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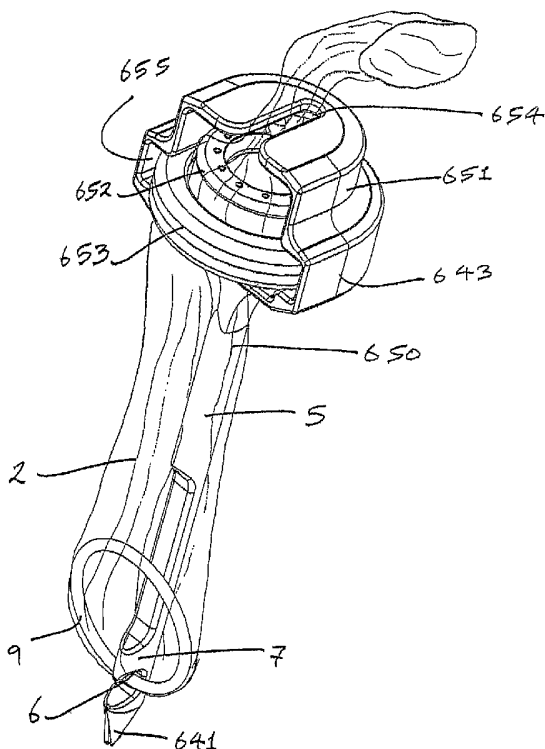
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[Continued on next page]

(54) Title: AN APPARATUS FOR INSERTING A SURGICAL DEVICE AT LEAST PARTIALLY THROUGH A WOUND
OPENING



(57) Abstract: An apparatus (650) for inserting a distal ring
(9) of a wound retractor device (2) through a wound opening
comprises a bladeless tip (641) for creating the wound open-
ing by forcing tissue apart, and a conveying device (5) for
conveying the distal ring (9) through the wound opening. The
conveying device (5) comprises a hook element (6) for engag-
ing the distal ring (9) to convey the distal ring (9) through the
wound opening, and a receiver housing (651) for receiving a
seal (652) and a proximal ring (653) of the wound retractor
device (2) to hold the seal (652) and the proximal ring (653)
externally of the wound opening, and thus maintain a sleeve
portion of the wound retractor device (2) in tension, during
conveying of the distal ring (9) through the wound opening.

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“An apparatus for inserting a surgical device at least partially through a wound opening”

Introduction

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This invention relates to an apparatus for inserting a surgical device at least partially through a wound opening, and to a method of inserting the surgical device at least partially through the wound opening.

Statements of Invention

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According to the invention there is provided an apparatus for inserting a surgical device at least partially through a wound opening, the apparatus comprising: -

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a conveying device insertable at least partially through a wound opening to convey a surgical device at least partially through the wound opening.

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In one embodiment of the invention the conveying device is configured to engage a surgical device to couple the surgical device to the conveying device. The conveying device may comprise a hook element to engage a surgical device. A concave portion of the hook element may face distally. The hook element may be provided in the region of a distal end of the conveying device. The conveying device may comprise a body portion, and the hook element may be movable relative to the body portion.

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In one embodiment the conveying device comprises a retaining element to retain a surgical device in engagement with the conveying device. The conveying device may comprise a passageway to facilitate location of a surgical device in engagement with the conveying device. The passageway may facilitate location of at least part of a surgical device in the concave portion of the hook element. The retaining element may be configured to selectively obstruct at least part of the passageway.

In one case the retaining element is movable between an obstructing configuration obstructing at least part of the passageway and a passage configuration facilitating passage of a surgical device through the passageway. The retaining element may be pivotably movable between the obstructing configuration and the passage configuration. The retaining element may be biased towards the obstructing configuration. The retaining element may comprise a resilient arm. The conveying device may comprise a control element to control movement of the retaining element between the obstructing configuration and the passage configuration.

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In one embodiment the apparatus is configured to insert a surgical device at least partially through a wound opening with at least part of the surgical device in a low-profile configuration. The apparatus may comprise a holder element for holding at least part of a surgical device in a low-profile configuration. The holder element may be movable relative to the conveying device between a holding configuration in which at least part of a surgical device is held in a low-profile configuration and a release configuration in which the surgical device is released. The holder element may be mounted to the conveying device. The holder element may be concentrically mounted around the conveying device.

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In one case the apparatus is configured to hold a first part of a surgical device externally of a wound opening during conveying of a second part of the surgical device through the wound opening. The apparatus may be configured to maintain part of a surgical device in tension. The apparatus may comprise a receiver portion for receiving a first part of a surgical device to hold the first part. The receiver portion may comprise a slot. The receiver portion may comprise a housing portion. The receiver portion may be provided at a proximal end of the conveying device.

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In another embodiment the conveying device comprises a housing portion for receiving at least part of a surgical device to couple the surgical device to the conveying device. The housing portion may have an exit opening to facilitate

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ejection of at least part of a surgical device from within the housing portion. The housing portion may have an entry opening to facilitate insertion of at least part of a surgical device into the housing portion. The housing portion may have an opening which acts as both the exit opening and the entry opening. The exit opening and/or the entry opening may be provided at a distal end of the housing portion. The exit opening and/or the entry opening may face distally.

The exit opening and/or the entry opening may be provided along at least part of a sidewall of the housing portion. In one case the exit opening and/or the entry opening faces laterally.

In one case the apparatus comprises a closure element to selectively close the exit opening and/or the entry opening.

The housing portion may have a sleeve opening to facilitate a part of a surgical device extending out of the housing portion. The sleeve opening may be provided along at least part of the sidewall of the housing portion. The sleeve opening may face laterally.

In one case the housing portion has an opening which acts as both the sleeve opening and the exit opening. The housing portion may have an opening which acts as both the sleeve opening and the entry opening.

In a further case the conveying device comprises an ejector element to assist ejection of at least part of a surgical device from within the housing portion. The ejector element may comprise a plunger.

The housing portion may be substantially non-circular in cross-section. The housing portion may be substantially oval-shaped in cross-section.

In another embodiment the conveying device comprises an insertion element insertable at least partially through a wound opening and a drawing element to couple a surgical device to the insertion element for drawing of the surgical device at least partially through the wound opening. The drawing element may be substantially flexible. The drawing element may comprise a length of string. The insertion element may have an opening through which the drawing element extends to couple the drawing element to the insertion element. The opening may be provided in the region of a distal end of the insertion element.

10 The conveying device may be configured to convey a surgical device arranged concentrically with respect to a longitudinal axis of the conveying device. The conveying device may be configured to convey a surgical device arranged offset with respect to a longitudinal axis of the conveying device.

15 In one case the conveying device has a wound extending portion with a maximum transverse dimension of between 3 mm and 35 mm. The maximum transverse dimension of the wound extending portion may be between 5 mm and 12 mm.

20 In one case a distal end of the conveying device is substantially blunt. In another case a distal end of the conveying device is substantially rounded.

In one embodiment the apparatus comprises an opening device to create a wound opening.

25 The opening device may comprise an incising device. The incising device may be configured to create a wound opening by cutting tissue. The incising device may comprise a substantially sharp tip. The incising device may comprise a blade element. The incising device may comprise an electrocautery scalpel.

The opening device may be configured to create a wound opening by forcing tissue apart. The opening device may comprise a substantially blunt tip. The opening device may comprise a substantially bladeless tip.

5 The opening device may be mounted to the conveying device. The conveying device may comprise a lumen extending therethrough and the opening device may be extendable through the lumen to mount the opening device to the conveying device. The opening device may be mounted substantially concentrically with respect to a longitudinal axis of the conveying device.

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The opening device may be attached to the conveying device. In one case the opening device is releasably attached to the conveying device. The apparatus may be configured to create a wound opening and convey a surgical device at least partially through the wound opening in a single step.

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The opening device may be provided at a distal end of the conveying device.

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In one case the opening device is movable relative to the conveying device between an extended configuration and a retracted configuration. The opening device may be manually movable relative to the conveying device between the extended configuration and the retracted configuration. The opening device may comprise a handle portion to facilitate manual movement of the opening device. The opening device may be biased towards the retracted configuration. The opening device may be biased towards the extended configuration.

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In another case the opening device is detached from the conveying device.

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The apparatus may be configured to create a wound opening in an opening step and to convey a surgical device at least partially through the wound opening in a separate conveying step. In one embodiment the conveying device is configured to be inserted at least partially through a wound opening after the opening device has been

removed from the wound opening. In another embodiment the conveying device is configured to be inserted at least partially through a wound opening while the opening device remains in position extending through the wound opening. In the retracted configuration a distal end of the opening device may be covered. In the
5 retracted configuration a distal end of the opening device may be housed within the conveying device. The opening device may have a wound extending portion with a substantially flattened cross-section. The conveying device may have a wound extending portion with a substantially flattened cross-section.

10 In a further embodiment the opening device comprises a cutting element for creating a wound opening and a shield element for shielding the cutting element. The shield element may be movable relative to the cutting element between a cutting configuration and a shielding configuration. The opening device may be biased towards the shielding configuration. The opening device may comprise a locking
15 element to releasably lock the opening device in the shielding configuration.

The cutting element may be fixed to the conveying device. The shield element may be mounted to the conveying device. The shield element may be concentrically mounted around the conveying device.

20 In one case the opening device comprises a support element, the cutting element being fixedly attached to the support element and the shield element being movably attached to the support element.

25 In another case the opening device comprises a support element, the shield element being fixedly attached to the support element and the cutting element being movably attached to the support element.

30 In a further embodiment the opening device comprises a cutting element for creating a wound opening and a support element, the cutting element being releasably attached to the support element.

In one case the apparatus comprises a limiting element to limit the extent of passage of the opening device through tissue. The limiting element may comprise an abutment member for abutting an external surface of tissue adjacent a wound opening. The limiting element may be mounted to the opening device. The position of mounting of the limiting element on the opening device may be adjustable.

The limiting element may be movable relative to the opening device between a retracted configuration and an extended configuration. The limiting element may be biased towards the retracted configuration.

The opening device may have a wound extending portion with a maximum transverse dimension of between 3 mm and 35 mm. The maximum transverse dimension of the wound extending portion may be between 5 mm and 12 mm.

In another embodiment the apparatus comprises a guide device insertable at least partially through a wound opening to maintain the patency of the wound opening.

The guide device may be substantially flexible. The guide device may comprise a length of string.

The guide device may be substantially rigid. In one case the guide device is substantially tubular. The guide device may have a substantially flattened, oblong cross-section. The guide device may have a slot extending along a sidewall of the guide device.

The guide device may be mountable to the conveying device and/or to the opening device.

The guide device may have a wound extending portion with a maximum transverse dimension of between 3 mm and 35 mm. The maximum transverse dimension of the wound extending portion may be between 5 mm and 12 mm.

5 In another case the apparatus comprises a removal device to assist in removal of a surgical device from a wound opening. The removal device may be detached from a surgical device. The removal device may be configured to engage a surgical device to assist in removal of the surgical device from a wound opening. The removal device may be configured to engage a distal portion of a surgical device.

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The removal device may comprise a hook element to engage a surgical device. A concave portion of the hook element may face proximally. The hook element may be provided in the region of a distal end of the removal device.

15 The removal device may comprise a gripping portion which may be gripped.

In one case the removal device comprises a connector element extendable at least partially through a wound opening. The connector element may be substantially flexible. The connector element may comprise a length of string.

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The guide device and the removal device may be provided by a single device.

In another aspect of the invention there is provided a surgical assembly comprising: -

25 a surgical device; and

an apparatus of the invention for inserting the surgical device at least partially through a wound opening.

30 The surgical device may comprise a wound retractor device. The wound retractor device may comprise a distal retaining element for location distally of a wound

opening to retain the wound retractor device in position retracting the wound opening.

In a further aspect, the invention provides a method of inserting a surgical device at least partially through a wound opening, the method comprising the steps of: -

providing a surgical device;

creating a wound opening; and

conveying the surgical device at least partially through the wound opening.

The wound opening may be created and the surgical device may be conveyed at least partially through the wound opening in a single step.

In one embodiment the wound opening is created using an opening device, and the surgical device is conveyed at least partially through the wound opening using a conveying device. The method may comprise the step of moving the opening device relative to the conveying device between an extended configuration and a retracted configuration. The opening device may be moved relative to the conveying device from the extended configuration to the retracted configuration after the wound opening has been created. The opening device may be moved relative to the conveying device from the extended configuration to the retracted configuration before the surgical device has been conveyed fully through the wound opening.

In one case the opening device is manually moved relative to the conveying device between the extended configuration and the retracted configuration. The opening device may be pulled proximally relative to the conveying device from the extended configuration to the retracted configuration. The opening device may be moved relative to the conveying device from the extended configuration to the retracted

configuration by a biasing element. The opening device may be moved while the conveying device remains in a fixed position.

5 The wound opening may be created in an opening step and the surgical device may be conveyed at least partially through the wound opening in a separate conveying step. In one case the wound opening is created using an opening device, and the surgical device is conveyed at least partially through the wound opening after the opening device has been removed from the wound opening. In another case the wound opening is created using an opening device, and the surgical device is
10 conveyed at least partially through the wound opening while the opening device remains in position extending through the wound opening.

The surgical device may be conveyed at least partially through the wound opening by engaging the surgical device and pushing the surgical device distally. In one
15 embodiment the method comprises the step of retaining the surgical device in engagement with a conveying device during the step of conveying at least partially through the wound opening.

The surgical device may be conveyed at least partially through the wound opening with at least part of the surgical device in a low-profile configuration. The method
20 may comprise the step of holding at least part of the surgical device in the low-profile configuration during the step of conveying at least partially through the wound opening. The method may comprise the step of releasing the surgical device after conveying at least partially through the wound opening.

25 In one case the method comprises the step of holding a first part of the surgical device externally of the wound opening during conveying of a second part of the surgical device through the wound opening. Part of the surgical device may be maintained in tension.

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The surgical device may be conveyed at least partially through the wound opening with at least part of the surgical device received in a housing portion of a conveying device. The method may comprise the step of inserting at least part of the surgical device into the housing portion before conveying at least partially through the wound opening. The method may comprise the step of ejecting at least part of the surgical device from within the housing portion after conveying at least partially through the wound opening.

The surgical device may be conveyed at least partially through the wound opening by drawing the surgical device distally.

In one case the wound opening is created by cutting tissue. In another case the wound opening is created by forcing tissue apart.

The wound opening may be created by advancing an opening device substantially distally through tissue. The wound opening may be created by rotating an opening device. The opening device may be rotated about an axis substantially parallel to the longitudinal axis of the wound opening.

In a further case the method comprises the steps of: -

providing a guide device; and

inserting the guide device at least partially through the wound opening to maintain the patency of the wound opening.

The wound opening may be created using an opening device, and the method may comprise the step of limiting the extent of passage of the opening device through tissue.

The wound opening may be created using an opening device, and the method may comprise the step of shielding a cutting element of the opening device after the wound opening has been created. The cutting element may be shielded before the surgical device has been conveyed fully through the wound opening. The method
5 may comprise the step of exposing the cutting element to create the wound opening.

In one case the method comprises the step of removing the surgical device from the wound opening. The method may comprise the step of engaging the surgical device to remove the surgical device from the wound opening. A distal portion of the
10 surgical device may be engaged.

The maximum transverse dimension of the wound opening is preferably between 3 mm and 35 mm. The maximum transverse dimension of the wound opening may be between 5 mm and 12 mm.
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The invention also provides in another aspect a guide device insertable at least partially through a wound opening to maintain the patency of the wound opening.

In another aspect the invention provides a removal device to assist in removal of a
20 surgical device from a wound opening.

According to another aspect the invention provides an opening device comprising a cutting element for creating a wound opening and a support element, the cutting element being releasably attached to the support element.
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In a further aspect the invention provides an opening device to create a wound opening, the opening device comprising a limiting element to limit the extent of passage of the opening device through tissue.

According to another aspect the invention provides an opening device comprising a cutting element for creating a wound opening and a shield element for shielding the cutting element.

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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 side view of an apparatus for inserting a surgical device at least partially through a wound opening according to the invention;

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Fig. 2 is an end view of the apparatus of Fig. 1;

Figs. 3 to 5 are partially cross-sectional, side views of the apparatus of Fig. 1, in use;

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Fig. 6 is a side view of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention;

Figs. 7 to 9 are partially cross-sectional, side views of the apparatus of Fig. 6, in use;

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Fig. 10 is a side view of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention and a surgical device;

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Fig. 11 is a partially cut-away, side view of the apparatus and surgical device of Fig. 10;

Figs. 12 to 15 are partially cross-sectional, side views of the apparatus of Fig. 10, in use;

5 Figs. 16 to 21 are partially cross-sectional, side views of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention, in use;

10 Figs. 21(a) to 21(f) are views similar to Figs. 10 to 15 of a further apparatus for inserting a surgical device at least partially through a wound opening according to the invention;

15 Fig. 21(g) is a cross-sectional, side view of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention;

Figs. 21(h) to 21(k) are partially cross-sectional, side views of the apparatus of Fig. 21(g), in use;

20 Figs. 21(l) to 21(p) are views similar to Figs. 21(g) to 21(k) of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention;

25 Fig. 21(q)(i) is a side view of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention;

Fig. 21(q)(ii) is a perspective view of an opening device of the apparatus of Fig. 21(q)(i);

Figs. 21(r)(i) to 21(v)(ii) are views similar to Figs. 21(q)(i) and 21(q)(ii) of further apparatus for inserting a surgical device at least partially through a wound opening according to the invention;

5 Figs. 22 to 24 are partially cross-sectional, side views of a further apparatus for inserting a surgical device at least partially through a wound opening according to the invention, in use;

10 Fig. 24(a) is an end view of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention;

Fig. 24(b) is a side view of the apparatus of Fig. 24(a);

15 Figs. 24(c) and 24(d) are views similar to Figs. 24(a) and 24(b) of the apparatus of Fig. 24(a) and a surgical device;

Figs. 24(e) to 24(j) are partially cut-away, perspective views of the apparatus of Fig. 24(a), in use;

20 Fig. 24(k) is a perspective view of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention;

Figs. 24(l) and 24(m) are perspective views of the apparatus of Fig. 24(k) and a surgical device;

25 Figs. 25 to 30 are partially cross-sectional, side views of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention, in use;

Figs. 31 to 36 are partially cross-sectional, side views of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention, in use;

5 Figs. 37 to 43 are partially cross-sectional, side views of a further apparatus for inserting a surgical device at least partially through a wound opening according to the invention, in use;

10 Figs. 43(a) to 43(f) are partially cut-away, perspective views of the apparatus of Figs. 24(a) to 24(j), in use;

Figs. 44 to 49 are partially cross-sectional, side views of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention, in use;

15 Fig. 50 is a perspective view of a guide device of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention;

20 Figs. 51 and 52 are perspective views of a guide device and an incising device of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention;

Figs. 53 to 58 are perspective views of the apparatus, in use;

25 Figs. 58(a) to 58(d) are perspective views of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention, in use;

Figs. 58(e) to 58(h) are perspective views of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention, in use;

5 Figs. 58(i) to 58(n) are partially cut-away, perspective views of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention, in use;

10 Figs. 59 to 61 are side views of incising devices of other apparatus for inserting a surgical device at least partially through a wound opening according to the invention;

15 Figs. 62 and 63 are partially cross-sectional, side views of the incising device of Fig. 61, in use;

Figs. 64 and 65 are partially cross-sectional, side views of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention, in use;

20 Fig. 66 is a side view of an incising device of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention;

25 Figs. 67 and 68 are partially cross-sectional, side views of the incising device of Fig. 66, in use;

Fig. 69 is a side view of a further apparatus for inserting a surgical device at least partially through a wound opening according to the invention;

30 Fig. 70 is an end view of the apparatus of Fig. 69;

Fig. 71 is a partially cross-sectional, side view of the apparatus of Fig. 69 in an extended configuration;

5 Fig. 72 is a partially cross-sectional, side view of the apparatus of Fig. 69 in a retracted configuration;

Figs. 73 to 75 are partially cross-sectional, side views of the apparatus of Fig. 69, in use;

10 Figs. 75(a) and 75(b) are views similar to Figs. 71 and 72 of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention;

15 Figs. 75(c) to 75(g) are partially cross-sectional, side views of the apparatus of Fig. 75(a) and 75(b), in use;

Fig. 75(h) is a side view of a distal end of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention in an obstructing configuration;

20 Fig. 75(i) is a side view of the apparatus of Fig. 75(h) in a passage configuration;

25 Fig. 75 (j) and 75(k) are views similar to Figs. 75(h) and 75(i) of a distal end of a further apparatus for inserting a surgical device at least partially through a wound opening according to the invention;

30 Figs. 75(k)(i) and 75(k)(ii) are side views of part of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention;

Fig. 75(k)(iii) is a front view of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention in an obstructing configuration;

5 Fig. 75(k)(iv) is a side view of the apparatus of Fig. 75(k)(iii) in the obstructing configuration;

Figs. 75(k)(v) and 75(k)(vi) are views similar to Figs. 75(k)(iii) and 75(k)(iv) of the apparatus of Fig. 75(k)(iii) in a passage configuration;

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Figs. 75(k)(vii) and 75(k)(viii) are views similar to Figs. 75(k)(iii) and 75(k)(iv) of the apparatus of Fig. 75(k)(iii) in the obstructing configuration and a surgical device;

15 Fig. 75(l) is a perspective view of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention in an extended configuration;

20 Fig. 75(m) is a side view of the apparatus of Fig. 75(l) in the extended configuration;

Fig. 75(n) is a partially cross-sectional, side view of the apparatus of Fig. 75(l) in the extended configuration;

25 Fig. 75(o) is a plan view from below of the apparatus of Fig. 75(l) in the extended configuration;

Figs. 75(p) and 75(q) are views similar to Figs. 75(m) and 75(n) of the apparatus of Fig. 75(l) in a retracted configuration;

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Fig. 75(r) is a side view of a conveying device of the apparatus of Fig. 75(l);

Fig. 75(s) is a cross-sectional, side view of the conveying device of Fig. 75(p);

5 Fig. 75(t) is a perspective view of an incising device of the apparatus of Fig. 75(l);

Figs. 75(u) to 75(y) are partially cross-sectional, side views of the apparatus of Fig. 75(l), in use;

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Figs. 76 to 81 are partially cross-sectional, side views of an incising device of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention, in use;

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Figs. 82 and 83 are perspective views of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention;

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Figs. 84 to 88 are partially cross-sectional, side views of the apparatus of Figs. 82 and 83, in use;

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Fig. 89 is a perspective view of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention with a holder element in a release configuration and with an incising device in a retracted configuration;

Fig. 90 is a front view of the apparatus of Fig. 89;

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Fig. 91 is a front view of the apparatus of Fig. 89 with the holder element in a holding configuration and with the incising device in the retracted configuration;

Fig. 92 is a perspective view of the apparatus of Fig. 89 with the holder element in the holding configuration and with the incising device in an extended configuration;

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Fig. 93 is a front view of the apparatus of Fig. 92;

Figs. 94 to 102 are partially cross-sectional, front views of the apparatus of Fig. 89, in use;

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Fig. 103 is a perspective view of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention;

Figs. 104 to 107 are partially cut-away, perspective views of the apparatus of Fig. 103, in use;

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Fig. 108 is a perspective view of a further apparatus for inserting a surgical device at least partially through a wound opening according to the invention in a shielding configuration;

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Figs. 109 and 110 are perspective views of the apparatus of Fig. 108 in a cutting configuration;

Fig. 111 is a view along line A-A in Fig. 110;

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Figs. 112 to 115 are partially cut-away, perspective views of the apparatus of Fig. 108, in use;

Fig. 116 is a perspective view of another apparatus for inserting a surgical device at least partially through a wound opening according to the invention in a retracted configuration; and

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Fig. 117 is a perspective view of the apparatus of Fig. 116 in an extended configuration.

5 Detailed Description

Referring to the drawings and initially to Figs. 1 to 5 thereof, there is illustrated an apparatus 1 according to the invention suitable for inserting a surgical device, such as a wound retractor device 2, at least partially through a wound opening 3. Together the apparatus 1 and the wound retractor device 2 form a surgical assembly.

10 The apparatus 1 comprises an incising device 4 for creating the wound opening 3, and a conveying device 5 insertable through the wound opening 3 to convey the wound retractor device 2 through the wound opening 3.

15 In this case the wound retractor device 2 has a distal retaining ring 9 for locating distally of the wound opening 3 to retain the wound retractor device 2 in position retracting the wound opening 3. However it will be appreciated that the apparatus 1 is suitable for conveying a variety of surgical devices at least partially through a wound opening 3. For example, the surgical device may be of any suitable construction such as the wound retractor devices described in US patent application published under No. 2001/0037053A, and/or US patent No. 6,582,364, and/or US patent application No. 10/678,653, the relevant contents of which are incorporated herein by reference.

25 In this case the incising device 4 is provided in the form of a sharpened blade element fixedly attached to the distal end 7 of the conveying device 5.

30 The conveying device 5 has a hook element 6 in the region of the distal end 7 for engaging a portion of the wound retractor device 2 to couple the wound retractor

device 2 to the conveying device 5. As illustrated in Fig. 1, the concave portion of the hook element 6 faces distally.

5 The hook element 6 opens to a side of the conveying device 5. The wound retractor device 2 is therefore arranged offset with respect to the longitudinal axis A-A of the conveying device 5.

10 In use, the wound retractor device 2 is coupled to the conveying device 5 by engaging the distal ring 9 of the wound retractor device 2 with the hook element 6 (Fig. 3). The apparatus 1 is then passed through tissue 8 with the blade element 4 as the leading end to create the wound opening 3, and is advanced through the wound opening 3 to convey the wound retractor device 2 through the wound opening 3 by passing the distal ring 9 distally (Fig. 4). Thus the apparatus 1 may be used to create the wound opening 3 and convey the wound retractor device 2 through the wound opening 3 in a single step. The apparatus 1 may then be withdrawn from the wound opening 3 leaving the wound retractor device 2 in position extending through the wound opening 3 and with the distal ring 9 distally of the wound opening 3 (Fig. 5).

20 The maximum transverse dimension of the wound opening 3 is between 3 mm and 35 mm, preferably between 5 mm and 12 mm.

The maximum transverse dimension of the incising device 4 and of the portion of the conveying device 5 which extends through the wound opening 3 is between 3 mm and 35 mm, preferably between 5 mm and 12 mm.

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In Figs. 6 to 9 there is illustrated another apparatus 11 according to the invention, which is similar to the apparatus 1 of Figs. 1 to 5, and similar elements in Figs. 6 to 9 are assigned the same reference numerals.

In this case the incising device 12 is provided in the form of an electrocautery scalpel fixedly attached to the distal end 7 of the conveying device 5. The electrocautery scalpel 12 has a power connection lead 13 for connecting to a power supply.

5 Figs. 10 to 15 illustrate a further apparatus 21 according to the invention, which is similar to the apparatus 1 of Figs. 1 to 5, and similar elements in Figs. 10 to 15 are assigned the same reference numerals.

10 In this case the conveying device 5 comprises a housing portion 22 for receiving the distal ring 9 of the wound retractor device 2. In this manner the wound retractor device 2 is coupled to the conveying device 5.

15 An entry/exit opening 23 is provided at the distal end of housing portion 22 facing distally. The opening 23 facilitates insertion of the distal ring 9 into and ejection of the distal ring 9 from within the housing portion 22.

20 A sleeve opening 25 is also provided through which a sleeve portion of the wound retractor device 2 may extend from the distal ring 9 proximally out of the housing portion 22. The sleeve opening 25 is provided along a part of the sidewall of the housing portion 22 and faces laterally.

25 The blade element 4 is hingeably attached to the housing portion 22. In this way the blade element 4 acts as a closure element to selectively close the opening 23 (Fig. 11) or selectively open the opening 23 (Fig. 14).

The conveying device also includes a plunger 24 which may be depressed to assist ejection of the distal ring 9 from within the housing portion 22 (Fig. 14).

30 In use, the wound retractor device 2 is coupled to the conveying device 5 by inserting the distal ring 9 into the housing portion 22 through the opening 23 and moving the blade element 4 across to close the opening 23. The sleeve portion of the

wound retractor device 2 extends proximally out through the sleeve opening 25. The apparatus 21 is then passed through tissue 8 with the blade element 4 as the leading end to create the wound opening 3, and is advanced through the wound opening 3 to convey the wound retractor device 2 through the wound opening 3 (Figs. 12 and 13).
5 The plunger 24 is then depressed to push the distal ring 9 distally to engage against the blade element 4, and thus move the blade element 4 across to open the opening 23. Further depression of the plunger 24 ejects the distal ring 9 from within the housing portion 22 through the opening 23 (Fig. 14). The apparatus 21 may then be withdrawn from the wound opening 3 leaving the wound retractor device 2 in
10 position extending through the wound opening 3 and with the distal ring 9 distally of the wound opening 3 (Fig. 15).

Referring to Figs. 16 to 21 there is illustrated another apparatus 31 according to the invention, which is similar to the apparatus 21 of Figs. 10 to 15, and similar elements
15 in Figs. 16 to 21 are assigned the same reference numerals.

In this case the housing portion 22 has an entry opening 32 in the form of an elliptical slot along a proximal part of the sidewall of the housing portion 22, and has an exit opening 33 in the form of an elliptical slot along a distal part of the sidewall.
20 The slots 32, 33 face laterally. A narrow slot 34 joins the entry opening 32 to the exit opening 33. The narrow slot 34 allows the sleeve portion of the wound retractor device 2 to pass into the body (Fig. 20).

The blade element 4 is fixedly attached to the housing portion 22 in this case.
25

In use, the wound retractor device 2 is coupled to the conveying device 5 by inserting the distal ring 9 into the housing portion 22 through the proximal opening 32 (Figs. 16 and 17). The apparatus 31 is then passed through tissue 8 with the blade element 4 as the leading end to create the wound opening 3, and is advanced through
30 the wound opening 3 to convey the wound retractor device 2 through the wound opening 3 (Figs. 18 and 19). The plunger 24 is depressed to eject the distal ring 9

from within the housing portion 22 through the exit opening 33 (Fig. 20). The sleeve of the wound retractor device 2 passes along the narrow slot 34. The apparatus 31 may then be withdrawn from the wound opening 3 leaving the wound retractor device 2 in position extending through the wound opening 3 and with the distal ring 9 distally of the wound opening 3 (Fig. 21).

Figs. 21(a) to 21(f) illustrate another apparatus 230 according to the invention, which is similar to the apparatus 31 of Figs. 16 to 21, and similar elements in Figs. 21(a) to 21(f) are assigned the same reference numerals.

In this case the housing portion 22 has a single opening 231, which faces laterally, along the distal portion of the sidewall. The opening 231 acts as the entry opening to facilitate insertion of the distal ring 9 of the wound retractor device 2 into the housing portion 22 (Figs. 21(a) and 21(b)), and acts as the exit opening to facilitate ejection of the distal ring 9 from within the housing portion 22 (Fig. 21(e)). The opening 231 also acts as the sleeve opening to facilitate extension the sleeve of the wound retractor device 2 out of the housing portion 22 during conveying through the wound opening 3 (Figs. 21(c) and Fig. 21(d)).

The method of using the apparatus 130 includes the following steps:

- Compress the distal ring 9 of the wound retractor device 2;
- Load the distal ring 9 through the cut-out 231 in the cannula 22 with the sleeve trailing out (Figs. 21(a) and 21(b));
- Pierce the skin 8 with the blade 4 and advance the introducer 230 until the cut-out 231 is inside the abdomen (Figs. 21(c) and 21(d));
- Depress the ejector plunger 24 to push out the distal ring 9 (Fig. 21(e));
- Remove the injector introducer 230 from the incision 3, leaving the distal ring 9 inside the abdomen (Fig. 21(f)).

Referring to Figs. 21(g) to 21(k) there is illustrated another apparatus 600 according to the invention, which is similar to the apparatus 230 of Figs. 21(a) to 21(f), and similar elements in Figs. 21(g) to 21(k) are assigned the same reference numerals.

5 In this case the apparatus 600 comprises the conveying device 5 and an opening device 601 for creating the wound opening 3 by forcing the tissue 8 apart. The opening device 601 is provided in this case in the form of a substantially blunt, solid bladeless tip fixedly attached to the distal end 7 of the conveying device 5.

10 In use the wound opening 3 is created by advancing the opening device 601 distally through the tissue 8 while simultaneously rotating the opening device 601 in a reciprocating clockwise – counter clockwise manner about an axis substantially parallel to the longitudinal axis of the wound opening 3 (Figs. 21(h) and 21(i)).

15 Figs. 21(g) to 21(k) show the ejector system 600. The ‘O’-ring 9 is loaded through the side opening 231 of the shaft 22. This allows the tip 601 to be more substantial in size.

20 At the intersection of the housing portion 22 and the opening device 601 at the distal end 7 of the conveying device 5, there is provided a ramp 602 to facilitate ejection of the ‘O’-ring 9. In use, the ‘O’-ring 9 is pushed outwards with the ramp system 602 (Fig. 21(j)).

25 Figs. 21(l) to 21(p) illustrate another apparatus 610 according to the invention, which is similar to the apparatus 600 of Figs. 21(g) to 21(h), and similar elements in Figs. 21(l) to 21(p) are assigned the same reference numerals.

In this case the opening device 601 is provided in the form of a substantially blunt, hollow bladeless tip fixedly attached to the distal end 7 of the conveying device 5.

A sleeve opening 611 is provided in the sidewall of the housing portion 22 facing laterally to facilitate a sleeve portion of the wound retractor device 2 to extend out of the housing portion 22 while the distal ring 9 of the wound retractor device 2 is housed within the housing portion 22 (Figs. 21(m) and 21(n)).

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Figs. 21(l) to 21(p) show the ejector type introducer 610 which is loaded from the front. The introducer 610 features the blunt, hollow, bladeless tip 601.

10

The buttonhole distal ring 9 is loaded up through the hollow bladeless tip 601, and subsequently ejected through the tip 601 (Fig. 21(o)). A back and forward motion together with a downwards pressure is employed to create the wound opening 3 (Figs. 21(m) and 21(n)). The rod 24 is pushed down to eject the 'O'-ring 9, and as a result the 'O'-ring 9 is pushed downwards (Fig. 21(o)).

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It will be appreciated that the blunt, bladeless tip opening device may have a variety of different configurations. For example, in the apparatus 620 according to the invention the opening device 621 comprises a winged tip configuration (Figs. 21(q)(i) and 21(q)(ii)), in the apparatus 622 according to the invention the opening device 623 comprises an asymmetrical tip configuration (Figs. 21(r)(i) and 21(r)(ii)), in the apparatus 624 according to the invention the opening device 625 comprises a four wing configuration (Figs. 21(s)(i) and 21(s)(ii)), in the apparatus 626 according to the invention the opening device 627 comprises a flap tip configuration (Figs. 21(t)(i) and 21(t)(ii)), in the apparatus 628 according to the invention the opening device 629 comprises a spiral tip configuration (Figs. 21(u)(i) and 21(u)(ii)), in the apparatus 630 according to the invention the opening device 631 comprises a series of protrusions (Figs. 21(v)(i) and 21(v)(ii)).

30

In the embodiments described previously with reference to Figs. 21(g) to 21(p), the blunt, bladeless tip opening device was employed with a conveying device 5 in which the distal ring 9 of the wound retractor device 2 is received within the housing portion 22. In the embodiments described previously with reference to Figs. 21(q)(i)

to 21(v)(ii), the blunt, bladeless tip opening device was employed with a conveying device 5 in which the distal ring 9 of the wound retractor device 2 may be engaged by the hook element 6. It will be appreciated that for any of the embodiments disclosed in this patent specification in which the wound opening is created by an incising device which creates the wound opening by cutting tissue, a blunt, bladeless tip opening device may be employed in place of the incising device to create the wound opening by forcing tissue apart instead. It will also be appreciated that for any of the embodiments disclosed in this patent specification in which the wound opening is created by a blunt, bladeless tip opening device which creates the wound opening by forcing tissue apart, an incising device may be employed in place of the blunt, bladeless tip opening device to create the wound opening by cutting tissue instead.

In Figs. 22 to 24 there is illustrated another apparatus 41 according to the invention, which is similar to the apparatus 21 of Figs. 10 to 15, and similar elements in Figs. 22 to 24 are assigned the same reference numerals.

In this case the incising device 42 is provided in the form of a sharpened blade element extending concentrically through the conveying device 5.

The housing portion 43 of the conveying device 5 comprises a flexible sleeve 44 and an inner tubular member 45 with a proximal spring 46. The distal end of the sleeve 44 is releasably attached to the distal end of the tubular member 45 with the distal ring 9 of the wound retractor device 2 housed between the sleeve 44 and the tubular member 45 (Fig. 22). The wound retractor device 2 is arranged concentrically with respect to the longitudinal axis A-A of the conveying device 5.

In use, the apparatus 41 is passed through tissue 8 with the blade element 42 as the leading end to create the wound opening 3, and is advanced through the wound opening 3 to convey the wound retractor device 2 through the wound opening 3 (Figs. 22 and 23).

The apparatus 41 is inserted as a normal trocar. The distal ring 9 and sleeve portion of the wound retractor device 2 are held close to the tubular member 45 by the retaining sleeve 44, which may be made out of a plastic film material/stretchable film material, or woven material.

The attachment of the distal end of the sleeve 44 to the distal end of the tubular member 45 is then released. In particular, when the distal ring 9 is within the abdomen, the sleeve 44 is released at the distal end by a release mechanism within the tubular member 45.

The apparatus 41 is then withdrawn from the wound opening 3 leaving the wound retractor device 2 in position extending through the wound opening 3 and with the distal ring 9 distally of the wound opening 3 (Fig. 24). In particular, the piercing introducer 42 and retaining sleeve 44 are pulled proximally, leaving the wound retractor device 2 in position to be deployed and secured.

Referring to Figs. 24(a) to 24(j) there is illustrated another apparatus 640 according to the invention, which is similar to the apparatus 1 of Figs. 1 to 5, and similar elements in Figs. 24(c) to 24(j) are assigned the same reference numerals.

In this case the apparatus 640 comprises an opening device 641 in the form of a blunt, bladeless tip similar to the tip 621 described previously with reference to Figs. 21(q)(i) and 21(q)(ii).

The conveying device 5 comprises a receiver slot 642 at the proximal end 643 of the conveying device 5. The sleeve portion of the wound retractor device 2 may be received in the slot 642 to hold the sleeve portion externally of the wound opening 3, and thus maintain the sleeve portion in tension, during conveying of the distal ring 9 of the wound retractor device 2 through the wound opening 3.

In use the wound opening 3 is created by advancing the opening device 641 distally while rotating the opening device 641 in a reciprocating clockwise – counter clockwise manner to force the tissue 8 apart (Figs. 24(f) to 24(i)), in a manner similar to that described previously with reference to Figs. 21(g) to 21(p).

5

The slot 642 holds the sleeve portion of the wound retractor device 2 in tension externally of the wound opening 3, and thus maintain the sleeve portion in tension, during conveying of the distal ring 9 of the wound retractor device 2 through the wound opening 3 (Figs. 24(e) to 24(i)).

10

In use, the sleeve is tensioned and passed through the slot 641 in the handle to keep the sleeve taut and to keep the ring 9 on the hook 6 (Fig. 24(c)). The distal ring 9 is fixed on the hook 6 due to the sleeve being in tension (Fig. 24(d)). An incision 644 is made in the skin 8 using a scalpel. The depth of the incision 644 is just sufficient to break the skin surface (Fig. 24(e)). The introducer 5 is twisted back and forth as it advances through the abdominal wall 8. The blunt tip 641 passes through the skin layers dissecting as it goes (Fig. 24(f)). The opening device 641 is twisted and advanced (Fig. 24(g)) until the bladeless tip 641 enters the abdominal cavity (Fig. 24(h)). Because the tip 641 is blunt, the procedure is therefore particularly safe. In particular the risk of damage to internal organs due to inadvertent contact with the tip 641 is minimised. The introducer 5 is further advanced until all of the distal ring 9 is inside the abdomen (Fig. 24(i)). The sleeve is unhooked from the slot 642 in the introducer handle and the introducer 5 is removed leaving the distal ring 9 in the abdomen (Fig. 24(j)).

25

In Figs. 24(k) to 24(m) there is illustrated a further apparatus 650 according to the invention, which is similar to the apparatus 640 of Figs. 24(a) to 24(j), and similar elements in Figs. 24 (k) and 24(m) are assigned the same reference numerals.

30

In this case the conveying device 5 comprises a receiver housing portion 651 at the proximal end 643 of the conveying device 5. A seal portion 652 and a proximal ring

portion 653 of the wound retractor device 2 may be received in the housing portion 651 (Fig. 24(m)) to hold the seal portion 652 and the proximal ring portion 653 externally of the wound opening 3, and thus maintain the sleeve portion of the wound retractor device 2 in tension, during conveying of the distal ring 9 of the wound retractor device 2 through the wound opening 3.

Fig. 24(k) illustrates the introducer 650 which includes a slot 654 for the excess sleeve portion at the proximal top end of the buttonhole device 2, a reception space 655 for part of the buttonhole device 2, and the hook 6 for the distal ring 9.

In use, the distal ring 9 is attached to the hook 6 (Fig. 24(l)).

The seal portion 652 and the proximal ring portion 653 of the buttonhole device 2 are inserted into the housing 651 at the proximal top end of the introducer 650, and the excess sleeve material is passed out through the slot 654 in the top of the buttonhole device housing 651 (Fig. 24(m)). The sleeve portion is now kept in tension.

It will be appreciated that the apparatus according to the invention, as disclosed in this patent specification, may be employed to insert a variety of different types of surgical devices at least partially through a wound opening. The apparatus according to the invention may be employed to insert a variety of different types of wound retractor devices at least partially through a wound opening, for example the wound retractor devices disclosed in International patent application No. PCT/IE2003/000141 the relevant contents of which are incorporated herein by reference, and/or the wound retractor devices disclosed in International patent application No. PCT/IE2005/000113 the relevant contents of which are incorporated herein by reference.

Figs. 25 to 30 illustrate a further apparatus 51 according to the invention, which is similar to the apparatus 1 of Figs. 1 to 5, and similar elements in Figs. 25 to 30 are assigned the same reference numerals.

In this case the incising device 4 comprises a sharpened blade element 57 fixedly attached to the distal end 52 of an elongate member 53. The incising device 4 remains detached from the conveying device 5.

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In this case the conveying device 5 has a rounded/blunt distal end 7.

The apparatus 51 further comprises a guide device 54 insertable through the wound opening 3. The guide device 54 is provided in this case in the form of a length of flexible string/ribbon 55 with a hook element 56 attached to a distal end of the string 55. The concave portion of the hook element 56 faces proximally.

10

The string 55 and the hook element 56 also act as a removal device to assist in removal of the wound retractor device 2 from the wound opening 3. The hook element 56 is engagable with the distal ring 9 of the wound retractor device 2, and the string 55 extends proximally through the wound opening 3 for actuation by a user. In this manner the string 55 connects the hook element 56 to the user.

