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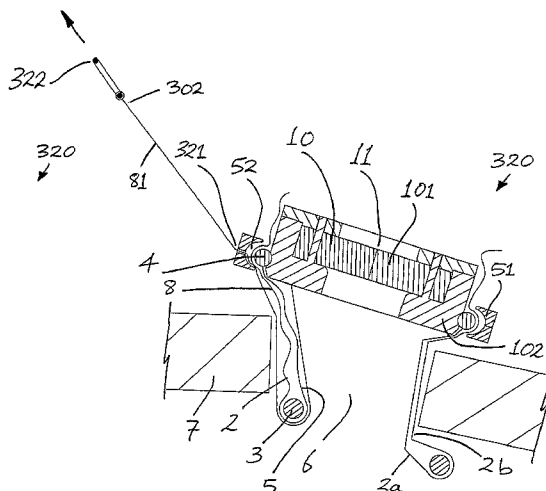
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(54) Title: A WOUND RETRACTOR



(57) Abstract: A wound retractor (320) comprises a distal ring (3) for insertion through a wound opening (6), a proximal ring (4) for location externally of the wound opening (6), a valve (10) mounted to the proximal ring (4), and a sleeve (2) for retracting laterally the sides of the wound opening (6). The wound retractor (320) also comprises a flexible release member (81) for releasing the distal ring (3) from a retracting configuration for removal of the distal ring (3) from the wound opening (6). A first end (301) of the release member (81) is attached to the valve housing (102), the release member (81) loops around the distal ring (3), and a second end (302) of the release member (81) is movable relative to the proximal ring (4) to release the distal ring (3) from the retracting configuration.

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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.*

“A wound retractor”

Introduction

5 This invention relates to a wound retractor. In particular this invention relates to a wound retractor for retracting laterally the sides of a wound opening to provide maximum exposure of an organ or body structures for examination and/or access for surgical procedures.

10 Some conventional wound retractors are difficult and cumbersome to use, and/or are relatively expensive. In addition, some conventional wound retractors are limited to use with a particular size of incision and a particular patient anatomy.

15 This invention is directed towards providing an improved wound retractor which will address at least some of these problems.

Statements of Invention

20 According to the invention there is provided a wound retractor comprising: -

- a distal member for insertion through a wound opening;
- a proximal member for location externally of the wound opening;
- 25 a connecting member extending at least between the distal member and the proximal member to retract laterally the sides of the wound opening; and

a release member for releasing the distal member from a retracting configuration for removal of the distal member from the wound opening;

5 the release member being configured to extend in two layers through the wound opening.

10 In the retracting configuration, the distal member is securely held in place in the retracted wound opening. By releasing the distal member from the retracting configuration, it is then possible to remove the distal member from the wound opening.

15 In one embodiment of the invention the release member extends in two layers between the distal member and the proximal member.

20 In another embodiment the retractor comprises a valve. The valve maintains gas pressure within the interior of the wound opening even when the wound opening is retracted. The valve may be mounted to the proximal member. The valve may be at least partially of a gelatinous elastomeric material. The valve may comprise a gelatinous elastomeric material portion and a housing portion. The housing portion may be mounted to the proximal member. The valve may comprise an opening extending therethrough. The opening through the valve facilitates access for instruments to pass through the valve and the retracted wound opening to access the interior of the wound opening. The opening may be biased towards a closed configuration. The opening is biased towards the closed configuration to minimise loss of gas pressure upon exchange of instruments through the opening. The opening may comprise a pinhole. The valve may be an instrument seal.

30 In another embodiment the release member is looped around the distal member. A first end of the release member may be attached to the proximal member and/or to the valve. The first end of the release member may be attached to the housing

portion of the valve. The first end of the release member may be fixedly attached to the proximal member and/or to the valve. A second end of the release member may be movable relative to the proximal member. The second end of the release member may be axially movable relative to the proximal member. The second end of the release member may be slidingly movable relative to the proximal member. The release member may be movable relative to the distal member. The release member may be slidingly movable relative to the distal member.

In another aspect of the invention there is provided a wound retractor comprising: -

- 10 a distal member for insertion through a wound opening;
- a proximal member for location externally of the wound opening;
- 15 a connecting member extending at least between the distal member and the proximal member to retract laterally the sides of the wound opening; and
- 20 a release member for releasing the distal member from a retracting configuration for removal of the distal member from the wound opening;
- 25 the release member having a stowed configuration in which a proximal end of the release member terminates substantially adjacent to the proximal member.

Before the release member is required to be used to release the distal member, the release member is stowed away. By stowing the release member, this provides for a neat, simple wound retractor without the risk of the release member obstructing the surgeon's potentially limited working space.

5 In one embodiment of the invention the retractor comprises a valve. The valve may be mounted to the proximal member. The valve may be at least partially of a gelatinous elastomeric material. The valve may comprise a gelatinous elastomeric material portion and a housing portion. The housing portion may be mounted to the proximal member. The valve may comprise an opening extending therethrough. The opening may be biased towards a closed configuration. The opening may comprise a pinhole. The valve may be an instrument seal.

10 In another embodiment in the stowed configuration the proximal end of the release member is attached to the proximal member and/or to the valve. In the stowed configuration the proximal end of the release member may be releasably attached to the proximal member and/or to the valve. The release member may be movable from the stowed configuration to a deployed configuration. In the stowed configuration, at least part of the release member may be substantially concertinaed. In the deployed configuration the proximal end of the release member may extend proximally of the proximal member. In the deployed configuration, the proximal end of the release member may be detached from the proximal member and/or from the valve.

20 In a further embodiment in the retracting configuration, the distal member is located in a plane substantially perpendicular to the longitudinal axis of a wound opening. In the retracting configuration, the distal member may engage an inner wall of body tissue adjacent a wound opening. The release member may be pullable to release the distal member from the retracting configuration. A distal end of the release member may be attached to the distal member.

30 In one embodiment the connecting member extends in two layers between the distal member and the proximal member. The release member may extend between the two layers of the connecting member. The release member may extend around the

two layers of the connecting member. The release member may be looped around the two layers of the connecting member.

In another embodiment at least part of the release member is substantially flexible. The release member may comprise a pull cord. The pull cord may comprise a ribbon. The release member may comprise a gripping portion. At least part of the gripping portion may be substantially rigid. The gripping portion may comprise a bead. The gripping portion may comprise a ring member. At least part of the gripping portion may be substantially flexible. The gripping portion may comprise a loop.

In another embodiment the connecting member comprises a sleeve. The sleeve acts to protect the sides of the retracted wound opening. The connecting member may have a proximal gripping portion for pulling the connecting member upwardly to shorten an axial extent located between the distal member and the proximal member. On release of the gripping portion the shortened axial extent between the distal member and the proximal member may be substantially maintained without a requirement for an additional locking device. The proximal gripping portion may be provided at a proximal end portion of the connecting member. The connecting member may be fixed to the proximal member at a first end portion and may be movable over the proximal member at a second end portion. The connecting member may be axially slidable over the proximal member at the second end portion. The second end portion of the connecting member may be slidably received over a portion of the proximal member to allow relative movement between the connecting member and the proximal member to shorten the axial extent of the connecting member located between the distal member and the proximal member. The portion of the proximal member that slidably receives the connecting member may include an outer portion of the proximal member. The second end portion of the connecting member may be biased against the proximal member. The proximal member may be located within the connecting member.

In one embodiment the proximal member forms a part of a securing arrangement configured to substantially fix the axial extent of the connecting member located between the distal member and the proximal member at a desired length. The  
5 connecting member may extend from the proximal member, around the distal member, and has a return section outside of the proximal member, the return section providing the proximal gripping portion. The distal member may comprise a distal ring. The distal ring may be an O-ring. The distal ring may be formed of an elastomeric material. The proximal member may comprise a proximal ring. The  
10 proximal ring may be an O-ring. The proximal ring may be relatively rigid with respect to the distal ring. The connecting member may be of a pliable material.

In another embodiment the retractor comprises a guide member for a proximal portion of the connecting member. The connecting member may extend between the  
15 guide member and the proximal member. The release member may extend at least partially between the guide member and the proximal member.

The release member may extend proximally substantially longitudinally into the space between the guide member and the proximal member. The release member  
20 may extend proximally substantially longitudinally out of the space between the guide member and the proximal member. The release member may extend proximally substantially transversely out of the space between the guide member and the proximal member. The release member may extend through an opening in a wall of the guide member. The guide member may comprise a receiver for the proximal  
25 member. The guide member may have an inwardly facing recess defining a receiver for the proximal member. The proximal member may comprise a proximal ring and the recess may have a shape which is complementary to that of the proximal ring. The recess may be substantially C-shaped in transverse cross section.



In another embodiment the retractor comprises a lock for locking the guide member to the proximal member. The guide member may be engageable with the proximal member to provide the lock.

5 In one case the invention provides a wound protector and retractor.

The invention also provides in another aspect a method of performing a surgical procedure, the method comprising the steps of: -

10 inserting a distal member of a wound retractor through a wound opening;

15 locating a proximal member of the wound retractor externally of the wound opening, with a release member of the wound retractor in a stowed configuration with a proximal end of the release member terminating substantially adjacent to the proximal member;

20 retracting laterally the sides of the wound opening using a connecting member of the wound retractor;

releasing the distal member from a retracting configuration; and

removing the distal member from the wound opening.

25 In one embodiment of the invention the method comprises the step of inserting an object through the retracted wound opening to access interior of the wound opening. The object may comprise an instrument. The retracted wound opening may be sealed. The method may comprise the step of inserting an object through the retracted wound opening while maintaining the retracted wound opening sealed.

30

In another embodiment a release member is pulled to release the distal member from the retracting configuration. The release member may be moved from the stowed configuration to a deployed configuration before releasing the distal member from the retracting configuration. The proximal end of the release member may be moved  
5 proximally relative to the proximal member to move the release member from the stowed configuration to the deployed configuration. The method may comprise the step of detaching the release member from the proximal member and/or from a valve.

10 In another embodiment the method comprises the step of gripping a portion of the connecting member and pulling the connecting member upwardly to shorten an axial extent of the connecting member located between the distal member and the proximal member. On release of the gripped portion the shortened axial extent of the  
15 connecting member between the distal member and the proximal member may be substantially maintained. The connecting member may be fixed to the proximal member at a first end portion and may extend over the proximal member at a second end portion, and the method may comprise the step of moving the connecting member over the proximal member as the connecting member is pulled upwardly to  
20 shorten the axial extent of the connecting member located between the distal member and the proximal member. The step of moving the connecting member relative to the proximal member may include sliding a portion of the connecting member against a radially outer portion of the proximal member.

In one case the retracted wound opening is of a size to receive an instrument. The  
25 connecting member may protect the sides of the retracted wound opening.

According to another aspect of the invention there is provided a wound retractor comprising: -

30 a distal member for insertion through a wound opening;

a proximal member for location externally of the wound opening;

5 a connecting member extending at least between the distal member and the proximal member to retract laterally the sides of the wound opening; and

10 a release member for releasing the distal member from a retracting configuration for removal of the distal member from the wound opening.

15 In one embodiment in the retracting configuration, the distal member is located in a plane substantially perpendicular to the longitudinal axis of a wound opening. In the retracting configuration, the distal member may engage an inner wall of body tissue adjacent a wound opening.

20 In one case the retractor comprises a valve. The valve may be mounted to the proximal member. The valve may be at least partially of a gelatinous elastomeric material. The valve may comprise a gelatinous elastomeric material portion and a housing portion. The housing portion may be mounted to the proximal member.

In one case the valve comprises an opening extending therethrough. The opening may be biased towards a closed configuration. The opening may comprise a pinhole. The valve may be an instrument seal.

25 In another embodiment the release member is pullable to release the distal member from the retracting configuration.

A distal end of the release member may be attached to the distal member. A proximal end of the release member may be attached to the proximal member and/or

to the valve. The proximal end of the release member may be releasably attached to the proximal member and/or to the valve.

5 In another case the release member is movable from a stowed configuration to a deployed configuration. In the stowed configuration, at least part of the release member may be substantially constrained. In the stowed configuration, a proximal end of the release member may be attached to the proximal member and/or to the valve. In the deployed configuration, a proximal end of the release member may be detached from the proximal member and/or from the valve.

10

In another embodiment the release member extends in two layers between the distal member and the proximal member. The release member may be looped around the distal member. A first end of the release member may be attached to the valve. The first end of the release member may be attached to the housing portion. The first end of the release member may be fixedly attached to the valve.

15

In one case a second end of the release member is movable relative to the proximal member. The second end of the release member may be axially movable relative to the proximal member. The second end of the release member may be slidably movable relative to the proximal member.

20

In another case the release member is movable relative to the distal member. The release member may be slidably movable relative to the distal member.

25

In a further embodiment the connecting member extends in two layers between the distal member and the proximal member. The release member may extend between the two layers of the connecting member.

In another embodiment the release member extends around the two layers of the connecting member. The release member may be looped around the two layers of the connecting member.

5 At least part of the release member may be substantially flexible. The release member may comprise a pull cord. The pull cord may comprise a ribbon.

In a further case the release member comprises a gripping portion. At least part of the gripping portion may be substantially rigid. The gripping portion may comprise  
10 a bead. The gripping portion may comprise a ring member.

