the longitudinal axis when the one securing member is in the second, actuated position.

6. The device of claim **5**, wherein the fixation segment of the one securing member comprises a shape memory alloy.

7. The device of claim **5**, including first and second securing members, the first and second securing members being at least partially accommodated within respective channels of the body portion.

8. The device of claim **5**, including at least three securing members, the at least three second securing members being at least partially accommodated within respective channels of the body portion.

9. The device of claim **5**, including at least four securing members, the at least four securing members being at least partially accommodated within respective channels of the body portion.

10. The device of claim **1**, including a conformable pad mounted to the fixation segment.

11. The device of claim **10** wherein the conformable pad comprises an elastomeric material.

12. The device of claim **1** wherein the fixation segment defines a general needle shape.

13. A surgical method, comprising the steps of:

providing a surgical port, including:

a body defining a longitudinal axis;

a lumen extending through the body; and

at least one securing member disposed in mechanical cooperation with the body;

positioning the port at least partially within tissue;

moving the one securing member relative to the body from a non-actuated position to an actuated position such that a fixation segment of the securing member is exposed from the body portion and grasps tissue;

introducing a surgical instrument through the lumen of the body;

performing a surgical procedure with the surgical instrument;

returning the one securing member to the non-actuated position; and

removing the port from the tissue.

14. The surgical method of claim **13** wherein the surgical port includes at least two securing members and, wherein during the step of moving, the at least two securing members are moved from the non-actuated position to the actuated position such that the respective fixation segments grasp tissue;