15

In use, the incising device 4 and the guide device 54 are passed through the tissue 8 with the blade element 57 as the leading end to create the wound opening 3 in an incision step (Fig. 25). The incising device 4 is then withdrawn from the wound opening 3 leaving the guide device 54 in position extending through the wound opening 3 and with the hook element 56 distally of the wound opening 3 (Fig. 26). Because the guide device 54 extends through the wound opening 3, this arrangement ensures that the patency of the wound opening 3 is maintained even when the incising device 4 has been withdrawn. In particular the string 55 ensures that the various layers of fat/muscle/fascia stay aligned as a straight incision.

20

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The wound retractor device 2 is coupled to the conveying device 5 by engaging the distal ring 9 with the hook element 6 (Fig. 26). The conveying device 5 is then

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advanced through the wound opening 3 to convey the wound retractor device 2 through the wound opening 3 in a conveying step (Fig. 27).

5 Thus the incising device 4 of the apparatus 51 is used to create the wound opening 3 in an incision step (Fig. 25), and the conveying device 5 of the apparatus 51 is used to subsequently convey the wound retractor device 2 through the wound opening 3 in a conveying step (Fig. 27). These two steps are distinct and separate.

10 The conveying device 5 may be withdrawn from the wound opening 3 leaving the wound retractor device 2 in position extending through the wound opening 3 and with the distal ring 9 distally of the wound opening 3 (Fig. 28).

15 To assist in removal of the wound retractor device 2 from the wound opening 3, the hook element 56 may be engaged with the distal ring 9 and pulled proximally by pulling the string 55 proximally (Fig. 30). The wound retractor device 2 may thus be removed from the wound opening 3.

20 The string 55 and hook element 56 remain detached from the wound retractor device 2. This enables the string 55 and hook element 56 to be inserted into the wound opening 3 before insertion of the wound retractor device 2, and thus enables the string 55 and hook element 56 to act as the guide device. The hook element 56 contacts the distal ring 9 to aid removal of the wound retractor device 2, but remains detached from the distal ring 9.

25 The maximum transverse dimension of the portion of the incising device 4 which extends through the wound opening 3 is between 3 mm and 35 mm, preferably between 5 mm and 12 mm.

30 Referring to Figs. 31 to 36 there is illustrated another apparatus 61 according to the invention, which is similar to the apparatus 51 of Figs. 25 to 30, and similar elements in Figs. 31 to 36 are assigned the same reference numerals.

In this case the guide device 54 comprises a loop 62 in the string 55 at the distal end of the string 55.

5 As illustrated in Figs. 35 and 36, to assist in removal of the wound retractor device 2, the loop 62 may be gripped by a grasping instrument 63 and pulled proximally while also pulling the string 35 proximally. In this case the loop 62 and string 35 are not required to contact the distal ring 9 to effect removal of the wound retractor device 2.

10 In Figs. 37 to 43 there is illustrated another apparatus 71 according to the invention, which is similar to the apparatus 51 of Figs. 25 to 30, and similar elements in Figs. 37 to 43 are assigned the same reference numerals.

In this case the blade element 57 is releasably attached to the distal end 52 of the elongate member 53, and the blade element 57 is fixedly attached to the distal end of
15 the string 55. A proximal side of the blade element 57 has a hook formation 72.

In use, the incising device 4, with the blade element 57 attached to the elongate member 53, and the string 55 are passed through tissue 8 with the blade element 57
20 as the leading end to create the wound opening 3 in an incision step (Fig. 38). The blade element 57 is detached from the elongate member 53 (Fig. 39), and the elongate member 53 is withdrawn from the wound opening 3 leaving the string 55 extending through the wound opening 3 and with the blade element 57 distally of the wound opening 3 (Fig. 40).

25

To assist in removal of the wound retractor device 2 from the wound opening 3, the hook formation 72 of the blade element 57 may be engaged with the distal ring 9 and pulled proximally by pulling the string 55 proximally (Fig. 43).

30 It will be appreciated that a surgical device, such as the wound retractor device 2, may be inserted at least partially through the wound opening 3 with the wound

opening 3 being created and the wound retractor device 2 being conveyed at least partially through the wound opening 3 in a single step, or alternatively with the wound opening 3 being created in an opening step and with the wound retractor device 2 being conveyed at least partially through the wound opening 3 in a separate conveying step.

For example, with reference to Figs. 24(e) to 24(j), the apparatus 640 is described and illustrated creating the wound opening 3 and conveying the wound retractor device 2 at least partially through the wound opening 3 in a single step. With reference to Figs. 43(a) to 43(f), the apparatus 640 may alternatively be employed to create the wound opening 3 in an opening step (Figs. 43(a) to 43(c)), and to subsequently convey the distal ring 9 of the wound retractor device 2 through the wound opening 3 in a separate conveying step (Figs. 43(d) to 43(f)).

To create the wound opening 3, the opening device 641 is advanced distally while the opening device 641 is rotated in a reciprocating clockwise – counter clockwise manner about an axis substantially parallel to the longitudinal axis of the wound opening 3 (Figs. 43(a) to 43(c)).

To convey the distal ring 9 through the wound opening 3, the conveying device 5 is advanced distally without rotating the conveying device 5 (Figs. 43(d) and 43(e)). It will be appreciated that the conveying device 5 may alternatively be rotated in a reciprocating clockwise – counter clockwise manner about an axis substantially parallel to the longitudinal axis of the wound opening 3 while advancing distally through the wound opening 3 to convey the distal ring 9 through the wound opening 3. By rotating the conveying device 5 in this manner, this may assist in overcoming frictional resistance to passage of the distal ring 9 through the wound opening 3.

In Figs. 43(a) to 43(f), the bladeless introducer 640 is employed to create the incision 3 prior to loading of the buttonhole distal ring 9 and delivery of the distal ring 9 through to the abdomen.

In use, the skin incision 644 is pre-made with a scalpel (Fig. 43(a)). The conveying device 641 is twisted back and forth and advanced (Fig. 43(b)). The blunt tip 641 enters the abdomen, and thus the incision 3 is created (Fig. 43(c)).

5

The introducer 640 is withdrawn, the buttonhole distal ring 9 is loaded on to the hook 6 and the sleeve is tensioned to keep the wound retractor device 2 fixed in position (Fig. 43(d)). The distal ring 9 is passed into the abdominal cavity (Fig. 43(e)). The sleeve is released, by untensioning the sleeve, from the introducer 640 which is then removed leaving the distal ring 9 in the abdomen (Fig. 43(f)). The buttonhole device 2 is now ready to be deployed.

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Figs. 44 to 49 illustrate a further apparatus 81 according to the invention, which is similar to the apparatus 71 of Figs. 37 to 43, and similar elements in Figs. 44 to 49 are assigned the same reference numerals.

15

In this case the incising device 4 is provided in the form of the blade element 57 releasably attached to the distal end 7 of the conveying device 5.

20

The distal end 7 of the conveying device 5 is rounded and blunt for added safety. The rounded/blunt distal end minimises the possibility of damage being caused to internal organs should the distal end 7 contact internal organs.

25

In use, the wound retractor device 2 is coupled to the conveying device 5 by engaging the distal ring 9 of the wound retractor device 2 with the hook element 6 (Fig. 44). The apparatus 81, with the blade element 57 attached to the conveying device 5, is passed through tissue 8 with the blade element 57 as the leading end to create the wound opening 3, and is advanced through the wound opening 3 to convey the wound retractor device 2 through the wound opening 3 (Fig. 45). Thus the apparatus 81 may be used to create the wound opening 3 and convey the wound retractor device 2 through the wound opening 3 in a single step.

30

In this case the string 55 and the blade element 57 are employed as the removal device 54 only, and not as the guide device. Because the wound opening 3 is created and the wound retractor device 2 is conveyed through the wound opening 3 in a single step, there is no requirement for a guide device in this case.

When the wound retractor device 2 is deployed to retract the wound opening 3, the blade element 57 remains distally of the wound opening 3 and the string 55 extends through the retracted wound opening 3 (Fig. 48).

Referring to Figs. 51 to 58 there is illustrated another apparatus 91 according to the invention, which is similar to the apparatus 51 of Figs. 25 to 30, and similar elements in Figs. 51 to 58 are assigned the same reference numerals.

In this case the guide device 92 is provided in the form of a rigid tubular member 93. The tubular member 93 has a substantially circular cross-section. A slot 94 extends longitudinally along a sidewall of the tubular member 93.

As illustrated in Fig. 52, the tubular member 93 is mountable to the incising device 4. In this case the elongate member 53 of the incising device 4 has an elongate protrusion 95 for mating with the slot 94 in the tubular member 93.

In use the guide device 92 is mounted to the incising device 4 (Fig. 52), and the incising device 4 and the guide device 92 are passed through tissue 8 with the blade element 57 as the leading end to create the wound opening 3 in an incision step (Fig. 53). The incising device 4 is then withdrawn from the wound opening 3 leaving the guide device 92 in position extending through the wound opening 3 (Fig. 54).

The wound retractor device 2 is coupled to the conveying device 5 by engaging the distal ring 9 with the hook element 6 (Fig. 55). The conveying device 5 is then advanced through the wound opening 3 to convey the wound retractor device 2

through the wound opening 3 in a conveying step (Fig. 56). The conveying device 5 and the guide device 92 may be withdrawn from the wound opening 3 leaving the wound retractor device 2 in position extending through the wound opening 3 and with the distal ring 9 distally of the wound opening 3 (Figs. 57 and 58).

5

The open slot 94 of the guide device 92 facilitates removal of the guide device 92 over the sleeve portion of the wound retractor device 2.

The maximum transverse dimension of the portion of the guide device 92 which extends through the wound opening 3 is between 3 mm and 35 mm, preferably between 5 mm and 12 mm.

10

The guide device 92 does not act as a removal device to assist in removal of the wound retractor device 2 from the wound opening 3, in this case.

15

In an alternative embodiment the tubular member 93 may have a substantially flattened, oblong cross-section, as illustrated in Fig. 50. The flattened, oblong cross-section of the tubular member 93 may in certain cases be easier to accommodate in the wound opening 3, and/or may in certain cases be able to accommodate the squeezed distal ring 9 more easily.

20

Figs. 58(a) to 58(d) illustrate another apparatus 161 according to the invention, which is similar to the apparatus 51 of Figs. 25 to 30, and similar elements in Figs. 58(a) to 58(d) are assigned the same reference numerals.

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In this case both the incising device 4 and the conveying device 5 have substantially flattened cross-sections. The flattened incising device 4 is particularly easy to introduce compared to conventional trocar blades.

30

In use, the incising device 4 is passed through tissue 8 with the blade element 57 as the leading end to create the wound opening 3 in an incision step (Fig. 58(a)).

The wound retractor device 2 is coupled to the conveying device 5 by engaging the distal ring 9 with the hook element 6. The conveying device 5 is advanced through the wound opening 3 to convey the wound retractor device 2 through the wound opening 3 in a conveying step, while the incising device 4 remains in position extending through the wound opening 3 (Fig. 58(b)).

Because both the incising device 4 and the conveying device 5 have flattened cross-sections, both may be accommodated extending through the wound opening 3 at the same time. The elasticity of the tissue 8 and of the distal ring 9 facilitate introduction of the distal ring 9 through the wound opening 3 while the incising device 4 remains in position extending through the wound opening 3.

Because the incising device 4 is not removed from the wound opening 3 before insertion of the conveying device 5, there is no requirement for a separate guide device in this case. The incising device 4 effects the function of maintaining the patency of the wound opening 3.

Both the incising device 4 and the conveying device 5 may then be withdrawn from the wound opening 3 leaving the wound retractor device 2 in position extending through the wound opening 3 and with the distal ring 9 distally of the wound opening 3 (Fig. 58(d)).

Referring to Figs. 58(e) to 58(h) there is illustrated another apparatus 171 according to the invention, which is similar to the apparatus 1 of Figs. 1 to 5, and similar elements in Figs. 58(e) to 58(h) are assigned the same reference numerals.

In this case the conveying device 5 comprises an insertion element 174 insertable through the wound opening 3, and a drawing element 172, provided in this case in the form of a length of flexible string. The string 172 is attached to the distal ring 9 of the wound retractor device 2 by means of a hook and extends through an opening

173 in the distal end 7 of the insertion element 174. In this manner the string 172 couples the distal ring 9 to the insertion element 174, and can be used to draw the distal ring 9 distally through the wound opening 3.

5 The blade element 4 is fixedly attached to the distal end 7 of the insertion element 174.

In use, the insertion element 174 is passed through tissue 8 with the blade element 4 as the leading end to create the wound opening 3 (Fig. 58(e)). The string 172 is then
10 pulled proximally (Fig. 58(g)). Because the string 172 is looped through the opening 173, the string 172 acts as a pulley to draw the distal ring 9 distally through the wound opening 3. The insertion element 174 may then be withdrawn from the wound opening 3 leaving the wound retractor device 2 in position extending through the wound opening 3 and with the distal ring 9 distally of the wound opening 3 (Fig.
15 58(h)).

The string 172 may be left in position extending through the wound opening 3. The string 172 may be subsequently used to assist in removal of the wound retractor device 2.

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In Figs. 58(i) to 58(n) there is illustrated another apparatus 660 according to the invention, which is similar to the apparatus 640 of Figs. 43(a) to 43(f), and similar elements in Figs. 58(i) to 58(n) are assigned the same reference numerals.

25 In this case the conveying device 5 comprises a body portion 661 and the hook element 6 is slidably moveable along the body portion 661.

In use, the distal ring 9 of the wound retractor device 2 is coupled to the hook element 6 by engaging the hook element 6 with the distal ring 9 (Fig. 58(j)). The
30 wound opening 3 is created in an opening step by advancing the opening device 641 distally while rotating the opening device 641 in a reciprocating clockwise – counter

clockwise manner to force the tissue 8 apart (Figs. 58(k) and 58(l)). The distal ring 9 remains externally of the wound opening 3 during the step of creating the wound opening 3.

5 The distal ring 9 is then conveyed through the wound opening 3 in a separate conveying step by sliding the hook element 6 distally along the body portion 661 of the conveying device 5 (Fig. 58(m)). During the step of conveying the distal ring 9 through the wound opening 3, the opening device 641 remains within the wound interior and the body portion 661 of the conveying device 5 remains extending
10 through the wound opening 3.

The apparatus 660 is then removed from the wound opening 3 to leave the distal ring 9 within the wound interior and the sleeve portion extending proximally out through the wound opening 3 (Fig. 58(n)).

15 The apparatus 660 comprises the proximal handle 643, the hook 6 on the sliding member, and the bladeless introducer tip 641 (Fig. 58(i)).

The distal ring 9 is attached to the sliding hook 6, which is initially positioned away
20 from the dissecting, leading edge 641 of the introducer 660 (Fig. 58(j)). This ensures that the ring 9 will not interfere with the twisting motion required by the bladeless tip 641.

The twisting motion advances the bladeless tip 641 through the abdominal wall 8
25 (Fig. 58(k)). The distal ring 9 does not interfere with the creation of the incision 3. In Fig. 58 (l), the bladeless tip 641 has entered the abdomen.

The sliding hook member 6 is then advanced down the shaft 661 of the introducer 660 to pass the distal ring 9 through the incision 3 (Fig. 58(m)). The introducer 660
30 is removed, leaving the distal ring 9 in the abdomen ready for deployment (Fig. 58(n)).

In Fig. 59 there is illustrated an incising device 101 of another apparatus according to the invention, which is similar to the incising device 4 of Figs. 25 to 30, and similar elements in Fig. 59 are assigned the same reference numerals.

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In this case the incising device 101 has an abutment member 102 fixedly mounted to the elongate member 53. The abutment member 102 is suitable for abutting an external surface of tissue 8 adjacent the wound opening 3. In this manner the abutment member 102 acts as a limiting element to limit the extent of passage of the incising device 101 through tissue 8. In particular the abutment member 102 prevents any sudden "jump-through" when the tissue 8 is pierced.

10

Fig. 60 illustrates a further incising device 111 of another apparatus according to the invention, which is similar to the incising device 101 of Fig. 59, and similar elements in Fig. 60 are assigned the same reference numerals.

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In this case the abutment member 102 is mounted to the elongate member 53 by means of a coiled spring 112. The coiled spring 112 extends between the abutment member 102 and the proximal end 113 of the elongate member 53. The abutment member 102 is thus movable relative to the elongate member 53 between a retracted configuration (Fig. 60) and an extended configuration, in which the spring 112 is compressed. The spring 112 acts to bias the abutment member 102 away from the proximal end 113 of the elongate member 53 towards the retracted configuration.

20

Referring to Figs. 61 to 63 there is illustrated another incising device 121 of another apparatus according to the invention, which is similar to the incising device 101 of Fig. 59, and similar elements in Figs. 61 to 63 are assigned the same reference numerals.

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In this case the abutment member 102 is mounted to the elongate member 53 by means of a screw-thread arrangement 122. This arrangement facilitates adjustment

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of the position of mounting of the abutment member 102 on the elongate member 53. Thus the abutment member 102 is adjustable to accommodate different abdomen thickness.

5 The abutment member 102 prevents the blade element 57 entering too far into the abdomen (Fig. 63).

In Figs. 64 and 65 there is illustrated another apparatus 131 according to the invention, which is similar to the apparatus 1 of Figs. 1 to 5, and similar elements in
10 Figs. 64 and 65 are assigned the same reference numerals.

In this case the apparatus 131 has the abutment member 102, similar to that described previously with reference to Fig. 59, fixedly mounted to the conveying
15 device 5.

Figs. 66 to 68 illustrate a further incising device 141 of another apparatus according to the invention, which is similar to the incising device 111 of Fig. 60, and similar
20 elements in Figs. 66 to 68 are assigned the same reference numerals.

In this case the coiled spring 112 extends between the abutment member 102 and the distal end 52 of the elongate member 53. The abutment member 102 is thus movable relative to the elongate member 53 between a retracted configuration (Fig. 67) and an extended configuration (Fig. 68), in which the spring 112 is extended. The spring
25 112 acts to bias the abutment member 102 towards the distal end 52 of the elongate member 53 towards the retracted configuration.

In order to fully pierce the tissue 8, the spring 112 must be stretched. Hence the piercing operation is a controlled one. In this manner, the possibility of sudden
30 "jump-through" when the blade element 57 breaks through is minimised.

Referring to Figs. 69 to 75 there is illustrated another apparatus 151 according to the invention, which is similar to the apparatus 1 of Figs. 1 to 5, and similar elements in Figs. 69 to 75 are assigned the same reference numerals.

5 In this case the blade element 4 is attached to the conveying device 5 by means of a spring 152 extending between the blade element 4 and the proximal end 153 of the conveying device 5. The blade element 4 is movable relative to the conveying device 5 between an extended configuration (Fig. 71) and a retracted configuration (Fig. 72), in which the spring 152 is compressed. The spring 152 acts to bias the
10 blade element 4 away from the proximal end 153 towards the extended configuration.

When the apparatus 151 pierces the tissue 8, the blade element 4 retracts into the conveying device 5 for safety (Fig. 74).

15

Figs. 75(a) to 75(g) illustrate another apparatus 200 according to the invention, which is similar to the apparatus 151 of Figs. 69 to 75, and similar elements in Figs. 75(a) to 75(g) are assigned the same reference numerals.

20 In this case the blade element 4 is detached from the conveying device 5. The blade element 4 is mounted to the conveying device 5 by extending the blade element 4 through a lumen 201 in the conveying device 5. A handle portion 202 is provided at the proximal end of the blade element 4 to facilitate gripping of the blade element 4 and manual movement of the blade element 4 relative to the conveying device 5
25 between the extended configuration (Fig. 75(a)) and the retracted configuration (Fig. 75(b)). In the retracted configuration, the distal end of the blade element 4 is housed within the distal end 7 of the conveying device 5 to safely cover the distal end of the blade element 4.

30 As illustrated in Fig. 75(a) the blade element 4 is mounted substantially concentrically with respect to the longitudinal axis of the conveying device 5. In this

concentric arrangement the longitudinal axis of the blade element 4 is substantially parallel to the longitudinal axis of the conveying device 5. The centre axis of the blade element 4 may be offset in the radial direction by a relatively small distance from the centre axis of the conveying device 5, in particular to accommodate the hook element 6 and a recess in the sidewall of the conveying device.

As illustrated in Fig. 75(b), the distal end 7 of the conveying device 5 is blunt and rounded for safety.

As illustrated in Fig. 75(b), lifting the blade element 4 by means of retraction of the handle 202 causes the blade 4 to move up into the body of the hook introducer 5.

In use, the apparatus 200 with the blade element 4 in the extended configuration is pushed distally through the tissue 8 until the blade element 4 has passed through the tissue 8 to create the wound opening 3 (Fig. 75(d)). The blade 4 creates the incision 3 and the hook 6 drags the distal ring 9 through the incision 3. The pushing force is stopped once the blade 4 is seen entering the abdomen. The handle portion 202 of the blade element 4 is then gripped, and the blade element 4 is manually pulled proximally while the conveying device 5 remains in a fixed position to move the blade element 4 from the extended configuration to the retracted configuration (Fig. 75(e)). The blade retracting handle 202 is pulled up to hide the blade 4 in the introducer body 5 to result in a safe blunt introducer 5. It is noted that the wound retractor device 2 has only been conveyed partially through the wound opening 3 at the point where the blade element 4 is retracted into the conveying device 5.

The conveying device 5 is then pushed further distally through the wound opening 3 until the distal ring 9 of the wound retractor device 2 has passed fully through the wound opening 3 into the abdomen (Fig. 75(f)). The introducer 5 is advanced until the distal ring 9 is fully inside the abdomen. The apparatus 200 is then withdrawn from the wound opening 3 leaving the wound retractor device 2 mounted in the

wound opening 3 (Fig. 75(g)). The introducer 5 is removed to leave the distal ring 9 in the abdomen and the wound retractor device 2 ready to be used.

5 In Figs. 75(h) and 75(i) there is illustrated another apparatus 210 according to the invention, which is similar to the apparatus 200 of Figs. 75(a) to 75(g), and similar elements in Figs. 75(h) and 75(i) are assigned the same reference numerals.

10 In this case the conveying device 5 comprises a resilient arm 211 which extends across the passageway 212 between the concave portion 213 of the hook element 6 and externally of the conveying device 5. The arm 211 is movable between an obstructing configuration in which the arm 211 extends across to obstruct part of the passageway 212 (Fig. 75(h)) and a passage configuration in which the arm 211 is bent back to facilitate passage of the distal ring 9 of the wound retractor device 2 through the passageway 212 into and out of the concave portion 213 of the hook element 6 (Fig 75(i)). In the obstructing configuration, the arm 211 retains the distal ring 9 in engagement with the hook element 6 during insertion of the wound retractor device 2 through a wound opening 3. The resilient nature of the arm 211 biases the arm 211 towards the obstructing configuration.

20 The soft rubber distal ring retainer 211 has enough strength to hold the distal ring 9 in place during delivery through the abdominal wall 8, but bends out of the way to deposit the ring 9 in the abdomen when the hook introducer 5 is being withdrawn.

25 As illustrated in Fig. 75(i), the soft rubber distal ring retainer 211 collapses to either load or deposit the distal ring 9 into/from the hook 213.

30 Referring to Figs. 75(j) and 75(k) there is illustrated a further apparatus 220 according to the invention, which is similar to the apparatus 210 of Figs. 75(h) and 75(i), and similar elements in Figs. 75(j) and 75(l) are assigned the same reference numerals.

In this case the arm 211 is substantially rigid and is pivotably attached to the body of the conveying device 5 by means of a hinge 221. The arm 211 is pivotably movable between the obstructing configuration (Fig. 75 (j)) and the passage configuration (Fig. 75(k)).

5

The pivot hook 211 is moved to (i) load the distal ring 9 into the concave position 213, or (ii) allow the distal ring 9 to be removed from the concave portion 213. The addition of the pivot hook 211 ensures that the distal ring 9 is fully held in the hook 213 of the introducer 5. When required the arm 211 is moved out of the way to load or deliver the distal ring 9.

10

Figs. 75(k)(i) and 75(k)(ii) illustrate another apparatus 670 according to the invention, which is similar to the apparatus 220 of the Figs. 75(j) and 75(k), and similar elements in Figs. 75(k)(i) and 75(k)(ii) are assigned the same reference numerals.

15

In this case the apparatus 670 comprises an opening device 671, in the form of a blunt, bladeless tip, fixedly attached to the distal end 7 of the conveying device 5. The tip 671 is similar to the tip 621 described previously with reference to Figs. 21(q)(i) and 21(q)(ii).

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Figs. 75(k)(i) and 75(k)(ii) show the hook introducer 670 with the mechanical clasp 211 to hold the 'O'-ring 9 in place. The clasp 211 could be spring loaded or controlled via a lever.

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Figs. 75 (k)(i) and 75(k)(ii) show the blunt tip 671 with two wings for serration of the tissue.

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Referring to Figs. 75(k)(iii) to 75(k)(viii) there is illustrated a further apparatus 680 according to the invention, which is similar to the apparatus 670 of Figs. 75(k)(i) and

75(k)(ii), and similar elements in Figs. 75(k)(iii) to 75(k)(viii) are assigned the same reference numerals.

5 In this case the conveying device 5 comprises a rigid arm 681 movable, under the control of a thumbswitch 682, between the obstructing configuration in which the arm 681 obstructs part of the passageway 212 (Figs. 75(k)(iii) and 75(k)(iv)), and the passage configuration in which the arm 681 is moved distally to facilitate passage of the distal ring 9 of the wound retractor device 2 through the passageway 212 into and out of the concave portion 213 of the hook element 6 (Figs. 75(k)(v) and 75(k)(vi)).

10

The locking bar feature 681 may be employed to secure the distal ring 9 to the hook 6. The apparatus 680 comprises the proximal handle 683, the shaft 5, the thumbswitch 682, the hook 6, the locking bar 681, and the bladeless tip 671. The thumbswitch 682 is spring-loaded towards the obstructing position, in which the locking bar 681 is moved proximally (Figs. 75(k)(iii) and 75(k)(iv)).

15

In Fig. 75(k)(vi), the thumbswitch 682 is pushed down distally. This causes the locking bar 681 to move down distally also. The distal ring 9 may now be fitted onto the hook 6 (Figs. 75(k)(vii) and 75(k)(viii)).

20

After the buttonhole distal ring 9 is placed on to the hook 6, the thumbswitch 682 is released. This causes the locking bar 681 to lock the ring 9 in place (Figs. 75(k)(vii) and 75(k)(viii)). To release the ring 9, for example in the abdomen, the thumbswitch 682 may be pressed distally down again.

25

In Figs. 75(l) to 75(y) there is illustrated a further apparatus 310 for inserting a surgical device at least partially through a wound opening according to the invention, which is similar to the apparatus 200 of Figs. 75(a) to 75(g), and similar elements in Figs. 75(l) to 75(y) are assigned the same reference numerals.

30

In this case the blade element 4 is biased towards the retracted configuration by means of a compression spring 313. The spring 313 is located between and engaging against an internal ledge 314 in the lumen 201 of the conveying device 5 and a laterally protruding handle 312 on the blade element 4 (Fig. 75(n)). In the extended configuration the spring 313 is compressed (Fig. 75(n)), and in the retracted configuration the spring 313 is in an uncompressed, at-rest state (Fig. 75(q)).

The blade element 4 is moved relative to the conveying device 5 from the retracted configuration to the extended configuration by manually pushing the handle 312 distally, for example using a thumb. To move the blade element 4 relative to the conveying device 5 from the extended configuration to the retracted configuration, the handle 312 is released and the biasing force of the spring 313 pushes the blade element 4 proximally.

A recess 311 is provided at a lateral side of the conveying device 5 to minimise the profile of the distal ring 9 during conveying through the wound opening 3 (Figs. 75(u) to 75(x)).

In use, the distal ring 9 of the wound retractor device 2 is hooked onto the introducer handle 5 by means of the hook 6 (Fig. 75(u)). The blade 4 is exposed by the surgeon depressing the thumb switch 312. The introducer 5 is advanced until the surgeon sees the blade 4 appearing through abdominal wall 8 on his monitor (Fig. 75(v)).

The surgeon removes his thumb from the thumb switch 312. The spring 313 extends, causing the blade 4 to retract safely into the introducer handle 5 (Fig. 75(w)). There is thus provided a safe, blunt introducer 5 which the surgeon advances into the abdomen until the distal ring 9 is fully inside (Fig. 75(x)).

The introducer 5 is withdrawn from the incision 3 leaving the distal ring 9 in the abdomen and the wound retractor device 2 is ready to be deployed to retract the incision 3 (Fig. 75(y)).

In Figs. 76 to 81 there is illustrated a further incising device 181 of another apparatus according to the invention, which is similar to the incising device 4 of Figs. 25 to 30, and similar elements in Figs. 76 to 81 are assigned the same reference numerals.

5

In this case the incising device 181 comprises a support element 182, a cutting element 183 for creating the wound opening 3 fixedly attached to the support element 182, and a shield element 184 for shielding the cutting element 183 movably attached to the support element 182 by means of two springs 185. The shield element 184 is movable relative to the cutting element 183 between an extended shielding configuration (Figs. 76, 78, 79, 81) and a retracted cutting configuration (Figs. 77 and 80). The springs 185 act to bias the shield element 184 towards the extended shielding configuration.

10

As illustrated in Figs. 79 to 81, the shield element 182 has a cantilever arm 186 with a radially inwardly protruding finger 187 at a proximal end of the arm 186. The finger 187 is engageable in a recess 188 in the cutting element 183 to releasably lock the shield element 182 in the extended shielding configuration (Fig. 81).

15

In use, the incising device 181 is configured with the shield element 184 in the extended shielding configuration and with the finger 187 disengaged from the recess 188 (Figs. 76 and 79). The incising device 181 is then moved distally towards the tissue 8 so that the cutting element 183 and the shield element 184 engage the tissue 8. Further movement of the incising device 181 distally causes the shield element 184 to move proximally relative to the cutting element 183 against the biasing force of the springs 185 due to the frictional resistance of the tissue 8 (Figs. 77 and 80). The proximal movement of the shield element 184 exposes the cutting element 183. The sharpened cutting element 183 passes through the tissue 8 to create the wound opening 3 (Fig. 77).

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The cutting element 183 breaks through to the distal side 189 of the tissue 8, and the shield element 184 then reaches the distal side 189 of the tissue 8. When the shield element 184 reaches the distal side 189, there is no further frictional resistance to advancement of the shield element 184 and thus the shield element 184 moves
5 distally relative to the cutting element 183 to the extended shielding configuration under the biasing force of the springs 185 (Fig. 78). As the shield element 184 moves distally, the finger 187 engages the recess 188 to lock the shield element 184 in the extended shielding configuration (Fig. 81).

10 In this extended shielding configuration, the shield element 184 shields the cutting element 183 and thus prevents the sharpened cutting element 183 from inadvertently contacting and potentially damaging any internal organs or tissue.

It will be appreciated that in an alternative embodiment of the invention, the shield
15 element may be fixedly attached to the support element, and the cutting element may be movably attached to the support element, for example by means of springs.

Figs. 82 to 88 illustrate another apparatus 300 for inserting a surgical device at least
20 partially through a wound opening according to the invention, which is similar to the apparatus 230 of Figs. 21(a) to 21(f), and similar elements in Figs. 82 to 88 are assigned the same reference numerals.

In this case the apparatus 300 comprises a shield element 184 attached to the housing
25 portion 22 by means of two compression springs 185, in a manner similar to that described previously with reference to Figs. 76 to 81.

The shield element 184 is movable relative to the blade element 4 between an
extended shielding configuration (Fig. 83) and a retracted cutting configuration (Fig.
82). The springs 185 act to bias the shield element 184 towards the extended
30 shielding configuration.

In use, the apparatus 300 is configured with the shield element 184 in the extended shielding configuration (Fig. 84). The apparatus 300 is then moved distally towards the tissue 8 so that the blade element 4 and the shield element 184 engage the tissue 8. Further movement of the apparatus 300 distally causes the shield element 184 to move proximally relative to the blade element 4 against the biasing force of the springs 185 due to the frictional resistance of the tissue 8 (Fig. 85). The proximal movement of the shield element 184 exposes the blade element 4. The sharpened blade element 4 passes through the tissue 8 to create the wound opening.

The blade element 4 breaks through to the distal side of the tissue 8, and the shield element 184 then reaches the distal side of the tissue 8. When the shield element 184 reaches the distal side, there is no further frictional resistance to advancement of the shield element 184 and thus the shield element 184 moves distally relative to the blade element 4 to the extended shielding configuration under the biasing force of the springs 185 (Fig. 86).

In this extended shielding configuration, the shield element 184 shields the blade element 4 and thus prevents the sharpened blade element 4 from inadvertently contacting and potentially damaging any internal organs or tissue (Fig. 87). The distal ring 9 of the surgical device 2 may then be ejected from the housing portion 22 (Fig. 88).

Figs. 82 to 88 illustrate the spring shield system. The springs 185 are configured so that the shield 184 is biased to slide forward to cover the blade 4.

The shield system protects organs from stabbing or other inadvertent damage due to introduction of the surgical device 2.

In Fig. 84 the protective shield 184 covers the blade 4 when not in use. In Fig. 85, when the introducer 5 is pushed against the skin, the shield 184 begins to retract exposing the blade 4. In Fig. 86, as soon as the blade 4 passes through the abdomen

wall, the shield 184 springs back to cover the blade 4. In Figs. 87 and 88, the introducer 5 can now be pushed further inside to release the O-ring 9.

5 Referring to Figs. 89 to 102 there is illustrated another apparatus 500 for inserting a surgical device at least partially through a wound opening according to the invention, which is similar to the apparatus 310 of Figs. 75(l) to 75(y), and similar elements in Figs. 89 to 102 are assigned the same reference numerals.

10 In this case the apparatus 500 comprises a holder element 501 concentrically mounted around the conveying device 5. The holder element 501 is suitable for holding the distal ring 9 of the wound retractor device 2 in a low-profile configuration, in this case an oval-shaped configuration (Fig. 95), during insertion of the distal ring 9 through the wound opening 3.

15 The holder element 501 is longitudinally slidable relative to the conveying device 5 between a holding configuration in which the distal ring 9 is held in the low-profile, oval configuration (Fig. 96), and a release configuration in which the distal ring 9 is released (Fig. 94).

20 In use the distal ring 9 of the wound retractor device 2 is hooked onto the introducer handle 5 by means of the hook 6 (Fig. 94). The distal ring 9 is compressed into the low-profile, oval configuration (Fig. 95), and the holder element 501 is slid distally along the conveying device 5 from the release configuration to the holding configuration to hold the distal ring 9 in the low-profile, oval configuration (Fig. 96).

25 The blade 4 is exposed by the surgeon depressing the thumb switch 312 (Fig. 97). The introducer 5 is advanced until the surgeon sees the blade 4 appearing through the abdominal wall 8 on his monitor (Fig. 98). The surgeon removes his thumb from the thumb switch 312. The spring 313 extends, causing the blade 4 to retract safely into the introducer handle 5 (Fig. 99). There is thus provided a safe, blunt introducer 5
30 which the surgeon advances into the abdomen until the distal ring 9 in the low-profile, oval configuration is fully inside (Fig. 100). The holder element 501 is slid

proximally along the conveying device 5 from the holding configuration to the release configuration to release the distal ring 9 (Fig. 101). The introducer 5 is withdrawn from the incision 3 leaving the distal ring 9 in the abdomen and the wound retractor device 2 is ready to be deployed to retract the incision 3 (Fig. 102).

5

In Fig. 89, the ring retainer 501 is fully retracted and the blade 4 is fully retracted.

In Fig. 92 the ring retainer 501 is fully advanced and the blade 4 is fully exposed.

10

In Fig. 97 the thumb switch 312 is pushed down to expose the blade 4.

In Fig. 98 the introducer 500 easily advances through the abdominal wall 8 because the distal ring 9 is compressed and does not present any excess width. The blade 4 is seen on a laparoscope to be just extending into the abdomen.

15

In Fig. 99 the surgeon removes his finger from the thumbswitch 312. The internal spring now automatically retracts the blade 4.

In Fig. 100 the introducer 500 can now be safely advanced into the abdomen.

20

In Fig. 101, the ring retainer 501 is pulled back up. The distal ring 9 is released and is no longer compressed. Alternatively the distal ring 9 could be ejected instead of withdrawing the holder element 501.

25

In Fig. 102, the introducer 500 is withdrawn from the incision 3. The distal ring 9 simply falls off the hook 6 and remains in the abdomen. The buttonhole device 2 is ready to be fired.

30

In Figs. 103 to 107, there is illustrated another apparatus 510 for inserting a surgical device at least partially through a wound opening according to the invention, which

is similar to the apparatus 230 of Figs. 21(a) to 21(f), and similar elements in Figs. 103 to 107 are assigned the same reference numerals.

5 In this case the blade element 4 is movable relative to the housing portion 22 between an extended configuration (Fig. 104) and a retracted configuration (Fig. 105). An actuator 511 is provided extending through a slot 512 in the housing portion 22 to facilitate movement of the blade element 4 between the extended configuration and the retracted configuration.

10 In use, the distal ring 9 of the wound retractor device 2 is compressed and inserted through the opening 231 into the housing portion 22 with the sleeve of the wound retractor device 2 extending out of the housing portion 22 through the opening 231. The apparatus 510 is extended through the tissue 8 with the blade element 4 in the extended configuration to create the wound opening 3 (Fig. 104). When the blade
15 element 4 has passed fully through the tissue 8 and is located within the wound interior, the blade element 4 is moved proximally to the retracted configuration by means of the actuator 511 while the housing portion 22 is held in a fixed position (Fig. 105). It is noted that the distal ring 9 has been conveyed only partially through the wound opening 3 when the blade element 4 is retracted.

20 The apparatus 510 is then advanced further through the wound opening 3, and the plunger 24 is depressed to eject the distal ring 9 from within the housing portion 22 (Fig. 106). The apparatus 510 is withdrawn from the wound opening 3 leaving the wound retractor device 2 in position extending through the wound opening 3 and
25 with the distal ring 9 distally of the wound opening 3 (Fig. 107).

The introducer 510 involves crushing the "O"-ring 9 down and sliding it into a slot 231 in the shaft 22 of the introducer 510. The slot 231 is at the distal tip of the shaft 22 so as to make firing the distal ring 9 safer.

30

In Fig. 103, the “O”-ring 9 is compressed and slid inside the shaft 22. The housing portion 22 may have an oval-shaped cross-section.

5 In Fig. 104 the introducer 510 is pushed into the abdomen wall 8. When the blade 4 is visible, the blade activation lever 511 is pulled up (Fig. 105) and the introducer 510 can be pushed in further if needed.

10 In Fig. 106 the plunger activation lever 24 is pushed downwards releasing the “O”-ring 9 and sleeve into the abdomen.

Figs. 108 to 115 illustrate another apparatus 520 according to the invention, which is similar to the apparatus 300 of Figs. 82 to 88, and similar elements in Figs. 108 to 115 are assigned the same reference numerals.

15 In this case the blade element 4 is fixedly attached to the distal end 7 of the housing portion 22. The shield element 184 is provided in the form of a tubular element concentrically mounted around the housing portion 22. The shield element 184 is manually movable relative to the housing portion 22 between the extended shielding configuration (Fig. 108) and the retracted cutting configuration (Fig. 109).

20 A cut-out portion 521 is provided in the shield element 184 to facilitate access to the opening 231 in the housing portion 22.

25 In this case the housing portion 22 has a substantially oval-shaped cross-section, as illustrated in Fig. 111. By streamlining the distal ring 9 into a compressed, oblong configuration, it may be easier to pass the distal ring 9 through the incision 3.

30 In use, the distal ring 9 of the wound retractor device 2 is compressed and inserted through the cut-away portion 521 in the shield element 184 and through the opening 231 into the housing portion 22 (Figs. 108 and 109). The apparatus 520 is passed through the tissue 8 with the shield element 184 in the retracted cutting configuration

to create the wound opening 3 through the tissue 8 (Fig. 112). When the blade element 4 has passed fully through the tissue 8 and is located within the wound interior, the shield element 184 is pushed distally while holding the housing portion 22 in a fixed position to move the shield element 184 to the extended shielding configuration (Fig. 113). It is noted that the blade element 4 is shielded before the distal ring 9 has been conveyed fully through the wound opening 3.

The apparatus 520 is inserted further through the wound opening 3 until the opening 231 is fully within the wound interior. The plunger 24 is then depressed to eject the distal ring 9 out of the housing portion 22 through the opening 231 and through the cut-away portion 521 (Fig. 114). The apparatus 520 is removed from the wound opening 3 leaving the distal ring 9 within the wound interior and the wound retractor device 2 extending through the wound opening 3 (Fig. 115).

The introducer 520 uses a system where the "O"-ring 9 and the sleeve are encapsulated inside the shaft 22. The sliding sheath 184 holds the "O"-ring 9 in place inside the shaft 22 and pushes forward to cover the blade 4 and release the "O"-ring 9.

The shaft 22 of the introducer 520 is oval in shape allowing easier compression of the "O"-ring 9.

When the blade 4 is visible through the underside of the abdomen wall 8, the sliding sheath 184 can be pushed forward to cover the blade element 4 (Fig. 113).

When the blade 4 is protected, the introducer 520 can be pushed in further if desired. When in far enough, the plunger 24 can be pushed down via the plunger lever to release the "O"-ring 9 and sleeve into the abdomen (Fig. 114).

Figs. 116 and 117 illustrate another apparatus 700 according to the invention, which is similar to the apparatus 310 of Figs. 75(l) to 75(y), and similar elements in Figs. 116 and 117 are assigned the same reference numerals.

5 In this case the apparatus 700 comprises a receiver housing portion 651 similar to that described previously with reference to Figs. 24(k) to 24(m). The apparatus 700 comprises the housing 651 for the outer proximal ring and seal of the wound retractor 2, the hook 6 and the blade 4. In use the handle 312 may be pushed down to expose the blade 4.

10

It will be appreciated that the apparatus of the invention are suitable for inserting a variety of surgical devices at least partially through a wound opening. For example the surgical device could be a wound retractor device as described previously. A sealing valve may be mounted to the wound retractor device. The sealing valve could be at least partially of a gelatinous elastomeric material. The sealing valve could be mounted to the wound retractor device before insertion through the wound opening or after insertion through the wound opening.

15

It will be appreciated that the apparatus of the invention may comprise an incising device in any suitable form. For example, the incising device may comprise a flat-tipped blade element or a pyramid-tipped blade element, or any other suitable blade element.