In one embodiment at least part of the gripping portion is substantially flexible. The gripping portion may comprise a loop.

15 In one case the connecting member comprises a sleeve. The connecting member may have a proximal gripping portion for pulling the connecting member upwardly to shorten an axial extent located between the distal member and the proximal member. On release of the gripping portion the shortened axial extent between the distal member and the proximal member may be substantially maintained without a  
20 requirement for an additional locking device. The proximal gripping portion may be provided at a proximal end portion of the connecting member.

In one case the connecting member is fixed to the proximal member at a first end portion and is movable over the proximal member at a second end portion. The  
25 connecting member may be axially slidable over the proximal member at a second end portion. The second end portion of the connecting member may be slidingly received over a portion of the proximal member to allow relative movement between the connecting member and the proximal member to shorten the axial extent of the connecting member located between the distal member and the proximal member.  
30 The portion of the proximal member that slidingly receives the connecting member

may include an outer portion of the proximal member. The second end portion of the connecting member may be biased against the proximal member.

In one embodiment the proximal member is located within the connecting member.

5

The proximal member may form a part of a securing arrangement configured to substantially fix the axial extent of the connecting member located between the distal member and the proximal member at a desired length. The connecting member may extend from the proximal member, around the distal member, and may have a return section outside of the proximal member, the return section providing the proximal gripping portion.

10

In one case the distal member comprises a distal ring. The distal ring may be an O-ring. The distal ring may be formed of an elastomeric material.

15

The proximal member may comprise a proximal ring. The proximal ring may be an O-ring. The proximal ring may be relatively rigid with respect to the distal ring.

In one case the connecting member is of a pliable material.

20

The retractor may comprise a guide member of a proximal portion of the connecting member. The connecting member may extend between the guide member and the proximal member. The release member may extend between the guide member and the proximal member. The guide member may comprise a receiver for the proximal member. The guide member may have an inwardly facing recess defining a receiver for the proximal member. The proximal member may comprise a proximal ring and the recess may have a shape which is complementary to that of the proximal ring. The recess may be substantially C-shaped in transverse cross section.

25

In one case the retractor comprises a lock for locking the guide member to the proximal member. The guide member may be engagable with the proximal member to provide the lock.

5 The invention provides in once case a wound protector and retractor.

In another aspect of the invention, there is provided a method of performing a surgical procedure, the method comprising the steps of: -

10 inserting a distal member of a wound retractor through a wound opening;

locating a proximal member of the wound retractor externally of the wound opening;

15 retracting laterally the sides of the wound opening using a connecting member of the wound retractor;

20 releasing the distal member from a retracting configuration; and

removing the distal member from the wound opening.

In one embodiment of the invention the method comprises the step of inserting an object through the retracted wound opening to access interior of the wound opening.

25 The object may comprise an instrument.

In one case the retracted wound opening is sealed. The method may comprise the step of inserting an object through the retracted wound opening while maintaining the retracted wound opening sealed.

30

In one embodiment a release member is pulled to release the distal member from the retracting configuration.

5 The release member may be moved from a stowed configuration to a deployed configuration before releasing the distal member from the retracting configuration. The release member may be detached from the proximal member and/or from a valve.

10 In another case the method comprises the step of gripping a portion of the connecting member and pulling the connecting member upwardly to shorten an axial extent of the connecting member located between the distal member and the proximal member. On release of the gripped portion the shortened axial extent of the connecting member between the distal member and the proximal member may be substantially maintained. The connecting member may be fixed to the proximal member at a first end portion and may extend over the proximal member at a second end portion, and the method may comprise the step of moving the connecting member over the proximal member as the connecting member is pulled upwardly to shorten the axial extent of the connecting member located between the distal member and the proximal member. The step of moving the connecting member relative to 20 the proximal member may include sliding a portion of the connecting member against a radially outer portion of the proximal member.

In a further case the retracted wound opening is of a size to receive an instrument.

25 The connecting member may protect the sides of the retracted wound opening.

According to the invention there is also provided a medical device comprising: -

30 a retractor member comprising a distal portion for insertion through an incision made in a patient, and a proximal portion for extending from the incision and outside of the patient;



a distal member associated with the distal portion of the retractor member;

5 a proximal member associated with the proximal portion of the retractor member;

the retractor member being axially movable relative to the proximal member to draw the proximal and distal members towards one another thereby shortening the axial extent of the retractor member between the proximal and  
10 distal members.

In one embodiment the retractor member comprises a sleeve member. The sleeve member preferably extends around the distal member.

15 In one embodiment the distal member is a ring member such as a resilient ring member, for example, an O-ring.

In one embodiment the proximal member is connected to the retractor member. The proximal member may be a ring member.

20 In one embodiment the sleeve is of a pliable material.

In one arrangement the sleeve extends from the proximal member, around the distal member and has a return section outside of the proximal member.

25 In one embodiment the device comprises a guide member.

The retractor member may extend between the guide member and the proximal member.

30

The guide member may comprise a receiver for the proximal member.

The guide member may comprise a guide ring-receiving member.

5 In another embodiment the sleeve return section is mounted to the guide member.

The sleeve return section may be extended into the opening defined by the guide member.

10 The device may comprise a lock for locking the guide member to the proximal member. Typically the guide member is engagable with the proximal member to provide the lock.

In one embodiment of the invention the device includes a valve.

15

In one embodiment the device comprises a release member for releasing the device from an incision. The release member may comprise an elongate member such as a pull ribbon or string extending from a distal end of the device.

20 The release member may extend from the distal member.

The invention also provides a method for retracting an incision comprising the steps of: -

25 providing a device comprising a retractor member having a distal portion and a proximal portion, a distal member associated with the distal portion and a proximal member associated with the proximal portion;

30 inserting the distal member and the distal portion of the retractor member through an incision made in a patient; and

pulling the retractor member axially relative to the proximal member to draw the proximal and distal members towards one another thereby shortening the axial extent of the retractor member between the proximal and distal members and retracting the incision.

5

Brief Description of the Drawings

The invention will be more clearly understood from the following description of some embodiments thereof, given by way of example only, with reference to the accompanying drawings, in which: -

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Fig. 1 is a cross-sectional, side view of a wound retractor according to the invention;

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Figs. 2 and 3 are perspective views of the wound retractor of Fig. 1, in use;

Fig. 4 is a cross-sectional, side view of the wound retractor of Fig. 1, in use;

20

Fig. 5 is a view similar to Fig. 1 of another wound retractor according to the invention;

Figs. 6 to 8 are views similar to Figs. 1 to 3 of another wound retractor according to the invention;

25

Fig. 9 is a view similar to Fig. 1 of a further wound retractor according to the invention;

Figs. 10 to 12 are cross-sectional, side views of another wound retractor according to the invention, in use;

30

Figs. 13 to 15 are views similar to Figs. 10 to 12 of a further wound retractor according to the invention, in use;

5 Fig. 16 is a perspective view of another wound retractor according to the invention; and

Figs. 17 to 19 are cross-sectional, side views of the wound retractor of Fig. 16, in use.

10 Detailed Description

Referring to the drawings, and initially to Figs. 1 to 4 thereof, there is illustrated a wound retractor 1 according to the invention, which comprises a retractor member provided by a sleeve 2, an elastomeric distal member provided by a distal ring 3 of resilient material such as an O-ring, and a relatively rigid proximal member provided by a proximal ring 4 which may also be an O-ring. The distal member 3 is suitable for insertion through a wound opening or incision 6, and the proximal member 4 is suitable for location externally of the wound opening/incision 6.

20 The sleeve 2 is of any suitable material such as of pliable plastics film material and comprises a distal portion 5 for insertion through the incision 6, in this case made in a patient's abdomen 7, and a proximal portion 8 for extending from the incision 6 and outside of the patient.

25 In this case the distal ring 3 is not fixed to the sleeve 2 but rather the sleeve 2 is led around the ring 3 and is free to move axially relative to the distal ring 3 somewhat in the manner of a pulley. The proximal ring 4 is fixed to the sleeve 2, in this case at the proximal inner end thereof.

30 To configure the wound retractor 1 according to the invention, the sleeve 2 is first provided with the proximal ring 4 fixed at one end of the sleeve 2. The distal ring 3

is then placed over the sleeve 2, and the sleeve 2 is manipulated so that the sleeve 2 is folded back on itself into the configuration of Fig. 1. The sleeve 2 extends from the proximal ring 4, and the distal ring 3 is contained between inner and outer layers 2a, 2b of the sleeve 2. The wound retractor 1 is now ready for use.

5

The resilient distal ring 3 is scrunched up and inserted through the incision 6 with the distal end 5 of the sleeve 2. The sleeve 2 is then pulled upwardly in the direction of the arrow A in Fig. 1. On pulling of the sleeve 2 upwardly, the outer layer 2b is pulled up while the inner layer 2a is drawn around the distal ring 3. This results in shortening of the axial extent of the sleeve 2 between the proximal ring 4 and the distal ring 3, tensioning the sleeve 2 and applying a retraction force to the margins of the incision 6. The wound retractor 1 appears to be self locking because when tension is applied to the sleeve 2 and the pulling force is released the rings 3, 4 remain in position with a retraction force applied. Frictional engagement between the layers 2a, 2b of the sleeve 2 in this retracting configuration may contribute to this self locking.

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In this retracting configuration, the distal ring 3 lies in a horizontal plane perpendicular to the longitudinal axis of the wound opening 6, and the distal ring 3 engages the inner wall of the abdomen 7 around the edges of the wound opening 6.

25

As the incision 6 is being retracted the margins are also protected by the sleeve 2. On retraction, an access port is provided, for example for a surgeon to insert an instrument to perform a procedure. The wound retractor 1 is used as a retractor and as a base for a valve/seal 10 to allow it to be used in laparoscopic surgery or for instrument access generally. In this case the valve 10 comprises a gelatinous elastomeric material mounted to the proximal ring 4. The valve 10 has a pinhole opening 11 extending therethrough through which an object, such as an instrument, may be inserted to access the interior of the abdomen 7. The opening 11 is biased

towards a closed configuration to maintain the interior of the abdomen 7 sealed and to minimise gas pressure leakage through the valve 10.

5 The valve 10 may be of any suitable configuration, for example in the form of a valve similar to the valves described in International patent applications published under Nos. WO 2005/044111 and WO 2005/034766, the relevant contents of which are incorporated herein by reference.

10 Any excess sleeve portion outside the incision 6 may, for example, be cut-away.

The wound retractor 1 is suitable for a range of incision sizes and is easily manufactured. It is also relatively easy to manipulate, in use. It not only retracts but also protects the incision 6.

15 The wound retractor 1 also comprises a guide member 51 for the proximal ring 4. The guide member 51 is in the form of an annular ring member with an inwardly facing C-shaped groove 52 which is sized to accommodate the proximal ring 4, as illustrated in Fig. 1. The outer layer 2b of the sleeve 2 is interposed between the proximal ring 4 and the guide member 51 to further control the pulling of the sleeve  
20 2 and thereby further controlling the application of the retraction force. The guide member 51 also assists in stabilising the proximal ring 4.

25 Any suitable guide such as the guide member 51 may be used to assist in retaining/stabilising the proximal ring 4 in a desired position during pulling up of the sleeve 2 to retract the incision 6. The guide may be located proximal of the ring 4.

The guide member 51 provides a mounting member to which devices such as valves may be attached.

30 The wound retractor 1 also has a release mechanism which in this case is provided by a flexible release pull cord or ribbon 81 which is attached at one end 82 to the

inner ring 3 and terminates in a rigid bead 83 at the opposite end. The bead 83 may be gripped by a user.

5 The ribbon 81, on assembly, is led through the gap between the proximal ring 4 and the guide member 51 so that it is positioned between the proximal ring 4 and the guide member 51 and is positioned between the inner and outer layers 2a, 2b of the sleeve 2. The ribbon 81 facilitates release of the distal ring 3 from the retracting configuration in the incision 6. Pulling on the ribbon 81 pulls on the distal ring 3, allowing the distal ring 3 to be released from the inner wall of the incision 6 to  
10 thereby release the wound retractor 1 (Figs. 3 and 4). The flexibility of the distal ring 3 facilitates this movement. The distal ring 3 and the sleeve 2 may then be removed from the wound opening 6.

15 The advantage of this arrangement is that a user can readily release the wound retractor 1 from the self locked retracting configuration.

The ribbon 81 has a stowed configuration, illustrated in Figs. 1 and 2, and a deployed configuration, illustrated in Figs. 3 and 4. In the stowed configuration, the bead 83 at the proximal end of the ribbon 81 terminates adjacent to the proximal ring 4. In the  
20 stored configuration the bead 83 is releasably attached to the proximal ring 4, and the ribbon 81 is concertinaed. To move the ribbon 81 from the stowed configuration to the deployed configuration, the bead 83 at the proximal end of the ribbon 81 is moved proximally relative to the proximal ring 4. In the deployed configuration, the ribbon 81 is pulled taut and the bead 83 at the proximal end of the ribbon 81 extends  
25 proximally of the proximal ring 4. In the deployed configuration, the bead 83 is detached from the proximal ring 4.