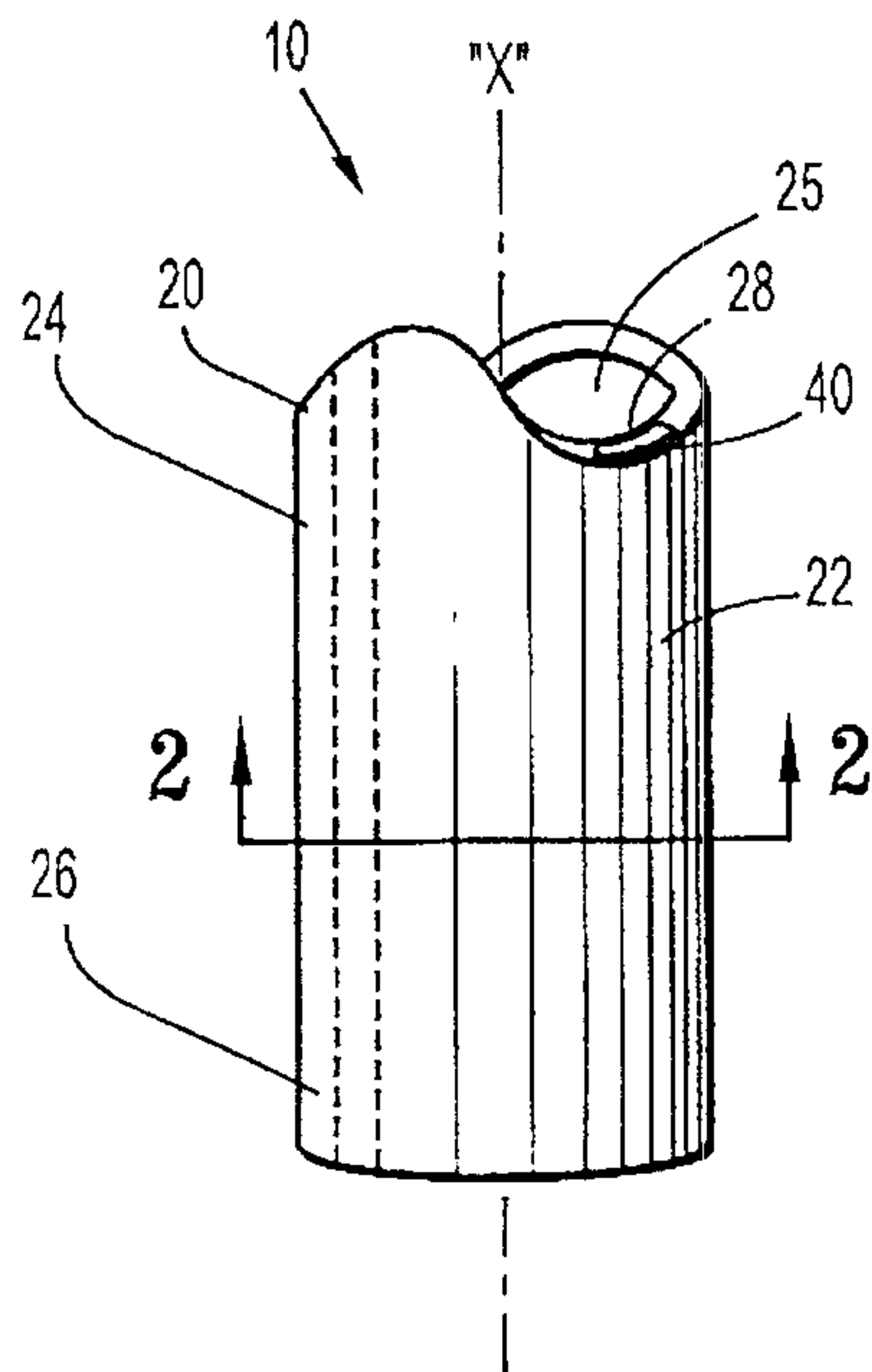


FIG. 1

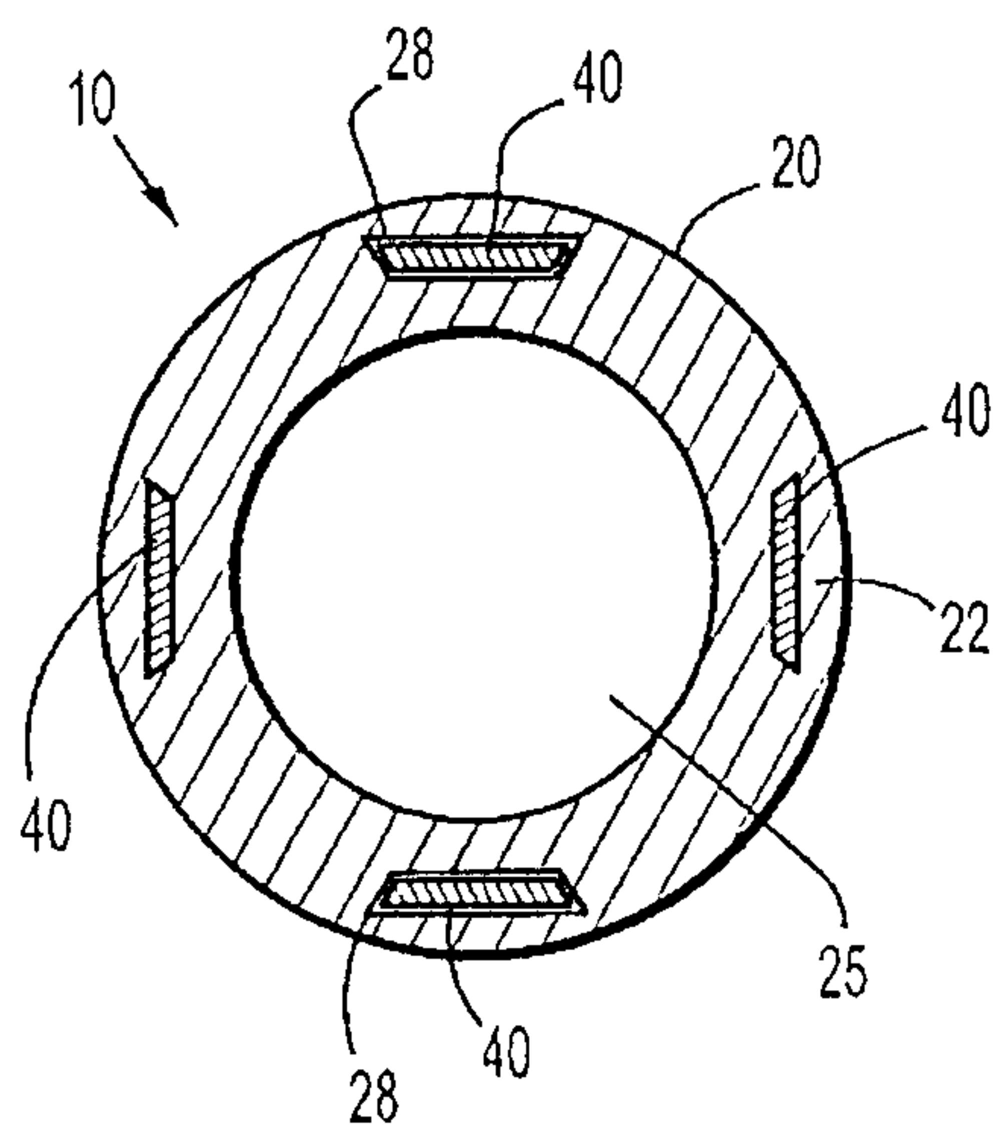