20

In the embodiments of the invention described above, the cutting element / blade element of the conveying device is pushed fully through the thickness of the tissue to create a wound opening. However it will be appreciated that the invention also provides a method of creating a wound opening in tissue in which the cutting element / blade element is pushed through the tissue only until the leading tip emerges on the interior side of the tissue. The cutting element / blade element may then be withdrawn and the distal ring of the surgical device pushed distally through the partially created wound opening. As the distal ring is pushed distally, the sides

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of the partially created wound opening are forced apart to create a wound opening. This method results in a smaller incision size and reduces the risk of herniation, by relying on the elasticity of the tissue to create the wound opening rather than relying on a larger incision size.

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

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Claims

1. An apparatus for inserting a surgical device at least partially through a wound opening, the apparatus comprising: -
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a conveying device insertable at least partially through a wound opening to convey a surgical device at least partially through the wound opening.
- 10 2. An apparatus as claimed in claim 1 wherein the conveying device is configured to engage a surgical device to couple the surgical device to the conveying device.
- 15 3. An apparatus as claimed in claim 2 wherein the conveying device comprises a hook element to engage a surgical device.
4. An apparatus as claimed in claim 3 wherein a concave portion of the hook element faces distally.
- 20 5. An apparatus as claimed in claim 3 or 4 wherein the hook element is provided in the region of a distal end of the conveying device.
- 25 6. An apparatus as claimed in claim 3 or 4 wherein the conveying device comprises a body portion and the hook element is movable relative to the body portion.
7. An apparatus as claimed in any of claims 2 to 6 wherein the conveying device comprises a retaining element to retain a surgical device in engagement with the conveying device.

8. An apparatus as claimed in any of claims 2 to 7 wherein the conveying device comprises a passageway to facilitate location of a surgical device in engagement with the conveying device.
- 5 9. An apparatus as claimed in claim 8 wherein the passageway facilitates location of at least part of a surgical device in the concave portion of the hook element.
10. An apparatus as claimed in claim 8 or 9 wherein the retaining element is configured to selectively obstruct at least part of the passageway.
- 10 11. An apparatus as claimed in claim 10 wherein the retaining element is movable between an obstructing configuration obstructing at least part of the passageway and a passage configuration facilitating passage of a surgical device through the passageway.
- 15 12. An apparatus as claimed in claim 11 wherein the retaining element is pivotably movable between the obstructing configuration and the passage configuration.
- 20 13. An apparatus as claimed in claim 11 or 12 wherein the retaining element is biased towards the obstructing configuration.
14. An apparatus as claimed in claim 13 wherein the retaining element comprises a resilient arm.
- 25 15. An apparatus as claimed in any of claims 11 to 14 wherein the conveying device comprises a control element to control movement of the retaining element between the obstructing configuration and the passage configuration.
- 30 16. An apparatus as claimed in any of claims 1 to 15 wherein the apparatus is configured to insert a surgical device at least partially through a wound opening with at least part of the surgical device in a low-profile configuration.

17. An apparatus as claimed in claim 16 wherein the apparatus comprises a holder element for holding at least part of a surgical device in a low-profile configuration.
- 5
18. An apparatus as claimed in claim 17 wherein the holder element is movable relative to the conveying device between a holding configuration in which at least part of a surgical device is held in a low-profile configuration, and a release configuration in which the surgical device is released.
- 10
19. An apparatus as claimed in claim 17 or 18 wherein the holder element is mounted to the conveying device.
20. An apparatus as claimed in claim 19 wherein the holder element is concentrically mounted around the conveying device.
- 15
21. An apparatus as claimed in any of claims 1 to 20 wherein the apparatus is configured to hold a first part of a surgical device externally of a wound opening during conveying of a second part of the surgical device through the wound opening.
- 20
22. An apparatus as claimed in claim 21 wherein the apparatus is configured to maintain part of a surgical device in tension.
- 25
23. An apparatus as claimed in claim 21 or 22 wherein the apparatus comprises a receiver portion for receiving a first part of a surgical device to hold the first part.
- 30
24. An apparatus as claimed in claim 23 wherein the receiver portion comprises a slot.

25. An apparatus as claimed in claim 23 wherein the receiver portion comprises a housing portion.
- 5 26. An apparatus as claimed in any of claims 23 to 25 wherein the receiver portion is provided at a proximal end of the conveying device.
- 10 27. An apparatus as claimed in any of claims 1 to 26 wherein the conveying device comprises a housing portion for receiving at least part of a surgical device to couple the surgical device to the conveying device.
28. An apparatus as claimed in claim 27 wherein the housing portion has an exit opening to facilitate ejection of at least part of a surgical device from within the housing portion.
- 15 29. An apparatus as claimed in claim 27 or 28 wherein the housing portion has an entry opening to facilitate insertion of at least part of a surgical device into the housing portion.
- 20 30. An apparatus as claimed in claim 29 wherein the housing portion has an opening which acts as both the exit opening and the entry opening.
- 25 31. An apparatus as claimed in any of claims 28 to 30 wherein the exit opening and/or the entry opening is provided at a distal end of the housing portion.
- 30 32. An apparatus as claimed in any of claims 28 to 31 wherein the exit opening and/or the entry opening faces distally.
33. An apparatus as claimed in any of claims 28 to 32 wherein the exit opening and/or the entry opening is provided along at least part of a sidewall of the housing portion.

34. An apparatus as claimed in claim 33 wherein the exit opening and/or the entry opening faces laterally.
- 5 35. An apparatus as claimed in any of claims 28 to 34 wherein the apparatus comprises a closure element to selectively close the exit opening and/or the entry opening.
- 10 36. An apparatus as claimed in any of claims 27 to 35 wherein the housing portion has a sleeve opening to facilitate a part of a surgical device extending out of the housing portion.
37. An apparatus as claimed in claim 36 wherein the sleeve opening is provided along at least part of the sidewall of the housing portion.
- 15 38. An apparatus as claimed in claim 36 or 37 wherein the sleeve opening faces laterally.
- 20 39. An apparatus as claimed in any of claims 36 to 38 wherein the housing portion has an opening which acts as both the sleeve opening and the exit opening.
40. An apparatus as claimed in any of claims 36 to 39 wherein the housing portion has an opening which acts as both the sleeve opening and the entry opening.
- 25 41. An apparatus as claimed in any of claims 27 to 40 wherein the conveying device comprises an ejector element to assist ejection of at least part of a surgical device from within the housing portion.
- 30 42. An apparatus as claimed in claim 41 wherein the ejector element comprises a plunger.

43. An apparatus as claimed in any of claims 27 to 42 wherein the housing portion is substantially non-circular in cross-section.
- 5 44. An apparatus as claimed in claim 43 wherein the housing portion is substantially oval-shaped in cross-section.
- 10 45. An apparatus as claimed in any of claims 1 to 44 wherein the conveying device comprises an insertion element insertable at least partially through a wound opening and a drawing element to couple a surgical device to the insertion element for drawing of the surgical device at least partially through the wound opening.
- 15 46. An apparatus as claimed in claim 45 wherein the drawing element is substantially flexible.
47. An apparatus as claimed in claim 46 wherein the drawing element comprises a length of string.
- 20 48. An apparatus as claimed in any of claims 45 to 47 wherein the insertion element has an opening through which the drawing element extends to couple the drawing element to the insertion element.
- 25 49. An apparatus as claimed in claim 48 wherein the opening is provided in the region of a distal end of the insertion element.
50. An apparatus as claimed in any of claims 1 to 49 wherein the conveying device is configured to convey a surgical device arranged concentrically with respect to a longitudinal axis of the conveying device.

51. An apparatus as claimed in any of claims 1 to 49 wherein the conveying device is configured to convey a surgical device arranged offset with respect to a longitudinal axis of the conveying device.
- 5 52. An apparatus as claimed in any of claims 1 to 51 wherein the conveying device has a wound extending portion with a maximum transverse dimension of between 3 mm and 35 mm.
- 10 53. An apparatus as claimed in claim 52 wherein the maximum transverse dimension of the wound extending portion is between 5 mm and 12 mm.
54. An apparatus as claimed in any of claims 1 to 53 wherein a distal end of the conveying device is substantially blunt.
- 15 55. An apparatus as claimed in any of claims 1 to 54 wherein a distal end of the conveying device is substantially rounded.
56. An apparatus as claimed in any of claims 1 to 55 wherein the apparatus comprises an opening device to create a wound opening.
- 20 57. An apparatus as claimed in claim 56 wherein the opening device comprises an incising device.
58. An apparatus as claimed in claim 57 wherein the incising device is configured to create a wound opening by cutting tissue.
- 25 59. An apparatus as claimed in claim 57 or 58 wherein the incising device comprises a substantially sharp tip.
- 30 60. An apparatus as claimed in any of claims 57 to 59 wherein the incising device comprises a blade element.

61. An apparatus as claimed in claim 57 or 58 wherein the incising device comprises an electrocautery scalpel.
- 5 62. An apparatus as claimed in claim 56 wherein the opening device is configured to create a wound opening by forcing tissue apart.
63. An apparatus as claimed in claim 62 wherein the opening device comprises a substantially blunt tip.
- 10 64. An apparatus as claimed in claim 62 or 63 wherein the opening device comprises a substantially bladeless tip.
65. An apparatus as claimed in any of claims 56 to 64 wherein the opening device
15 is mounted to the conveying device.
66. An apparatus as claimed in claim 65 wherein the conveying device comprises a lumen extending therethrough and the opening device is extendable through the lumen to mount the opening device to the conveying device.
- 20 67. An apparatus as claimed in claim 65 or 66 wherein the opening device is mounted substantially concentrically with respect to a longitudinal axis of the conveying device.
- 25 68. An apparatus as claimed in claim 65 wherein the opening device is attached to the conveying device.
69. An apparatus as claimed in claim 68 wherein the opening device is releasably attached to the conveying device.
- 30

70. An apparatus as claimed in any of claims 65 to 69 wherein the apparatus is configured to create a wound opening and convey a surgical device at least partially through the wound opening in a single step.
- 5 71. An apparatus as claimed in any of claims 65 to 70 wherein the opening device is provided at a distal end of the conveying device.
72. An apparatus as claimed in any of claims 65 to 71 wherein the opening device is movable relative to the conveying device between an extended configuration and a retracted configuration.
- 10
73. An apparatus as claimed in claim 72 wherein the opening device is manually movable relative to the conveying device between the extended configuration and the retracted configuration.
- 15
74. An apparatus as claimed in claim 73 wherein the opening device comprises a handle portion to facilitate manual movement of the opening device.
75. An apparatus as claimed in any of claims 72 to 74 wherein the opening device is biased towards the retracted configuration.
- 20
76. An apparatus as claimed in any of claims 72 to 74 wherein the opening device is biased towards the extended configuration.
77. An apparatus as claimed in any of claims 56 to 64 wherein the opening device is detached from the conveying device.
- 25
78. An apparatus as claimed in claim 77 wherein the apparatus is configured to create a wound opening in an opening step and to convey a surgical device at least partially through the wound opening in a separate conveying step.
- 30

79. An apparatus as claimed in claim 77 or 78 wherein the conveying device is configured to be inserted at least partially through a wound opening after the opening device has been removed from the wound opening.
- 5 80. An apparatus as claimed in claim 77 or 78 wherein the conveying device is configured to be inserted at least partially through a wound opening while the opening device remains in position extending through the wound opening.
- 10 81. An apparatus as claimed in any of claims 72 to 79 wherein in the retracted configuration a distal end of the opening device is covered.
82. An apparatus as claimed in claim 81 wherein in the retracted configuration a distal end of the opening device is housed within the conveying device.
- 15 83. An apparatus as claimed in any of claims 56 to 82 wherein the opening device has a wound extending portion with a substantially flattened cross-section.
84. An apparatus as claimed in any of claims 1 to 83 wherein the conveying device has a wound extending portion with a substantially flattened cross-section.
- 20 85. An apparatus as claimed in any of claims 56 to 84 wherein the opening device comprises a cutting element for creating a wound opening and a shield element for shielding the cutting element.
- 25 86. An apparatus as claimed in claim 85 wherein the shield element is movable relative to the cutting element between a cutting configuration and a shielding configuration.
- 30 87. An apparatus as claimed in claim 86 wherein the opening device is biased towards the shielding configuration.

88. An apparatus as claimed in claim 86 or 87 wherein the opening device comprises a locking element to releasably lock the opening device in the shielding configuration.
- 5 89. An apparatus as claimed in any of claims 85 to 88 wherein the cutting element is fixed to the conveying device.
90. An apparatus as claimed in any of claims 85 to 89 wherein the shield element is mounted to the conveying device.
- 10 91. An apparatus as claimed in claim 90 wherein the shield element is concentrically mounted around the conveying device.
92. An apparatus as claimed in any of claims 86 to 91 wherein the opening device comprises a support element, the cutting element being fixedly attached to the support element and the shield element being movably attached to the support element.
- 15 93. An apparatus as claimed in any of claims 86 to 91 wherein the opening device comprises a support element, the shield element being fixedly attached to the support element and the cutting element being movably attached to the support element.
- 20 94. An apparatus as claimed in any of claims 56 to 93 wherein the opening device comprises a cutting element for creating a wound opening and a support element, the cutting element being releasably attached to the support element.
- 25 95. An apparatus as claimed in any of claims 56 to 94 wherein the apparatus comprises a limiting element to limit the extent of passage of the opening device through tissue.
- 30

96. An apparatus as claimed in claim 95 wherein the limiting element comprises an abutment member for abutting an external surface of tissue adjacent a wound opening.
- 5 97. An apparatus as claimed in claim 95 or 96 wherein the limiting element is mounted to the opening device.
98. An apparatus as claimed in claim 97 wherein the position of mounting of the limiting element on the opening device is adjustable.
- 10 99. An apparatus as claimed in claim 97 or 98 wherein the limiting element is movable relative to the opening device between a retracted configuration and an extended configuration.
- 15 100. An apparatus as claimed in claim 99 wherein the limiting element is biased towards the retracted configuration.
101. An apparatus as claimed in any of claims 56 to 100 wherein the opening device has a wound extending portion with a maximum transverse dimension of
- 20 between 3 mm and 35 mm.
102. An apparatus as claimed in claim 101 wherein the maximum transverse dimension of the wound extending portion is between 5 mm and 12 mm.
- 25 103. An apparatus as claimed in any of claims 1 to 102 wherein the apparatus comprises a guide device insertable at least partially through a wound opening to maintain the patency of the wound opening.
- 30 104. An apparatus as claimed in claim 103 wherein the guide device is substantially flexible.

105. An apparatus as claimed in claim 104 wherein the guide device comprises a length of string.
- 5 106. An apparatus as claimed in claim 103 wherein the guide device is substantially rigid.
107. An apparatus as claimed in claim 106 wherein the guide device is substantially tubular.
- 10 108. An apparatus as claimed in claim 107 wherein the guide device has a substantially flattened, oblong cross-section.
109. An apparatus as claimed in claim 107 or 108 wherein the guide device has a slot extending along a sidewall of the guide device.
- 15 110. An apparatus as claimed in any of claims 103 to 109 wherein the guide device is mountable to the conveying device and/or to the opening device.
111. An apparatus as claimed in any of claims 103 to 110 wherein the guide device has a wound extending portion with a maximum transverse dimension of between 3 mm and 35 mm.
- 20 112. An apparatus as claimed in claim 111 wherein the maximum transverse dimension of the wound extending portion is between 5 mm and 12 mm.
- 25 113. An apparatus as claimed in any of claims 1 to 112 wherein the apparatus comprises a removal device to assist in removal of a surgical device from a wound opening.
- 30 114. An apparatus as claimed in claim 113 wherein the removal device is detached from a surgical device.

115. An apparatus as claimed in claim 113 or 114 wherein the removal device is configured to engage a surgical device to assist in removal of the surgical device from a wound opening.
- 5
116. An apparatus as claimed in claim 115 wherein the removal device is configured to engage a distal portion of a surgical device.
117. An apparatus as claimed in claim 115 or 116 wherein the removal device comprises a hook element to engage a surgical device.
- 10
118. An apparatus as claimed in claim 117 wherein a concave portion of the hook element faces proximally.
119. An apparatus as claimed in claim 117 or 118 wherein the hook element is provided in the region of a distal end of the removal device.
- 15
120. An apparatus as claimed in any of claims 115 to 119 wherein the removal device comprises a gripping portion which may be gripped.
- 20
121. An apparatus as claimed in any of claims 113 to 120 wherein the removal device comprises a connector element extendable at least partially through a wound opening.
122. An apparatus as claimed in claim 121 wherein the connector element is substantially flexible.
- 25
123. An apparatus as claimed in claim 122 wherein the connector element comprises a length of string.
- 30

124. An apparatus as claimed in any of claims 103 to 123 wherein the guide device and the removal device are provided by a single device.
- 5 125. An apparatus for inserting a surgical device at least partially through a wound opening substantially as hereinbefore described with reference to the accompanying drawings.
126. A surgical assembly comprising: -
- 10 a surgical device; and
- an apparatus as claimed in any of claims 1 to 125 for inserting the surgical device at least partially through a wound opening.
- 15 127. An assembly as claimed in claim 126 wherein the surgical device comprises a wound retractor device.
128. An assembly as claimed in claim 127 wherein the wound retractor device comprises a distal retaining element for location distally of a wound opening to
- 20 retain the wound retractor device in position retracting the wound opening.
129. A surgical assembly substantially as hereinbefore described with reference to the accompanying drawings.
- 25 130. A method of inserting a surgical device at least partially through a wound opening, the method comprising the steps of: -
- providing a surgical device;
- 30 creating a wound opening; and

conveying the surgical device at least partially through the wound opening.

- 5 131. A method as claimed in claim 130 wherein the wound opening is created and the surgical device is conveyed at least partially through the wound opening in a single step.
- 10 132. A method as claimed in claim 131 wherein the wound opening is created using an opening device, and the surgical device is conveyed at least partially through the wound opening using a conveying device.
- 15 133. A method as claimed in claim 132 wherein the method comprises the step of moving the opening device relative to the conveying device between an extended configuration and a retracted configuration.
- 20 134. A method as claimed in claim 133 wherein the opening device is moved relative to the conveying device from the extended configuration to the retracted configuration after the wound opening has been created.
- 25 135. A method as claimed in claim 133 or 134 wherein the opening device is moved relative to the conveying device from the extended configuration to the retracted configuration before the surgical device has been conveyed fully through the wound opening.
- 30 136. A method as claimed in any of claims 133 to 135 wherein the opening device is manually moved relative to the conveying device between the extended configuration and the retracted configuration.
137. A method as claimed in claim 136 wherein the opening device is pulled proximally relative to the conveying device from the extended configuration to the retracted configuration.

138. A method as claimed in claim 135 wherein the opening device is moved relative to the conveying device from the extended configuration to the retracted configuration by a biasing element.
- 5
139. A method as claimed in any of claims 135 to 138 wherein the opening device is moved while the conveying device remains in a fixed position.
140. A method as claimed in claim 130 wherein the wound opening is created in an opening step and the surgical device is conveyed at least partially through the wound opening in a separate conveying step.
- 10
141. A method as claimed in claim 140 wherein the wound opening is created using an opening device, and the surgical device is conveyed at least partially through the wound opening after the opening device has been removed from the wound opening.
- 15
142. A method as claimed in claim 140 wherein the wound opening is created using an opening device, and the surgical device is conveyed at least partially through the wound opening while the opening device remains in position extending through the wound opening.
- 20
143. A method as claimed in any of claims 130 to 142 wherein the surgical device is conveyed at least partially through the wound opening by engaging the surgical device and pushing the surgical device distally.
- 25
144. A method as claimed in claim 143 wherein the method comprises the step of retaining the surgical device in engagement with a conveying device during the step of conveying at least partially through the wound opening.
- 30

145. A method as claimed in any of claims 130 to 144 wherein the surgical device is conveyed at least partially through the wound opening with at least part of the surgical device in a low-profile configuration.
- 5 146. A method as claimed in claim 145 wherein the method comprises the step of holding at least part of the surgical device in the low-profile configuration during the step of conveying at least partially through the wound opening.
147. A method as claimed in claim 146 wherein the method comprises the step of
10 releasing the surgical device after conveying at least partially through the wound opening.
148. A method as claimed in any of claims 130 to 147 wherein the method
15 comprises the step of holding a first part of the surgical device externally of the wound opening during conveying of a second part of the surgical device through the wound opening.
149. A method as claimed in claim 148 wherein part of the surgical device is
20 maintained in tension.
150. A method as claimed in any of claims 130 to 142 wherein the surgical device is conveyed at least partially through the wound opening with at least part of the surgical device received in a housing portion of a conveying device.
- 25 151. A method as claimed in claim 150 wherein the method comprises the step of inserting at least part of the surgical device into the housing portion before conveying at least partially through the wound opening.
152. A method as claimed in claim 150 or 151 wherein the method comprises the
30 step of ejecting at least part of the surgical device from within the housing portion after conveying at least partially through the wound opening.

153. A method as claimed in any of claims 130 to 142 wherein the surgical device is conveyed at least partially through the wound opening by drawing the surgical device distally.
- 5
154. A method as claimed in any of claims 130 to 153 wherein the wound opening is created by cutting tissue.
155. A method as claimed in any of claims 130 to 153 wherein the wound opening is created by forcing tissue apart.
- 10
156. A method as claimed in any of claims 130 to 155 wherein the wound opening is created by advancing an opening device substantially distally through tissue.
157. A method as claimed in any of claims 130 to 156 wherein the wound opening is created by rotating an opening device.
- 15
158. A method as claimed in claim 157 wherein the opening device is rotated about an axis substantially parallel to the longitudinal axis of the wound opening.
- 20
159. A method as claimed in any of claims 130 to 158 wherein the method comprises the steps of: -
- 25
- providing a guide device; and
- inserting the guide device at least partially through the wound opening to maintain the patency of the wound opening.
- 30
160. A method as claimed in any of claims 130 to 159 wherein the wound opening is created using an opening device, and the method comprises the step of limiting the extent of passage of the opening device through tissue.

- 5 161. A method as claimed in any of claims 130 to 160 wherein the wound opening is created using an opening device, and the method comprises the step of shielding a cutting element of the opening device after the wound opening has been created.
162. A method as claimed in claim 161 wherein the cutting element is shielded before the surgical device has been conveyed fully through the wound opening.
- 10 163. A method as claimed in claim 161 or 162 wherein the method comprises the step of exposing the cutting element to create the wound opening.
164. A method as claimed in any of claims 130 to 163 wherein the method comprises the step of removing the surgical device from the wound opening.
- 15 165. A method as claimed in claim 164 wherein the method comprises the step of engaging the surgical device to remove the surgical device from the wound opening.
- 20 166. A method as claimed in claim 165 wherein a distal portion of the surgical device is engaged.
167. A method as claimed in any of claims 130 to 166 wherein the maximum transverse dimension of the wound opening is between 3 mm and 35 mm.
- 25 168. A method as claimed in claim 167 wherein the maximum transverse dimension of the wound opening is between 5 mm and 12 mm.
- 30 169. A method of inserting a surgical device at least partially through a wound opening substantially as hereinbefore described with reference to the accompanying drawings.

170. A guide device insertable at least partially through a wound opening to maintain the patency of the wound opening.
- 5 171. A removal device to assist in removal of a surgical device from a wound opening.
172. An opening device comprising a cutting element for creating a wound opening and a support element, the cutting element being releasably attached to the support element.
- 10
173. An opening device to create a wound opening, the opening device comprising a limiting element to limit the extent of passage of the opening device through tissue.
- 15
174. An opening device comprising a cutting element for creating a wound opening and a shield element for shielding the cutting element.

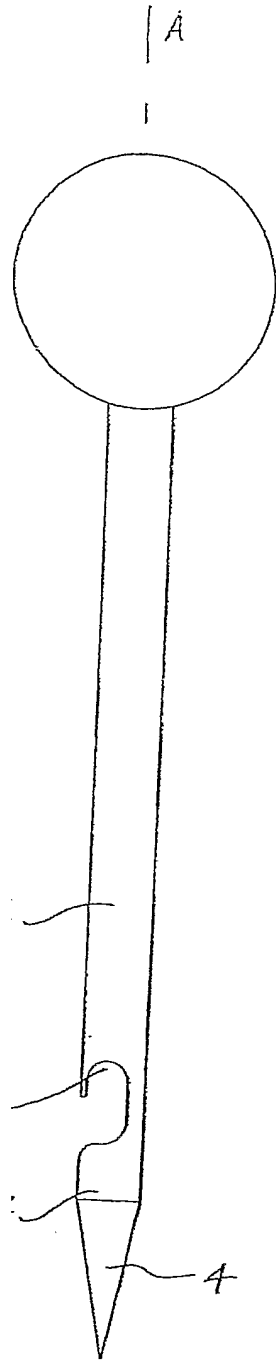
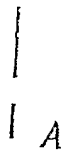


Fig. 1



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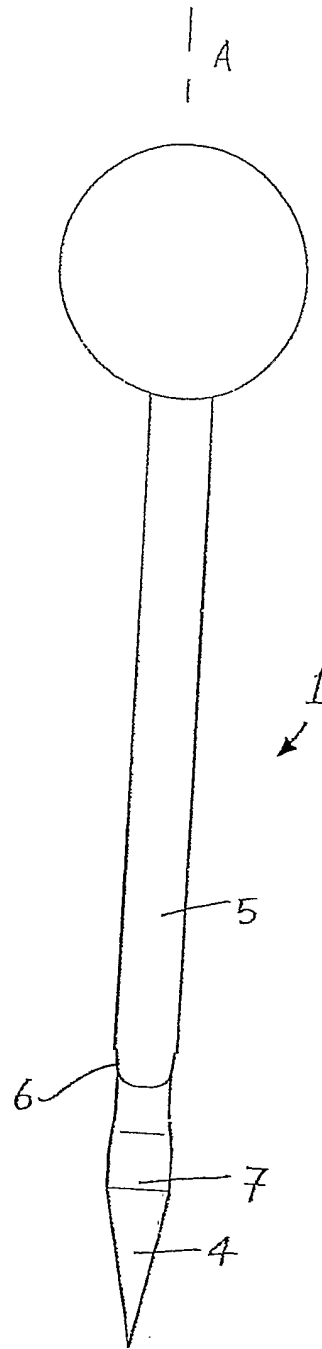
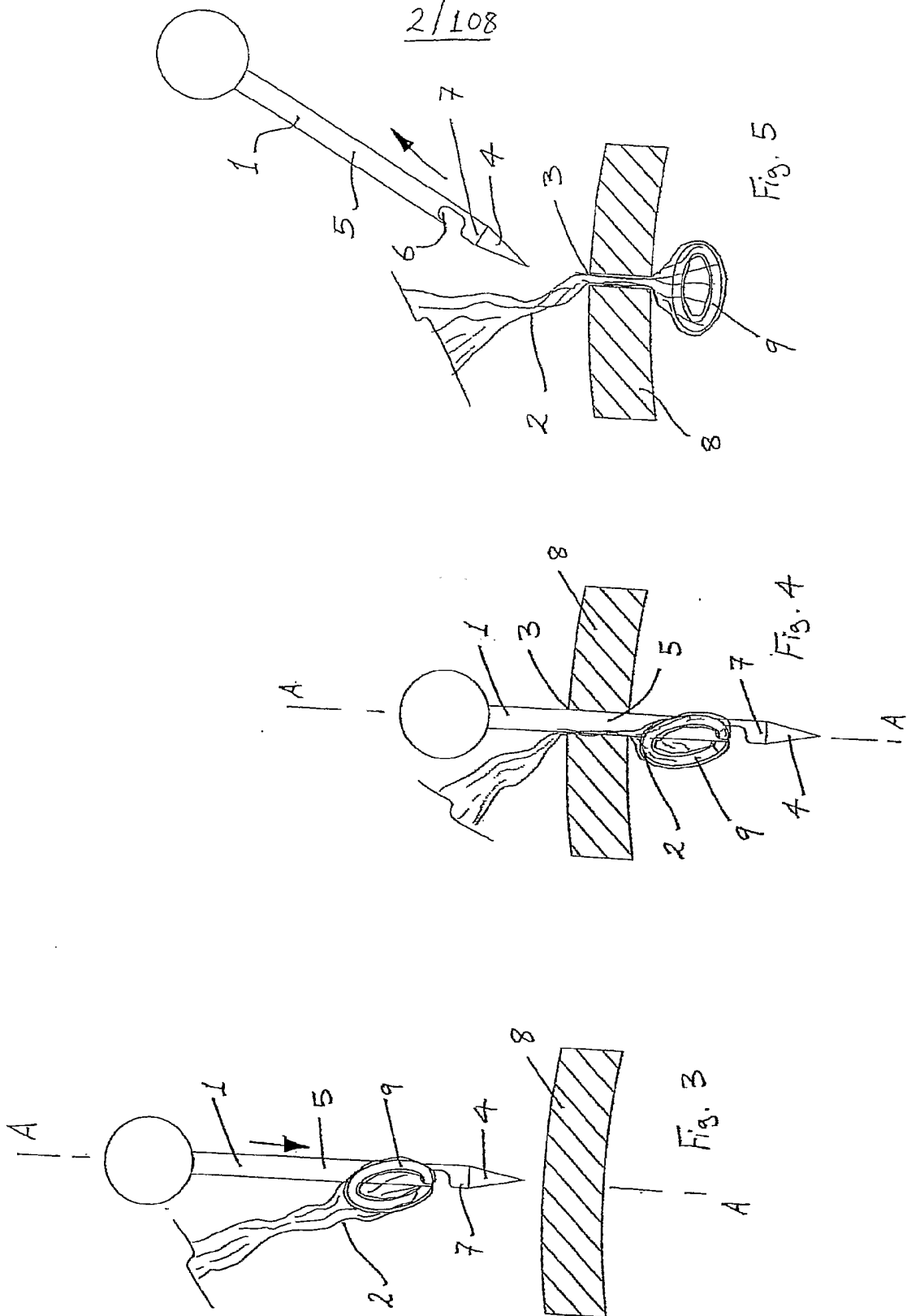


Fig. 2



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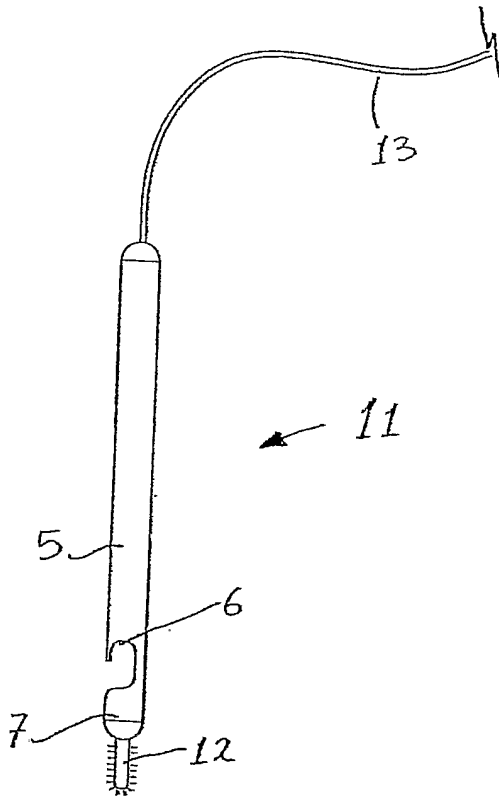


Fig. 6

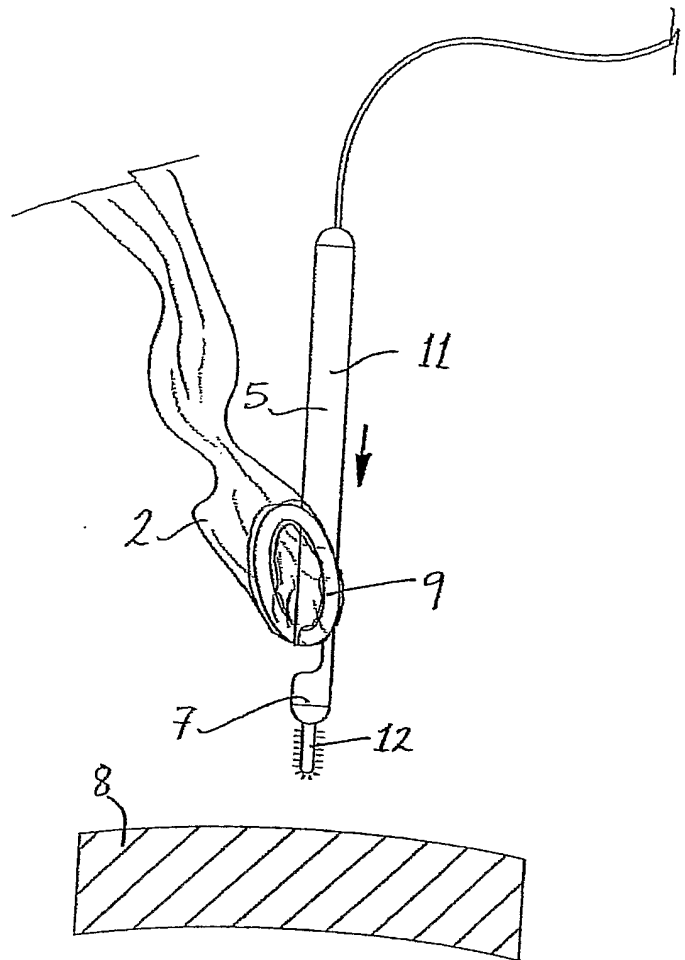


Fig. 7

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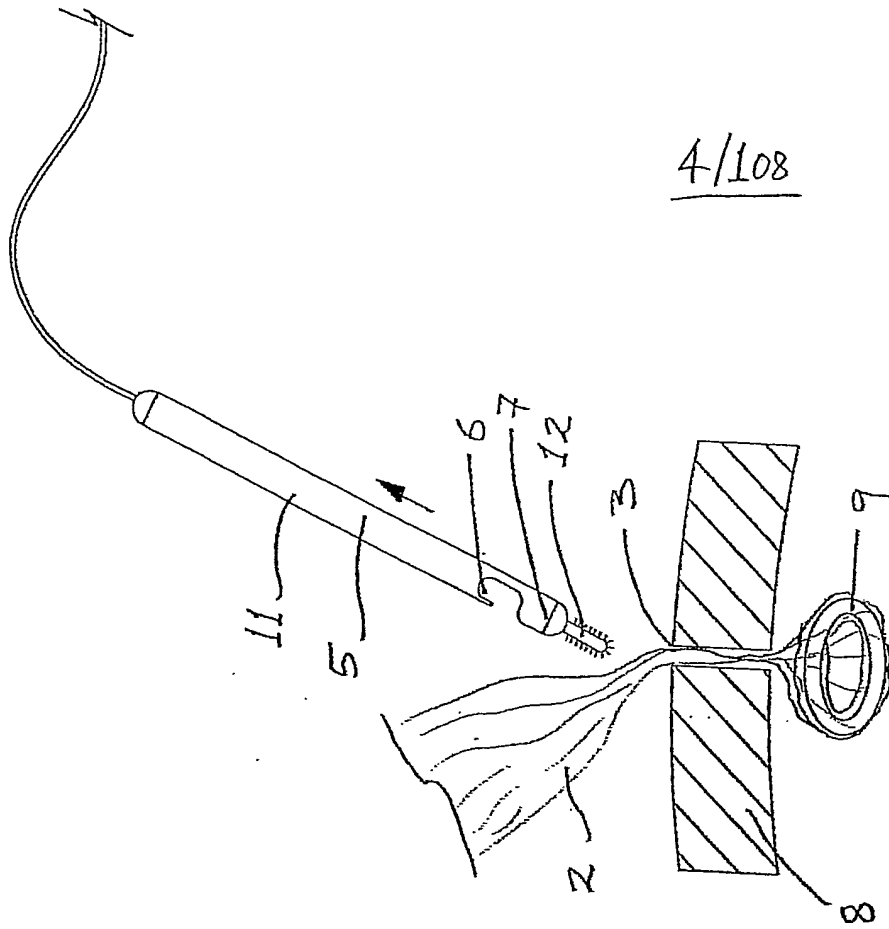


Fig. 9

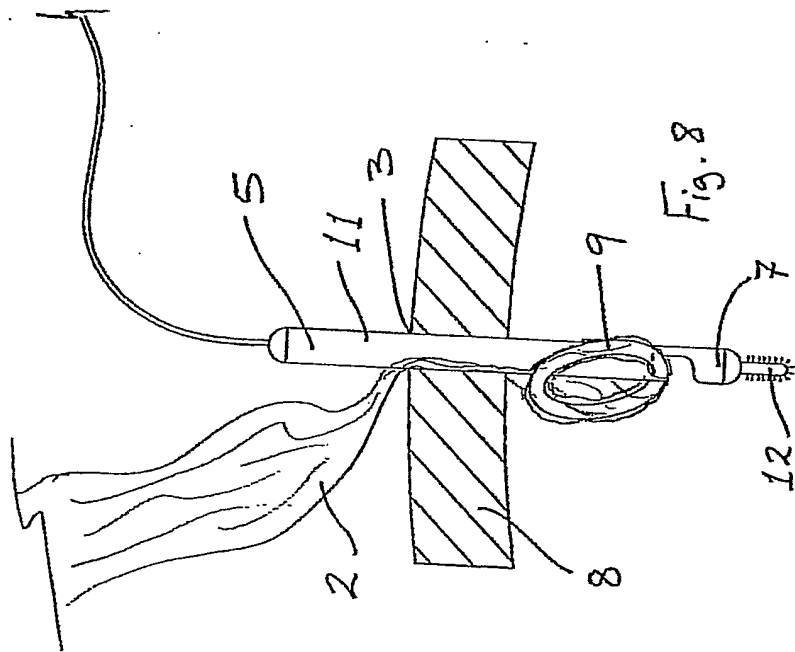


Fig. 8

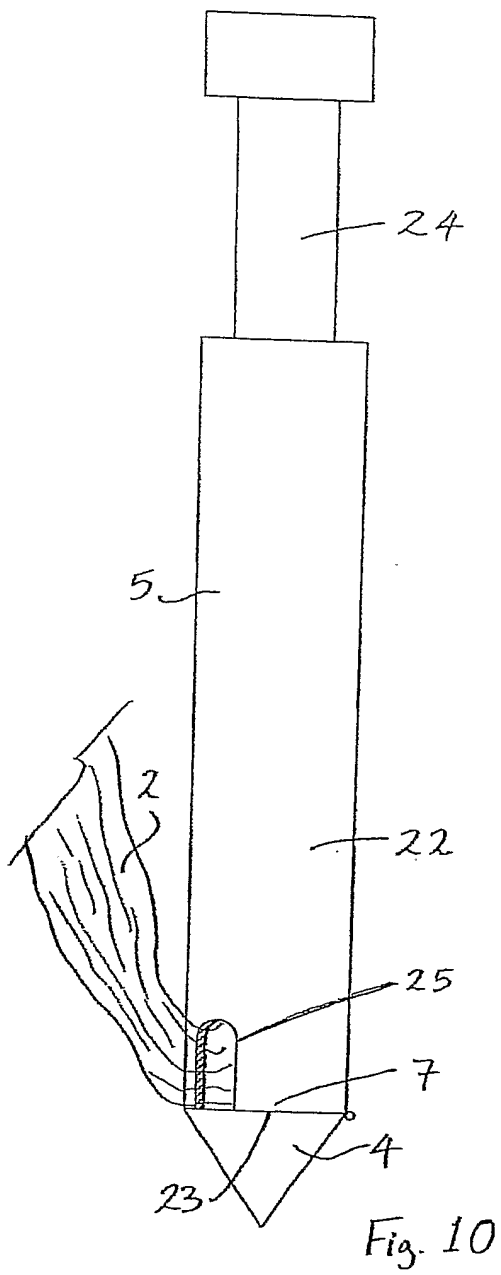


Fig. 10

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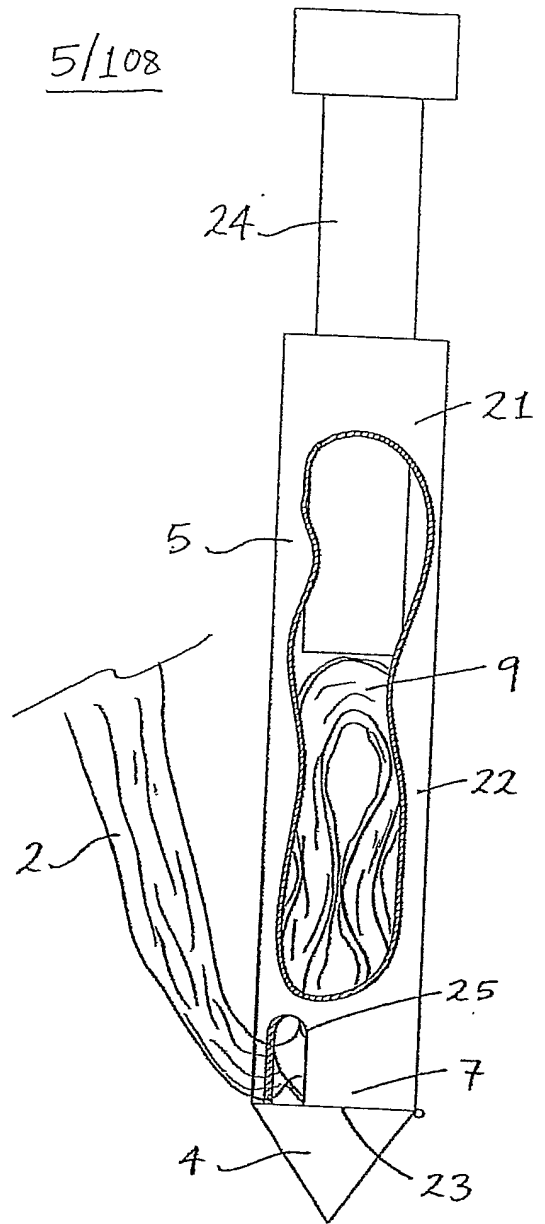
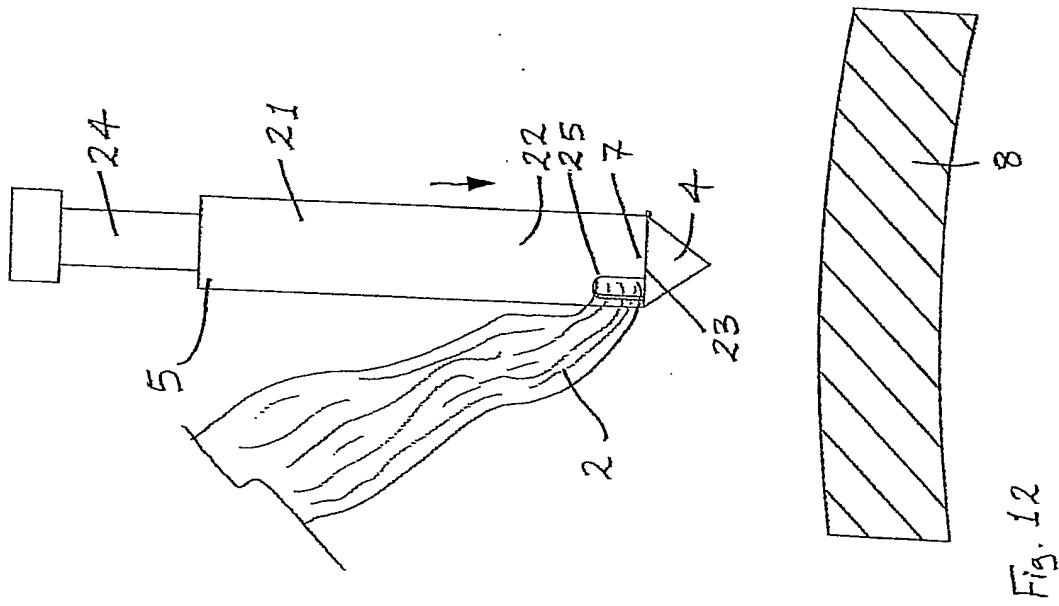
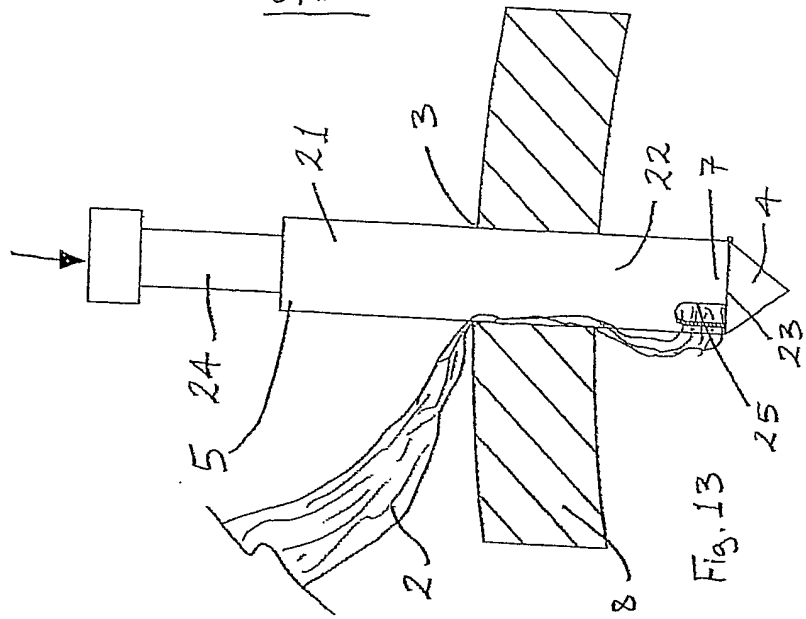
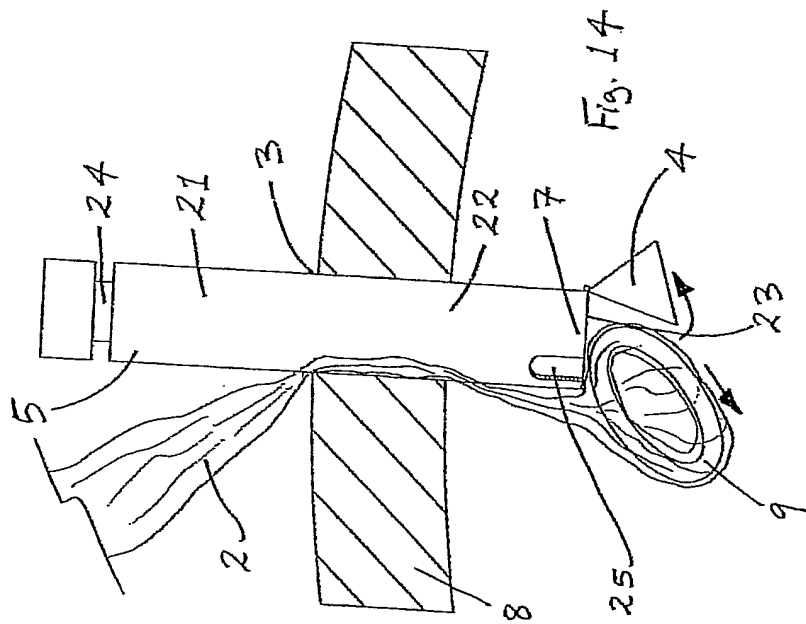
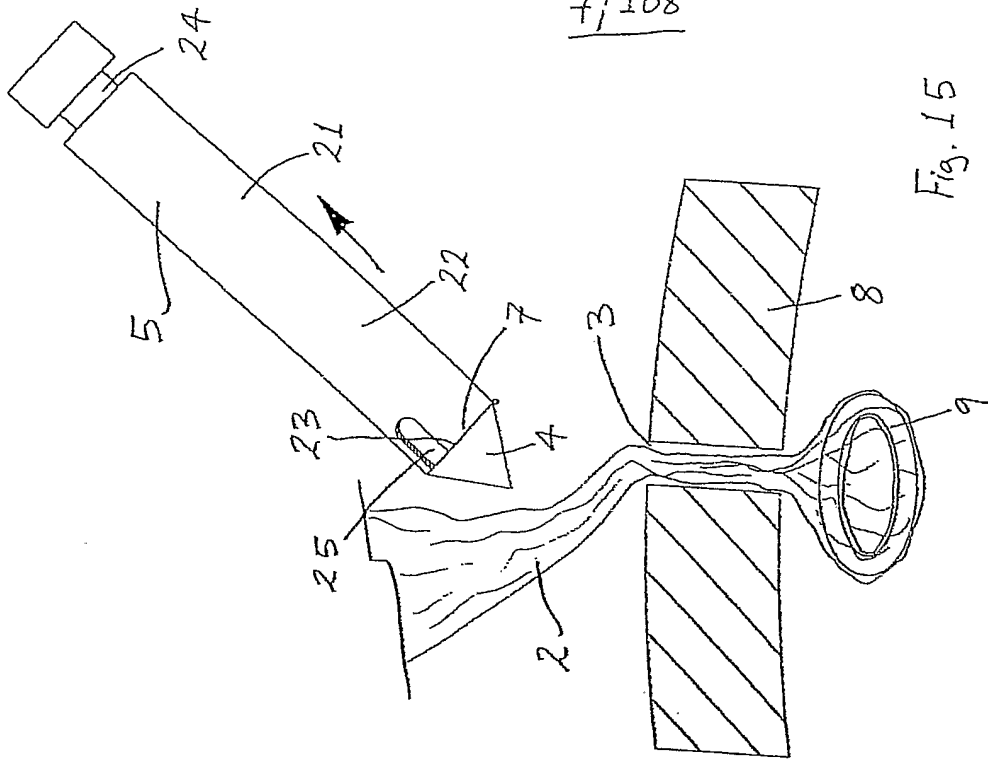