A flexible loop 84 on the bead 83 may be used to grip the release member.

In use, the wound opening 6 is created in the abdomen 7. The distal ring 3 is scrunched up and inserted through the wound opening 6, and the proximal ring 4 is located externally of the wound opening 6. The sleeve 2 extends between the proximal ring 4 and the distal ring 3. The proximal end of the sleeve 2 is then pulled  
5 upwardly to shorten the axial extent of the sleeve 2 between the proximal ring 4 and the distal ring 3 to retract laterally the sides of the wound opening 6. When the wound opening 6 has been retracted the desired amount, the proximal end of the sleeve 2 is released by the user and the wound retractor 1 remains locked in this retracting configuration (Fig. 1).

10 It is noted that in this retracting configuration, the ribbon 81 is concertinaed and the bead 83 is attached to the proximal member 4 in the stowed configuration. In this stowed configuration the ribbon 81 does not extend proximally past the proximal ring 4. Thus the ribbon 81 will not obstruct access to the wound interior through the  
15 retracted wound opening 6.

Fig. 1 shows how the majority of the ribbon/tie component 81 remains below the skin surface when not in use. There is a temporary fix means on the bead 83 or ribbon section 81 to hold it in place until needed. The temporary fix prevents the  
20 ribbon 81 following the sleeve 2 up during deployment. The ribbon 81 for removing the distal ring 3 is compressed in a concertina manner into the lower part of the retracting sleeve 2. The bead 83 or similar stop component prevents loss of access to the ribbon/tie 81 in case it entirely slips downward. There is a means to grip the ribbon tie 81 with either fingertips or hooking instrument, this means may be similar  
25 to the loop 84 illustrated in Fig. 2. The bead 83 is temporarily fixed to the proximal O-ring 4 in Fig. 2.

An object, such as an instrument may be inserted through the pinhole opening 11 in the valve 10 and through the retracted wound opening 6 to access the interior of the  
30 abdomen 7. The self-closing pinhole 11 maintains a seal around the instrument passed through the valve 10.



When the surgical procedure has been completed and it is desired to remove the wound retractor 1 from the retracted wound opening 6, the bead 83 is detached from the proximal member 4 and pulled upwardly to draw the ribbon 81 taut (Fig. 3). Fig. 3 shows how the ribbon/tie 84 can be grabbed by the fingertips when the surgeon is ready to take the distal ring 3 out of the incision 6. In Fig. 3, the temporary fix is broken. Further pulling of the bead 83 upwardly releases the distal ring 3 from the retracting configuration, and thus releases the wound retractor 1 to enable the distal ring 3 and the sleeve 2 to be removed from the wound opening 6 (Fig. 4). Fig. 4 shows how the ribbon tie 81 is connected to the distal ring 3 inside the incision 6. When pulled upwards, the ribbon 81 causes the distal ring 3 to buckle and become dislodged from the incision 6.

In Fig. 5 there is illustrated another wound retractor 100 according to the invention, which is similar to the wound retractor 1 of Figs. 1 to 4, and similar elements in Fig. 5 are assigned the same reference numerals.

In this case, the valve 10 comprises a gelatinous elastomeric portion 101 and a housing portion 102 radially outwardly of the gelatinous elastomeric portion 101. The housing portion 102 is mounted to the proximal ring 4. In the stowed configuration illustrated in Fig. 5, the bead 83 is releasably attached to the housing portion 102.

Figs. 6 to 8 illustrate another wound retractor 110 according to the invention, which is similar to the wound retractor 1 of Figs. 1 to 4, and similar elements in Figs. 6 to 8 are assigned the same reference numerals.

In this case the release member comprises the ribbon 81 and a ring member 183 attached to the proximal end of the ribbon 81. In the stowed configuration illustrated in Fig. 6, the ring member 183 lies on top of the valve 10 in a plane perpendicular to

the longitudinal axis of the wound opening 6, and the ring member 183 is releasably attached to the proximal ring 4. Fig. 6 shows how the ring removal device 183 may be integrated into the valve housing. There is a temporary fix of the ring member 183 to the proximal ring 4.

5

After completion of a surgical procedure, the ring member 183 may be detached from the proximal ring 4 (Fig. 7) and pulled upwardly to release the distal ring 3 from the retracting configuration (Fig. 8). Fig. 8 shows how the ring 183 can be dislodged from the housing and used to lever the internal distal ring 3 out of the incision 6.

10

Figs. 6 to 8 show the same idea as the bead 83 but instead using a ring 183 that can be neatly integrated into the valve housing, and easily gripped by a fingertip.

15

Referring to Fig. 9, there is illustrated a further wound retractor 120 according to the invention, which is similar to the wound retractor 100 of Fig. 5, and similar elements in Fig. 9 are assigned the same reference numerals.

20

In this case the release member comprises the ribbon 81 and a ring member 183 attached to the proximal end of the ribbon 81. In the stowed configuration illustrated in Fig. 9, the ring member 183 lies on top of the valve 10 in a plane perpendicular to the longitudinal axis of the wound opening 6, and the ring member 183 is releasably attached to the housing portion 102.

25

After completion of a surgical procedure, the ring member 183 may be detached from the housing portion 102 and pulled upwardly to release the distal ring 3 from the retracting configuration.

30

In Figs. 10 to 12 there is illustrated another wound retractor 300 according to the invention, which is similar to the wound retractor 100 of Fig. 5, and similar elements in Figs. 10 to 12 are assigned the same reference numerals.

In this case the ribbon 81 extends in two layers between the proximal ring 4 and the distal ring 3 through the wound opening 6. In particular a first end 301 of the ribbon 81 is fixedly attached to the housing portion 102 of the valve 10, and a second end 302 of the ribbon 81 is slidingly movable relative to the proximal ring 4 and the guide member 51. The ribbon 81 extends distally from the first end 301 to the distal ring 3, loops around the distal ring 3, extends proximally from the distal ring 3 between the guide member 51 and the proximal ring 4 to the second end 302. In particular the ribbon 81 extends proximally longitudinally into the space between the guide member 51 and the proximal ring 4, through the space between the guide member 51 and the proximal ring 4, and longitudinally out of the space between the guide member 51 and the proximal ring 4 (Fig. 10).

The ribbon 81 is looped around the two layers 2a, 2b of the sleeve 2.

When pulled the ribbon 81 is axially movable between the guide member 51 and the proximal ring 4, and the ribbon 81 is slidingly movable relative to the distal ring 3 (Fig. 12).

In the configuration of Figs. 10 to 12 the ribbon/cord 81 is attached to the underside of the gel housing 102 and passes around the distal ring 3 and beyond the outer proximal ring 51. A simple upward lift of the ribbon 81 is all that is needed to release the distal O-ring 3 (Fig. 12).

Figs. 13 to 15 illustrate a further wound retractor 310 according to the invention which is similar to the wound retractor 300 of Figs. 10 to 12, and similar elements in Figs. 13 to 15 are assigned the same reference numerals.

In this case the ribbon 81 does not extend between the guide member 51 and the proximal ring 4. As illustrated, the ribbon 81 extends distally from the first end 301

to the distal ring 3, loops around the distal ring 3, extends proximally from the distal ring 3 to the second end 302.

The ribbon 81 extends in two layers through the wound opening 6.

5

The fixed end of the removal ribbon 81 is attached to the underside of the gel housing 102.

10

Fig. 14 illustrates the wound retractor 310 after it has been deployed. Any slack or excess ribbon 81 may be gently used up by lightly tugging on the free end 302 of the ribbon 81.

15

To remove the wound retractor 310, a user pulls on the free end 302 of the ribbon 81. This deforms the distal ring 3 and drags it out through the incision 6 (Fig. 15).

20

In this case a slot opening 321 is provided in the wall of the guide member 51.

25

The ribbon 81 extends distally from the first end 301 to the distal ring 3, loops around the distal ring 3, extends proximally from the distal ring 3 between the guide member 51 and the proximal ring 4 to the second end 302. As illustrated in Fig. 17 the ribbon 81 extends proximally longitudinally into the space between the guide member 51 and the proximal ring 4 through part of the space between the guide member 51 and the proximal ring 4, and transversely out of the space between the guide member 51 and the proximal ring 4 through the slot opening 321.

30

A rigid ring member 322 is fixedly attached to the ribbon 81 at the second end 302.

In further detail, Fig. 16 illustrates the pull ring 322, the ribbon 81, the slot 321 for the ribbon 81, the outer proximal ring 51, and the sleeve 2. Fig. 17 illustrates the removal ring 322, the ribbon 81, and the slot 321 for the ribbon 81. Fig. 19 illustrates removal of the wound retractor 320 after completion of the surgical procedure.

It will be appreciated that the connecting member extending between the distal member and the proximal member may be provided in any suitable form, such as in the form of one or more straps.

The wound retractor of the invention can be used in a number of ways. In one method the wound retractor is used as described above with the distal ring being inserted into an incision and the proximal ring being slid to controllably radially expand the incision. The wound retractor may then be locked in position. If necessary, the proximal ring can be moved further downwardly to create a larger incision.

In some arrangements an instrument may be bent manually outside the body and the bent instrument is delivered through the wound retractor to readily access the operative site.

In a further embodiment an instrument is inserted into the wound retractor and the surgeon uses the abdominal wall itself to bend the instrument and then insert the bent section further into the abdomen.

In all cases the sleeve may be gripped by gripping a valve or other element mounted thereto.

The wound retractor of the invention has at least some of the following advantages:

Controlled Radial Expansion

1. Greater access using smaller incision
2. Can vary incision size as need be (e.g. specimen removal during lap coli.)

5 Greater Sealing Capabilities

1. No gas leakage from the wound margins
2. Cannot be inadvertently pulled out of the incision
3. Will seal any incision and never require secondary sealing method (suture, Hasson port, etc.)

10

Eliminate Intra-abdominal Profile

1. Gives back more working space in the abdomen (critical in pelvic surgery)
2. Perineal access for operations such as Radical Prostatectomy.

15 Protection of Wound from Infection and Cancer Seeding

1. Tight seal with no “chimney stack” effect
2. Upon removal all areas of potential contamination are isolated from the incision

Reduced Extra-abdominal Profile

- 20
1. Will increase the effective working length of an instrument
  2. Greater working area outside the abdomen

Increase the freedom of movement of conventional laparoscopic instruments25 

The invention is not limited to the embodiments hereinbefore described, with reference to the accompanying drawings, which may be varied in construction and detail.

CLAIMS

1. A wound retractor comprising: -
  - 5 a distal member for insertion through a wound opening;
  - a proximal member for location externally of the wound opening;
  - a connecting member extending at least between the distal member and  
10 the proximal member to retract laterally the sides of the wound  
opening; and
  - a release member for releasing the distal member from a retracting  
15 configuration for removal of the distal member from the wound  
opening;
  - the release member being configured to extend in two layers through  
the wound opening.
- 20 2. A retractor as claimed in claim 1 wherein the release member extends in two  
layers between the distal member and the proximal member.
3. A retractor as claimed in claim 1 or 2 wherein the retractor comprises a valve.
- 25 4. A retractor as claimed in claim 3 wherein the valve is mounted to the proximal  
member.
5. A retractor as claimed in claim 3 or 4 wherein the valve is at least partially of a  
30 gelatinous elastomeric material.

6. A retractor as claimed in claim 5 wherein the valve comprises a gelatinous elastomeric material portion and a housing portion.
- 5 7. A retractor as claimed in claim 6 wherein the housing portion is mounted to the proximal member.
8. A retractor as claimed in any of claims 3 to 7 wherein the valve comprises an opening extending therethrough.
- 10 9. A retractor as claimed in claim 8 wherein the opening is biased towards a closed configuration.
10. A retractor as claimed in claim 9 wherein the opening comprises a pinhole.
- 15 11. A retractor as claimed in any of claims 3 to 10 wherein the valve is an instrument seal.
12. A retractor as claimed in any of claims 1 to 11 wherein the release member is looped around the distal member.
- 20 13. A retractor as claimed in any of claims 3 to 12 wherein a first end of the release member is attached to the proximal member and/or to the valve.
14. A retractor as claimed in claim 13 wherein the first end of the release member is attached to the housing portion of the valve.
- 25 15. A retractor as claimed in claim 13 or 14 wherein the first end of the release member is fixedly attached to the proximal member and/or to the valve.
- 30 16. A retractor as claimed in any of claims 1 to 15 wherein a second end of the release member is movable relative to the proximal member.



17. A retractor as claimed in claim 16 wherein the second end of the release member is axially movable relative to the proximal member.
- 5 18. A retractor as claimed in claim 16 or 17 wherein the second end of the release member is slidingly movable relative to the proximal member.
19. A retractor as claimed in any of claims 1 to 18 wherein the release member is movable relative to the distal member.
- 10 20. A retractor as claimed in claim 19 wherein the release member is slidingly movable relative to the distal member.
21. A wound retractor comprising: -
- 15 a distal member for insertion through a wound opening;
- a proximal member for location externally of the wound opening;
- 20 a connecting member extending at least between the distal member and the proximal member to retract laterally the sides of the wound opening; and
- 25 a release member for releasing the distal member from a retracting configuration for removal of the distal member from the wound opening;
- 30 the release member having a stowed configuration in which a proximal end of the release member terminates substantially adjacent to the proximal member.