FIG. 2

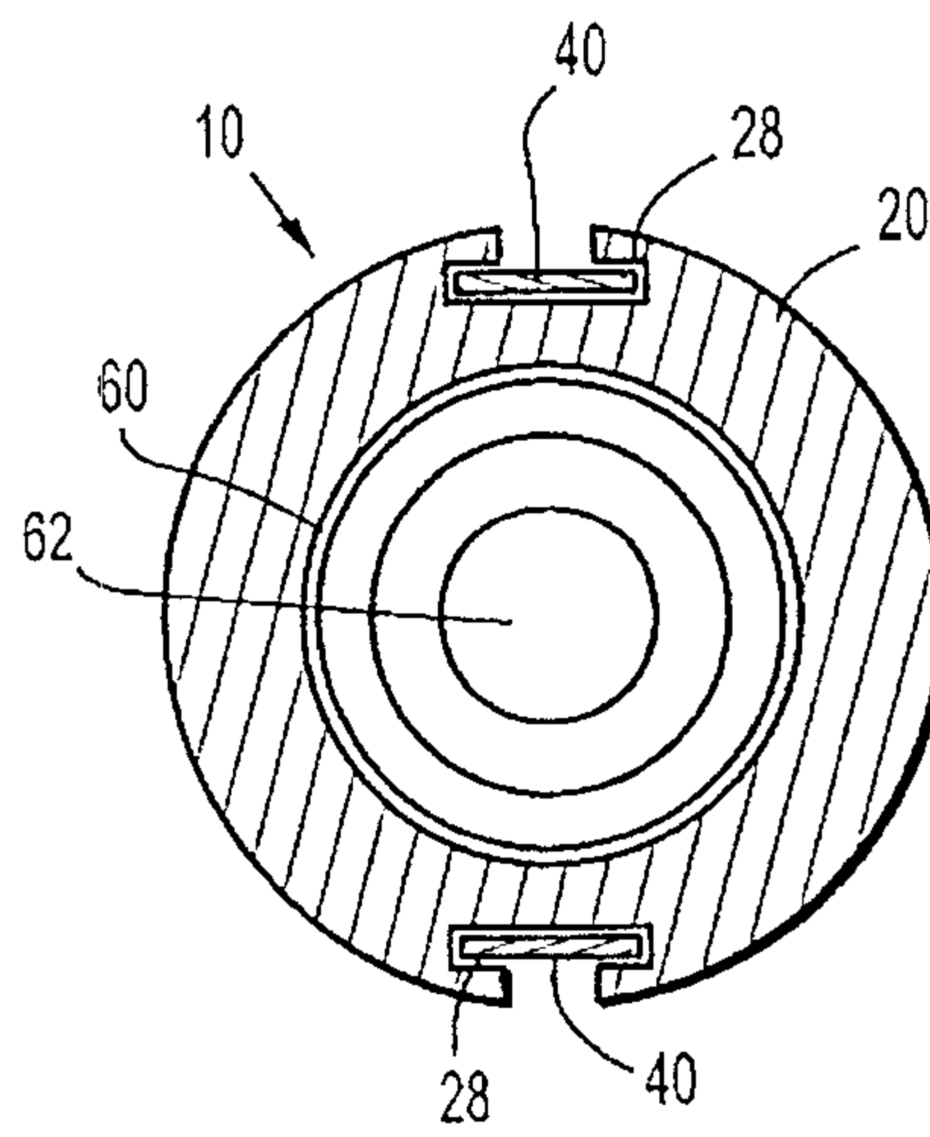


FIG. 2A

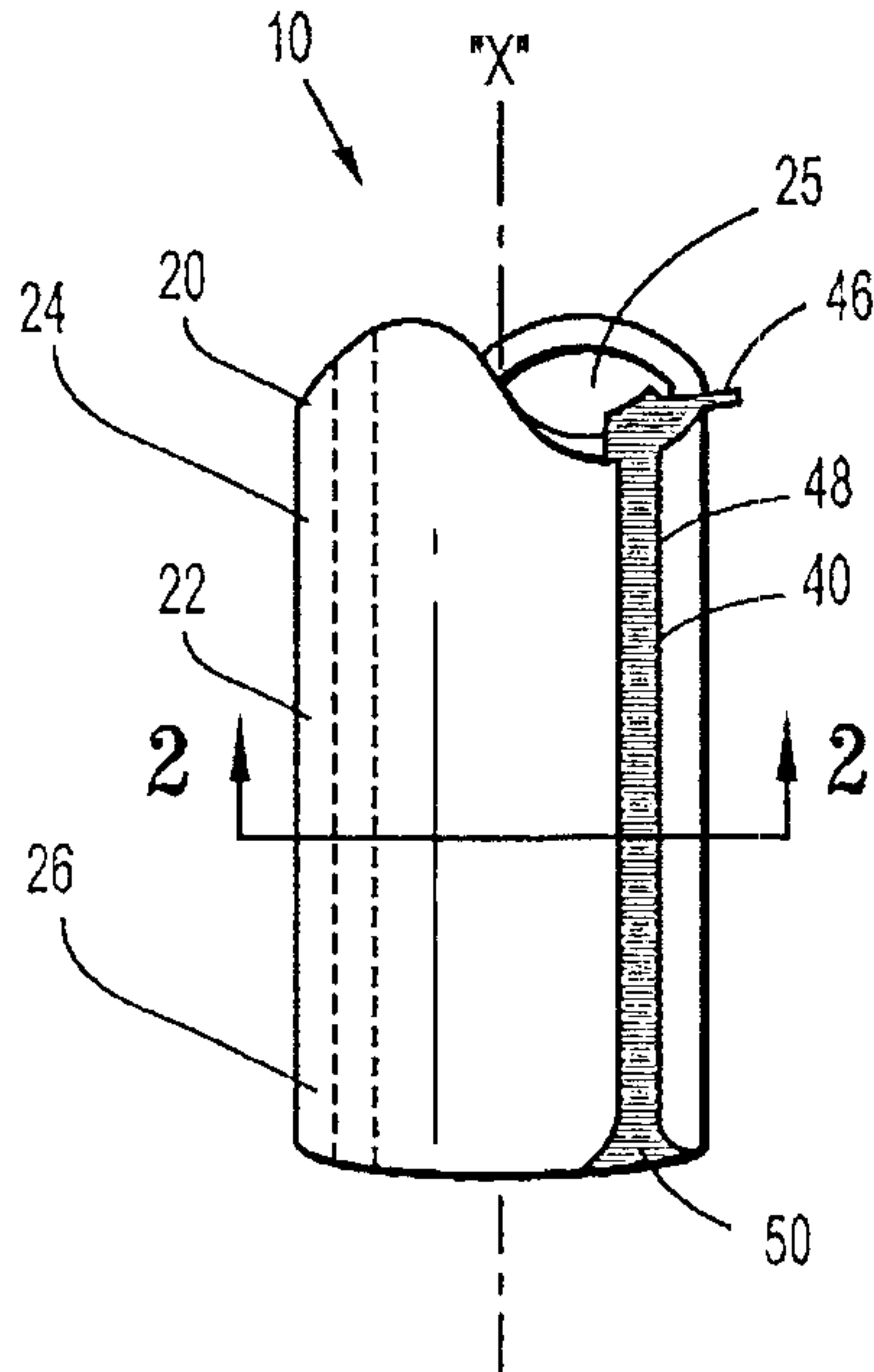