Fig. 11

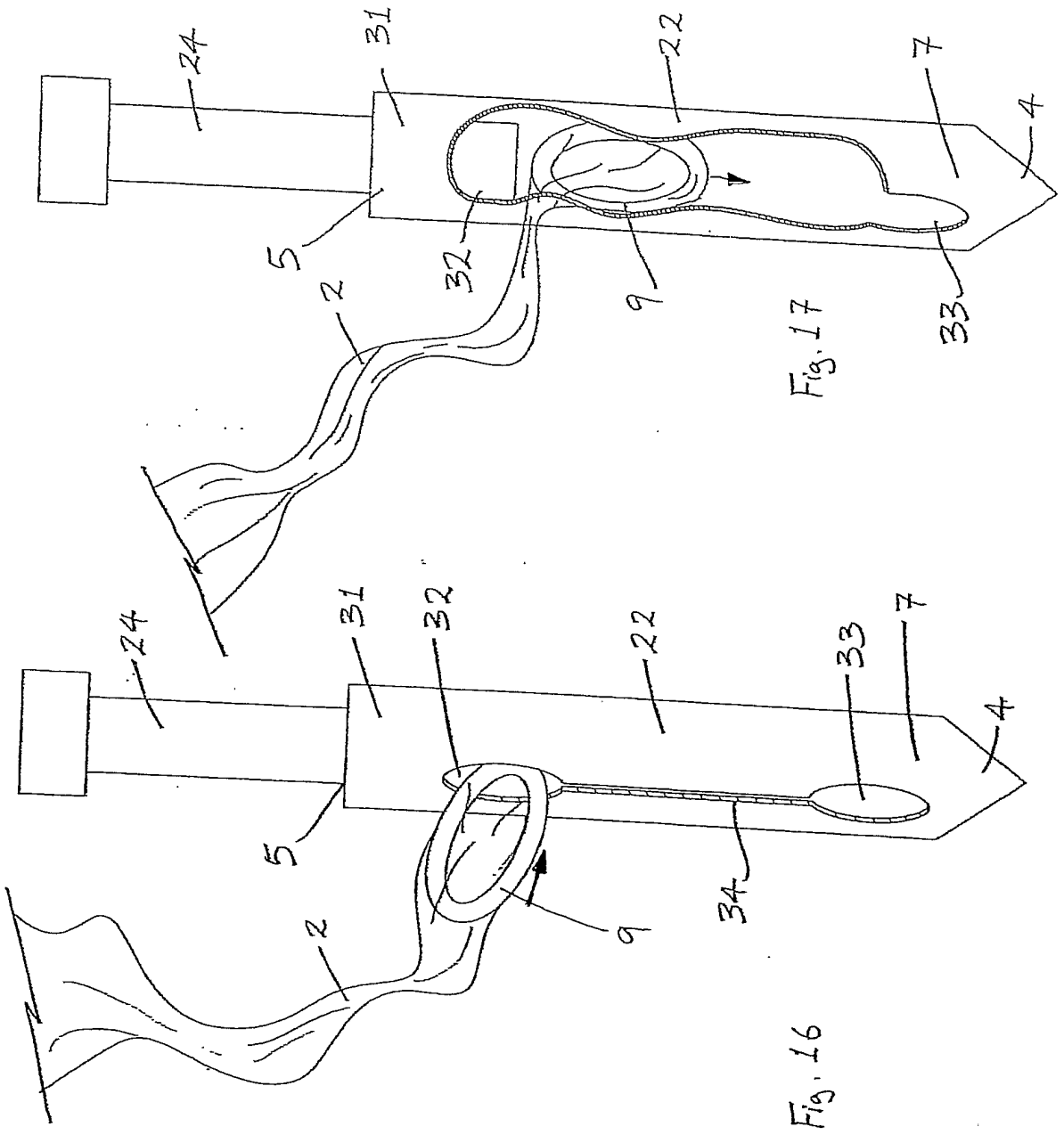
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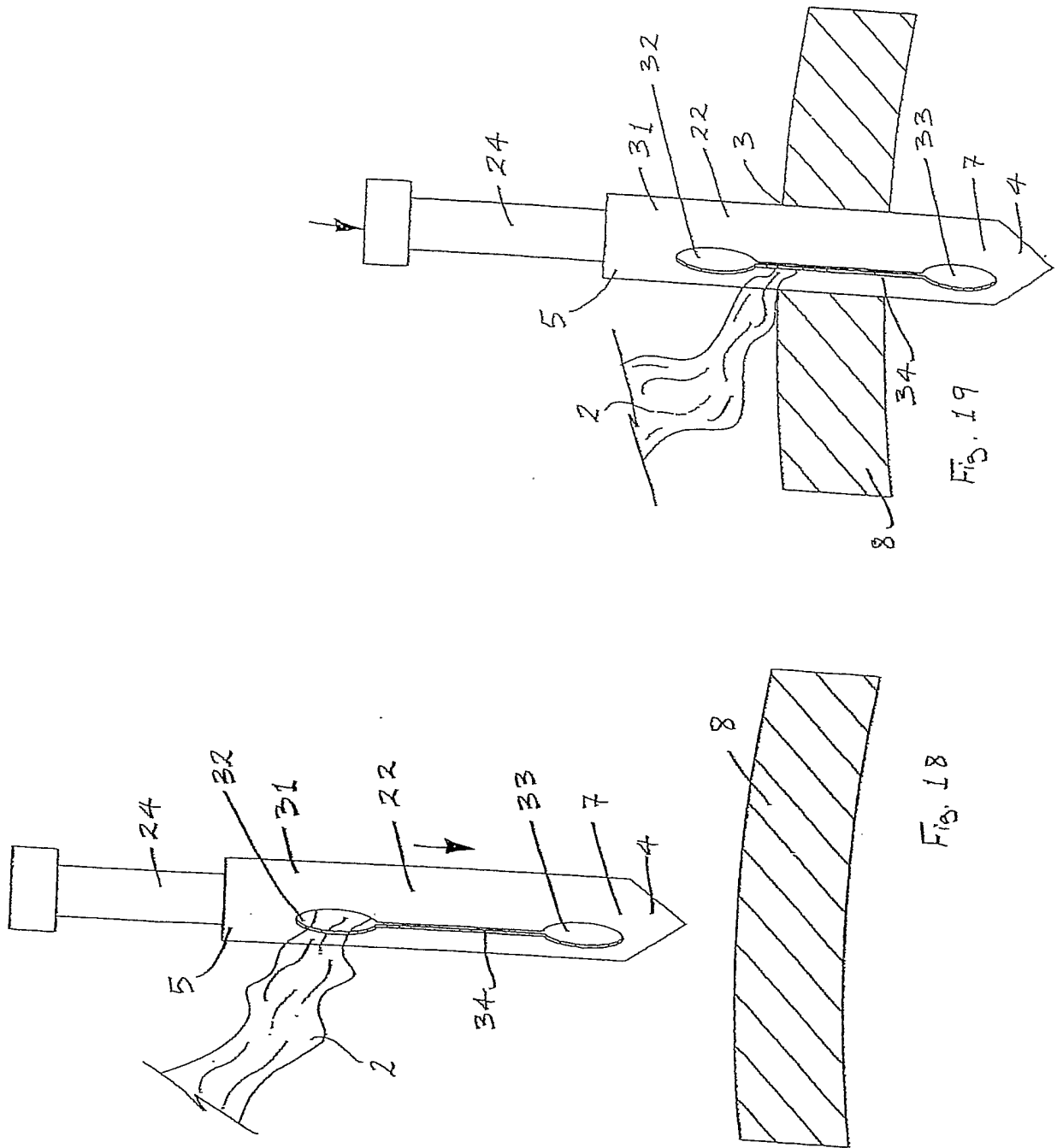
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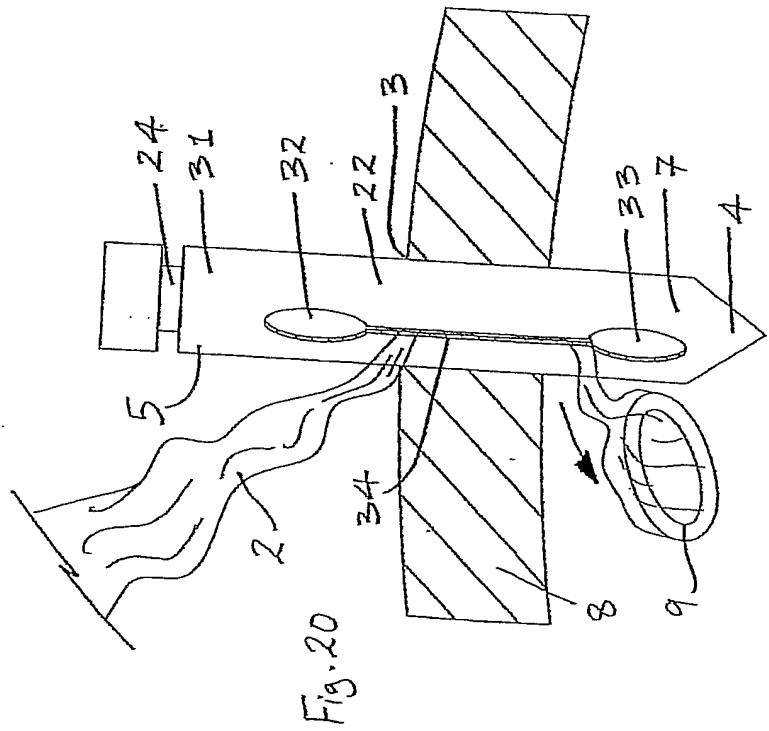
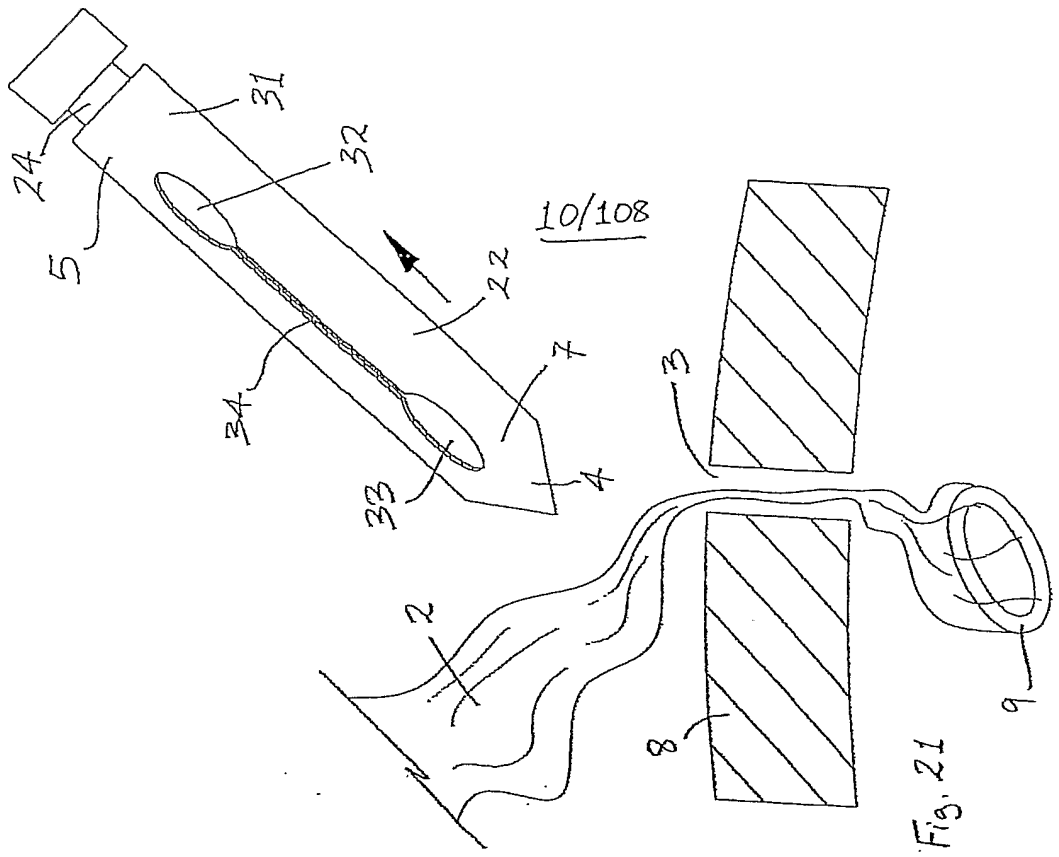


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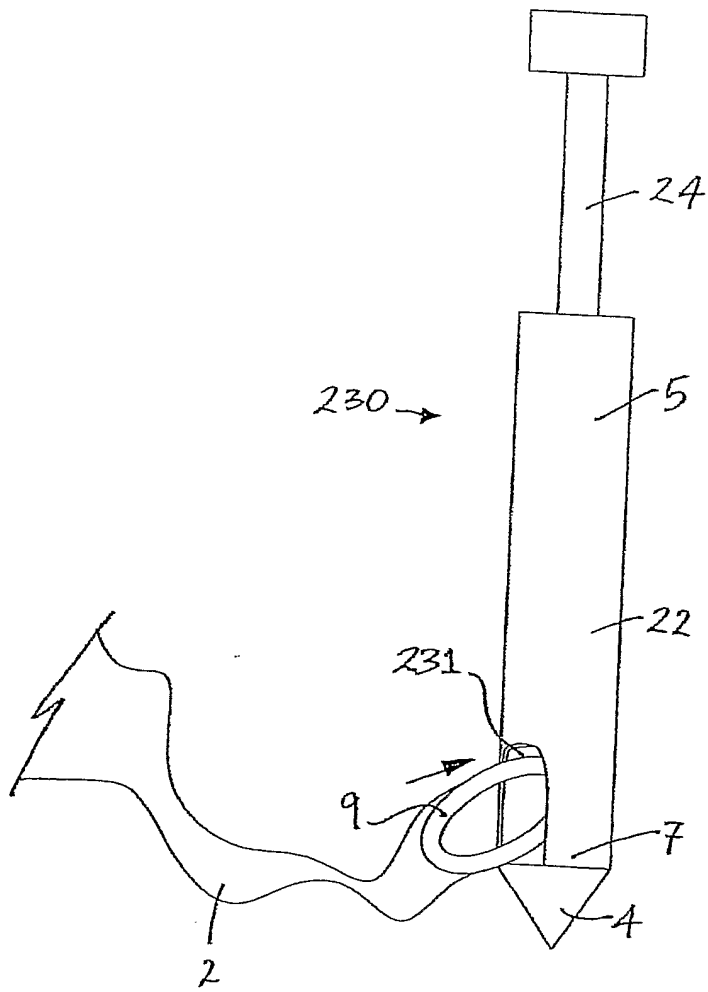


Fig. 21(a)

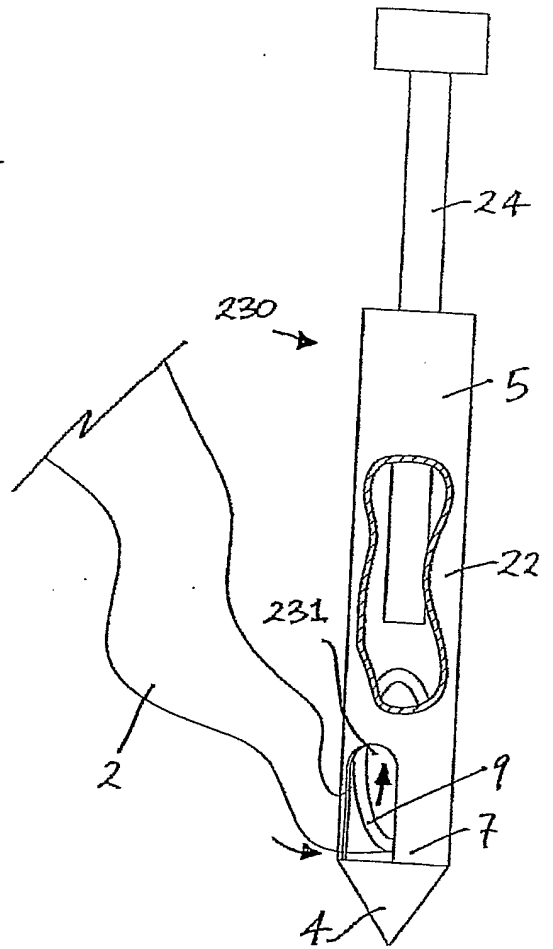


Fig. 21(b)

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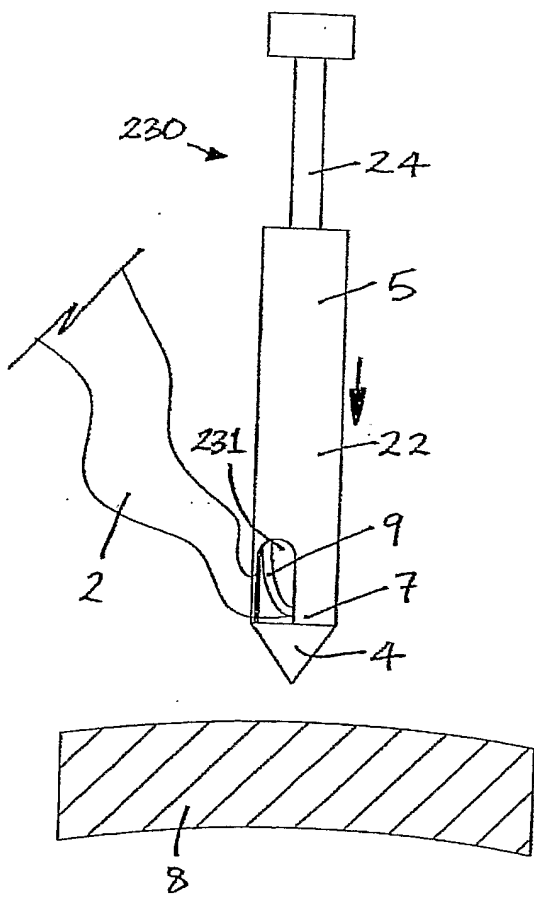


Fig. 21(c)

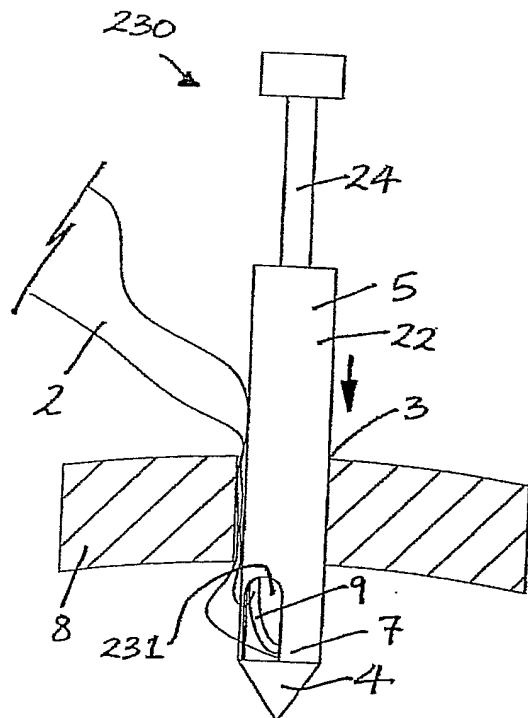
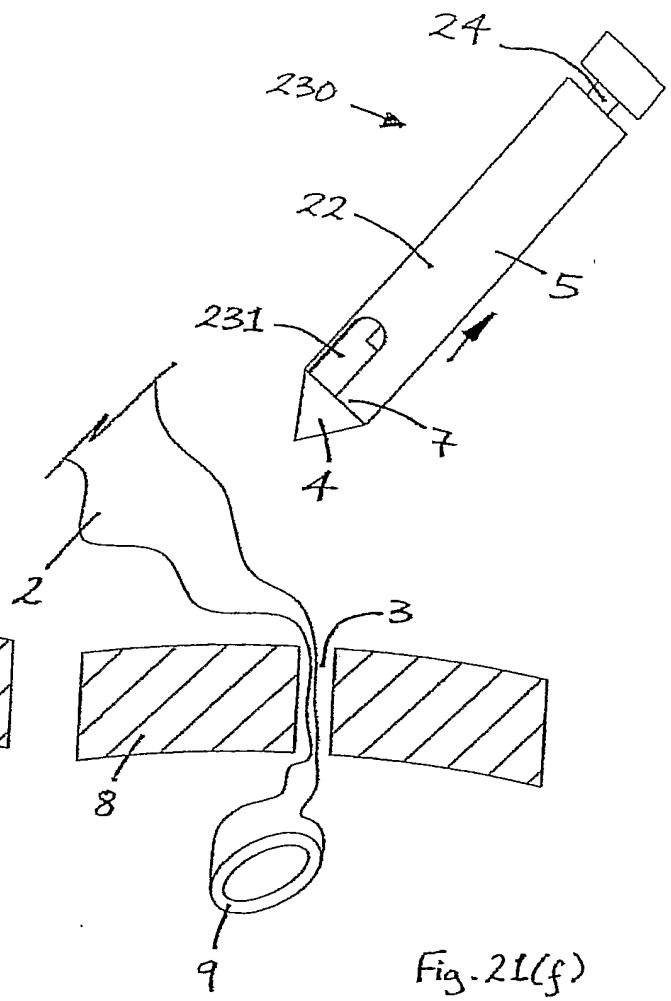
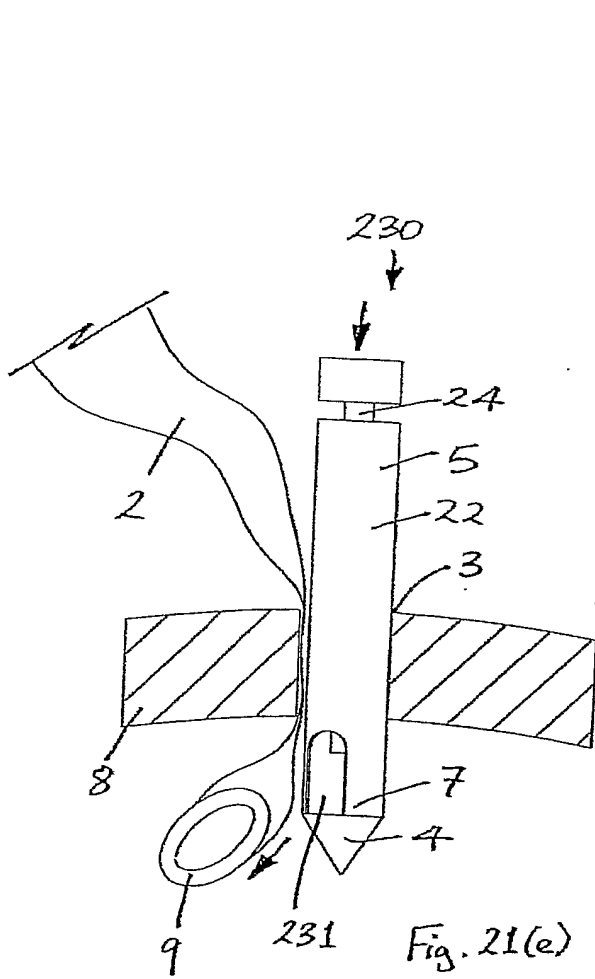


Fig. 21(d)

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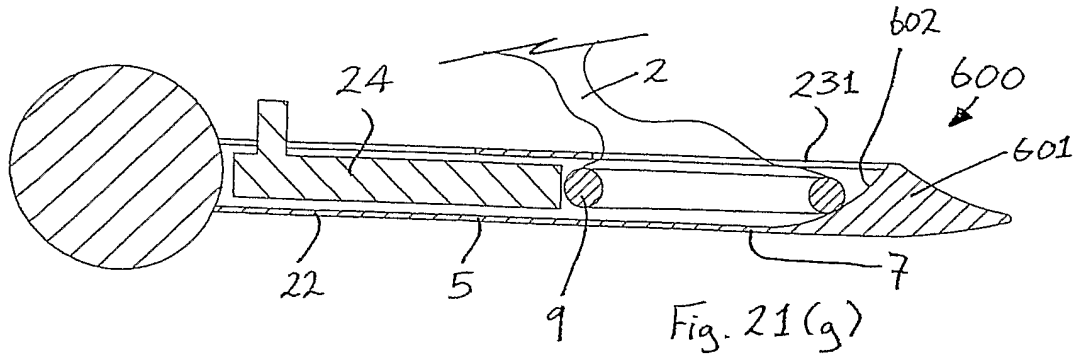


Fig. 21(g)

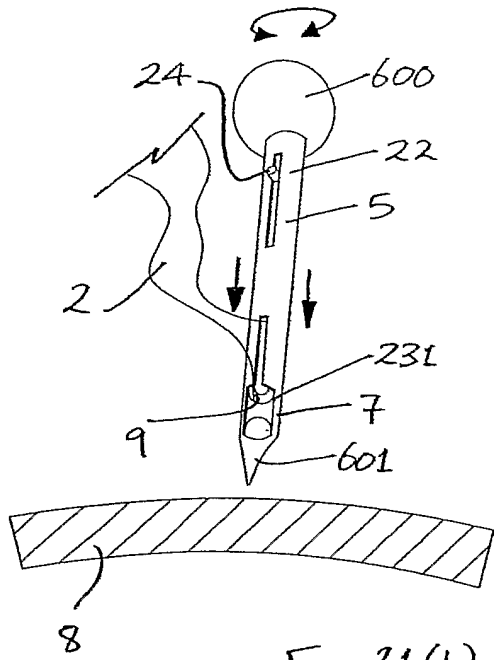


Fig. 21(h)

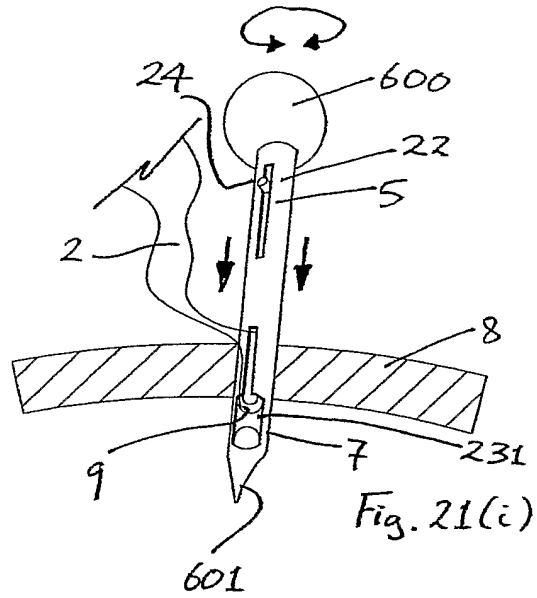


Fig. 21(i)

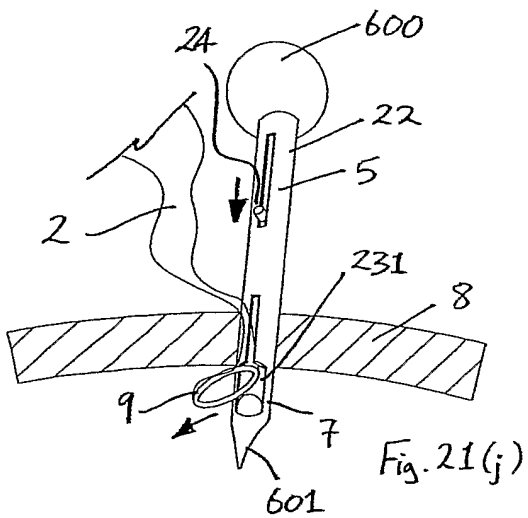


Fig. 21(j)

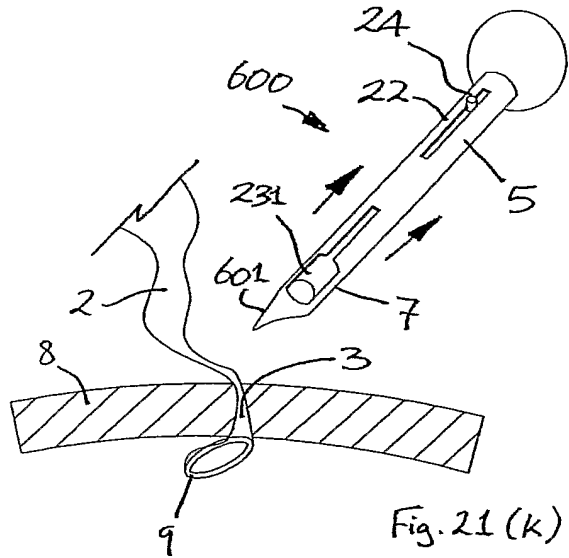
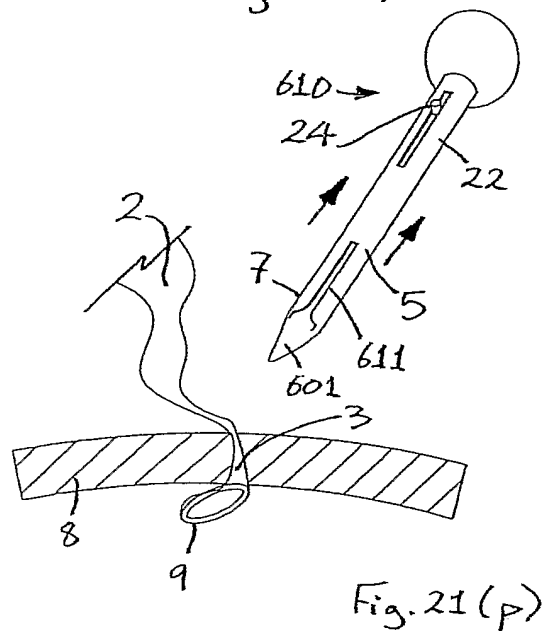
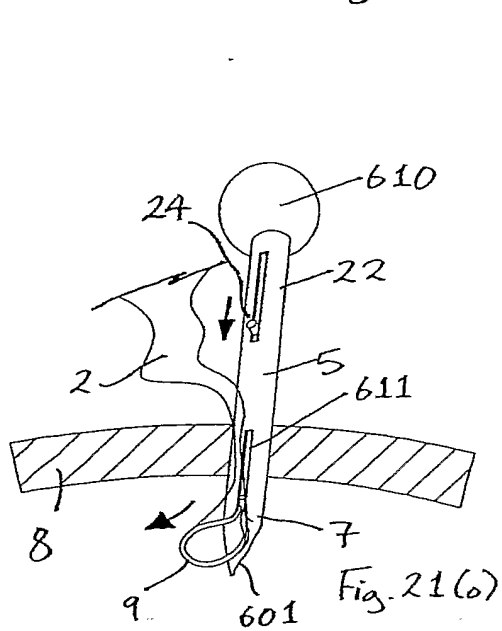
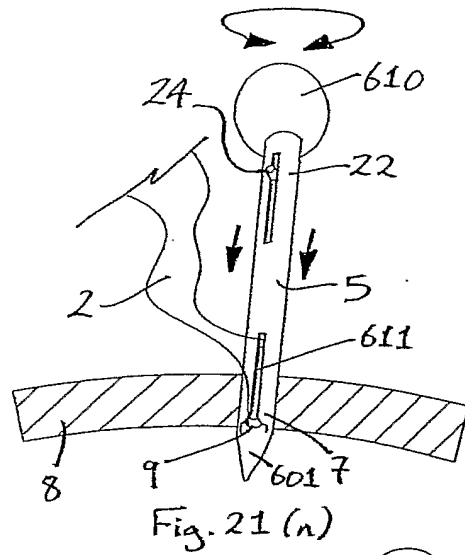
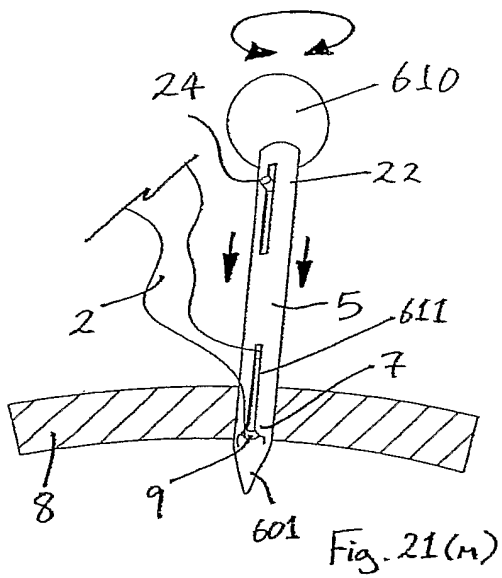
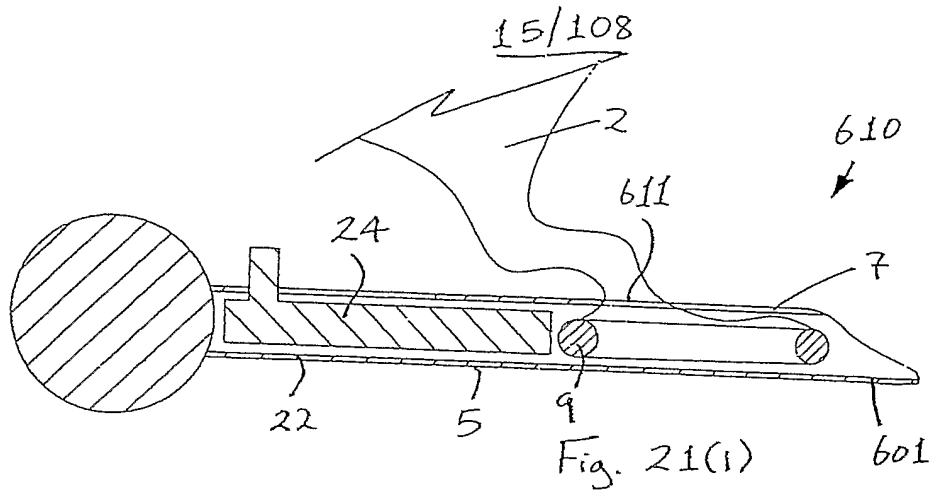
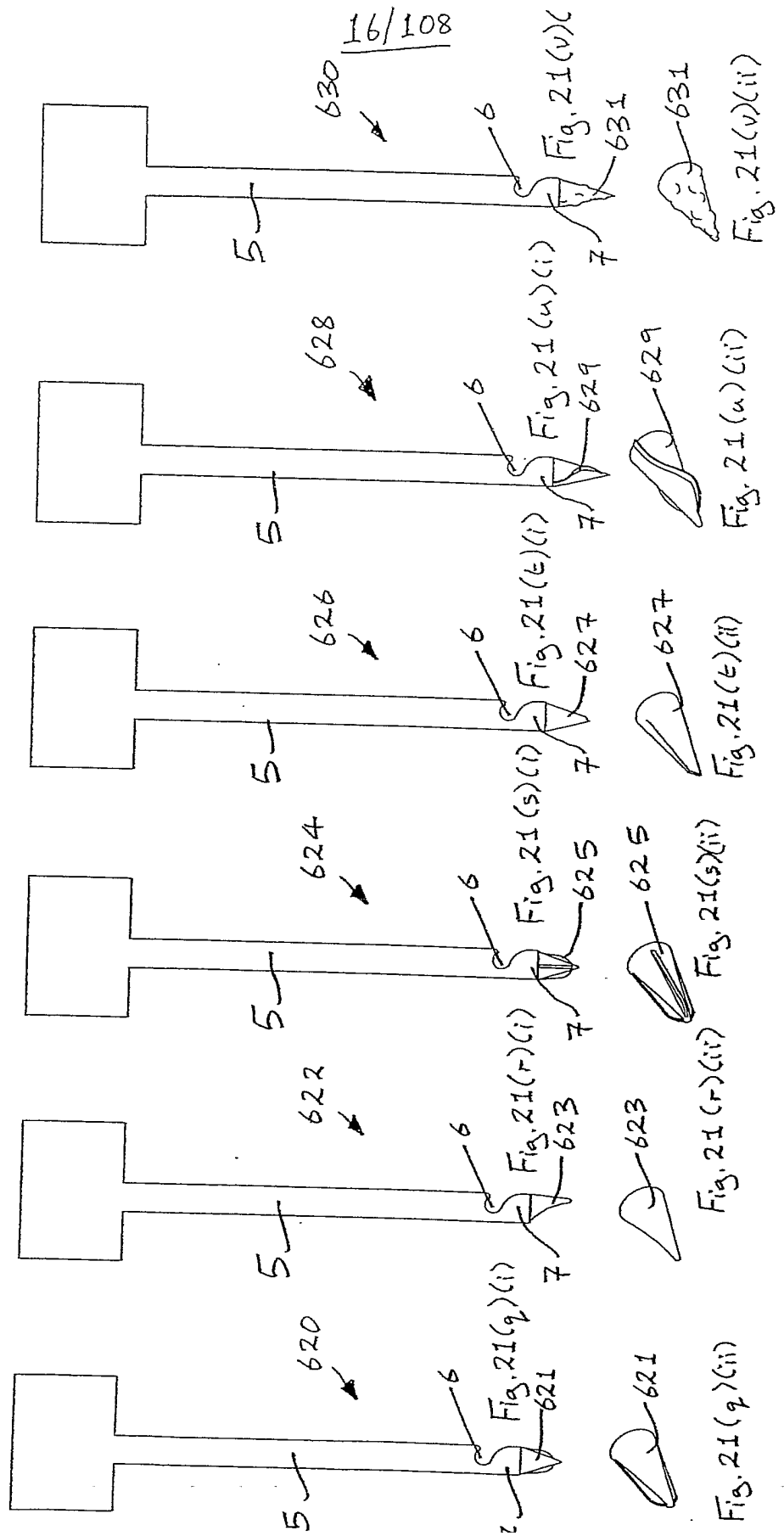