22. A retractor as claimed in claim 21 wherein the retractor comprises a valve.
23. A retractor as claimed in claim 22 wherein the valve is mounted to the proximal member.
24. A retractor as claimed in claim 22 or 23 wherein the valve is at least partially of a gelatinous elastomeric material.
25. A retractor as claimed in claim 24 wherein the valve comprises a gelatinous elastomeric material portion and a housing portion.
26. A retractor as claimed in claim 25 wherein the housing portion is mounted to the proximal member.
27. A retractor as claimed in any of claims 22 to 26 wherein the valve comprises an opening extending therethrough.
28. A retractor as claimed in claim 27 wherein the opening is biased towards a closed configuration.
29. A retractor as claimed in claim 28 wherein the opening comprises a pinhole.
30. A retractor as claimed in any of claims 22 to 29 wherein the valve is an instrument seal.
31. A retractor as claimed in any of claims 21 to 30 wherein in the stowed configuration the proximal end of the release member is attached to the proximal member and/or to the valve.

32. A retractor as claimed in claim 31 wherein in the stowed configuration the proximal end of the release member is releasably attached to the proximal member and/or to the valve.
- 5 33. A retractor as claimed in any of claims 21 to 32 wherein the release member is movable from the stowed configuration to a deployed configuration.
34. A retractor as claimed in claims 21 to 33 wherein in the stowed configuration, at least part of the release member is substantially concertinaed.
- 10 35. A retractor as claimed in claim 33 or 34 wherein in the deployed configuration the proximal end of the release member extends proximally of the proximal member.
- 15 36. A retractor as claimed in any of claims 33 to 35 wherein in the deployed configuration, the proximal end of the release member is detached from the proximal member and/or from the valve.
- 20 37. A retractor as claimed in any of claims 1 to 36 wherein in the retracting configuration, the distal member is located in a plane substantially perpendicular to the longitudinal axis of a wound opening.
- 25 38. A retractor as claimed in any of claims 1 to 37 wherein in the retracting configuration, the distal member engages an inner wall of body tissue adjacent a wound opening.
39. A retractor as claimed in any of claims 1 to 38 wherein the release member is pullable to release the distal member from the retracting configuration.

40. A retractor as claimed in any of claims 1 to 39 wherein a distal end of the release member is attached to the distal member.
- 5 41. A retractor as claimed in any of claims 1 to 40 wherein the connecting member extends in two layers between the distal member and the proximal member.
42. A retractor as claimed in claim 41 wherein the release member extends between the two layers of the connecting member.
- 10 43. A retractor as claimed in claim 41 wherein the release member extends around the two layers of the connecting member.
44. A retractor as claimed in claim 43 wherein the release member is looped around the two layers of the connecting member.
- 15 45. A retractor as claimed in any of claims 1 to 44 wherein at least part of the release member is substantially flexible.
- 20 46. A retractor as claimed in claim 45 wherein the release member comprises a pull cord.
47. A retractor as claimed in claim 46 wherein the pull cord comprises a ribbon.
- 25 48. A retractor as claimed in any of claims 1 to 47 wherein the release member comprises a gripping portion.
49. A retractor as claimed in claim 48 wherein at least part of the gripping portion is substantially rigid.
- 30 50. A retractor as claimed in claim 49 wherein the gripping portion comprises a bead.

51. A retractor as claimed in claim 49 wherein the gripping portion comprises a ring member.
- 5 52. A retractor as claimed in any of claims 1 to 51 wherein at least part of the gripping portion is substantially flexible.
53. A retractor as claimed in claim 52 wherein the gripping portion comprises a loop.
- 10 54. A retractor as claimed in any of claims 1 to 53 wherein the connecting member comprises a sleeve.
55. A retractor as claimed in any of claims 1 to 54 wherein the connecting member has a proximal gripping portion for pulling the connecting member upwardly to shorten an axial extent located between the distal member and the proximal member.
- 15 56. A retractor as claimed in claim 55 wherein, on release of the gripping portion the shortened axial extent between the distal member and the proximal member is substantially maintained without a requirement for an additional locking device.
- 20 57. A retractor as claimed in claim 55 or 56 wherein the proximal gripping portion is provided at a proximal end portion of the connecting member.
- 25 58. A retractor as claimed in any of claims 1 to 57 wherein the connecting member is fixed to the proximal member at a first end portion and is movable over the proximal member at a second end portion.
- 30

59. A retractor as claimed in claim 58 wherein the connecting member is axially slidable over the proximal member at the second end portion.
- 5 60. A retractor as claimed in claim 58 or 59 wherein the second end portion of the connecting member is slidingly received over a portion of the proximal member to allow relative movement between the connecting member and the proximal member to shorten the axial extent of the connecting member located between the distal member and the proximal member.
- 10 61. A retractor as claimed in claim 60 wherein the portion of the proximal member that slidingly receives the connecting member includes an outer portion of the proximal member.
- 15 62. A retractor as claimed in claim 61 wherein the second end portion of the connecting member is biased against the proximal member.
63. A retractor as claimed in any of claims 1 to 62 wherein the proximal member is located within the connecting member.
- 20 64. A retractor as claimed in any of claims 1 to 63 wherein the proximal member forms a part of a securing arrangement configured to substantially fix the axial extent of the connecting member located between the distal member and the proximal member at a desired length.
- 25 65. A retractor as claimed in any of claims 55 to 64 wherein the connecting member extends from the proximal member, around the distal member, and has a return section outside of the proximal member, the return section providing the proximal gripping portion.
- 30 66. A retractor as claimed in any of claims 1 to 65 wherein the distal member comprises a distal ring.

67. A retractor as claimed in claim 66 wherein the distal ring is an O-ring.
- 5 68. A retractor as claimed in claim 66 or 67 wherein the distal ring is formed of an elastomeric material.
69. A retractor as claimed in any of claims 1 to 68 wherein the proximal member comprises a proximal ring.
- 10 70. A retractor as claimed in claim 69 wherein the proximal ring is an O-ring.
71. A retractor as claimed in claim 69 or 70 wherein the proximal ring is relatively rigid with respect to the distal ring.
- 15 72. A retractor as claimed in any of claims 1 to 71 wherein the connecting member is of a pliable material.
73. A retractor as claimed in any of claims 1 to 72 further comprising a guide member for a proximal portion of the connecting member.
- 20 74. A retractor as claimed in claim 73 wherein the connecting member extends between the guide member and the proximal member.
75. A retractor as claimed in claim 73 or 74 wherein the release member extends at least partially between the guide member and the proximal member.
- 25 76. A retractor as claimed in claim 75 wherein the release member extends proximally substantially longitudinally into the space between the guide member and the proximal member.
- 30

77. A retractor as claimed in claim 75 or 76 wherein the release member extends proximally substantially longitudinally out of the space between the guide member and the proximal member.
- 5 78. A retractor as claimed in claim 75 or 76 wherein the release member extends proximally substantially transversely out of the space between the guide member and the proximal member.
- 10 79. A retractor as claimed in any of claims 73 to 78 wherein the release member extends through an opening in a wall of the guide member.
80. A retractor as claimed in any of claims 73 to 79 wherein the guide member comprises a receiver for the proximal member.
- 15 81. A retractor as claimed in any of claims 73 to 80 wherein the guide member has an inwardly facing recess defining a receiver for the proximal member.
- 20 82. A retractor as claimed in claim 81 wherein the proximal member comprises a proximal ring and the recess has a shape which is complementary to that of the proximal ring.
83. A retractor as claimed in claim 82 wherein the recess is substantially C-shaped in transverse cross section.
- 25 84. A retractor as claimed in any of claims 73 to 83 further comprising a lock for locking the guide member to the proximal member.
85. A retractor as claimed in claim 84 wherein the guide member is engageable with the proximal member to provide the lock.



86. A wound protector and retractor as claimed in any of claims 1 to 85.
87. A wound retractor substantially as hereinbefore described with reference to the accompanying drawings.

5

88. A method of performing a surgical procedure, the method comprising the steps of: -

10                   inserting a distal member of a wound retractor through a wound opening;

15                   locating a proximal member of the wound retractor externally of the wound opening, with a release member of the wound retractor in a stowed configuration with a proximal end of the release member terminating substantially adjacent to the proximal member;

                      retracting laterally the sides of the wound opening using a connecting member of the wound retractor;

20                   releasing the distal member from a retracting configuration; and

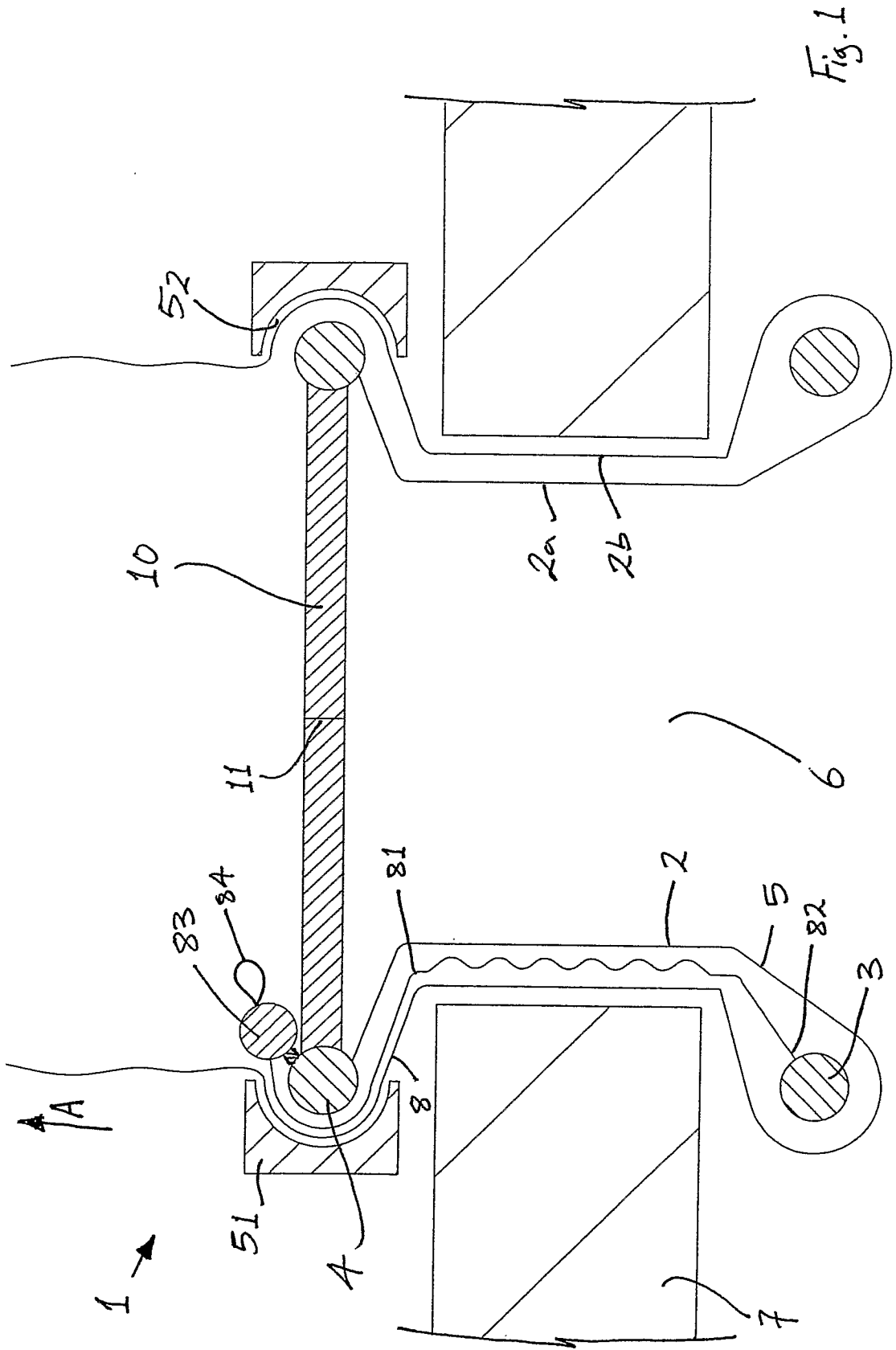
                      removing the distal member from the wound opening.

- 25                   89. A method as claimed in claim 88 wherein the method comprises the step of inserting an object through the retracted wound opening to access interior of the wound opening.

90. A method as claimed in claim 89 wherein the object comprises an instrument.

91. A method as claimed in any of claims 88 to 90 wherein the retracted wound opening is sealed.
- 5 92. A method as claimed in claim 91 wherein the method comprises the step of inserting an object through the retracted wound opening while maintaining the retracted wound opening sealed.
- 10 93. A method as claimed in any of claims 88 to 92 wherein a release member is pulled to release the distal member from the retracting configuration.
94. A method as claimed in any of claims 88 to 93 wherein the release member is moved from the stowed configuration to a deployed configuration before releasing the distal member from the retracting configuration.
- 15 95. A method as claimed in claim 94 wherein the proximal end of the release member is moved proximally relative to the proximal member to move the release member from the stowed configuration to the deployed configuration.
- 20 96. A method as claimed in any of claims 88 to 95 wherein method comprises the step of detaching the release member from the proximal member and/or from a valve.
- 25 97. A method as claimed in any of claims 88 to 96 wherein the method comprises the step of gripping a portion of the connecting member and pulling the connecting member upwardly to shorten an axial extent of the connecting member located between the distal member and the proximal member.
- 30 98. A method as claimed in claim 97 wherein, on release of the gripped portion the shortened axial extent of the connecting member between the distal member and the proximal member is substantially maintained.