FIG. 3

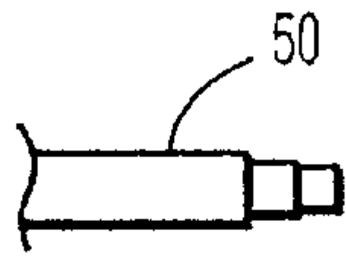


FIG. 4A

FIG. 5A

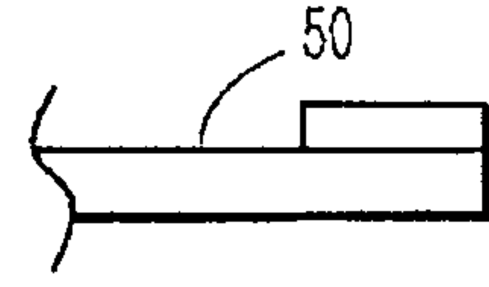


FIG. 6A

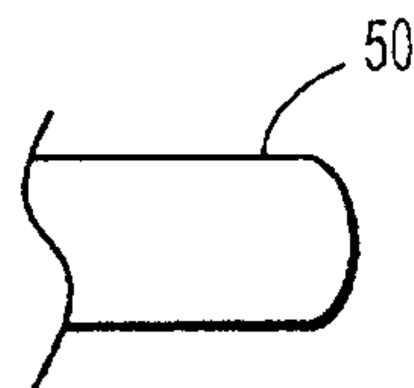


FIG. 4B