Fig. 21(k)





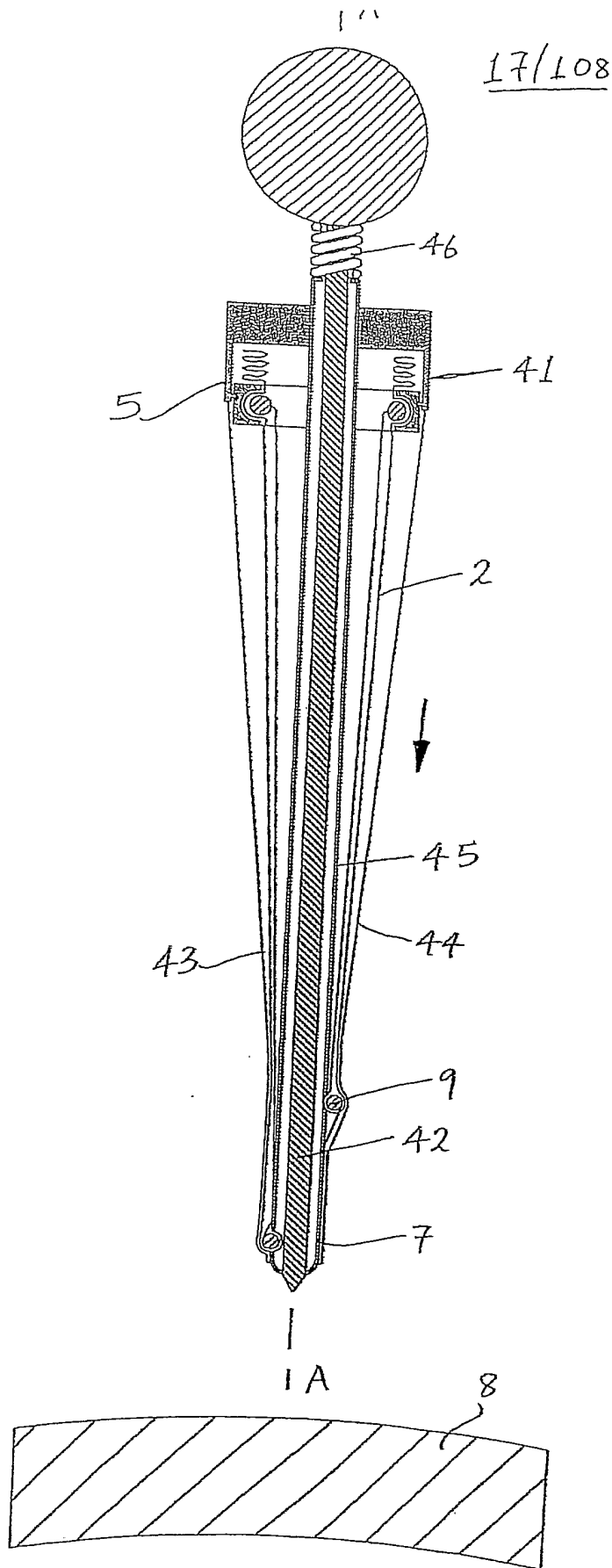


Fig. 22

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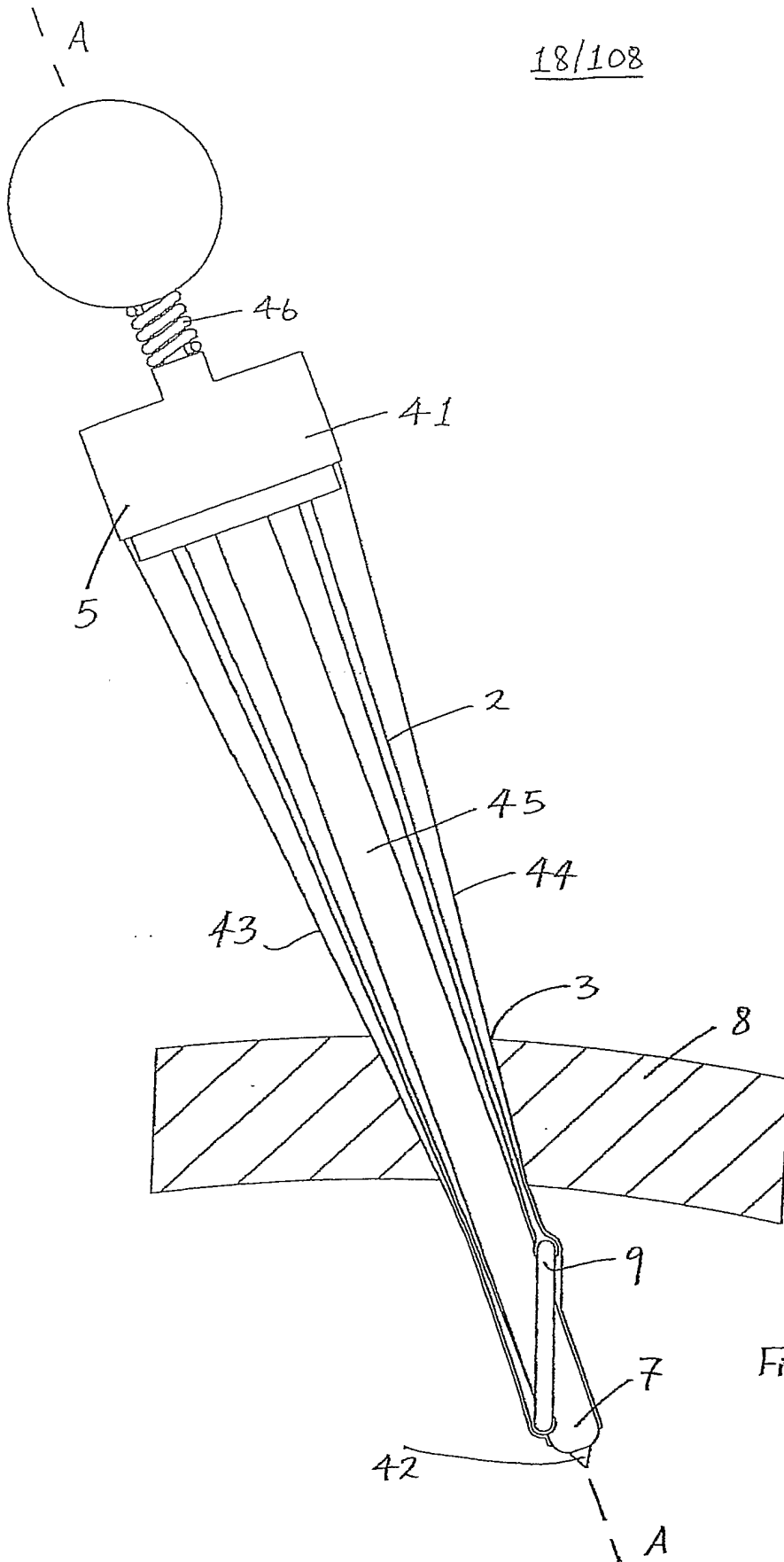


Fig. 23

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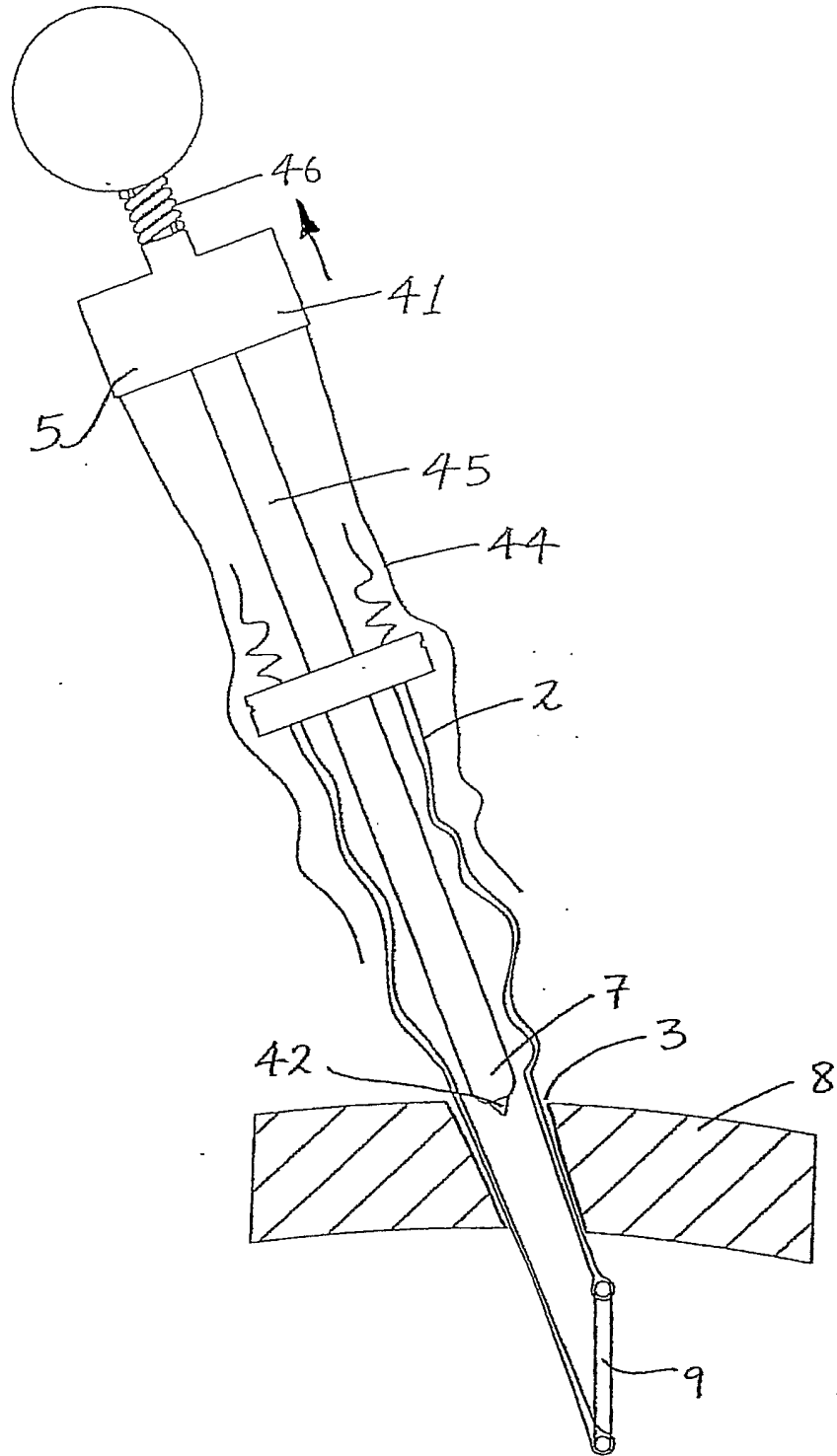


Fig. 24

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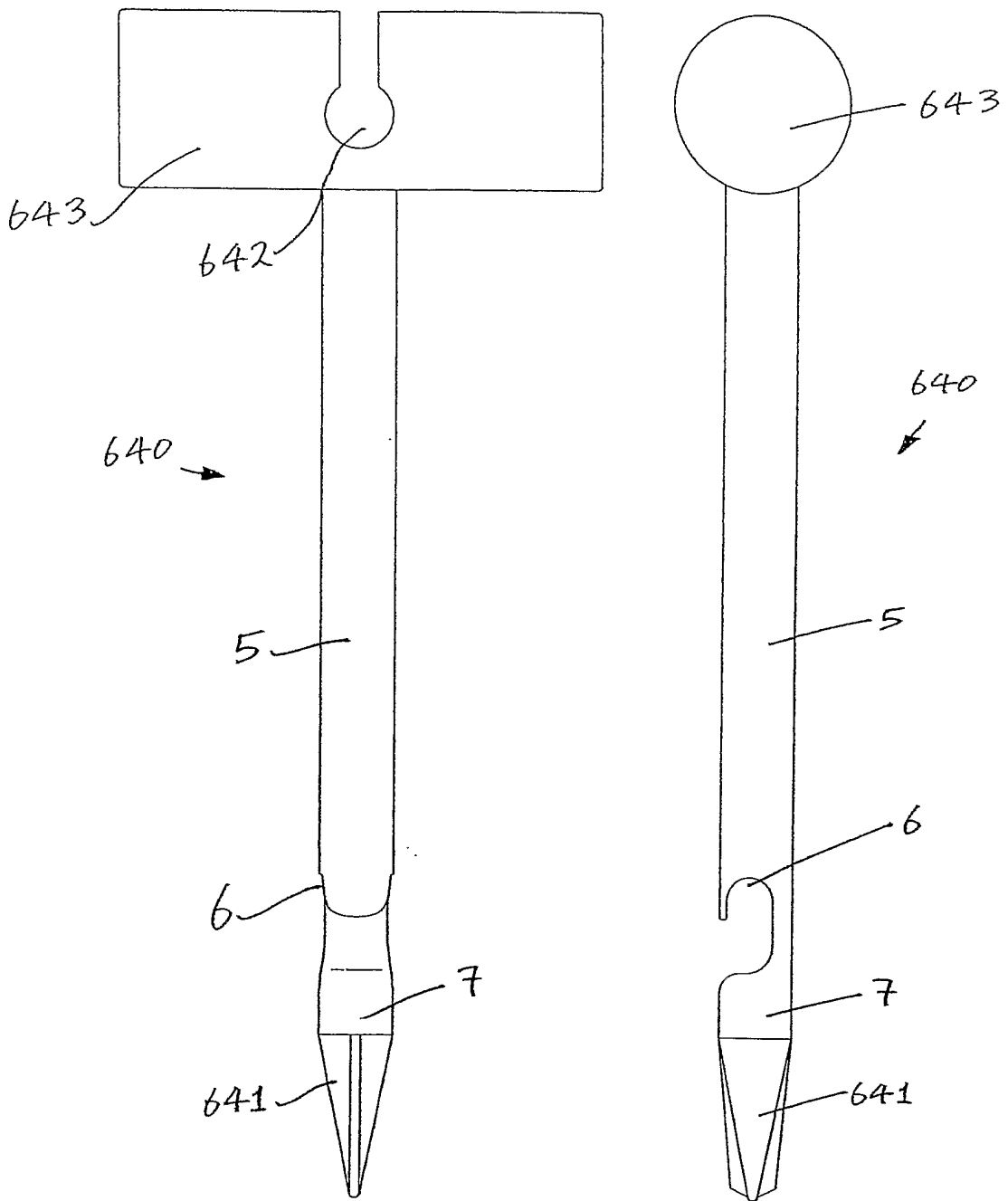


Fig. 24(a)

Fig. 24(b)

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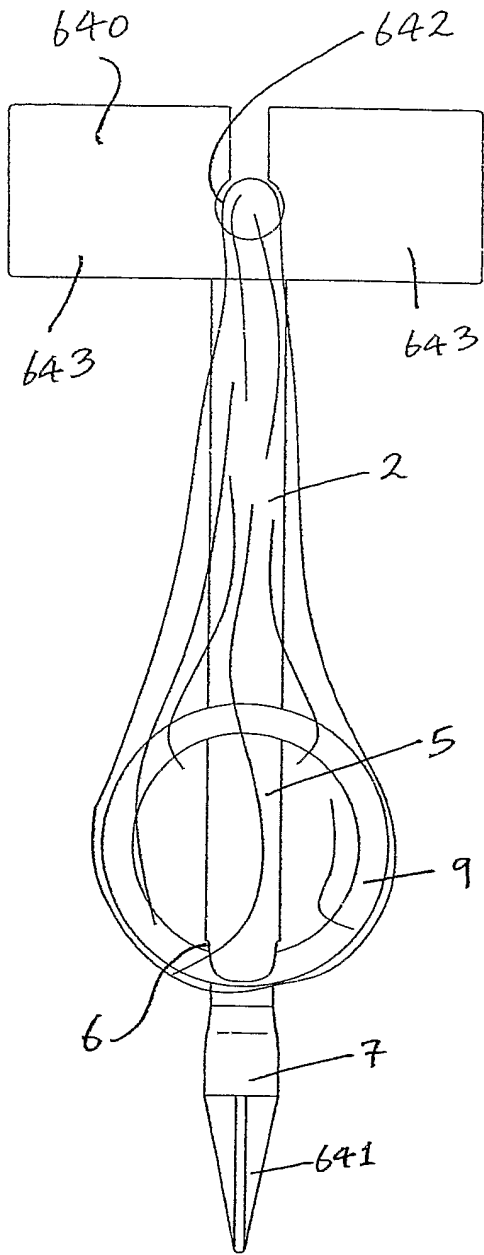


Fig. 24(c)

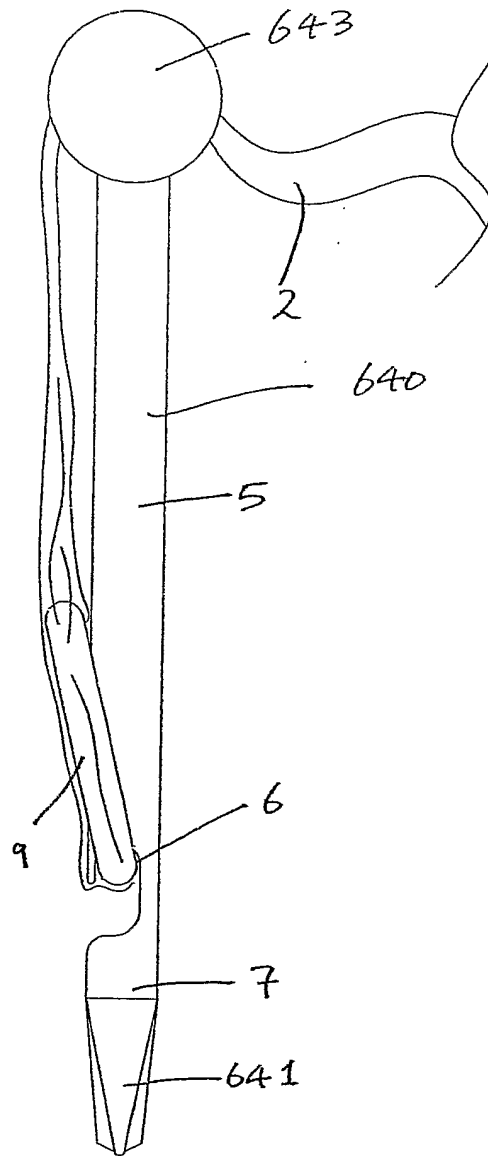
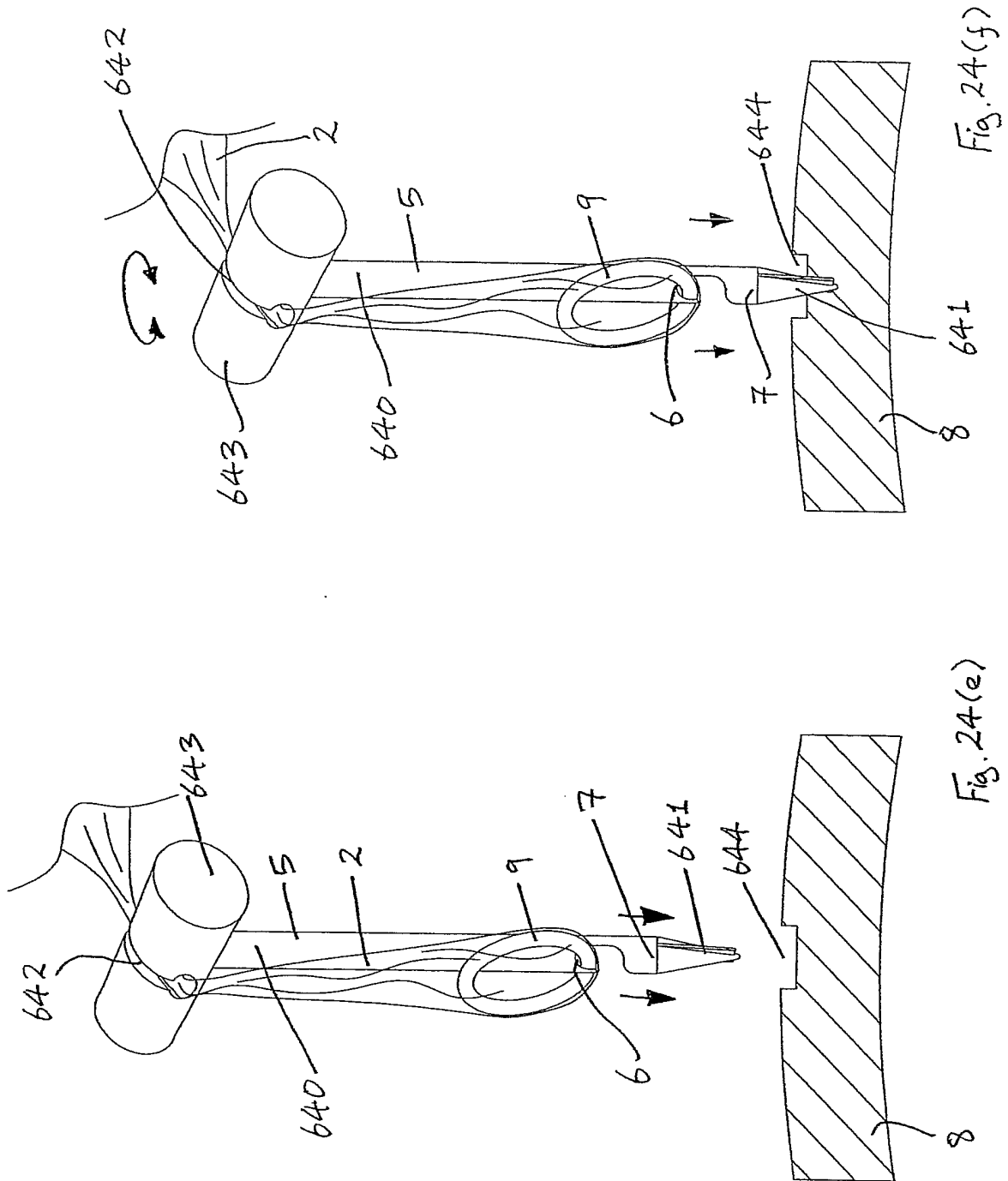


Fig. 24(d)

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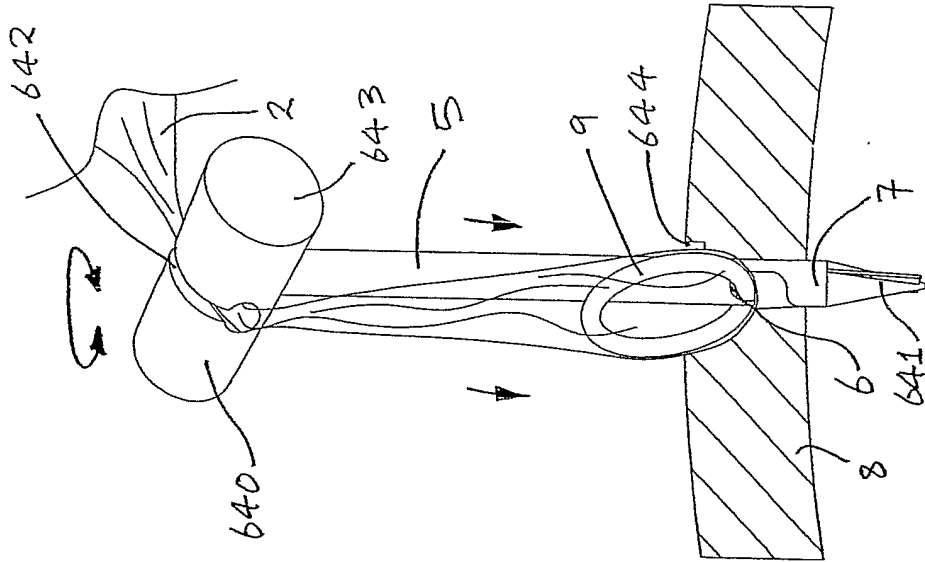


Fig. 24(h)

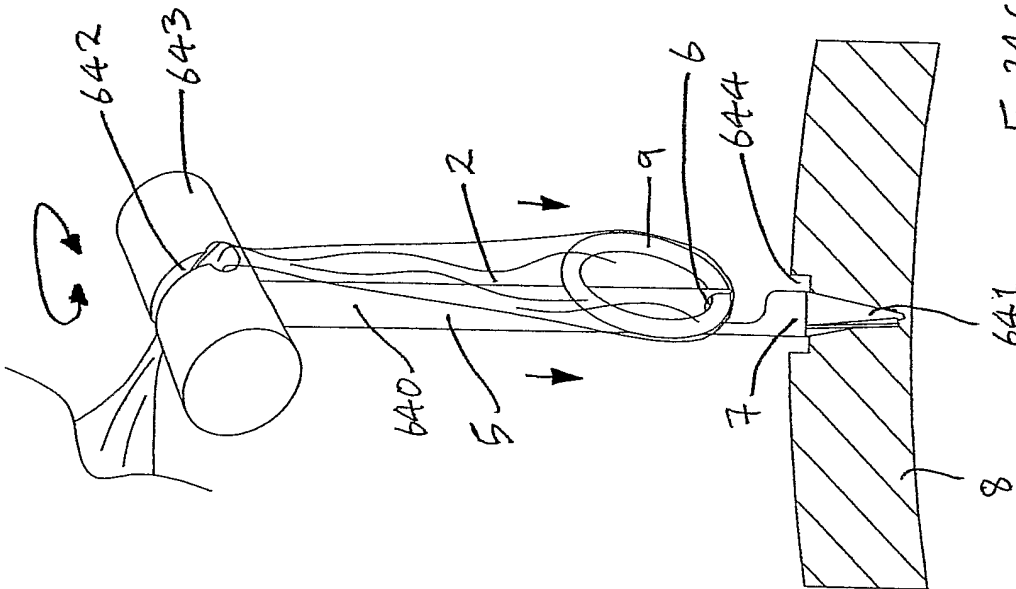
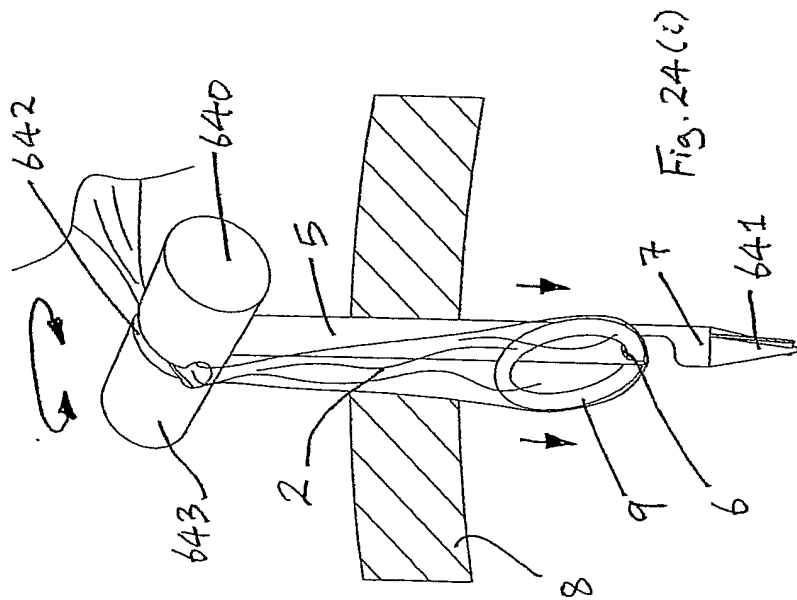
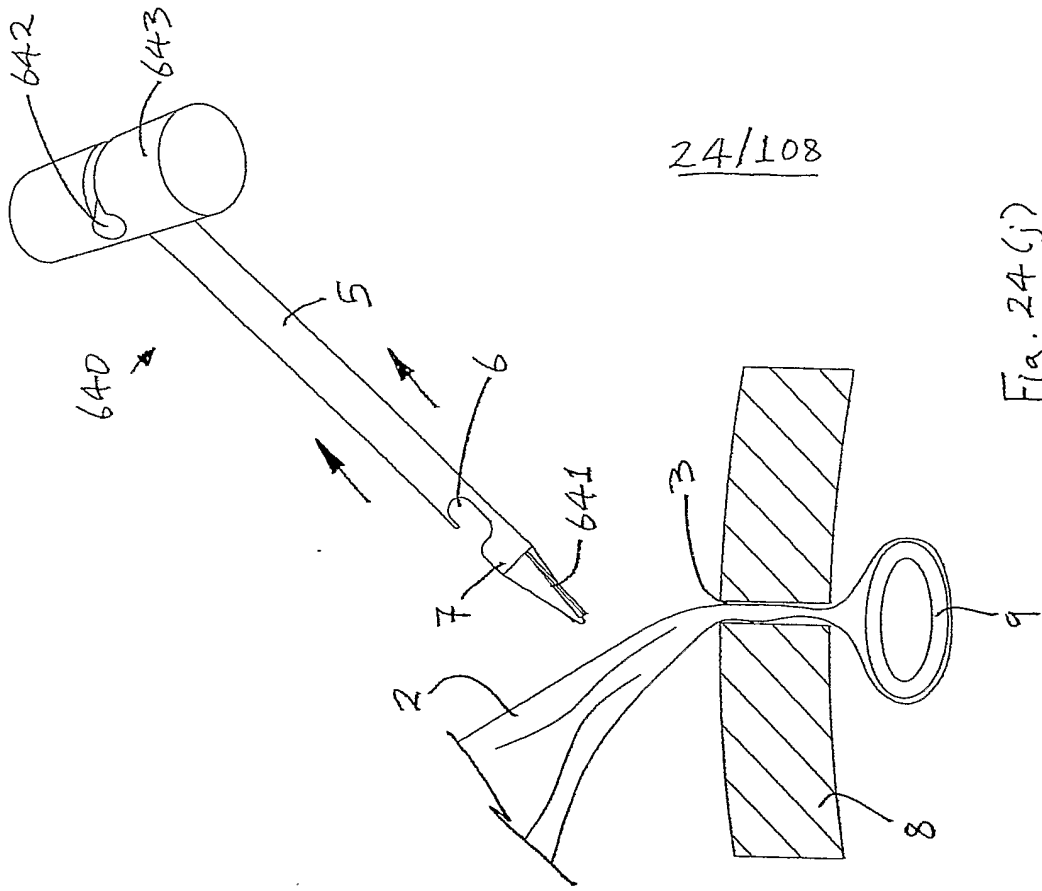


Fig. 24(g)



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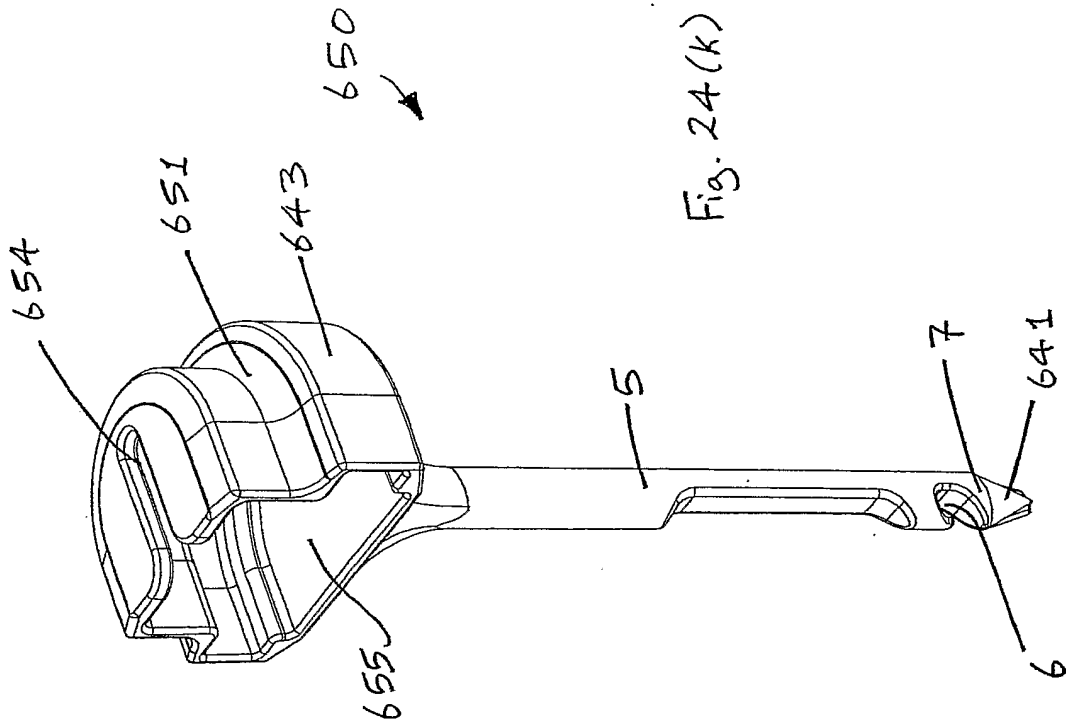
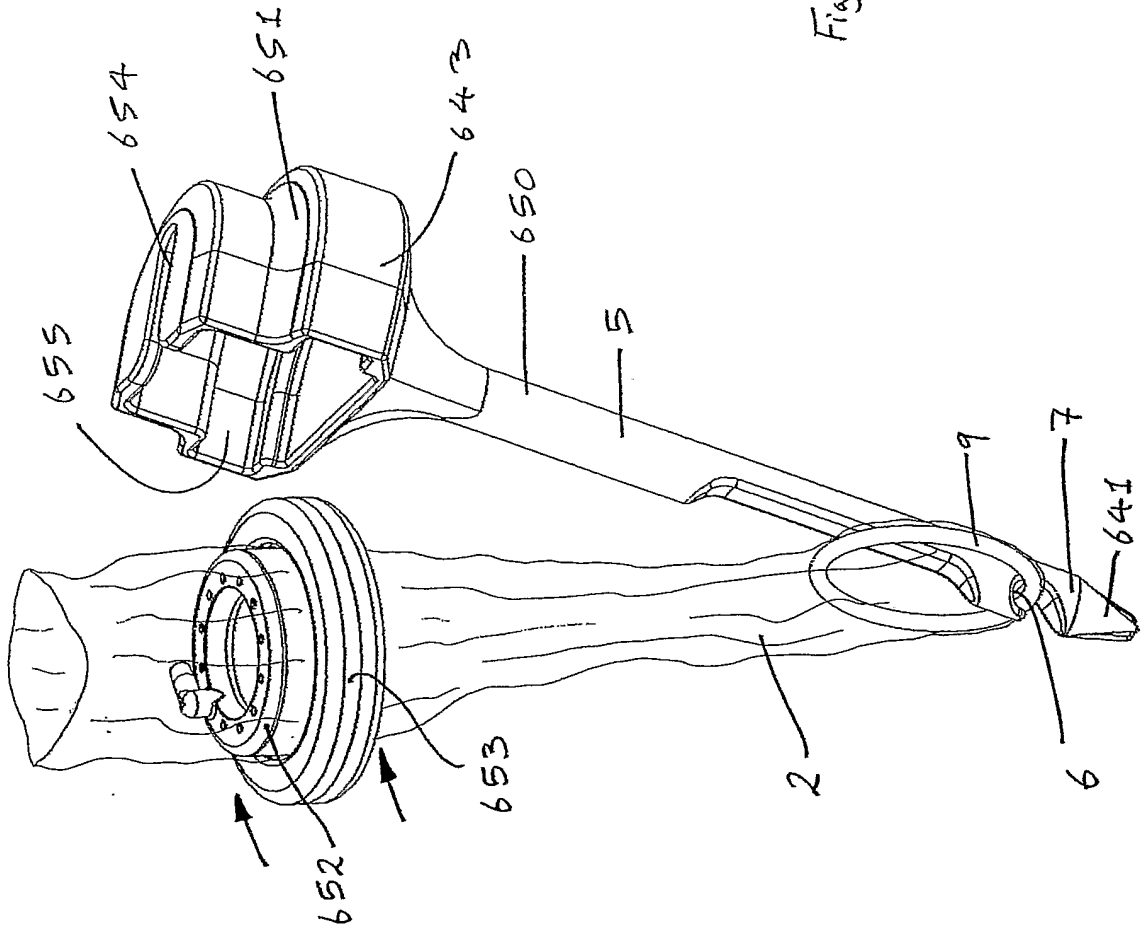


Fig. 24(k)

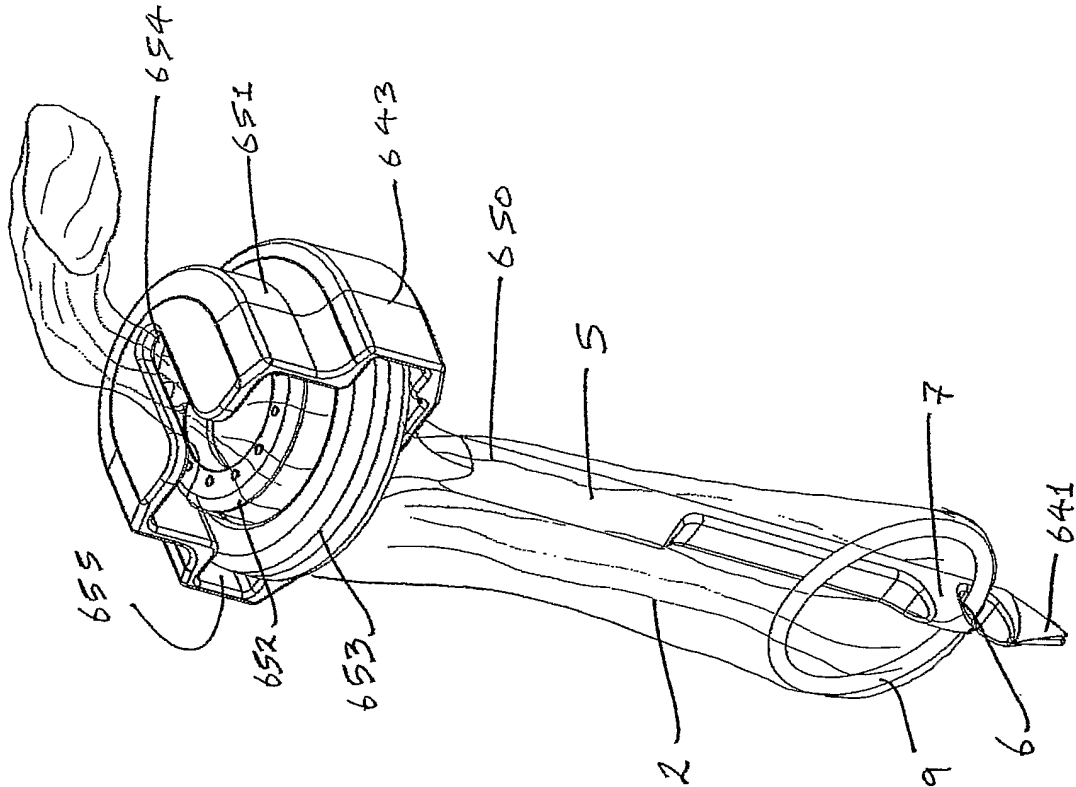
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Fig. 24(1)