- 5 99. A method as claimed in claim 97 or 98 wherein the connecting member is fixed to the proximal member at a first end portion and extends over the proximal member at a second end portion, and the method comprises the step of moving the connecting member over the proximal member as the connecting member is pulled upwardly to shorten the axial extent of the connecting member located between the distal member and the proximal member.
- 10 100. A method as claimed in claim 99 wherein the step of moving the connecting member relative to the proximal member includes sliding a portion of the connecting member against a radially outer portion of the proximal member.
- 15 101. A method as claimed in any of claims 88 to 100 wherein the retracted wound opening is of a size to receive an instrument.
- 20 102. A method as claimed in any of claims 88 to 101 wherein the connecting member protects the sides of the retracted wound opening.
103. A method of performing a surgical procedure substantially as hereinbefore described with reference to the accompanying drawings.



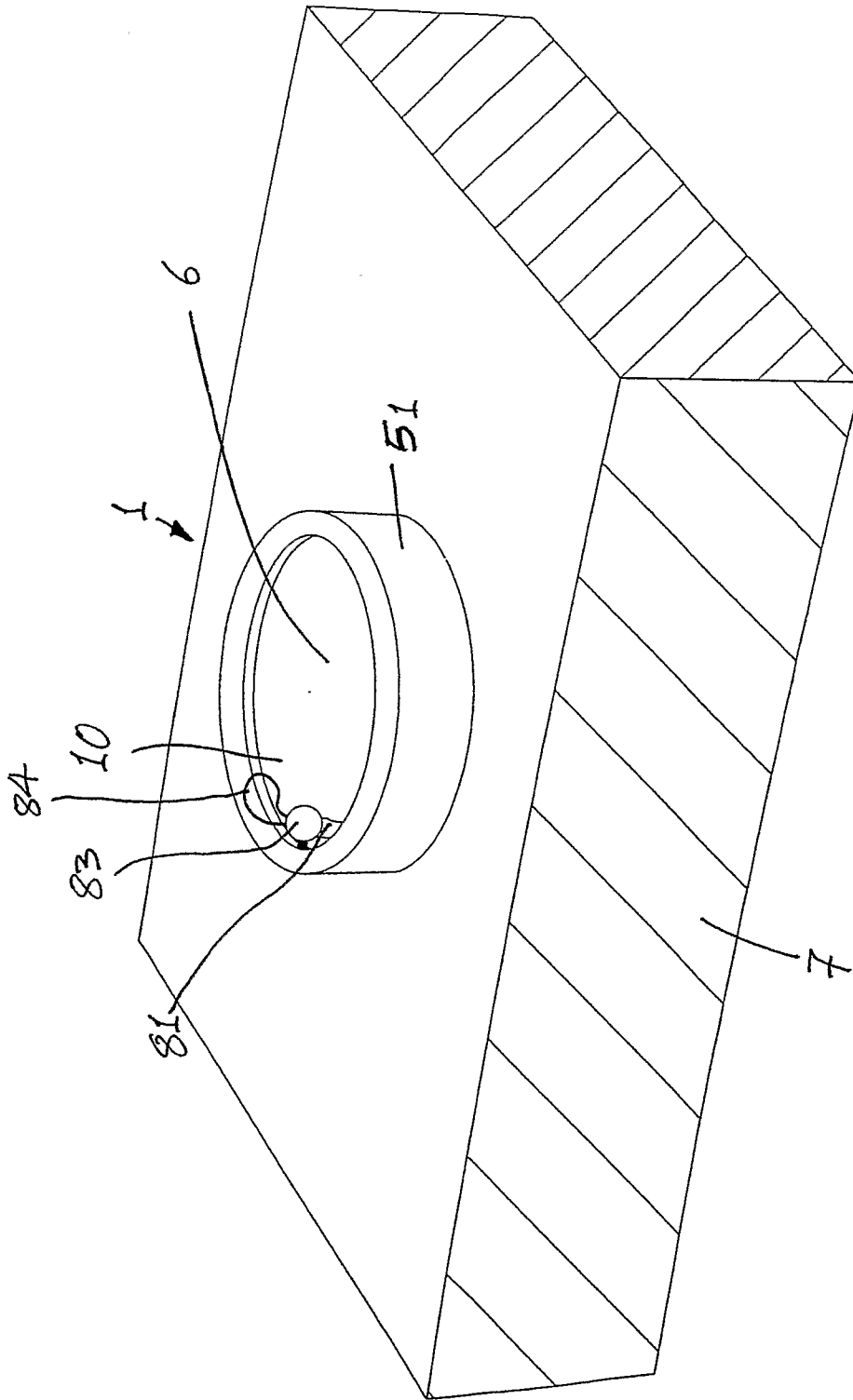


Fig. 2

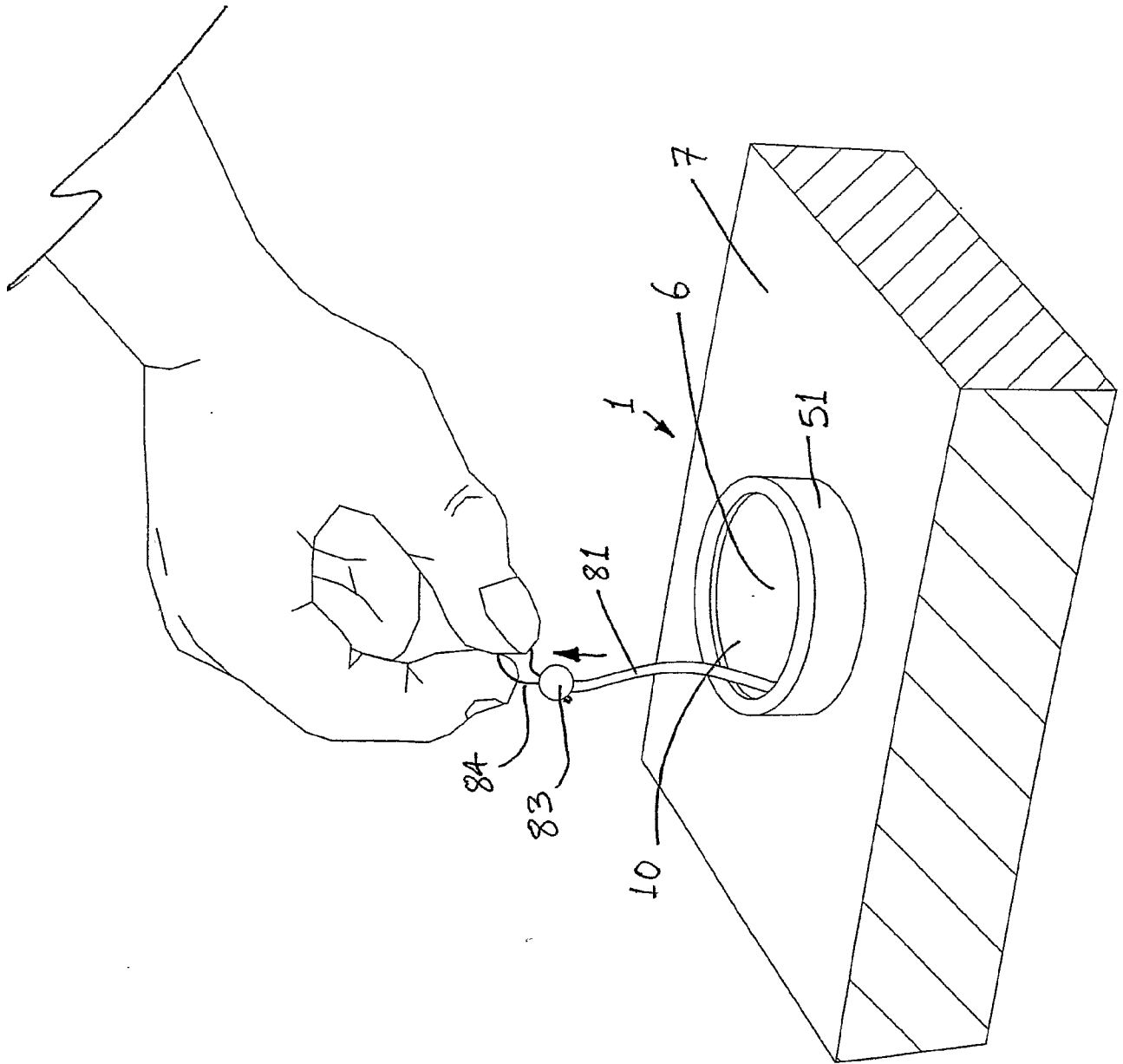
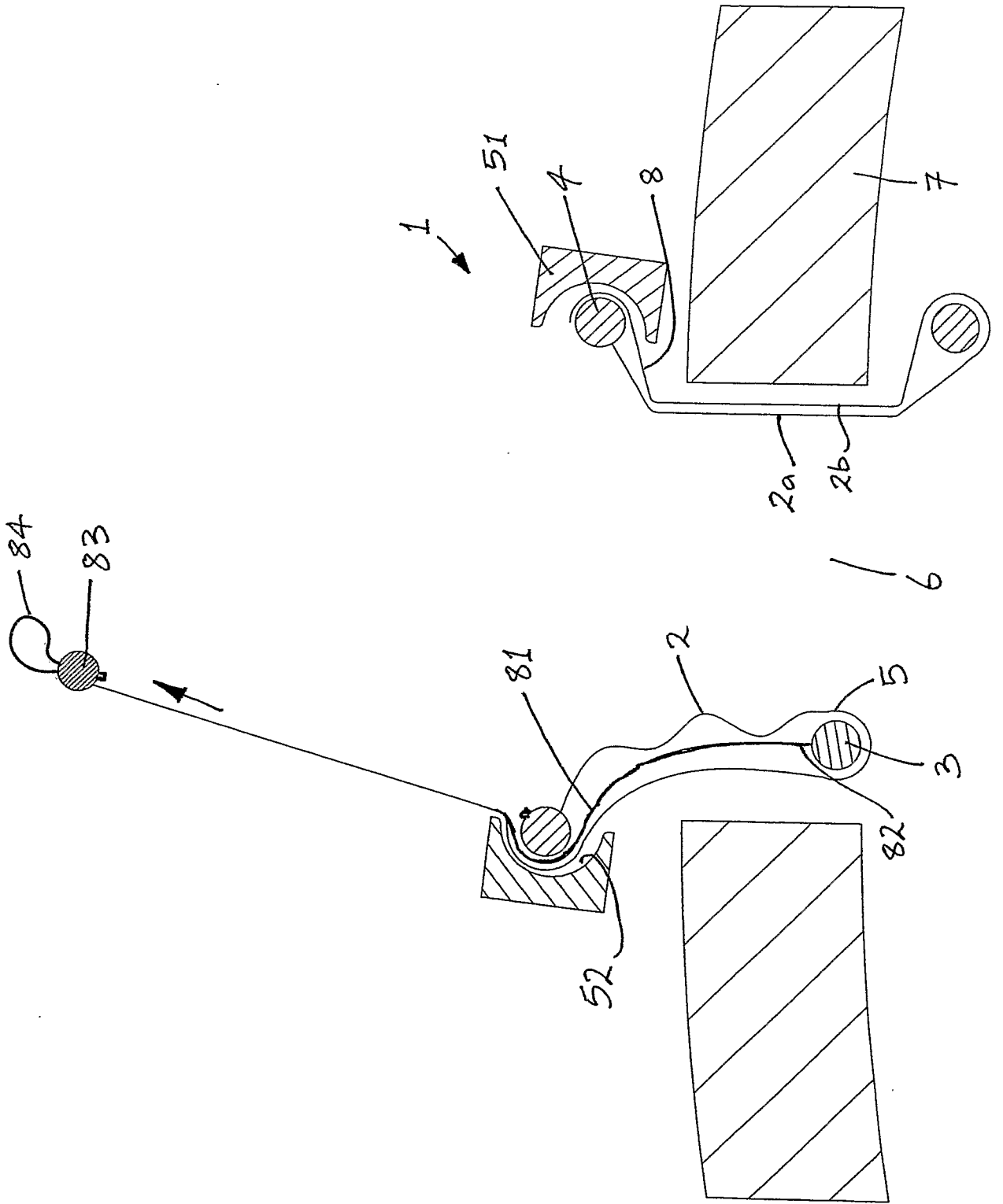