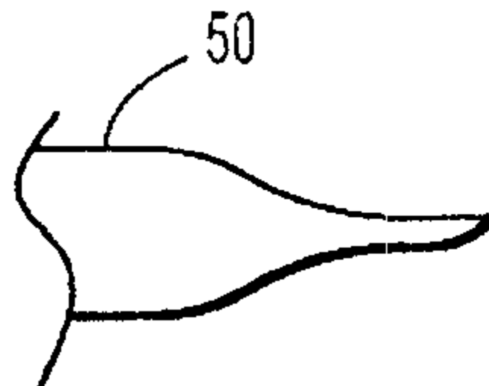


FIG. 5B

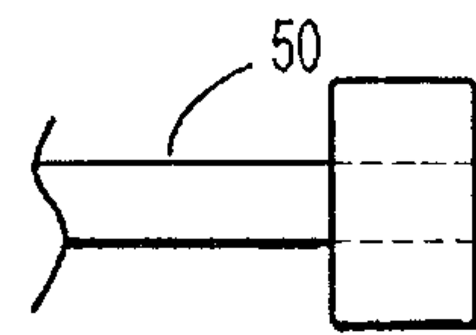


FIG. 6B

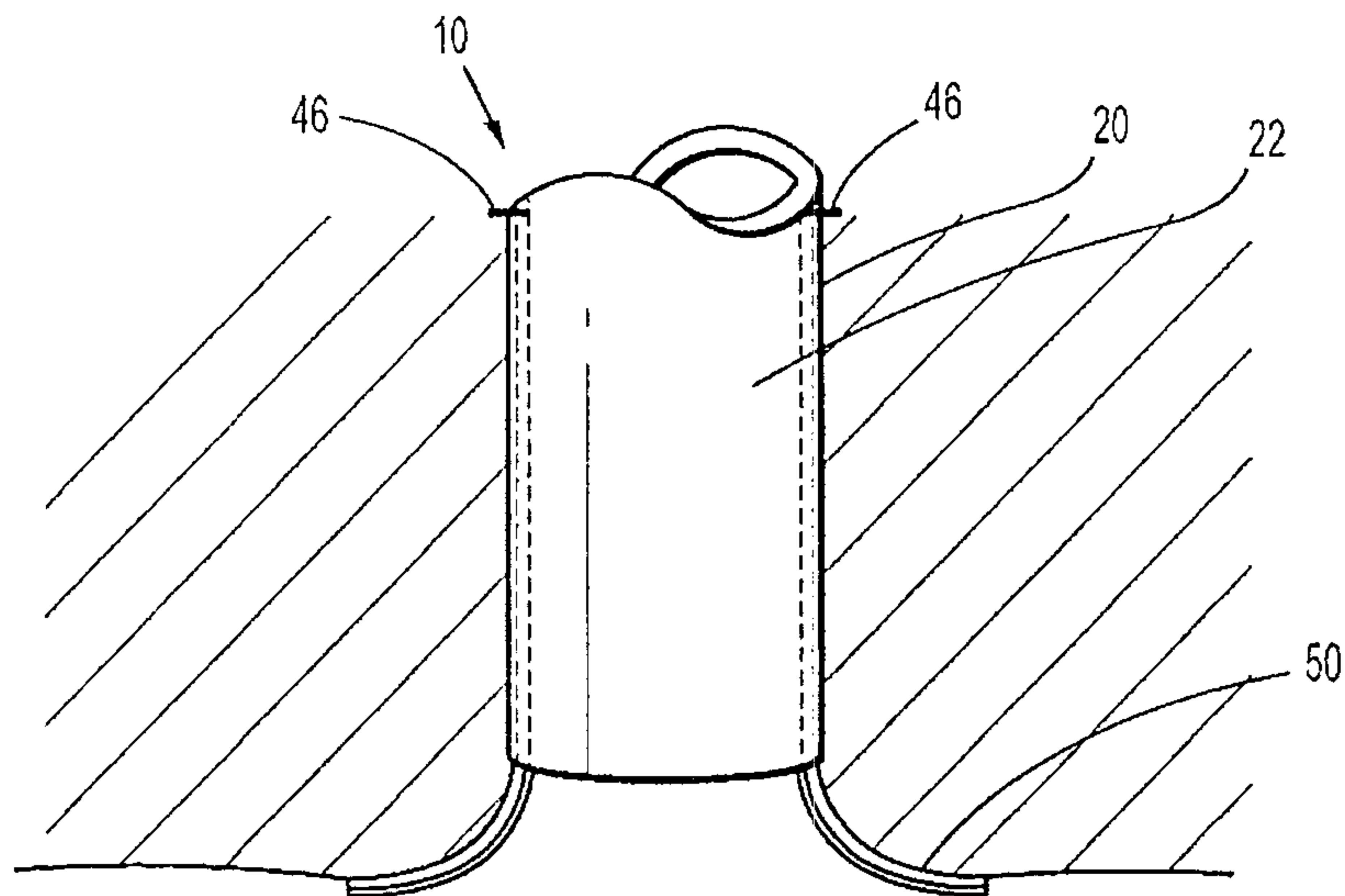


FIG. 3A

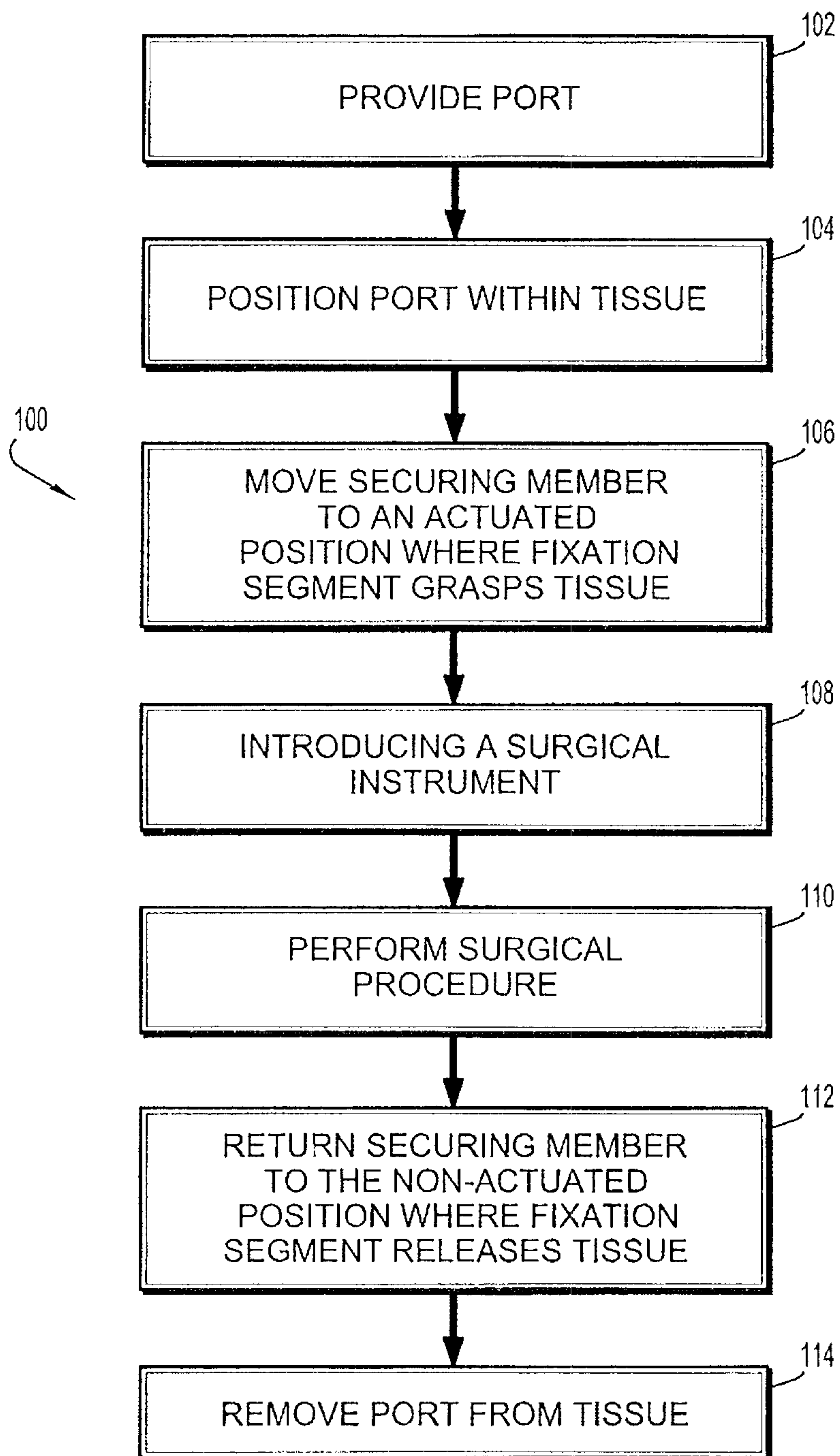