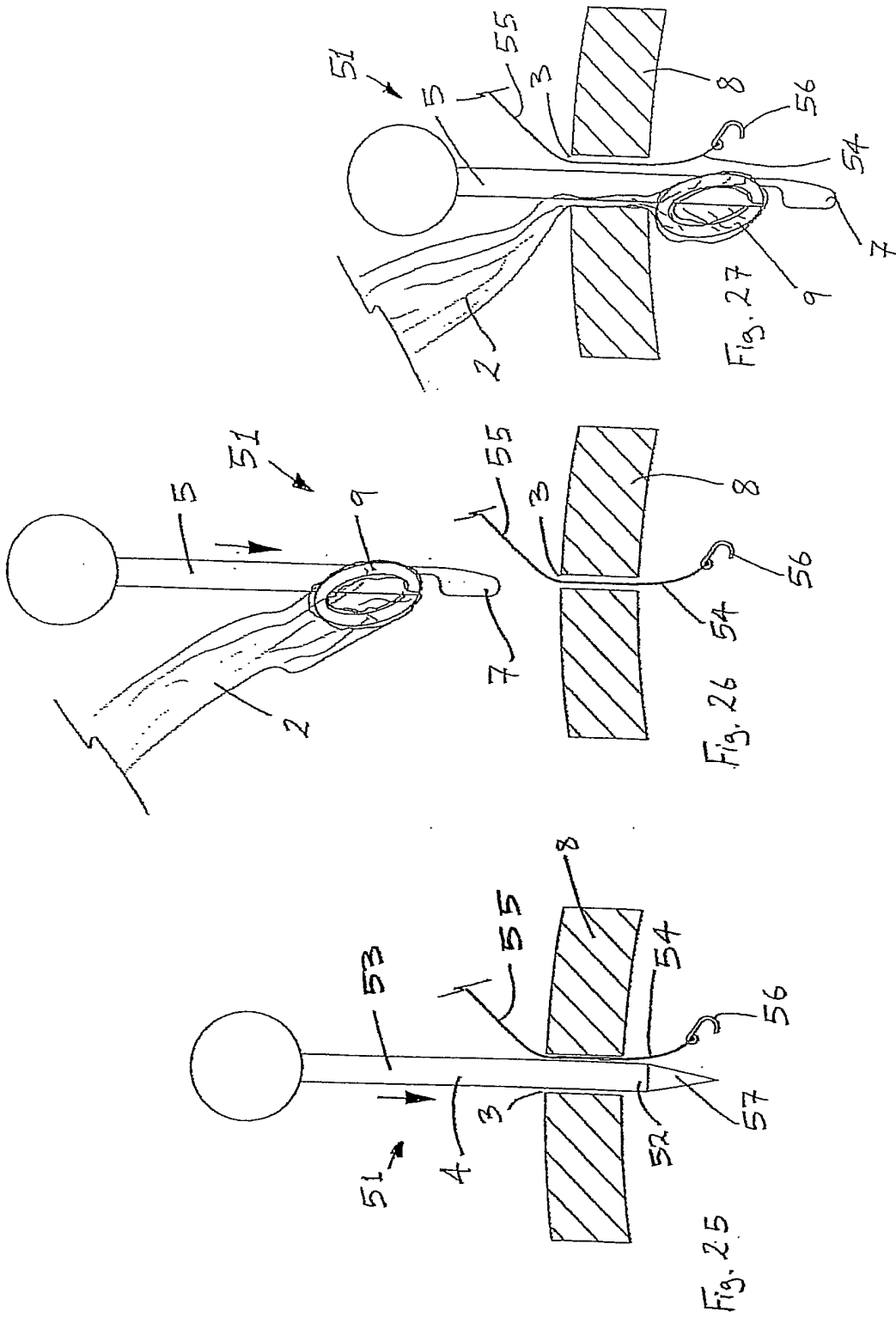


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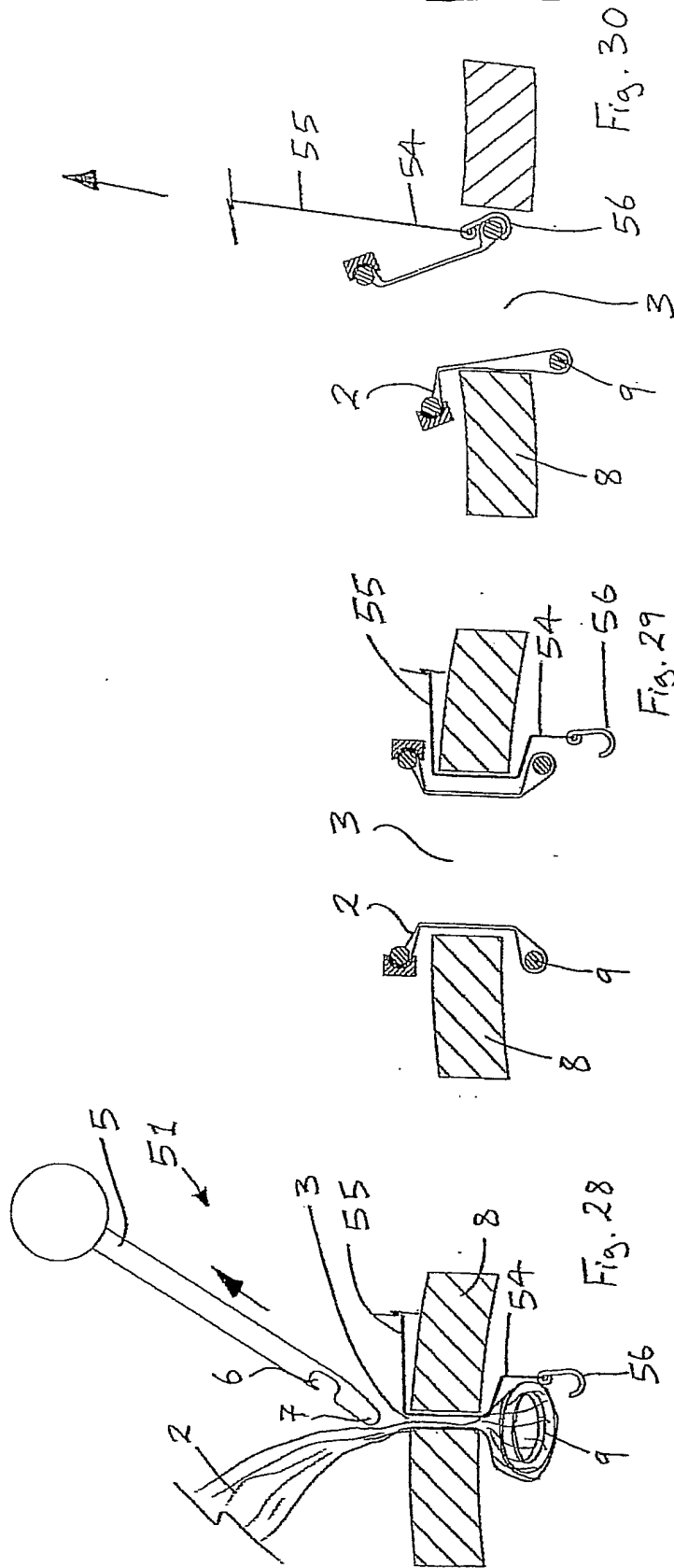
Fig. 24 (H)



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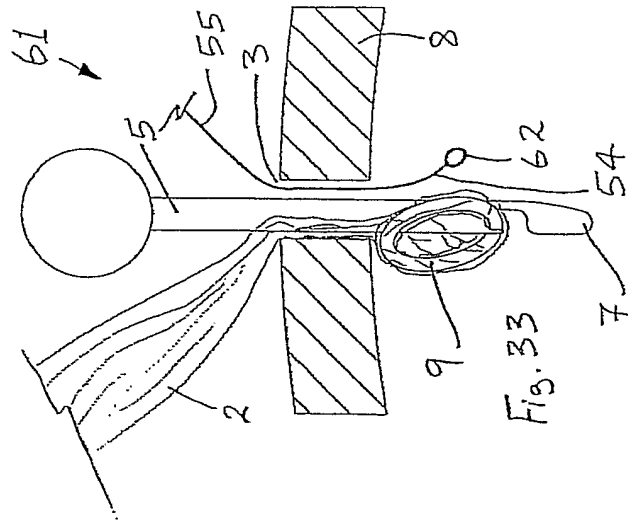


Fig. 33

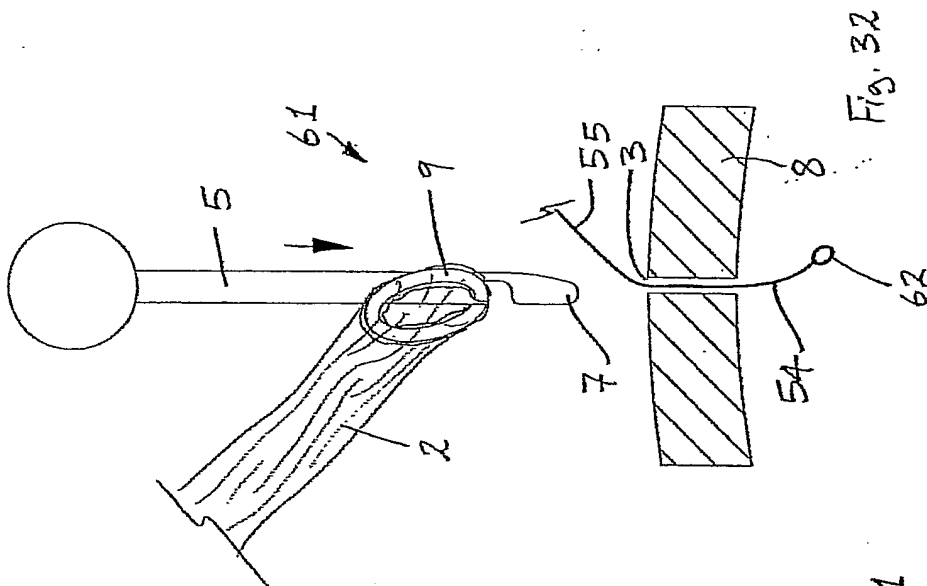


Fig. 32

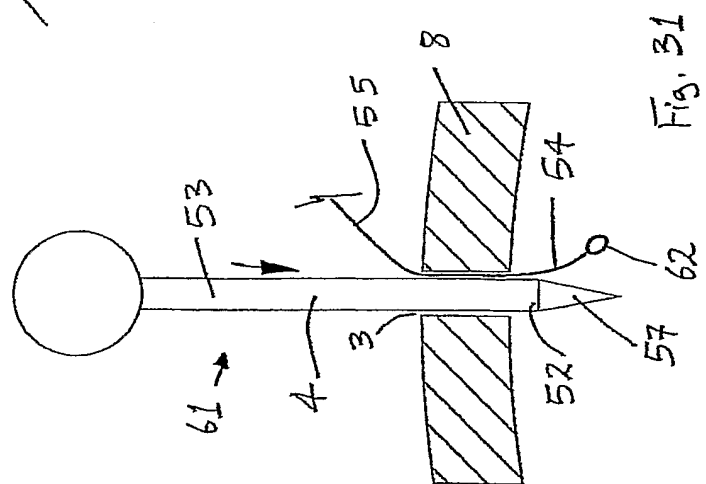


Fig. 31

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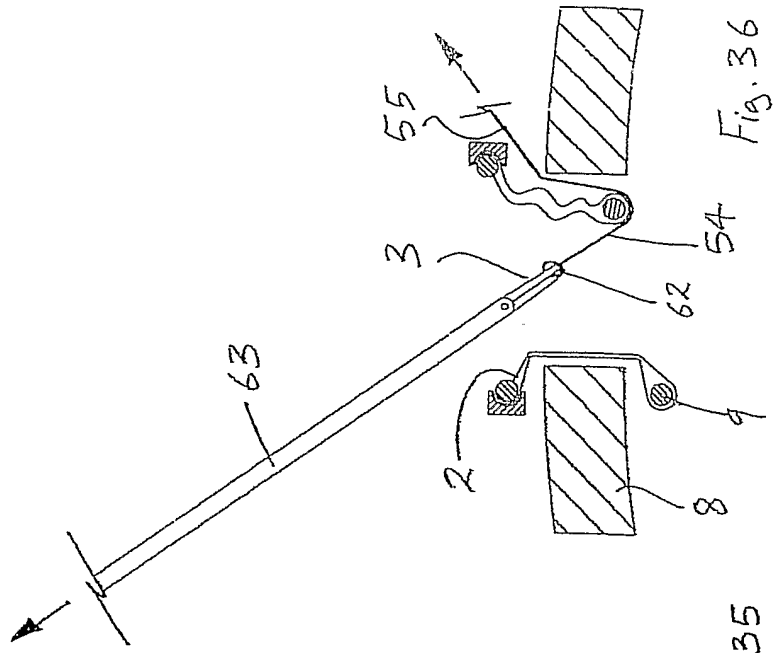


Fig. 36

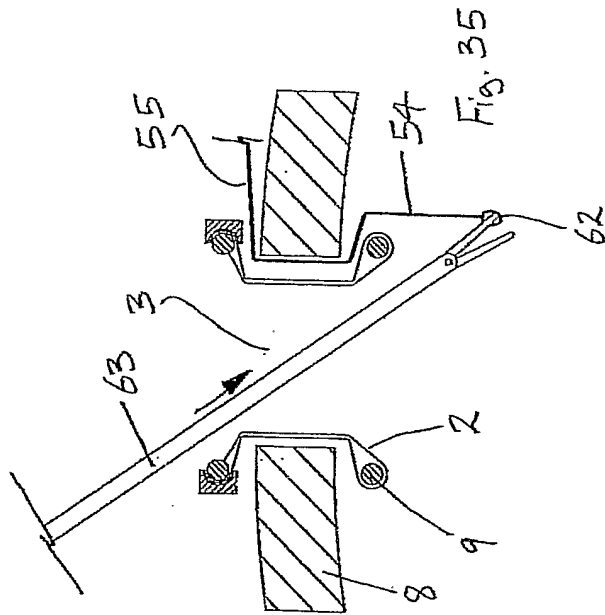


Fig. 35

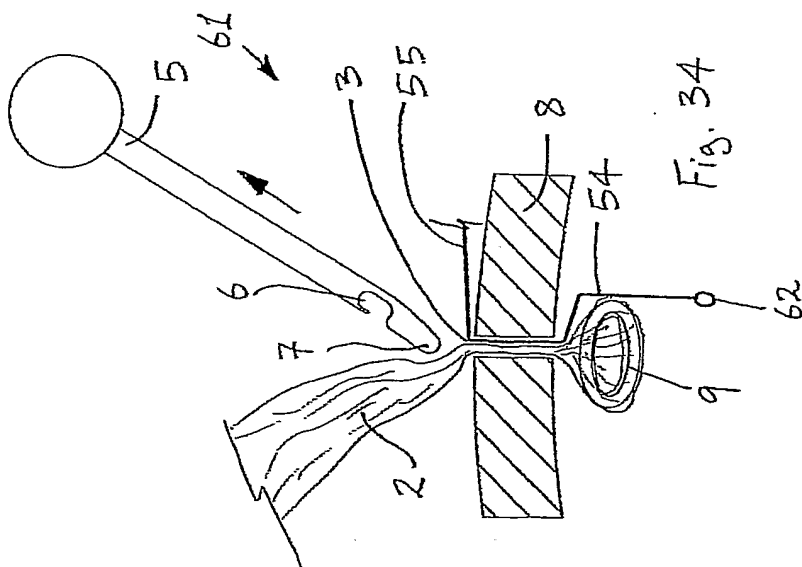
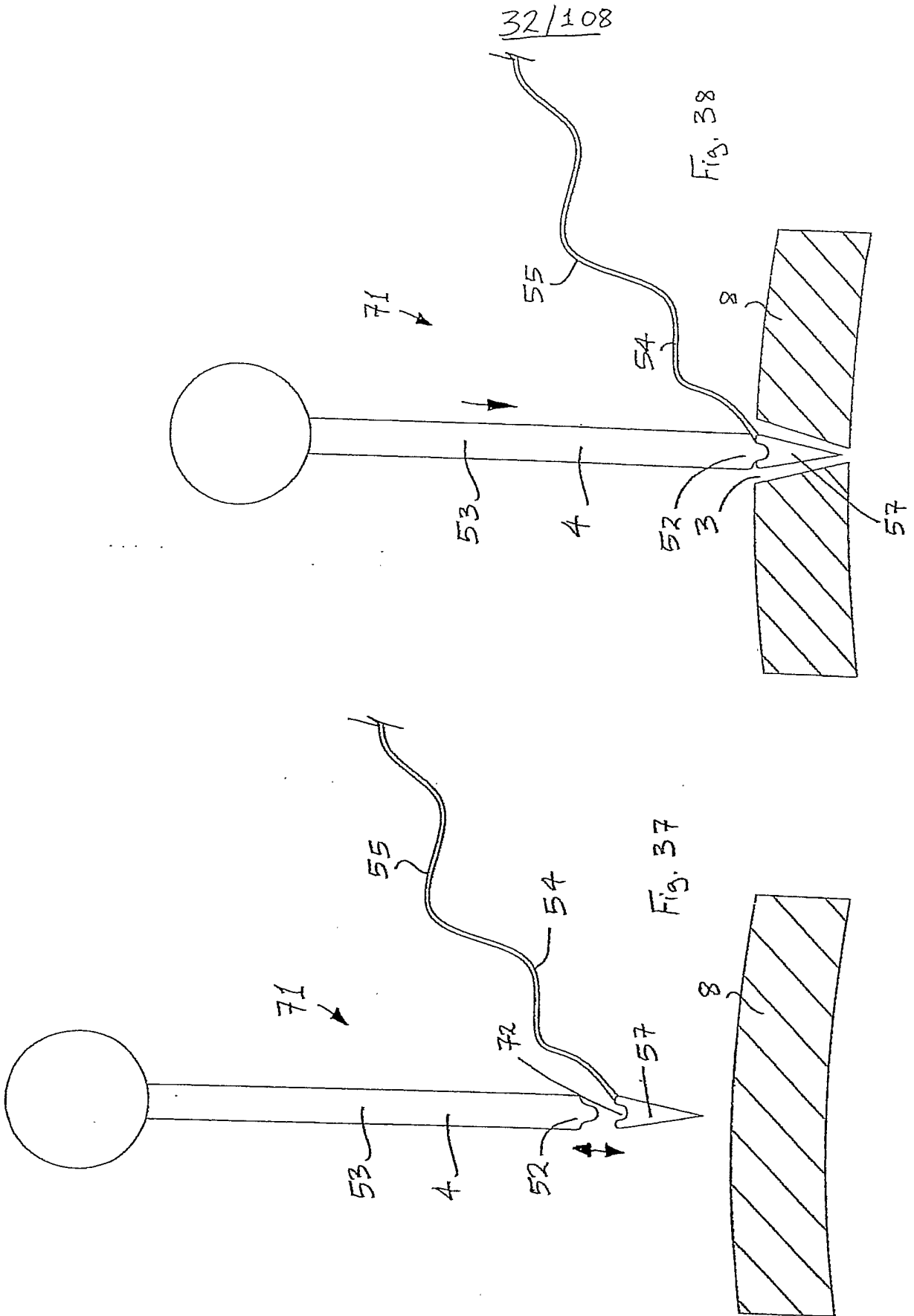


Fig. 34



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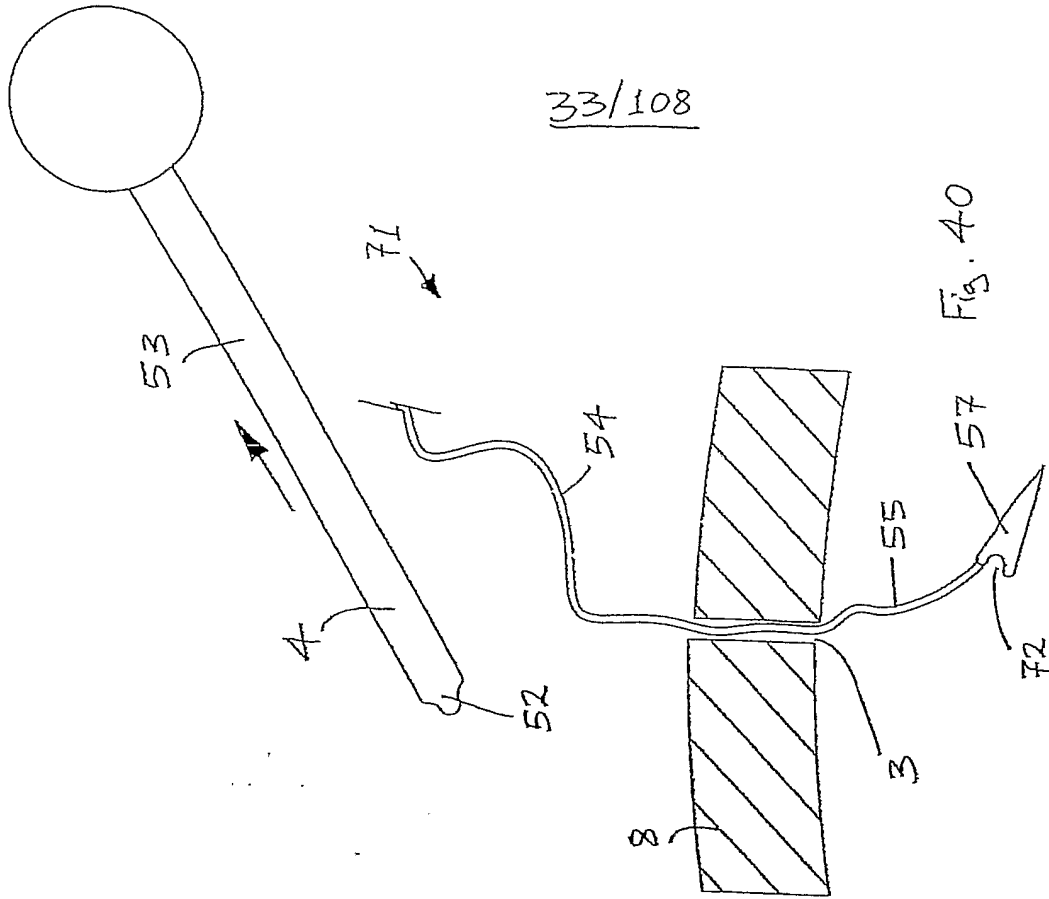


Fig. 40

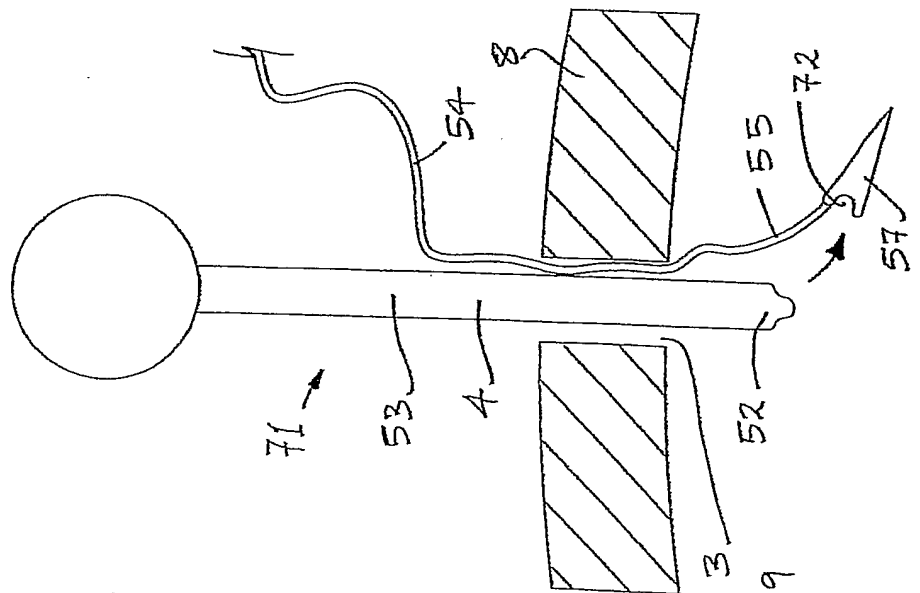
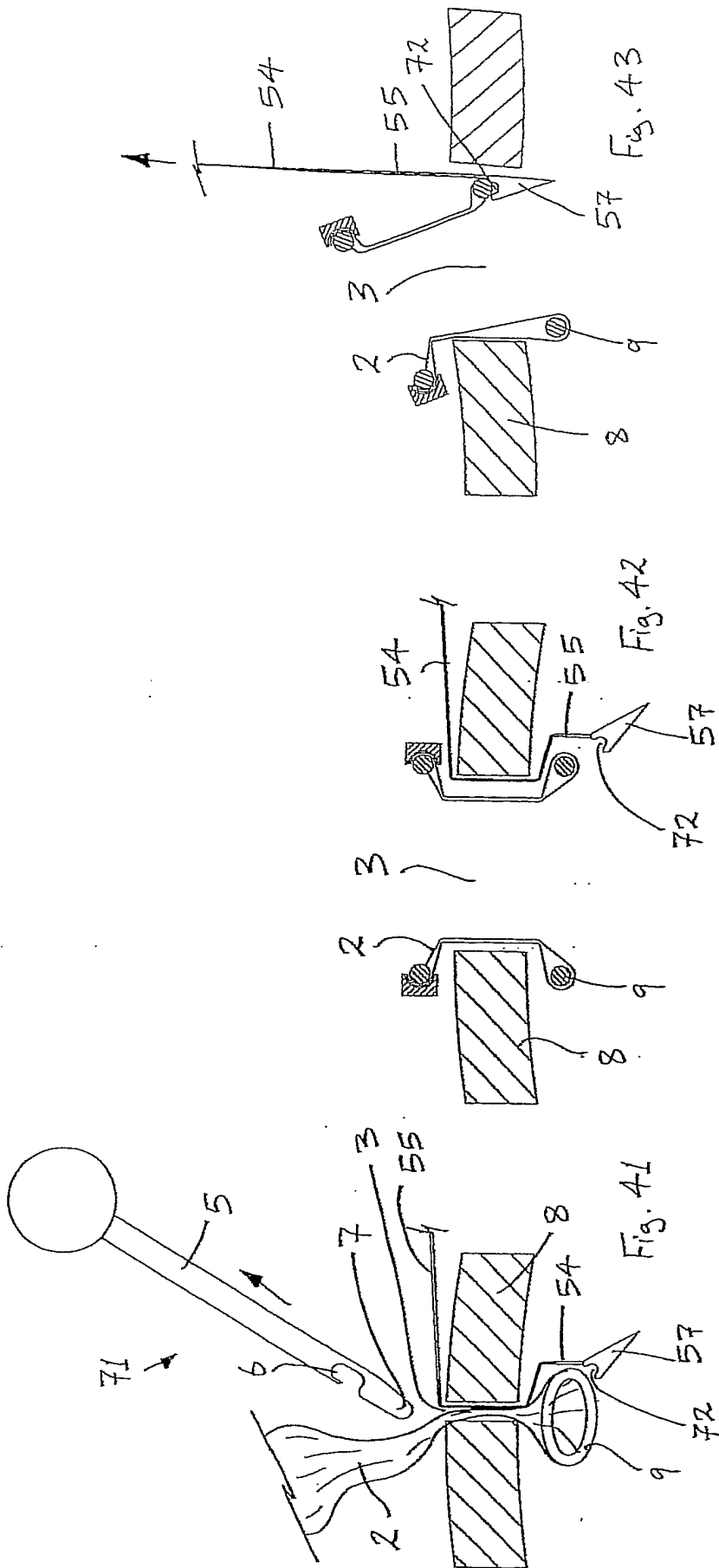


Fig. 39

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Fig. 43(b)

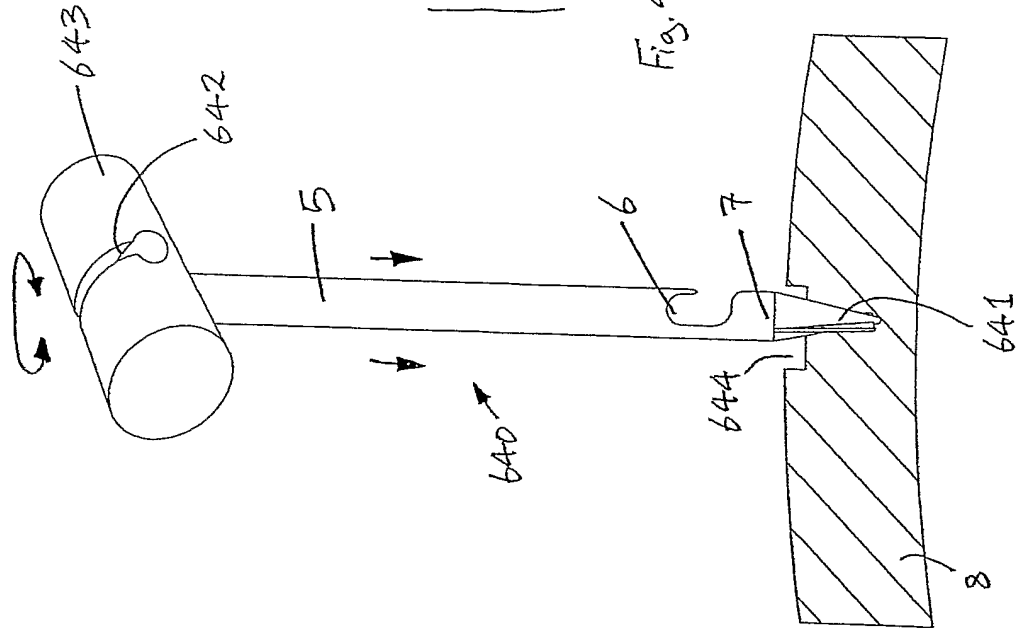
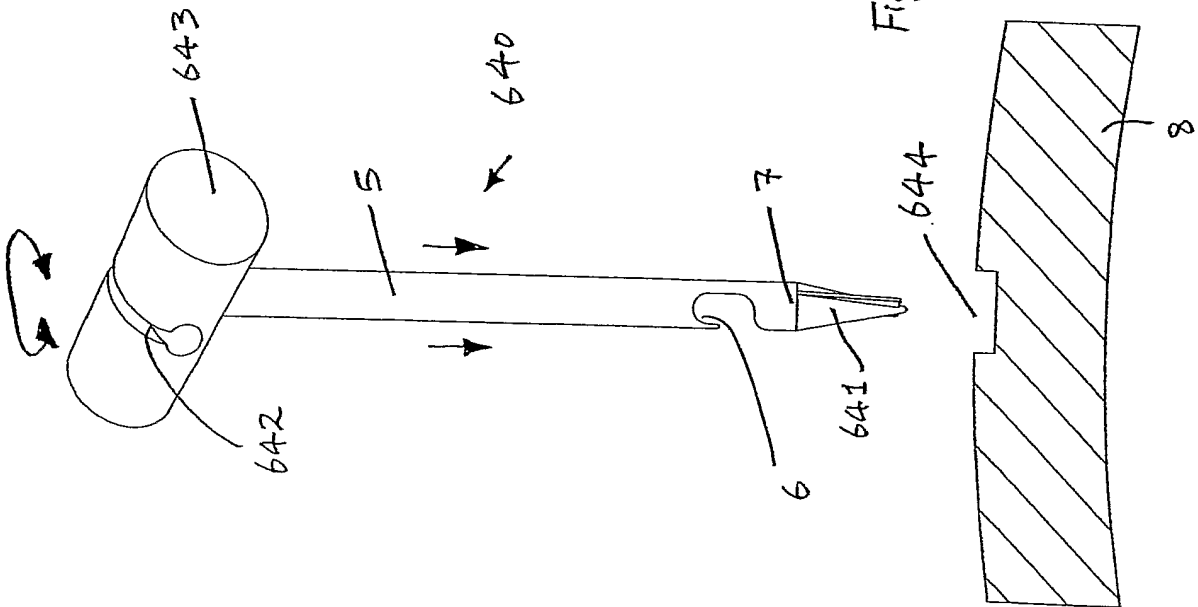
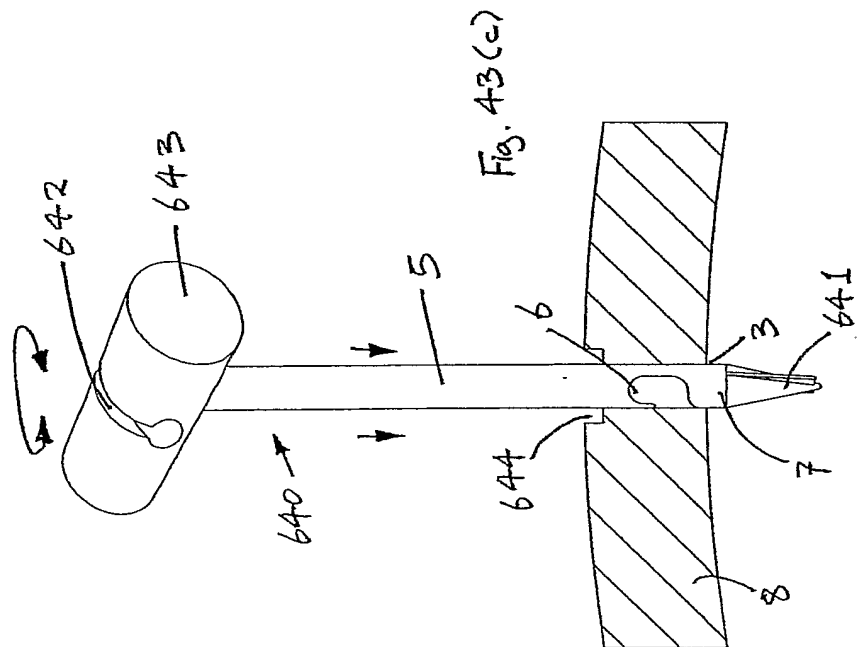
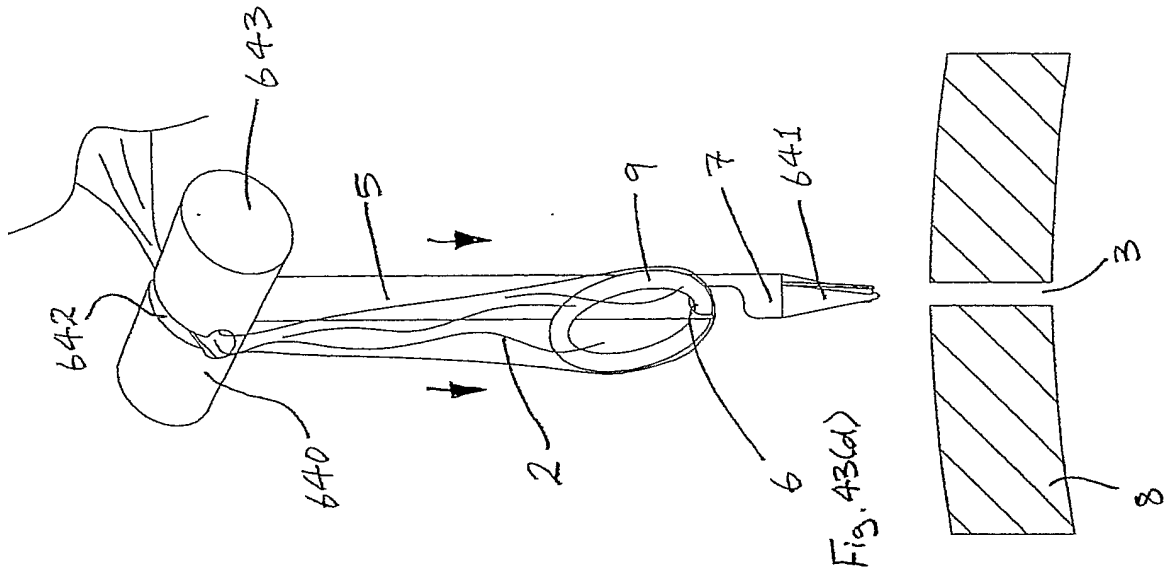


Fig. 43(a)



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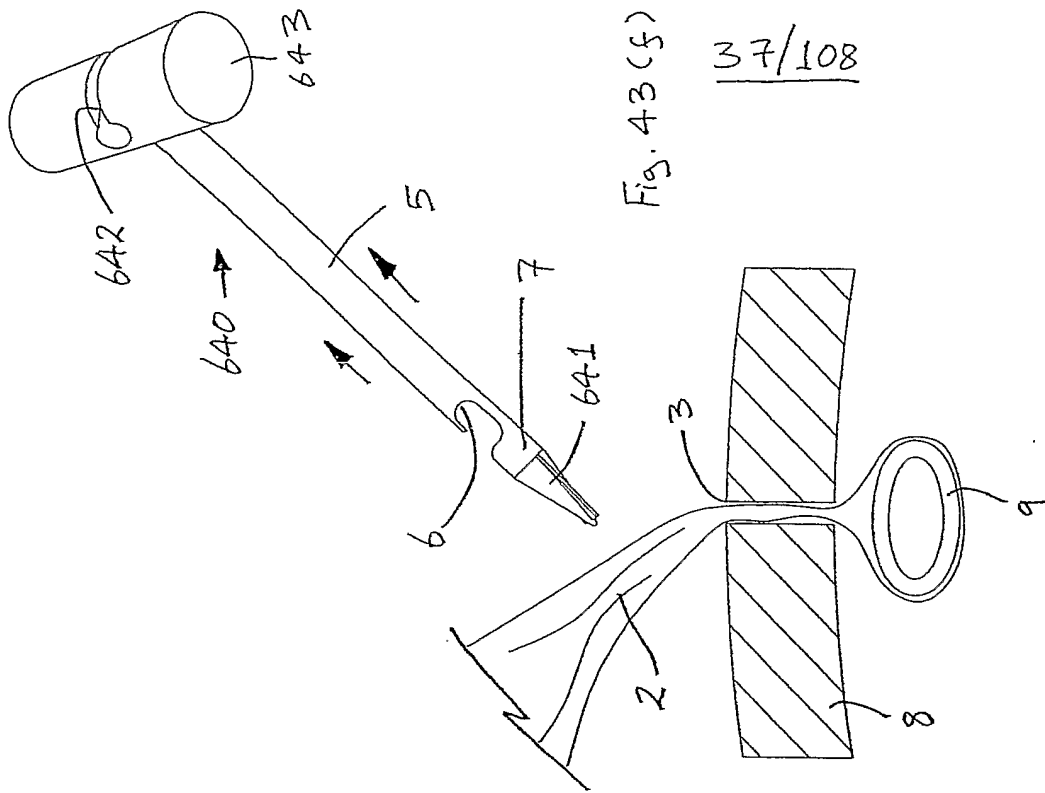


Fig. 43(f)

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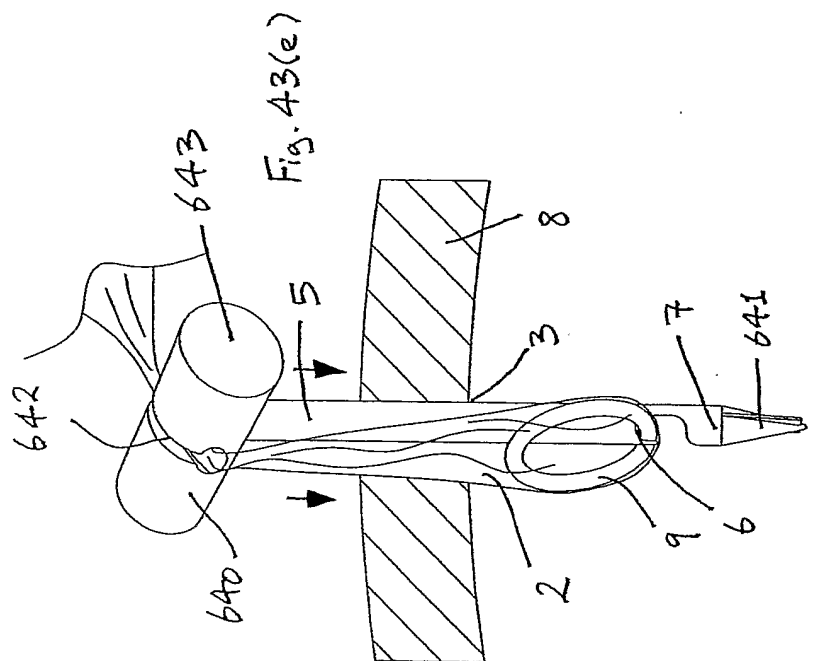


Fig. 43(e)

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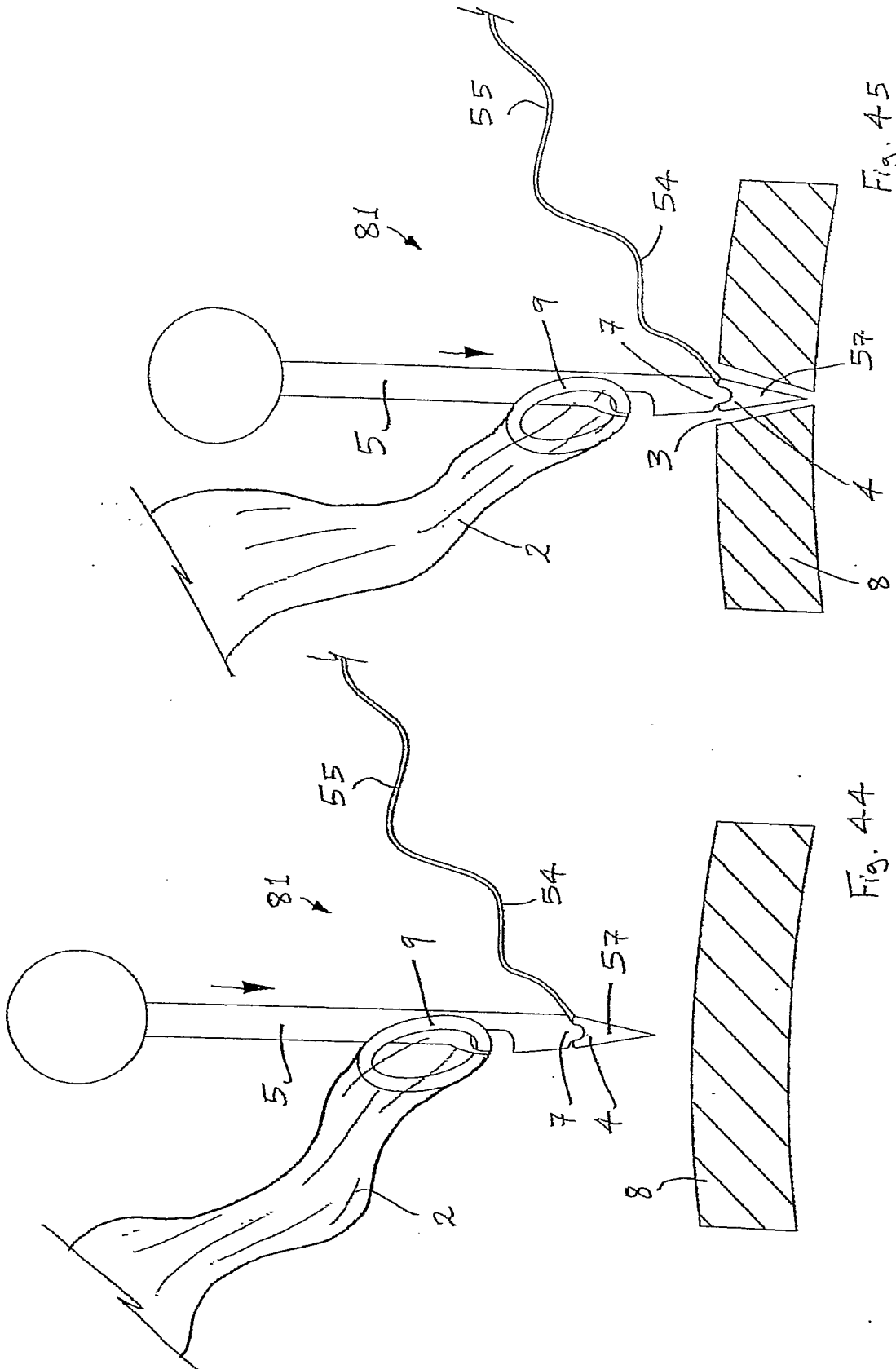
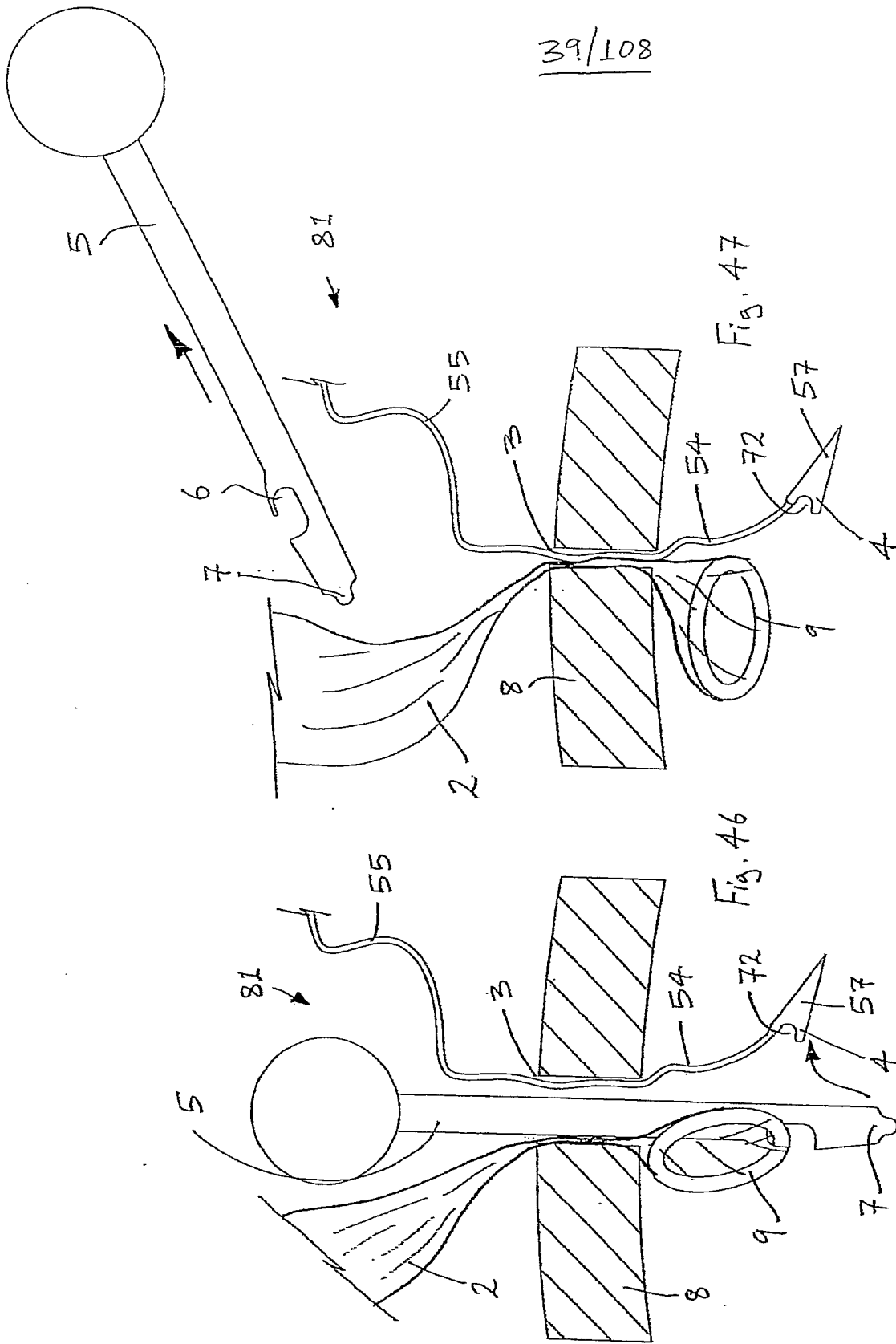