Fig. 3

Fig. 4



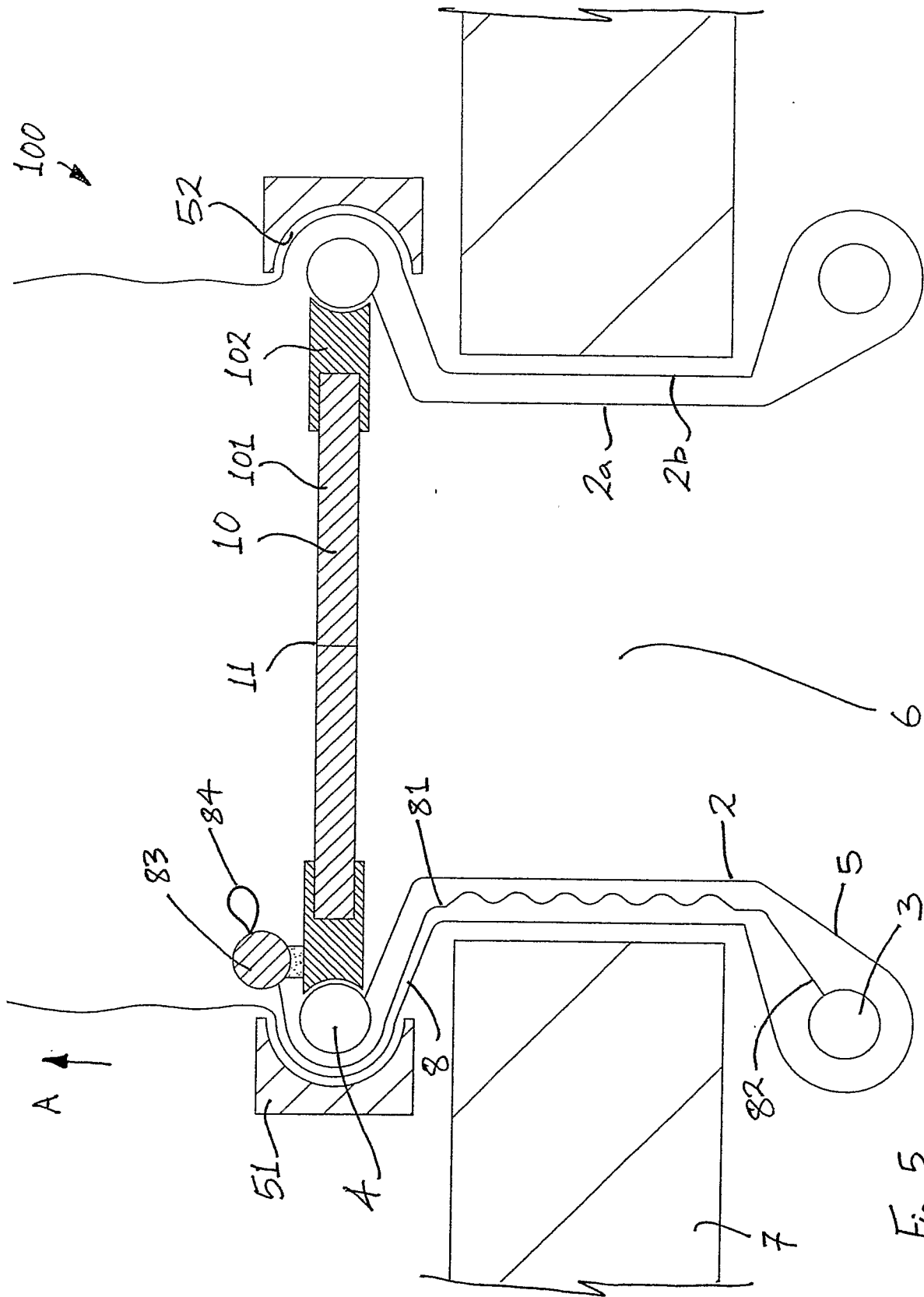


Fig. 5



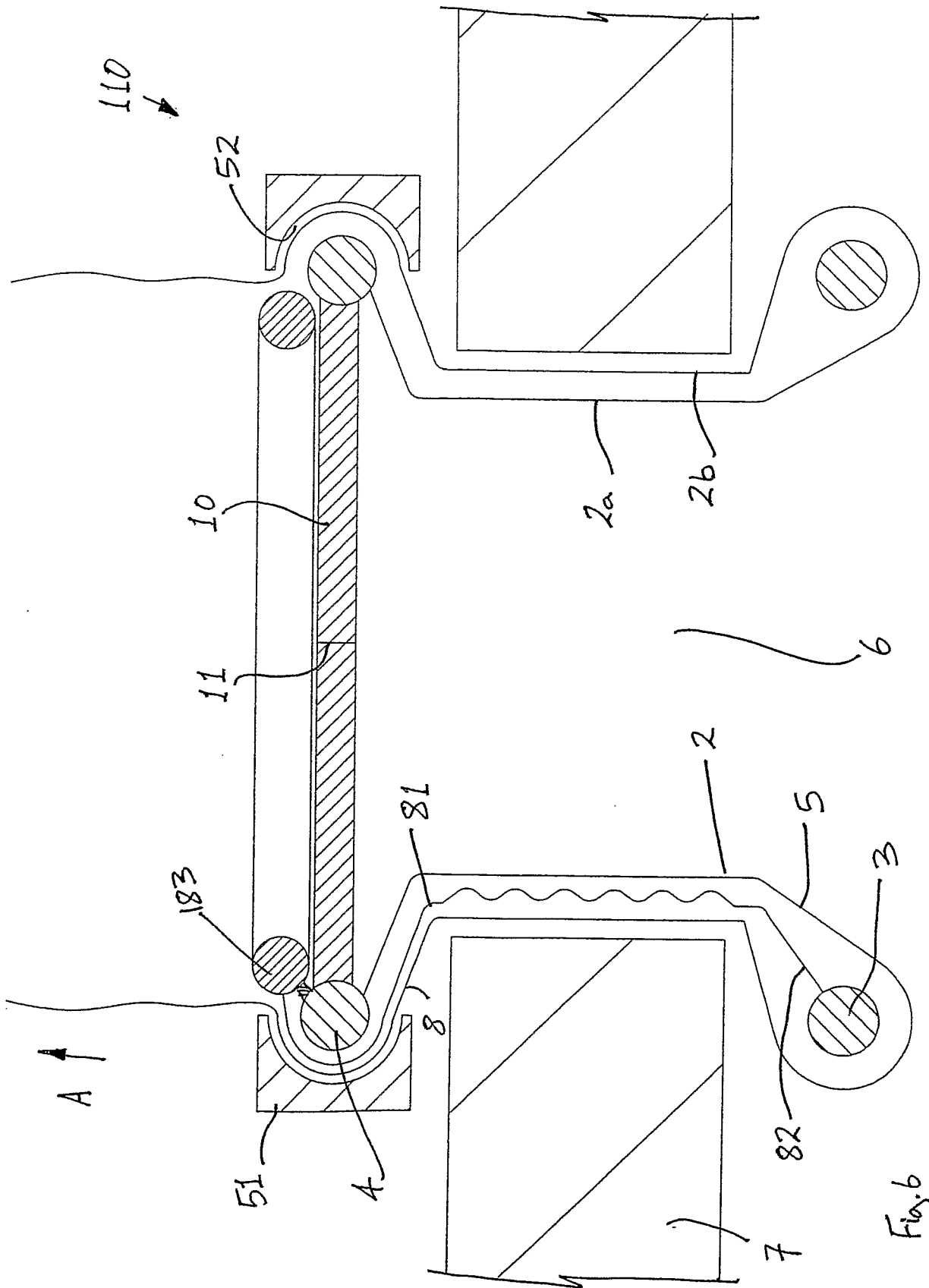


Fig. 6

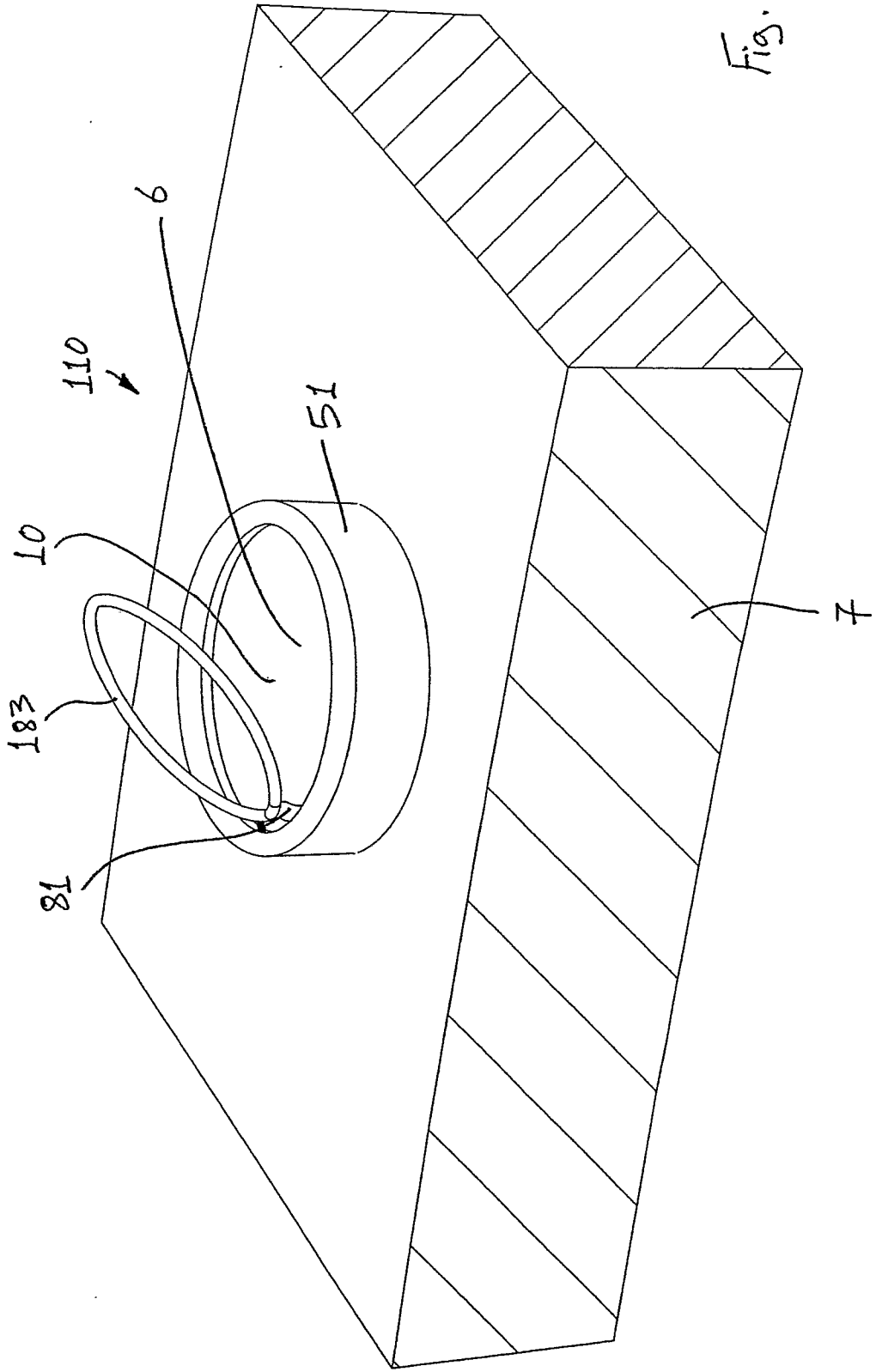


Fig. 7

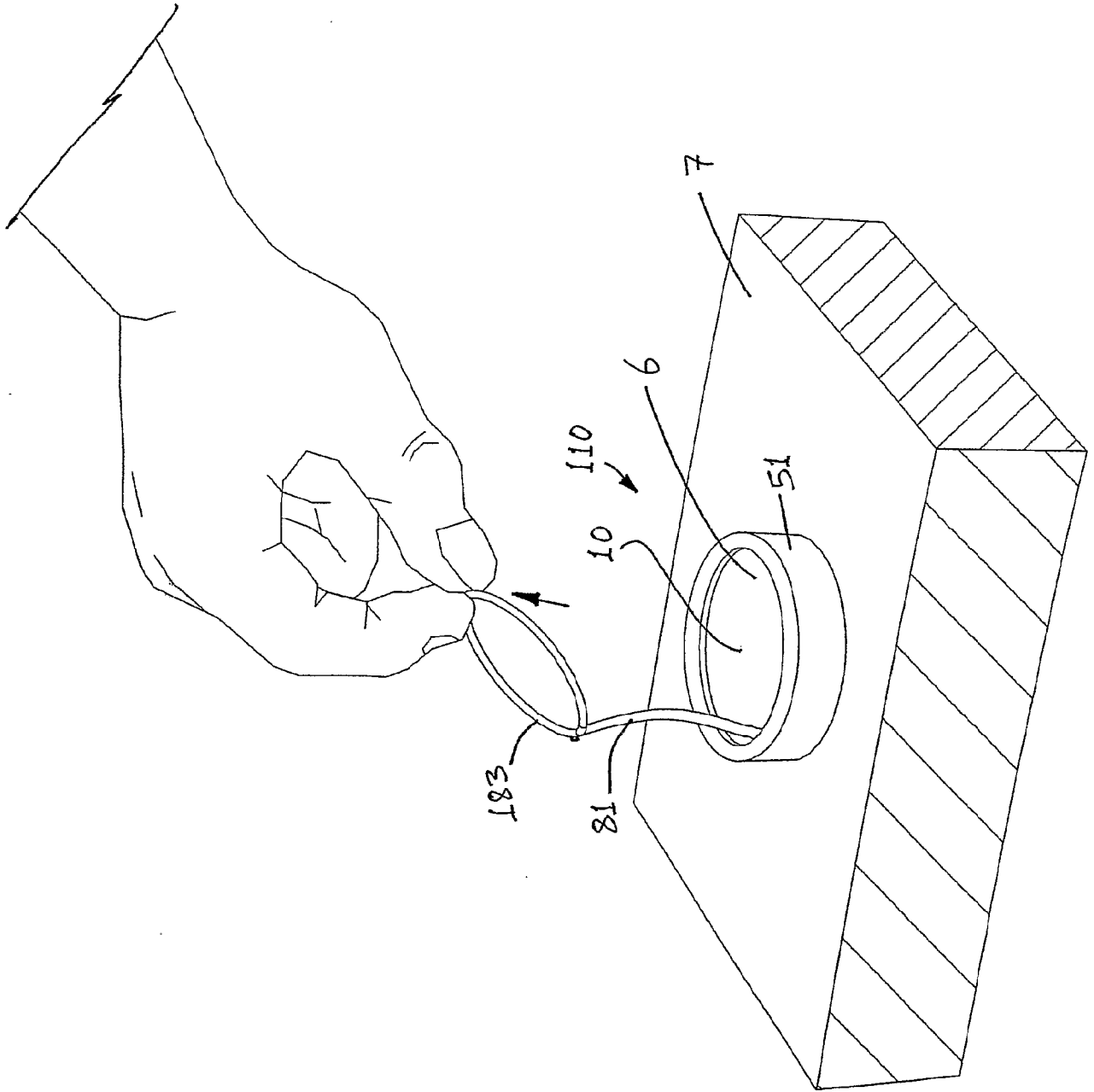


Fig. 8

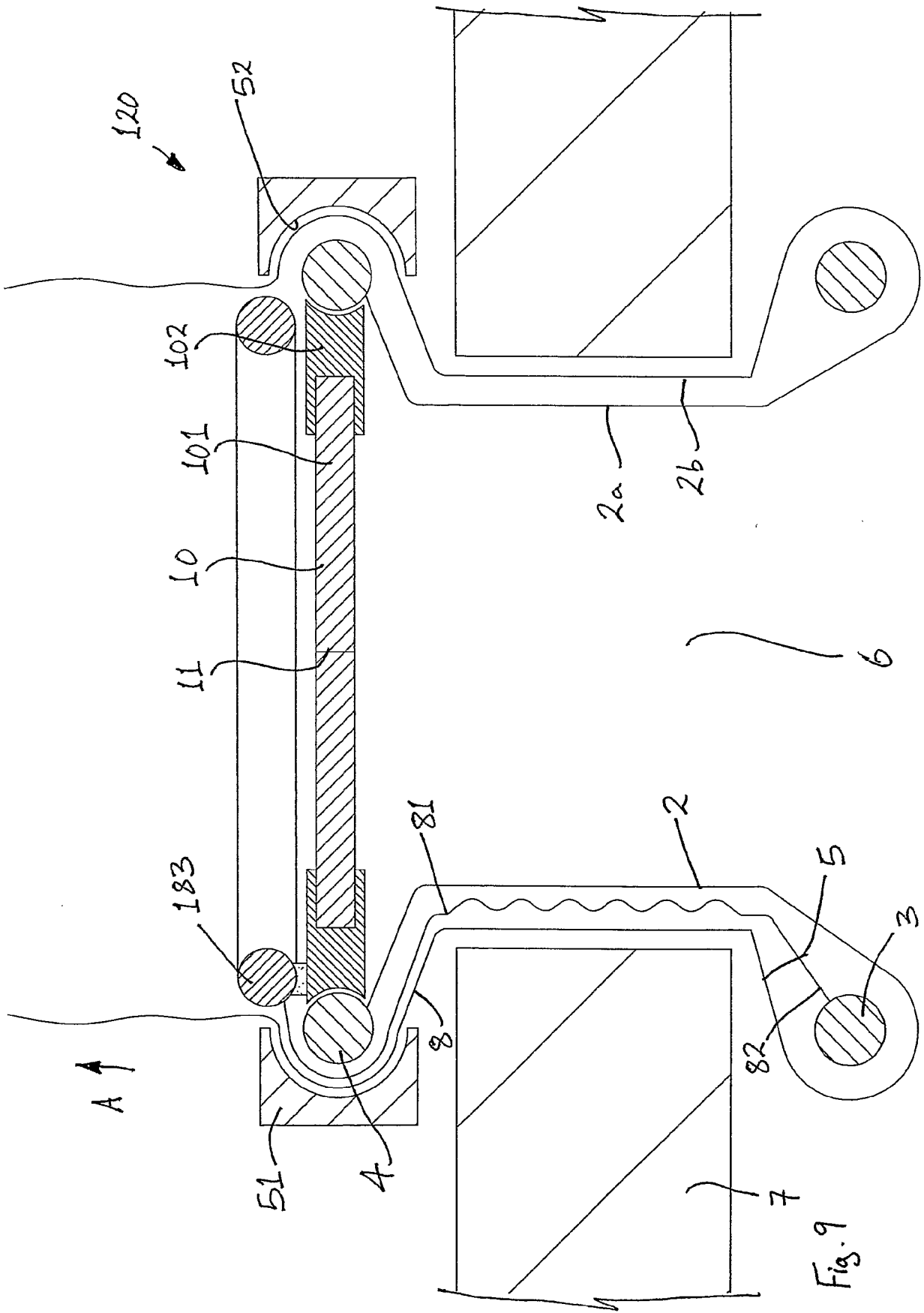


Fig. 9

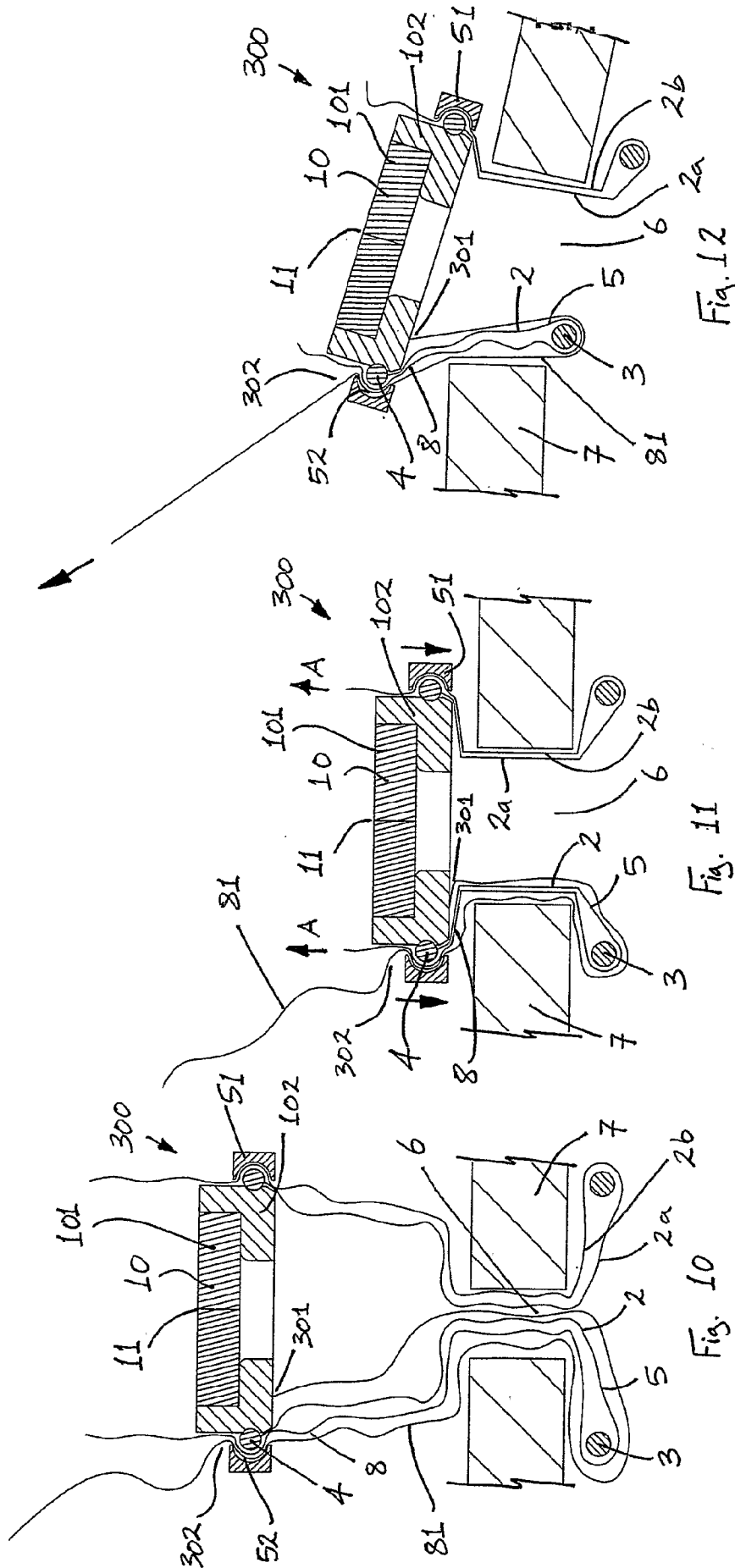


Fig. 12

Fig. 11

Fig. 10

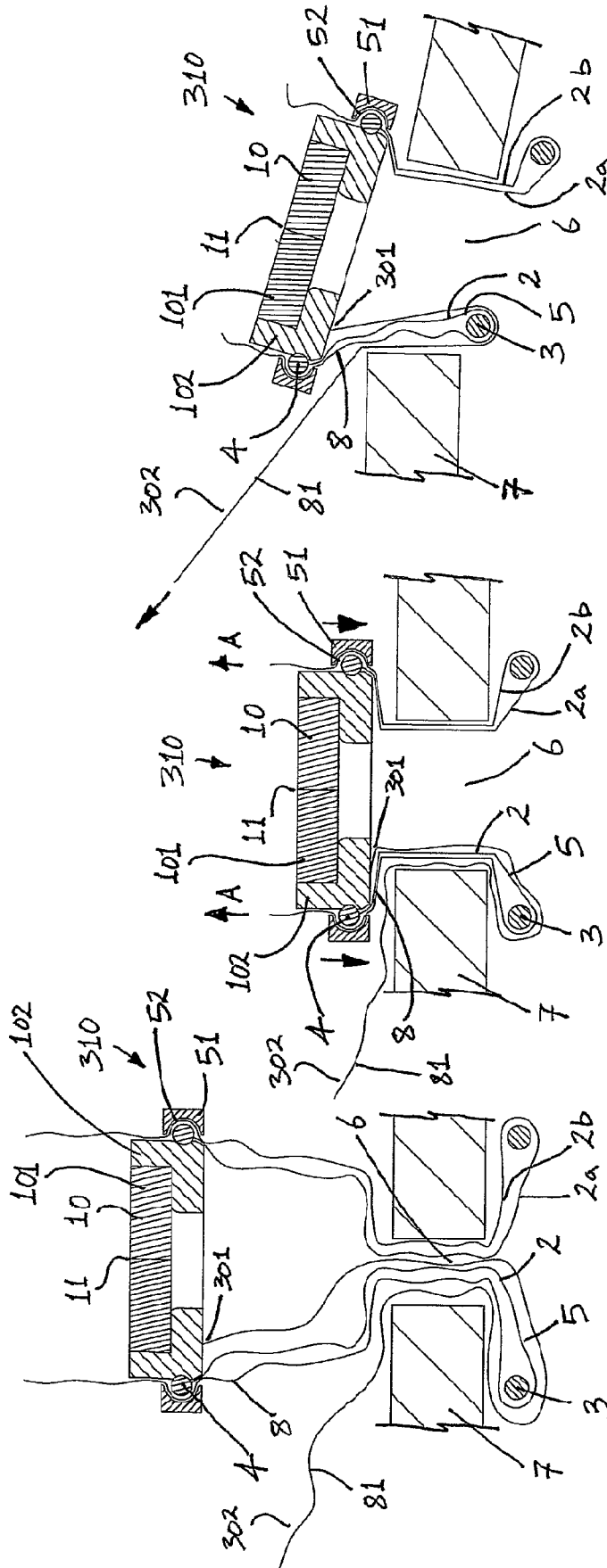


Fig. 15

Fig. 14

Fig. 13

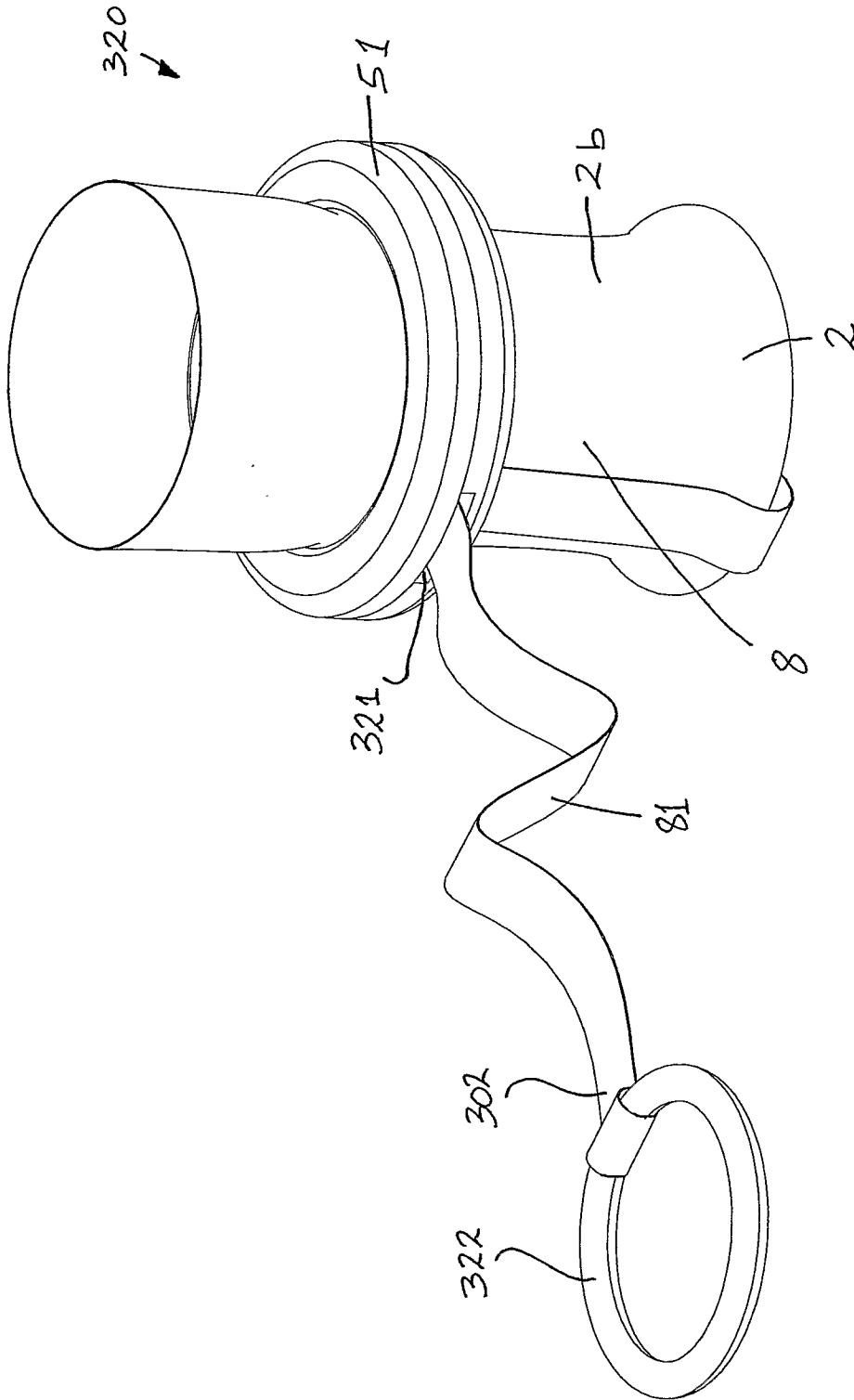


Fig. 16

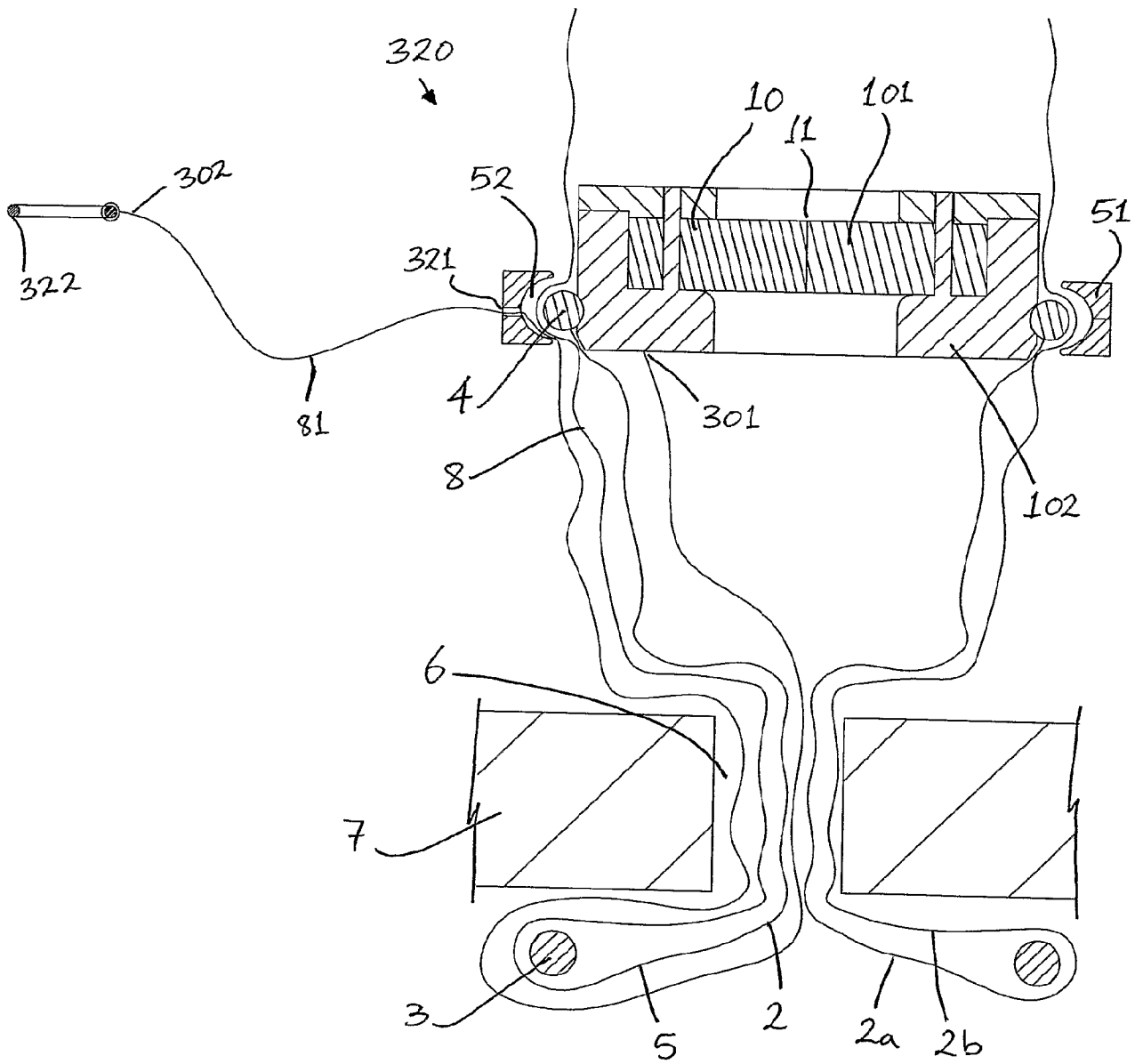


Fig. 17



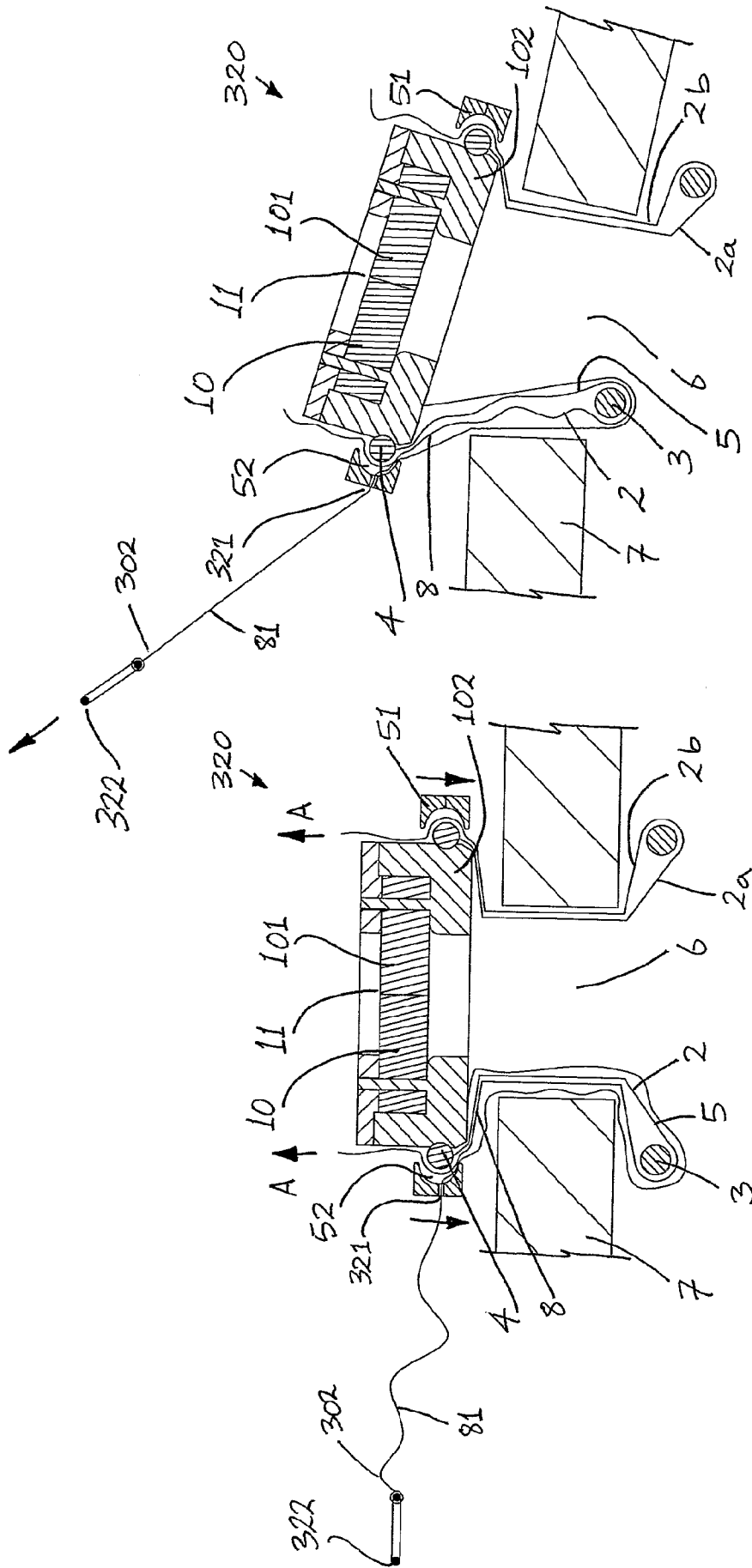


Fig. 19

Fig. 18

**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/IE2006/000073

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> INV. A61B17/34				
According to International Patent Classification (IPC) or to both national classification and IPC				
<b>B. FIELDS SEARCHED</b>				
Minimum documentation searched (classification system followed by classification symbols) A61B				
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched				
Electronic data base consulted during the International search (name of data base and, where practical, search terms used) EPO-Internal				
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>				
<b>Category*</b>	<b>Citation of document, with indication, where appropriate, of the relevant passages</b>	<b>Relevant to claim No.</b>		