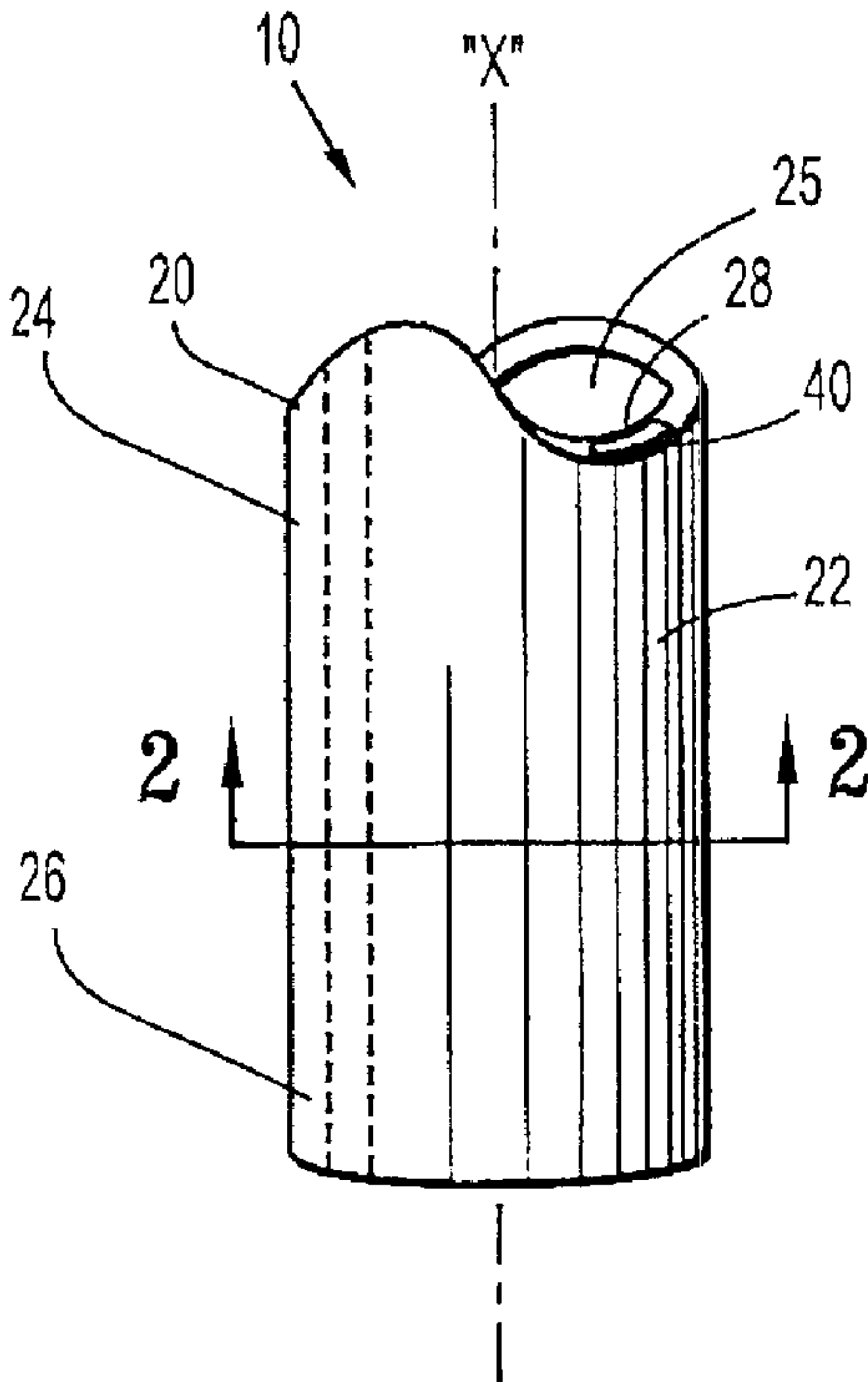


FIG. 7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