Fig. 4-4

Fig. 4-5

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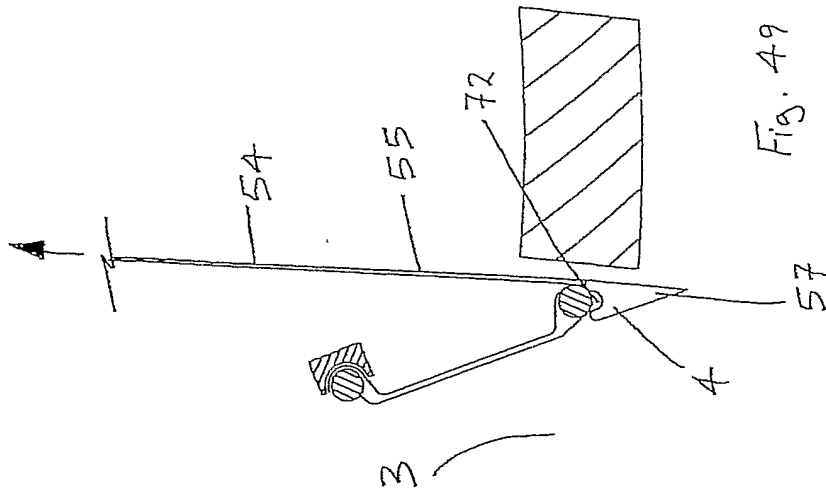


Fig. 49

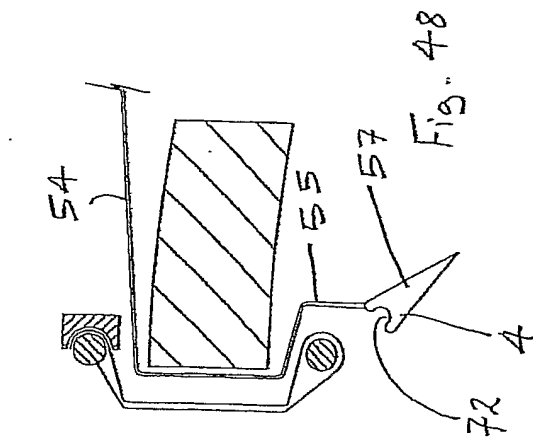
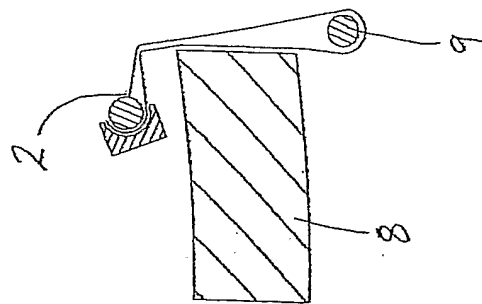
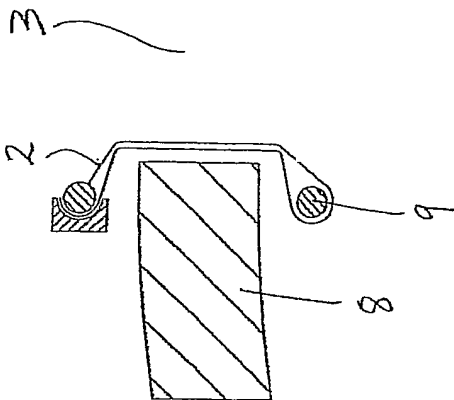


Fig. 48



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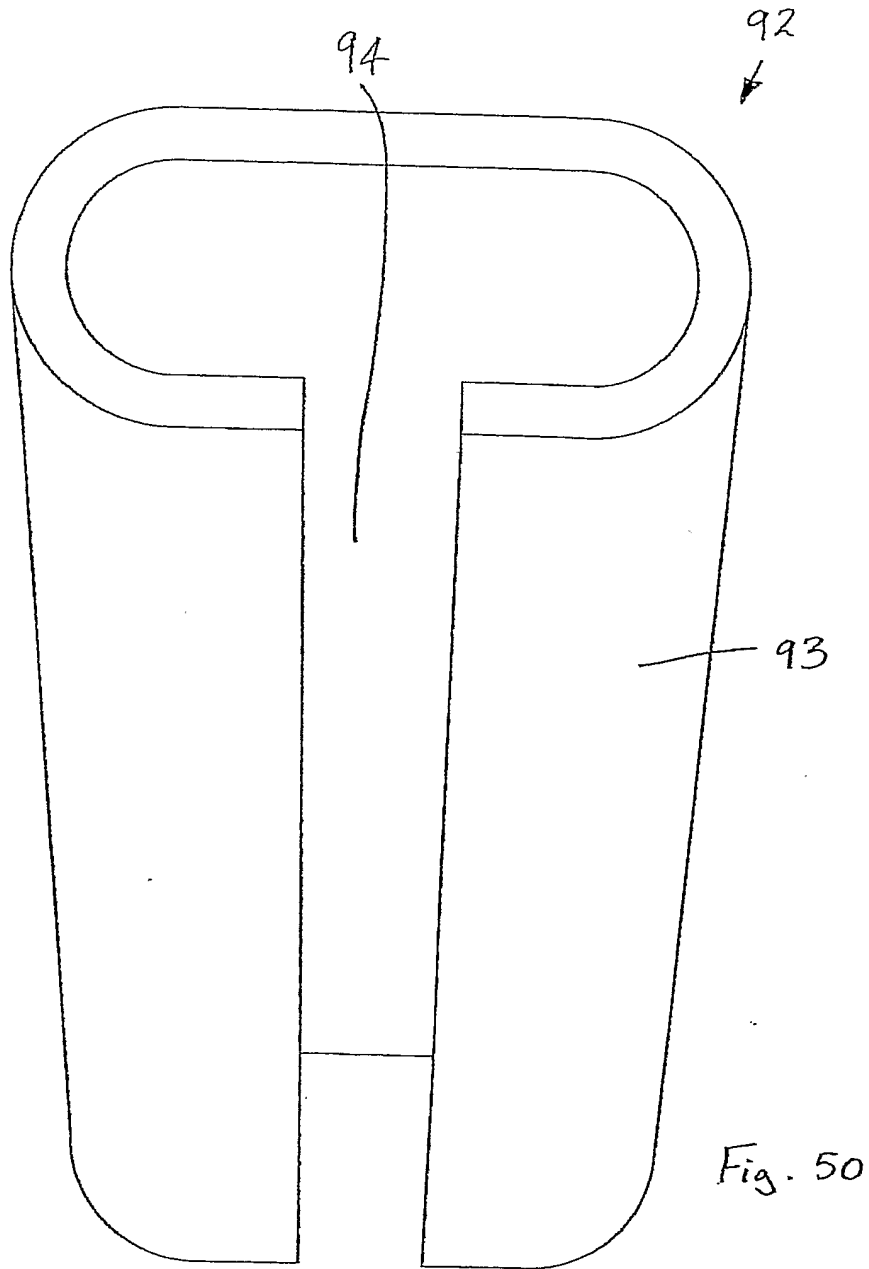
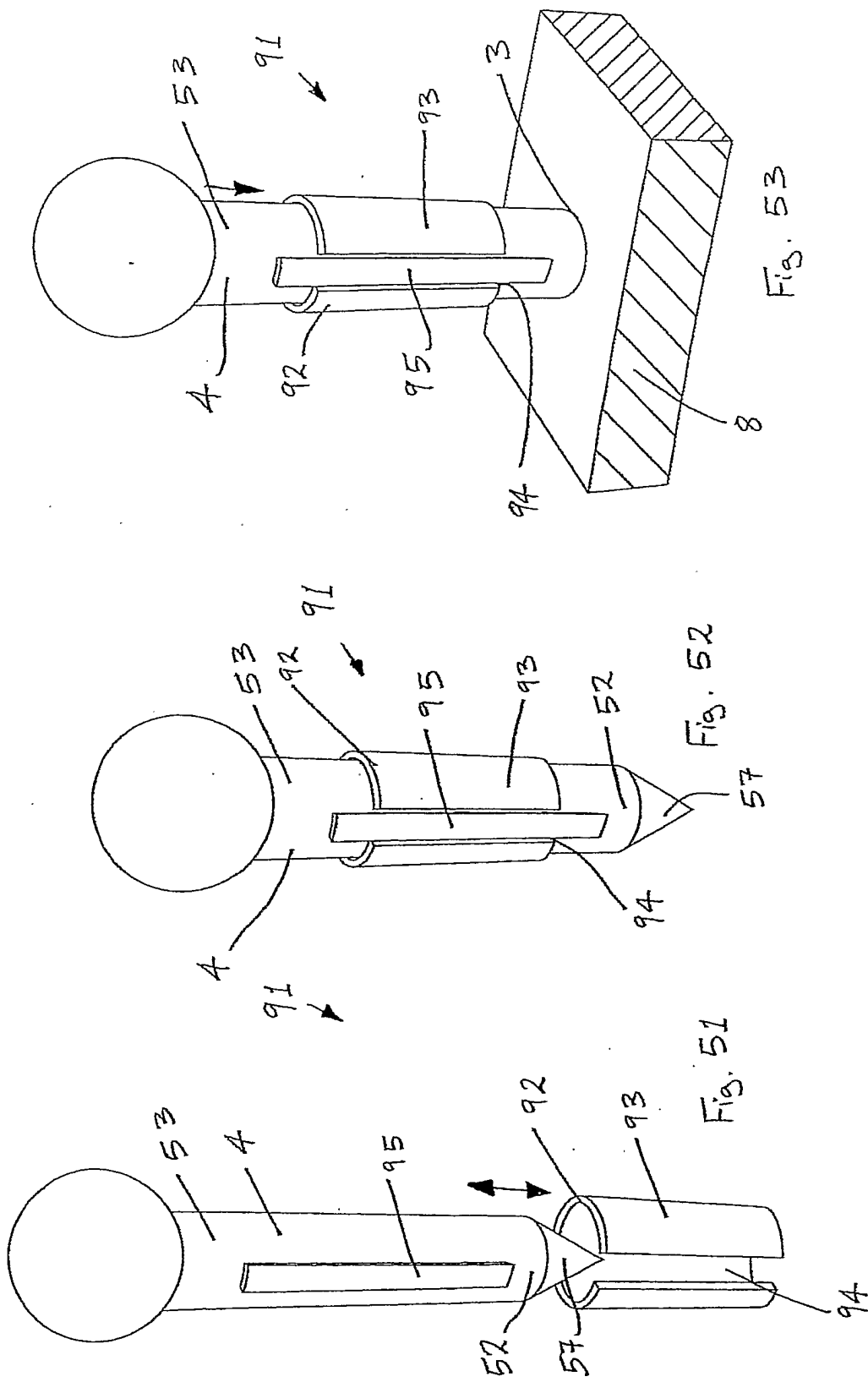
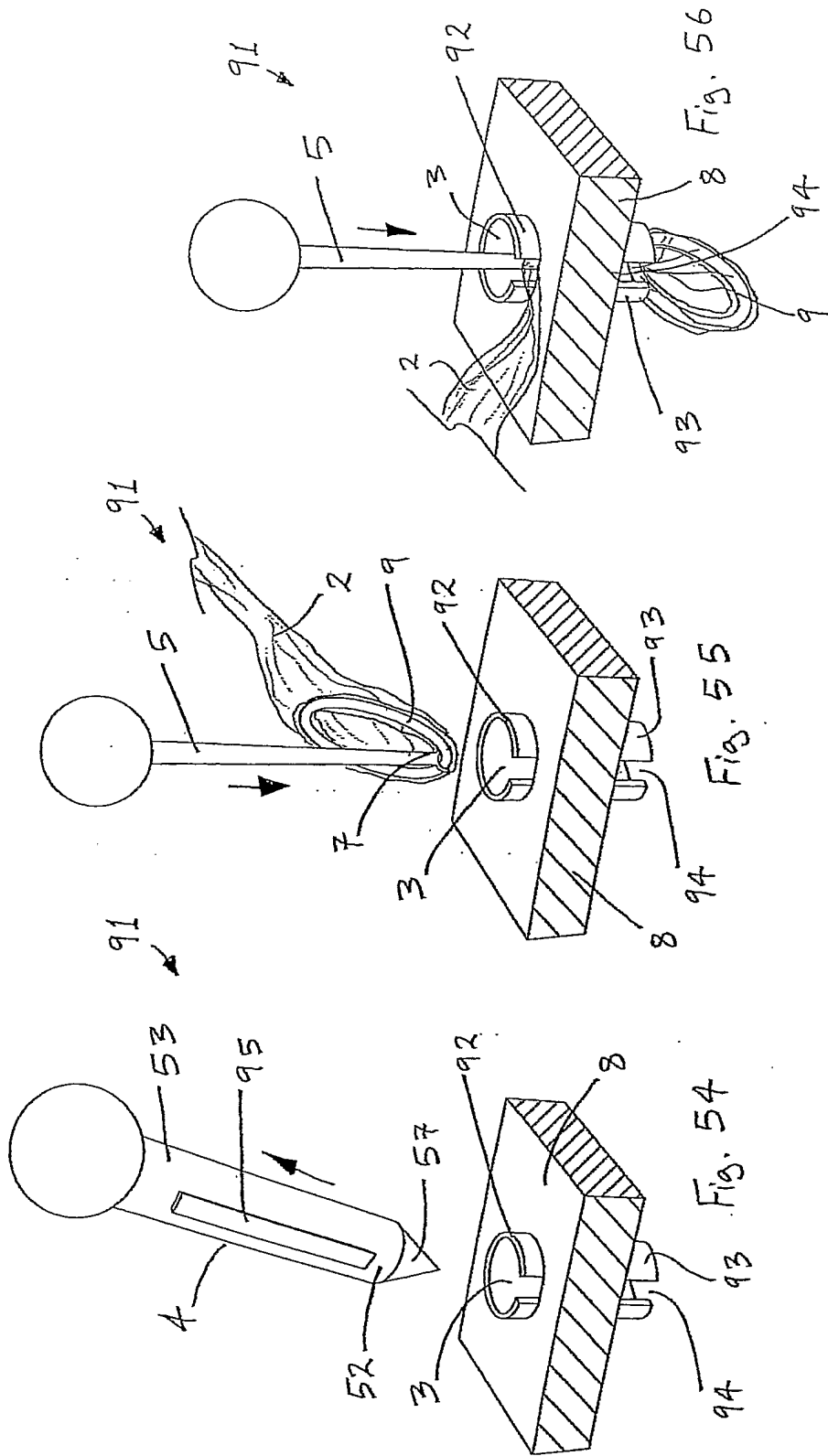


Fig. 50

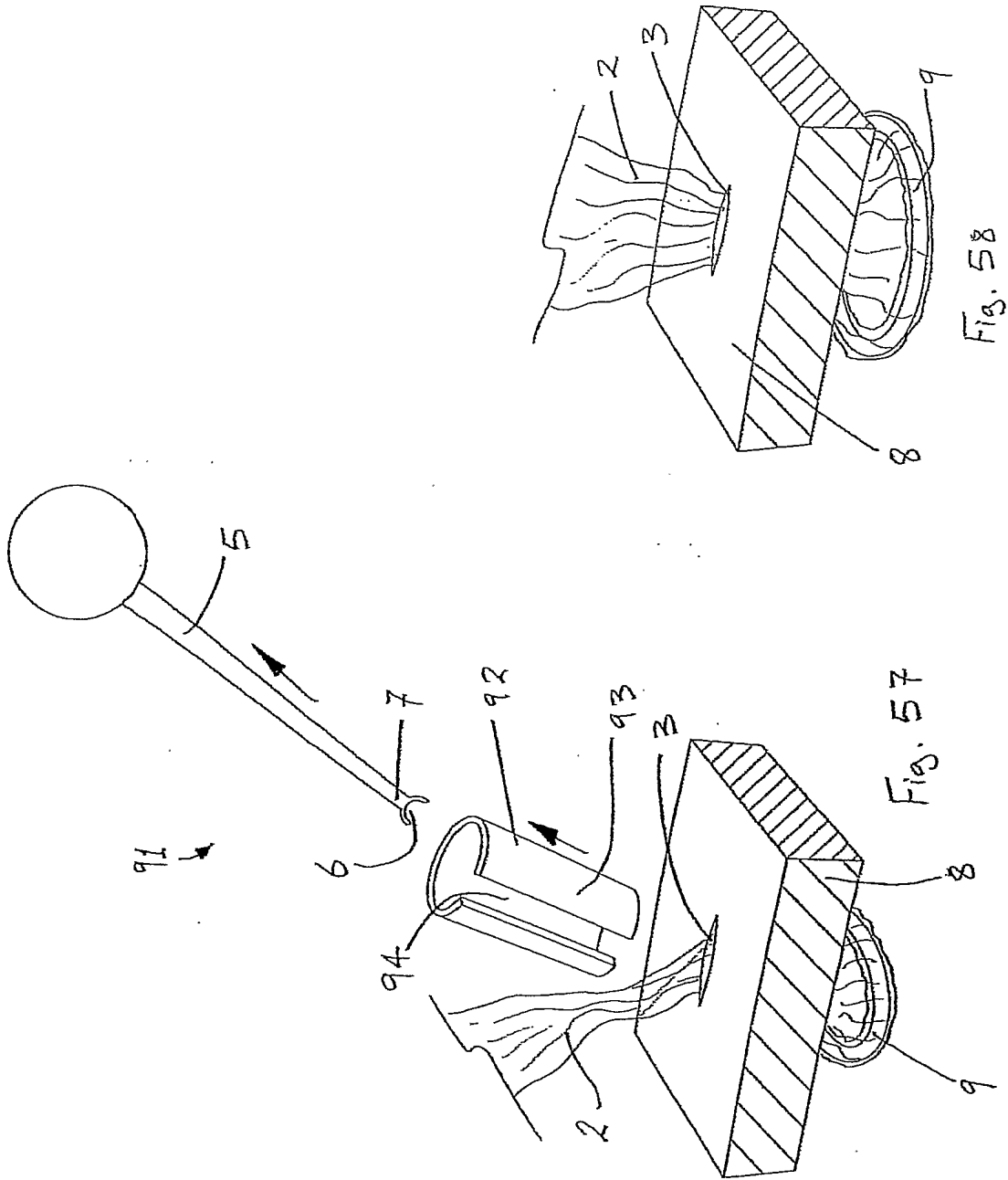
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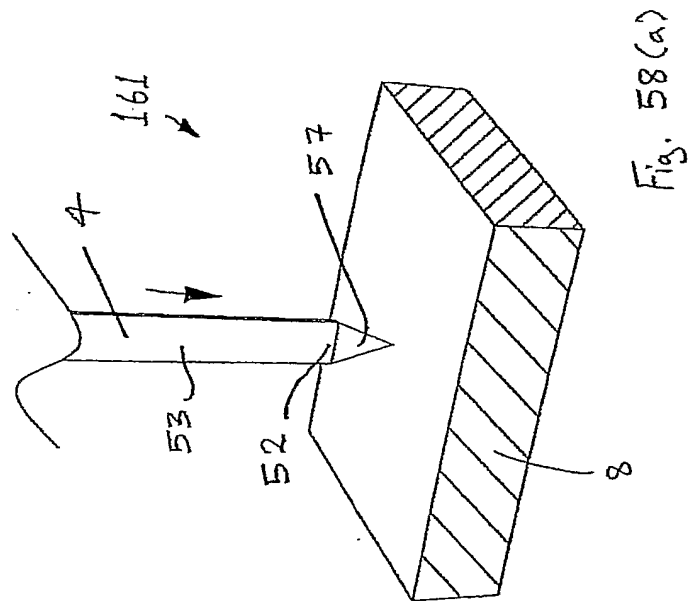
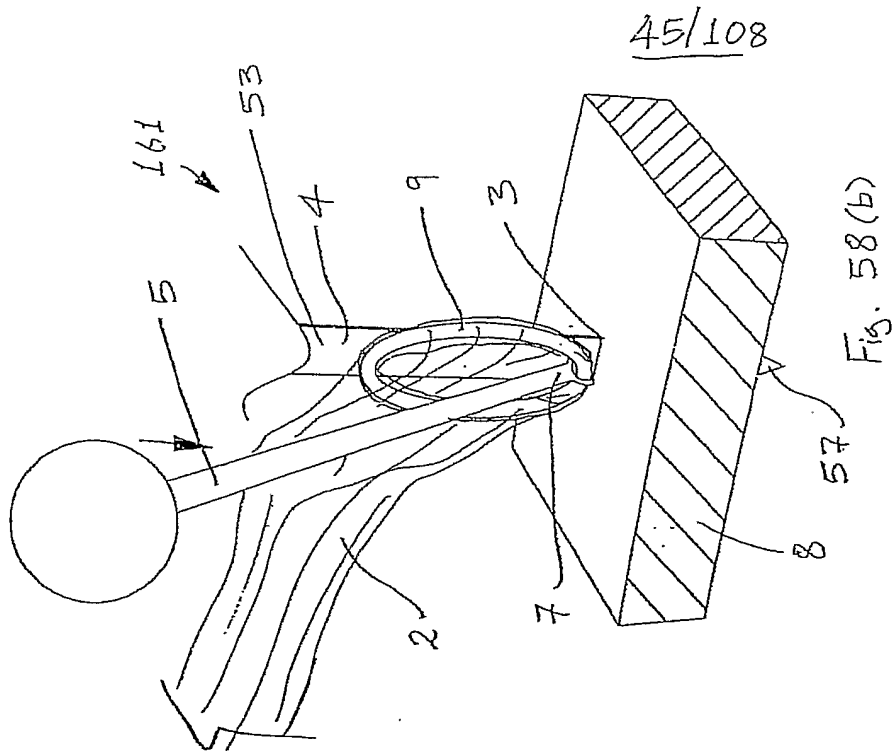


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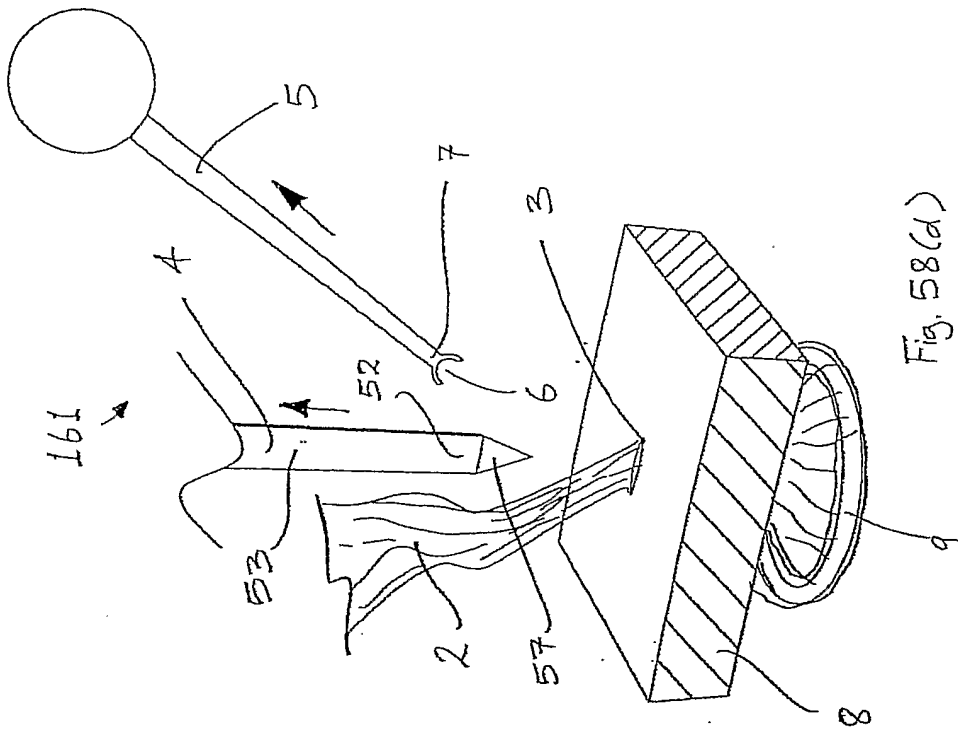


Fig. 58(a)

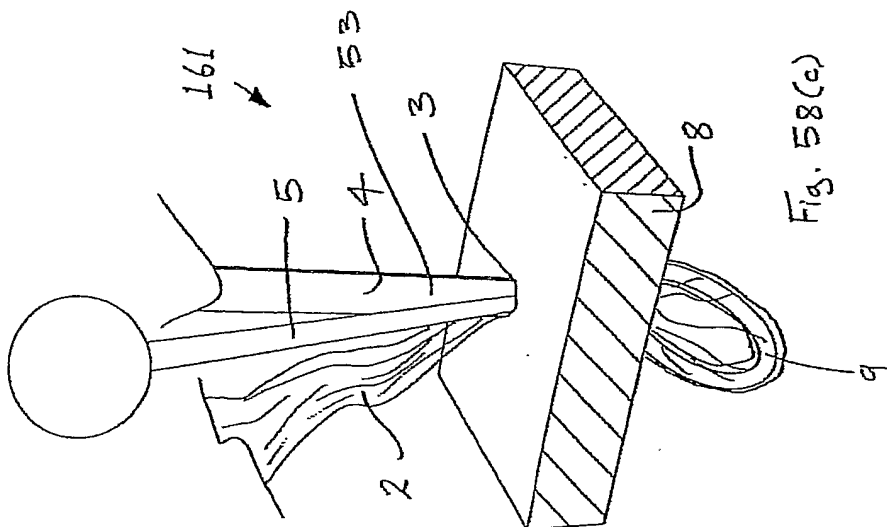


Fig. 58(a)

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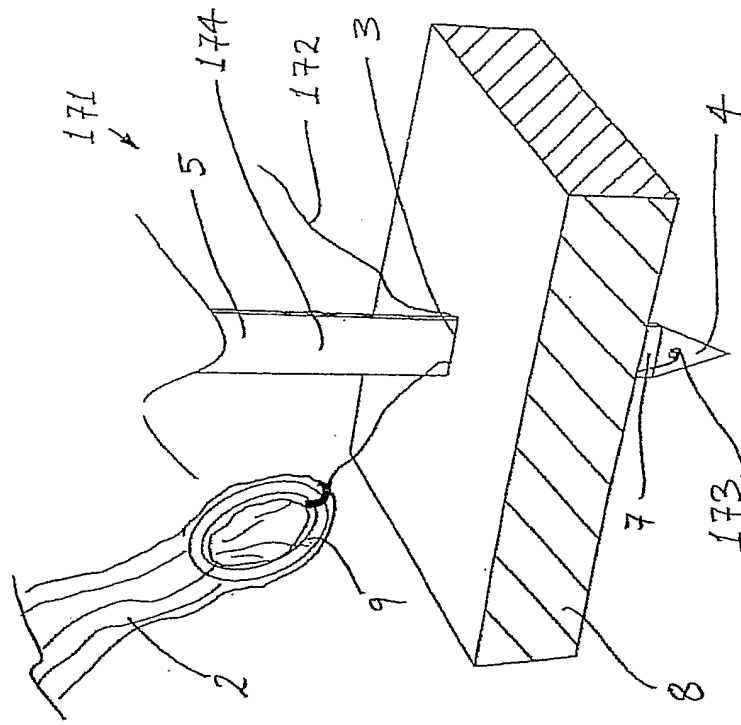


Fig. 58 (f)

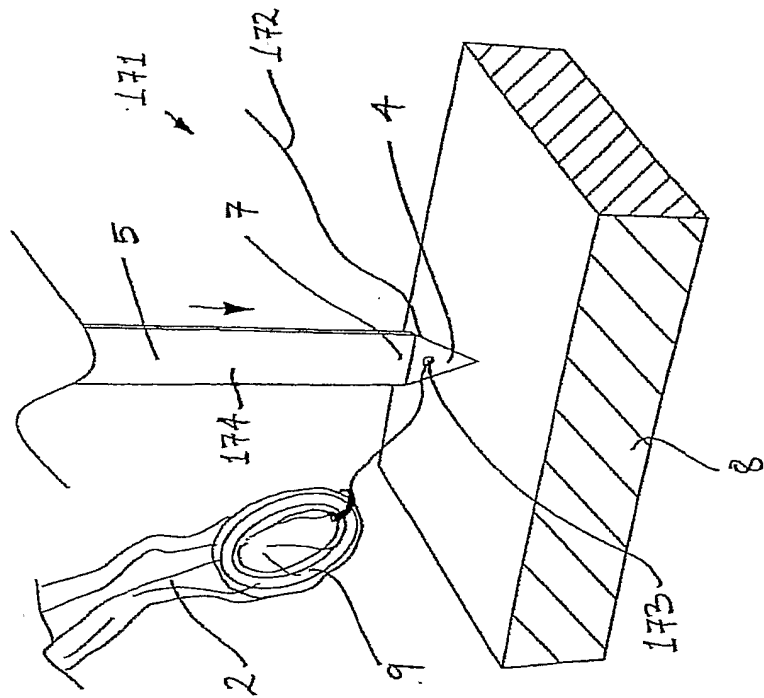


Fig. 58 (e)

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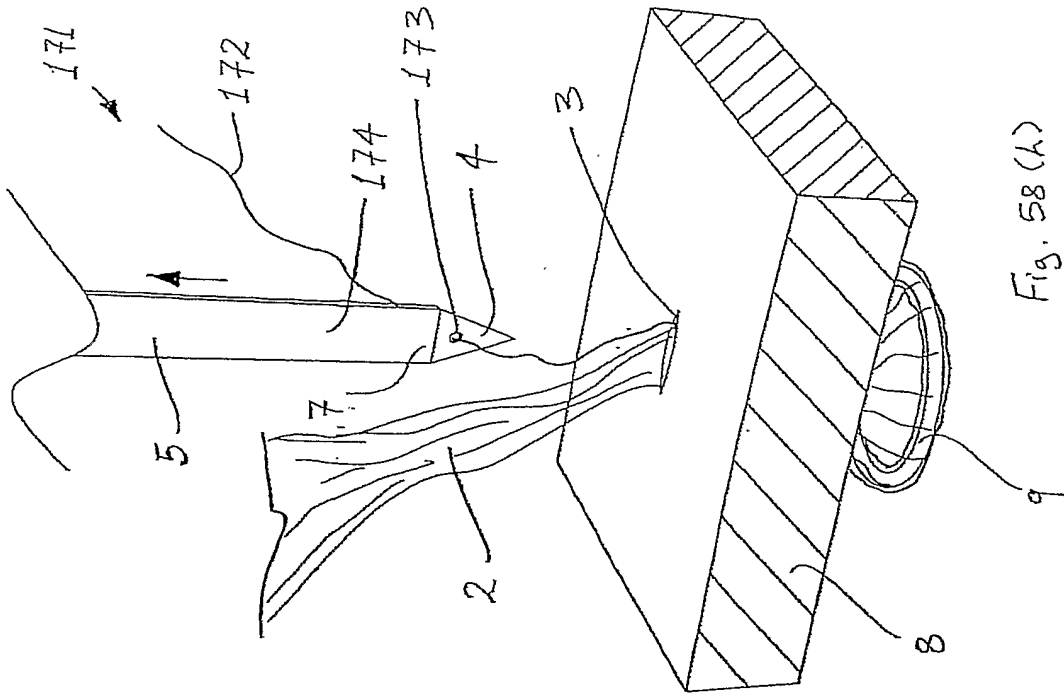


Fig. 58(h)

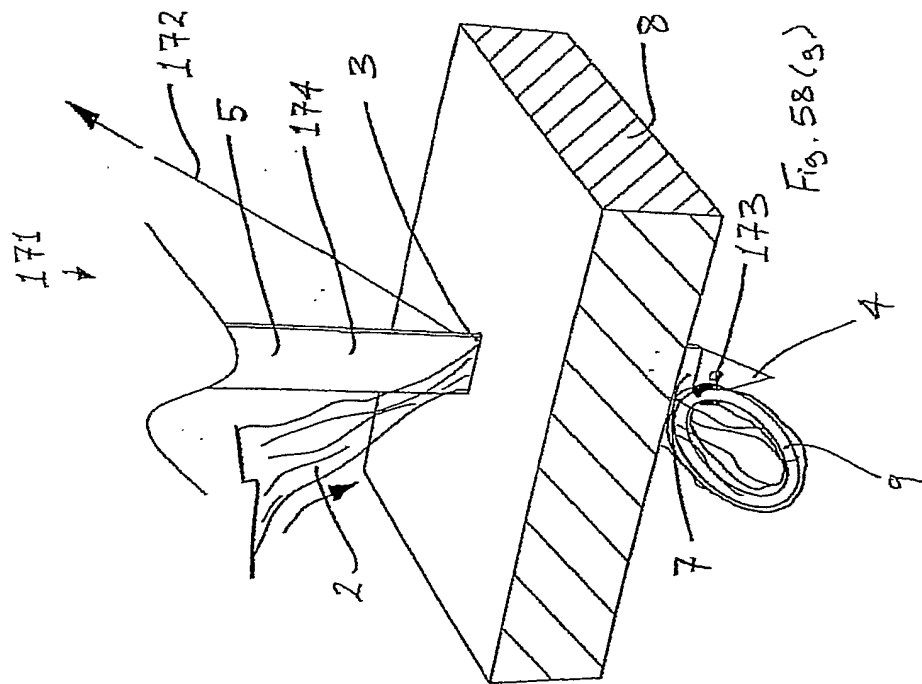


Fig. 58(g)

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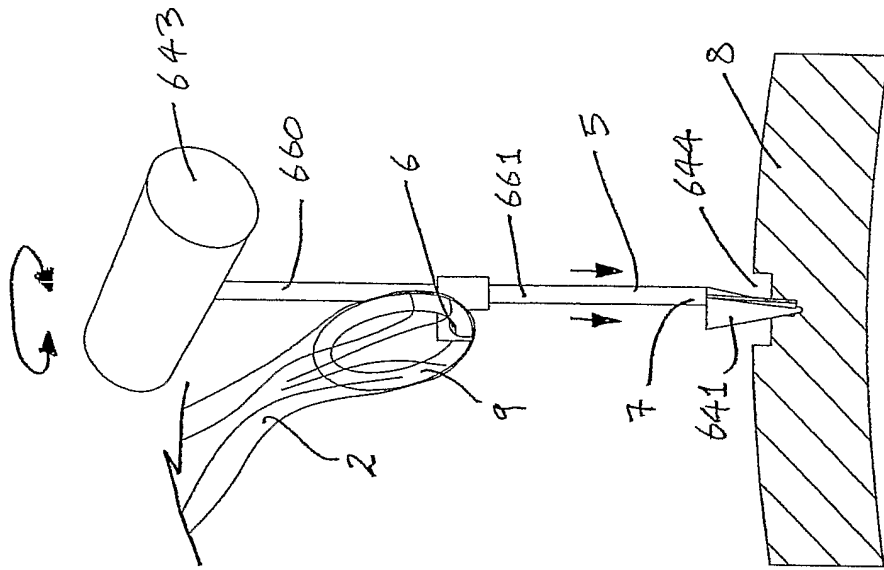


Fig. 58(j)

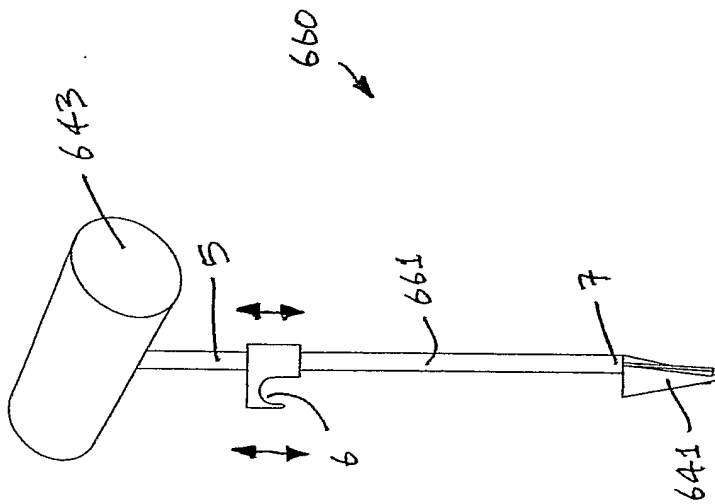
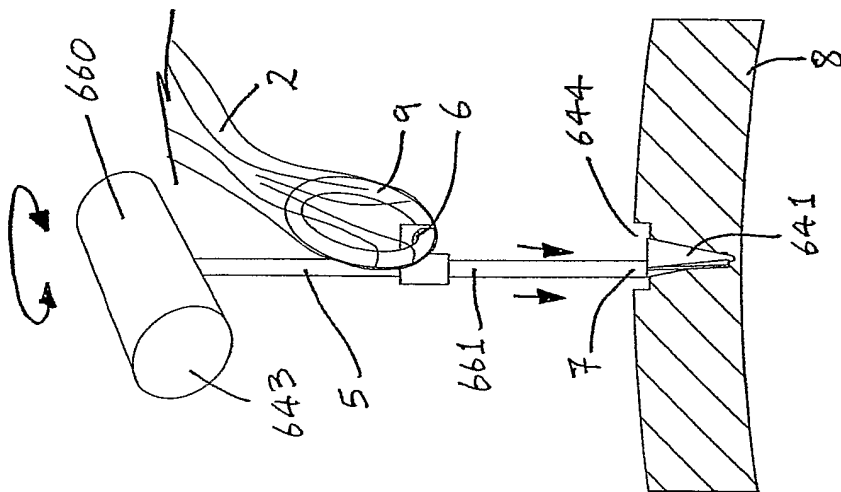
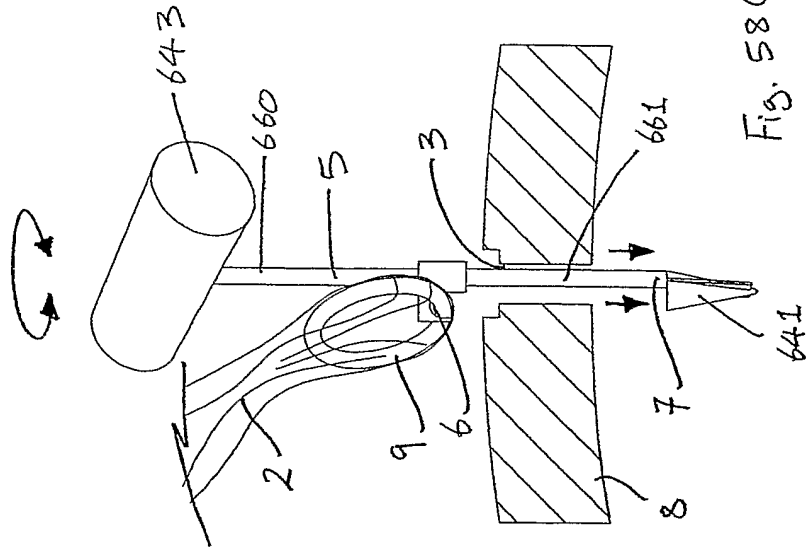


Fig. 58(i)

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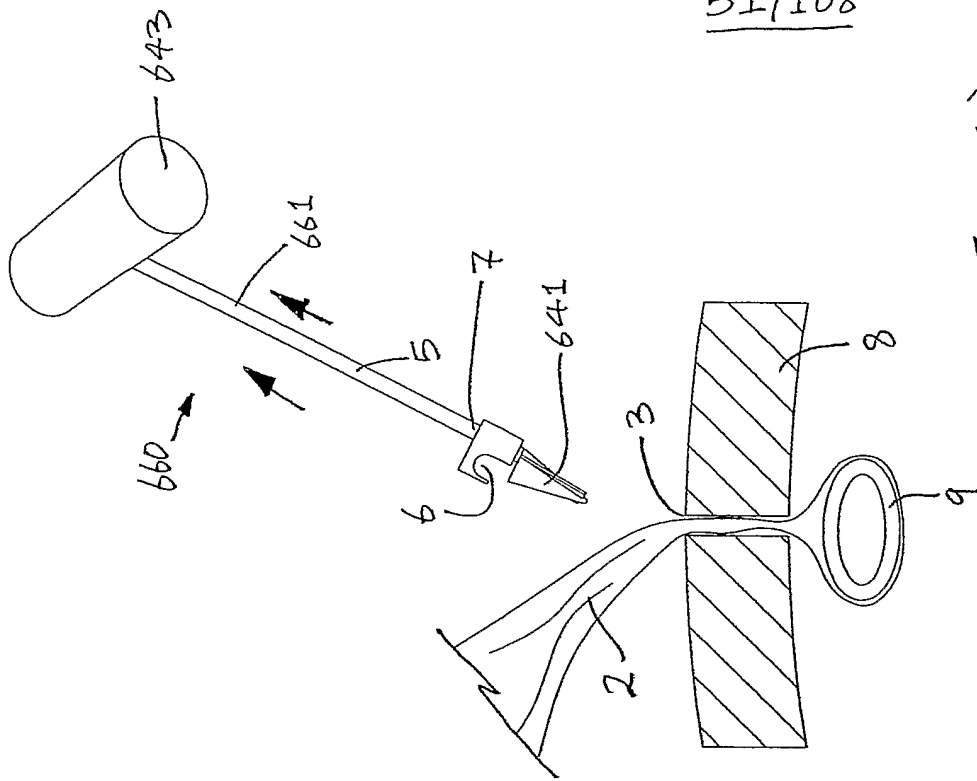