X	WO 2005/009257 A2 (ATROPOS LTD [IE]; BONADIO FRANK [IE]; BUTLER JOHN [IE]; VAUGH TREVOR [ ] 3 February 2005 (2005-02-03) page 39, line 25 - page 40, line 9; figures 23-28  -----	1-86		
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.				
* Special categories of cited documents : <table style="width:100%; border:none;"> <tr> <td style="width:50%; border:none;">           "A" document defining the general state of the art which is not considered to be of particular relevance            "E" earlier document but published on or after the international filing date            "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)            "O" document referring to an oral disclosure, use, exhibition or other means            "P" document published prior to the international filing date but later than the priority date claimed         </td> <td style="width:50%; border:none;">           "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention            "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone            "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.            "&amp;" document member of the same patent family         </td> </tr> </table>			"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family
"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family			
Date of the actual completion of the international search  24 November 2006		Date of mailing of the international search report  04/12/2006		
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016		Authorized officer  Hansen, Soren		

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/IE2006/000073

## Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.: 87-103  
because they relate to subject matter not required to be searched by this Authority, namely:  
Claims 88-103: Rule 39.1(iv) PCT - Method for treatment of the human or animal body by surgery
2.  Claims Nos.: 87  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:  
see FURTHER INFORMATION sheet PCT/ISA/210
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1.  As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3.  As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4.  No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.1

Claims Nos.: 87-103

Claims 88-103: Rule 39.1(iv) PCT - Method for treatment of the human or animal body by surgery

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Continuation of Box II.2

Claims Nos.: 87

Claim 87 - Claims shall not rely on references to the description or drawings, Art. 6, Rule 6.2(a)

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IE2006/000073

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2005009257 A2	03-02-2005	AU 2004258765 A1	03-02-2005
		CA 2533798 A1	03-02-2005
		EP 1656073 A2	17-05-2006

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