Fig. 58(n)

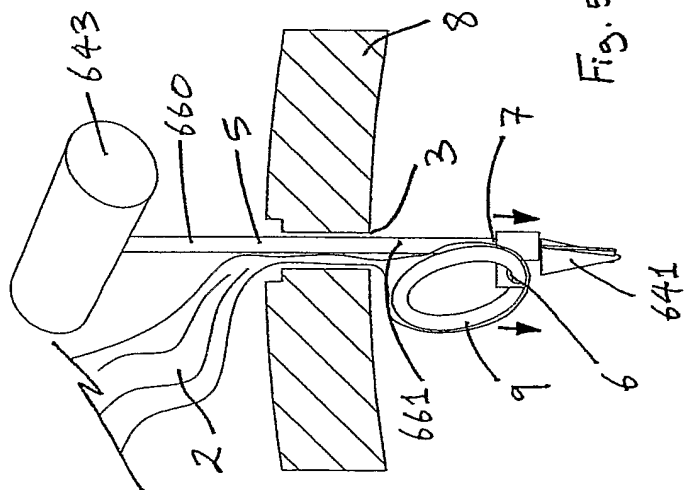
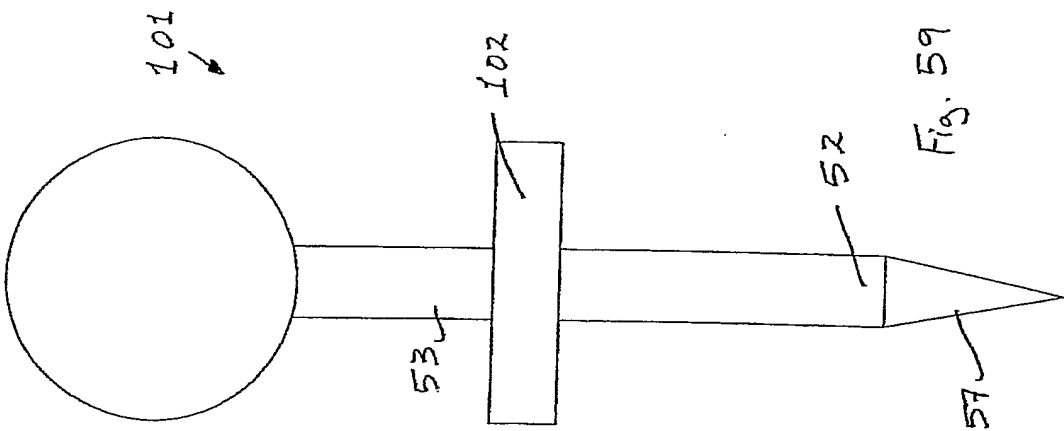
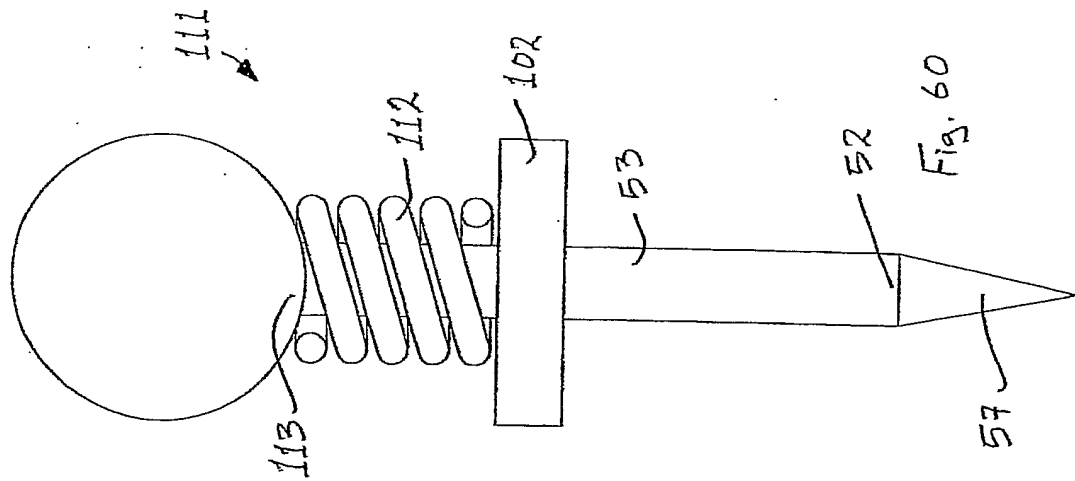
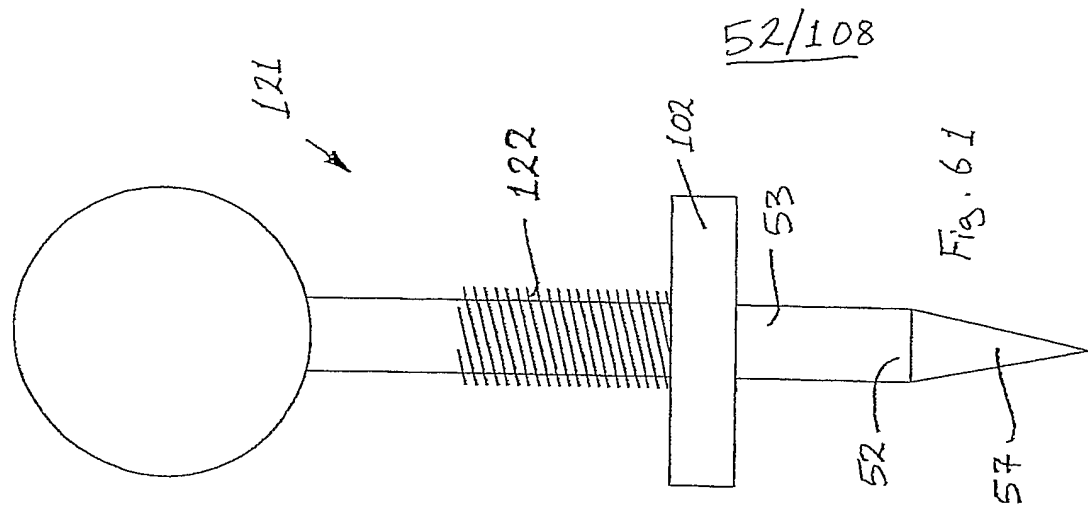
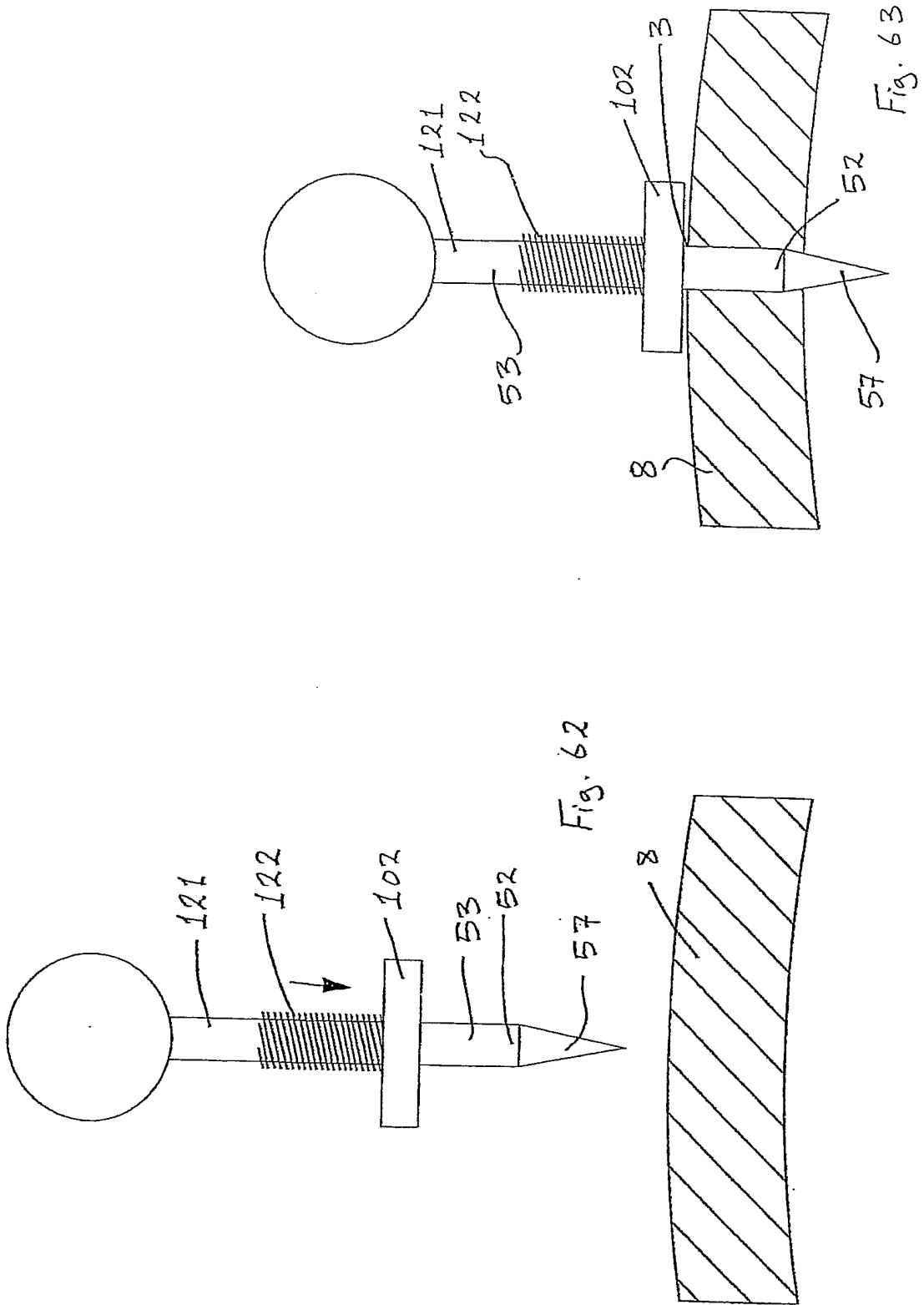


Fig. 58(n)



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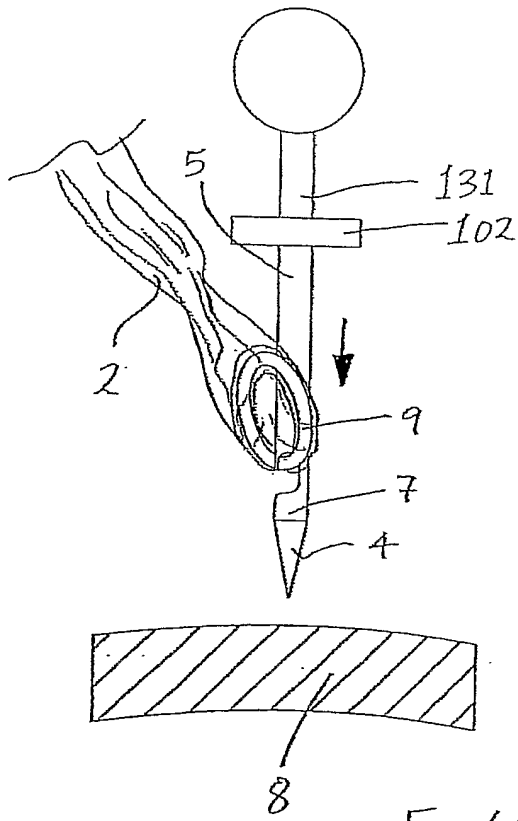


Fig. 64

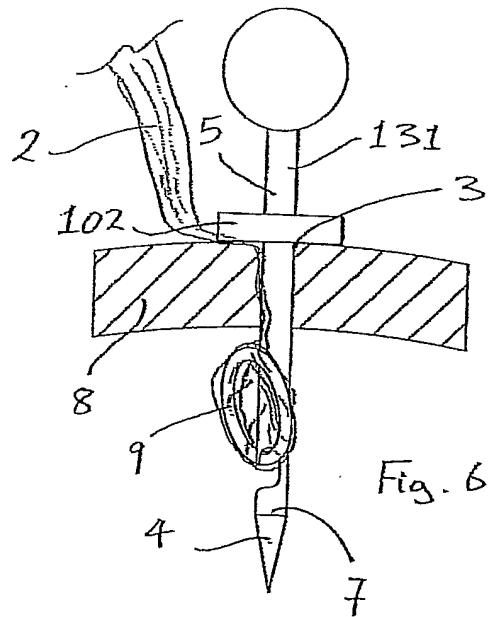
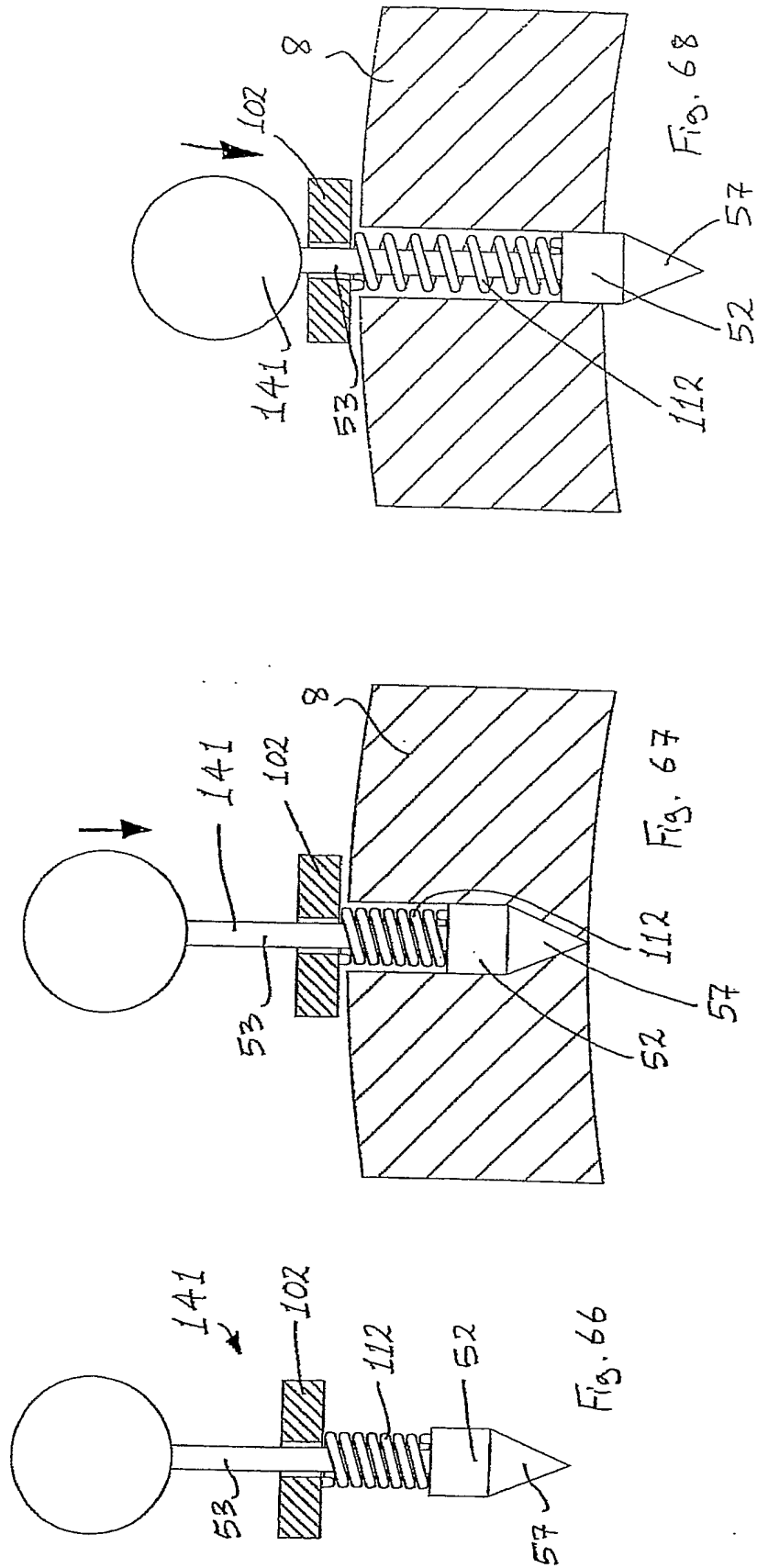


Fig. 65

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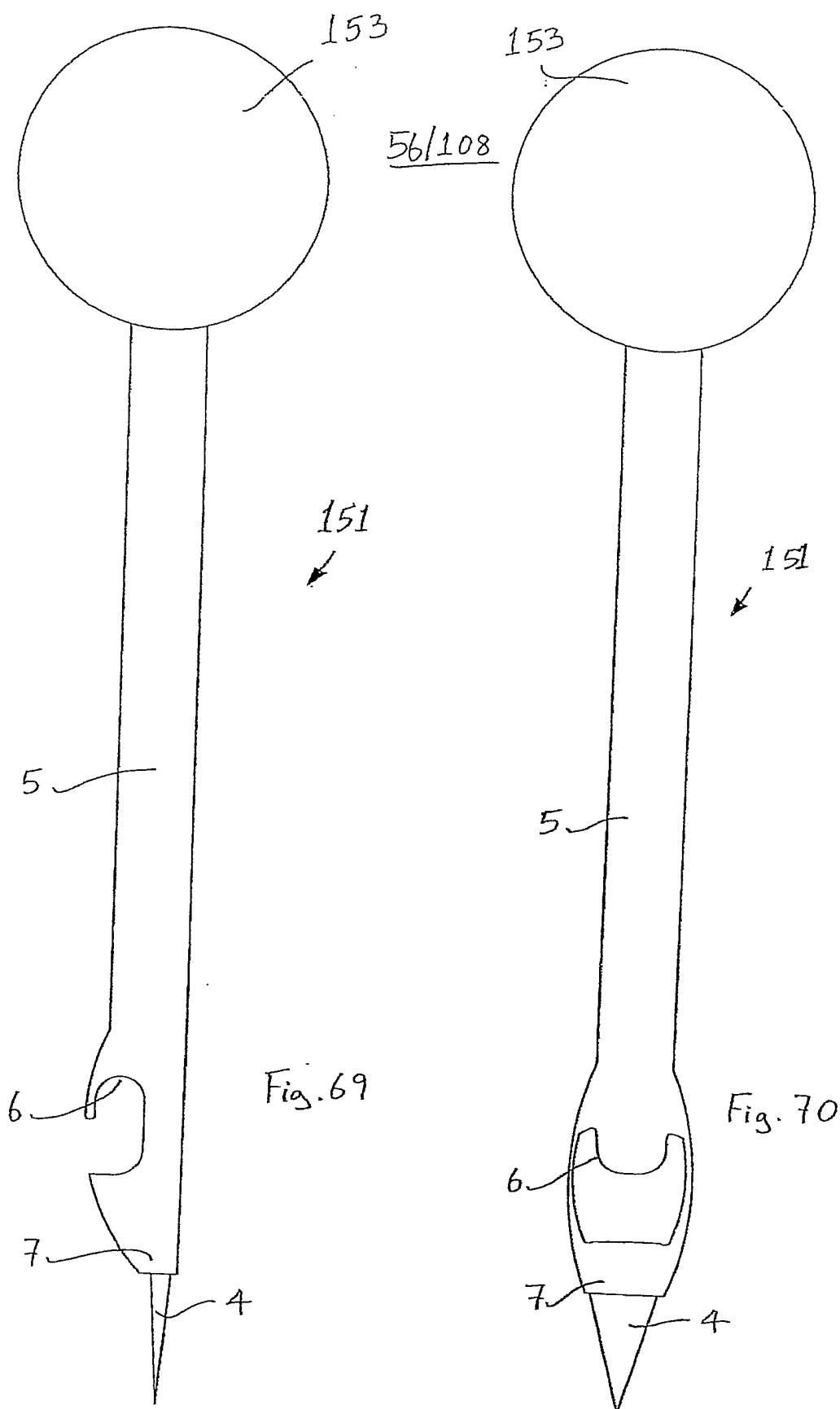
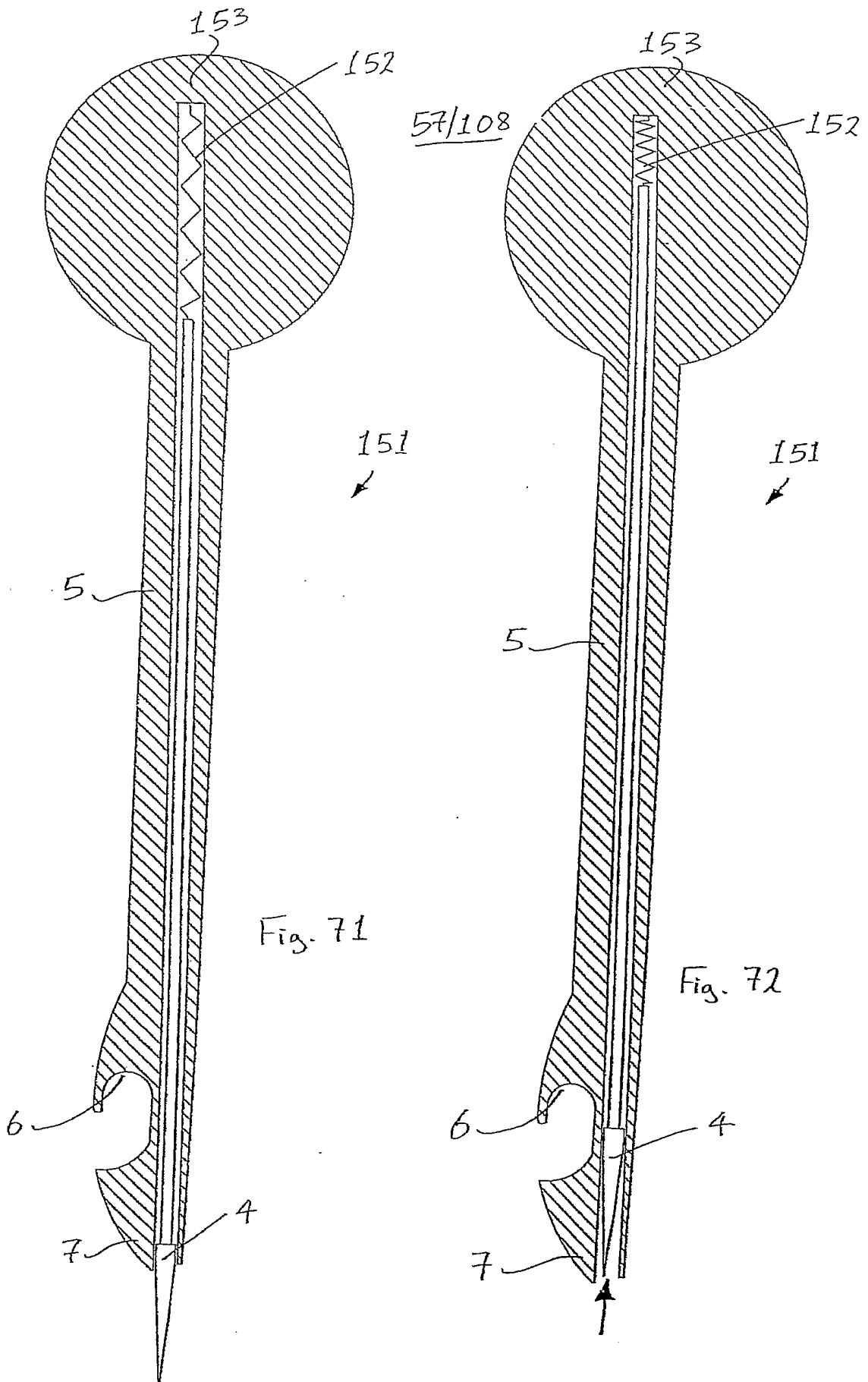


Fig. 69

Fig. 70



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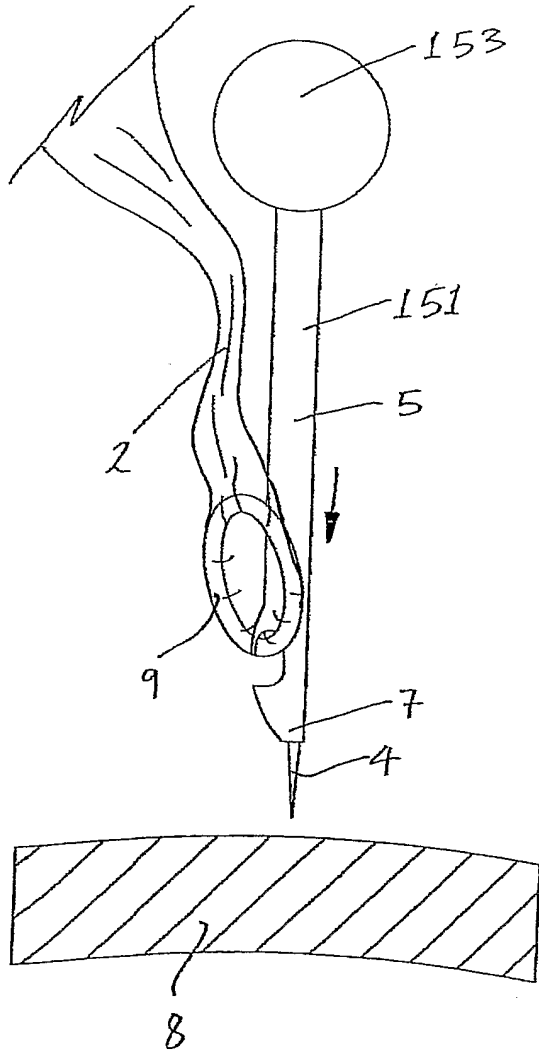


Fig. 73

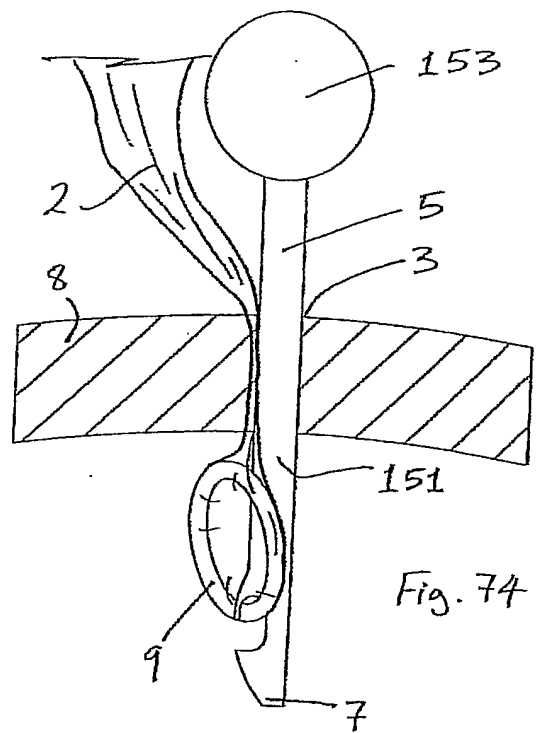


Fig. 74

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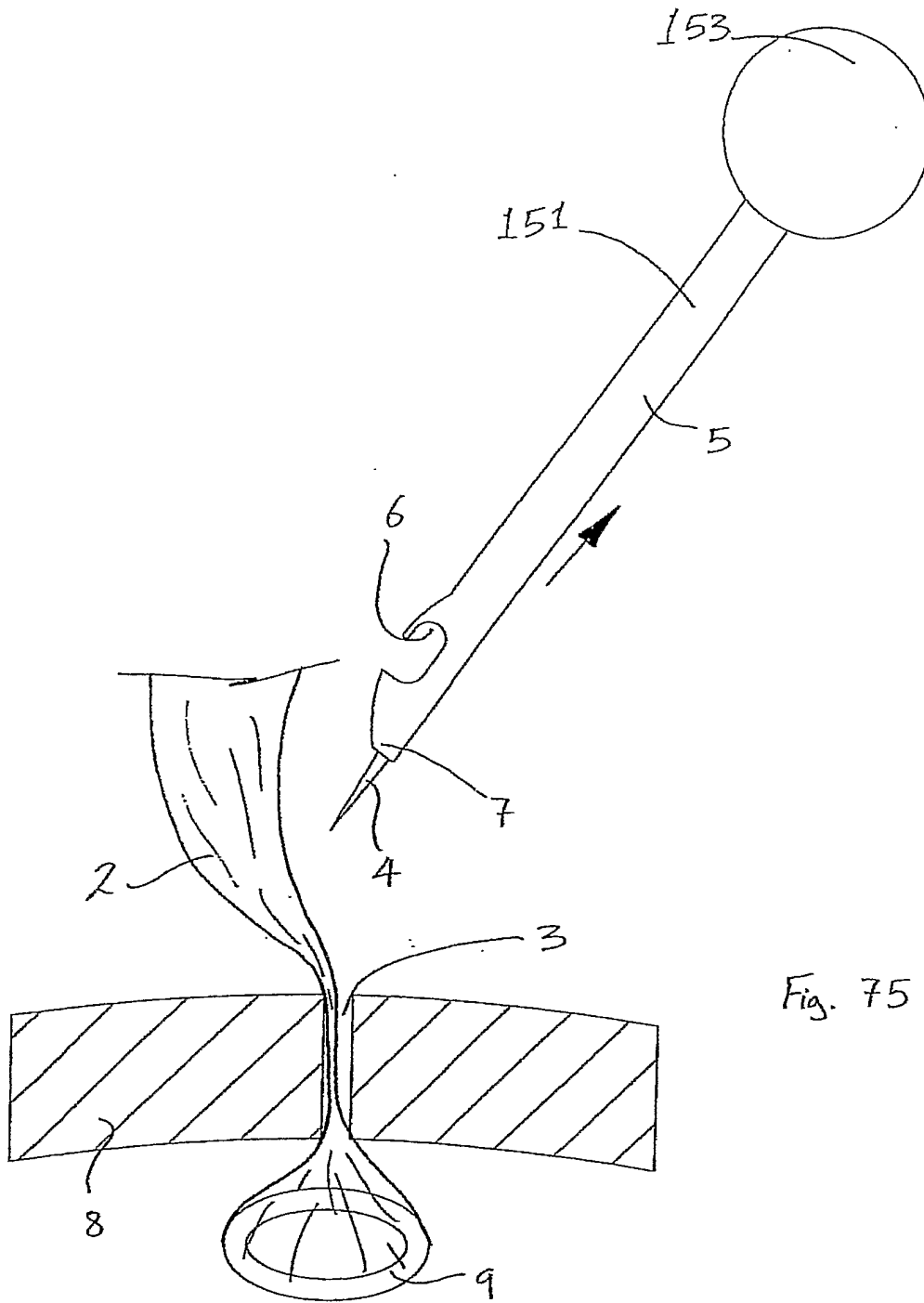


Fig. 75

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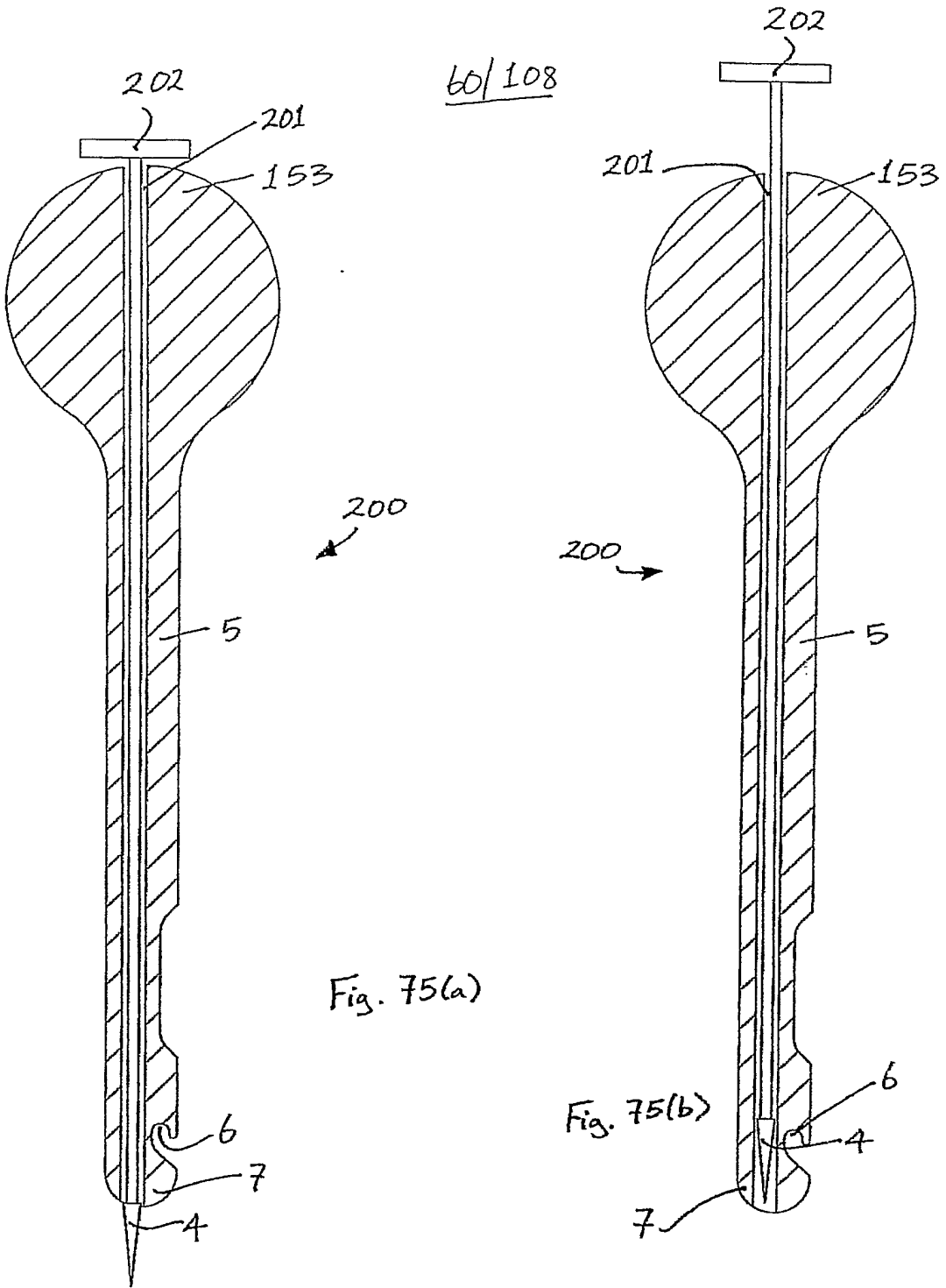
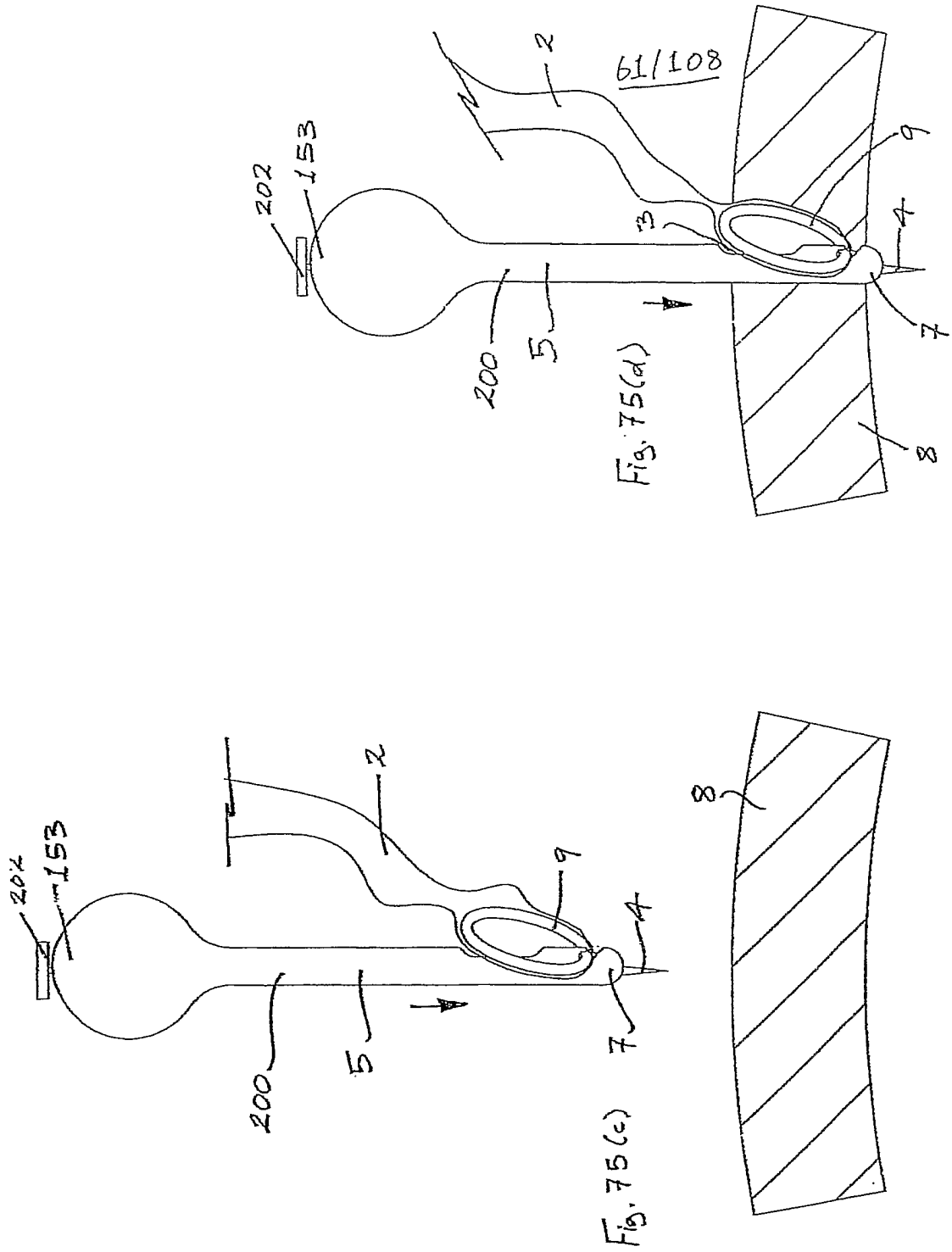


Fig. 75(a)

Fig. 75(b)



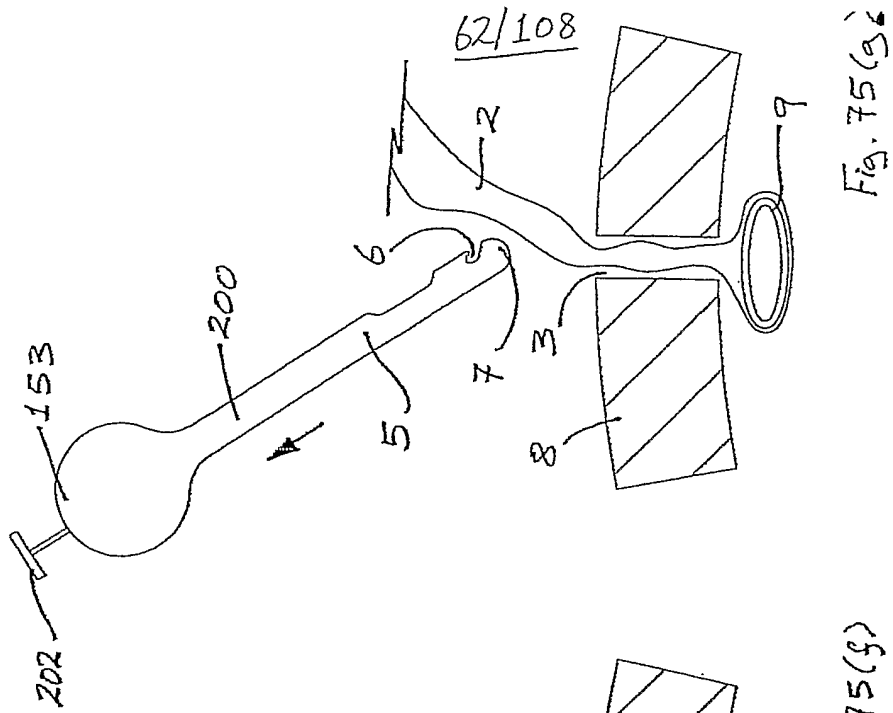


Fig. 75(g)

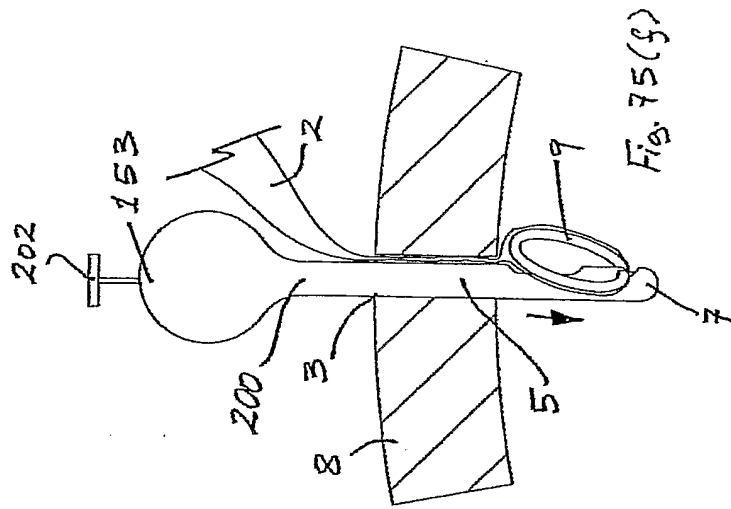


Fig. 75(f)

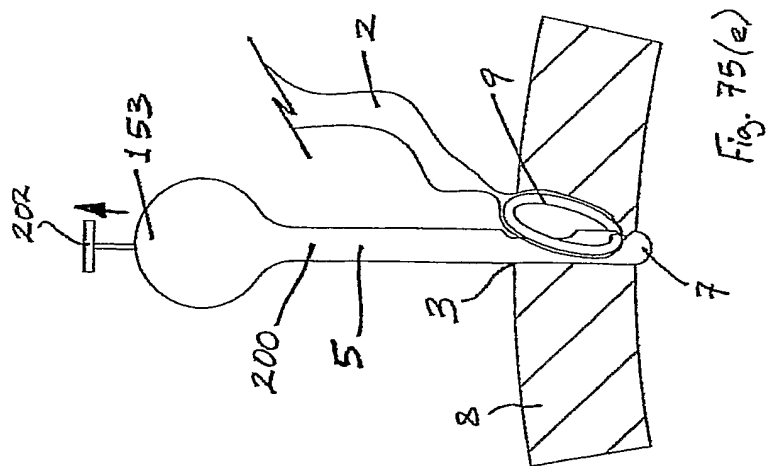
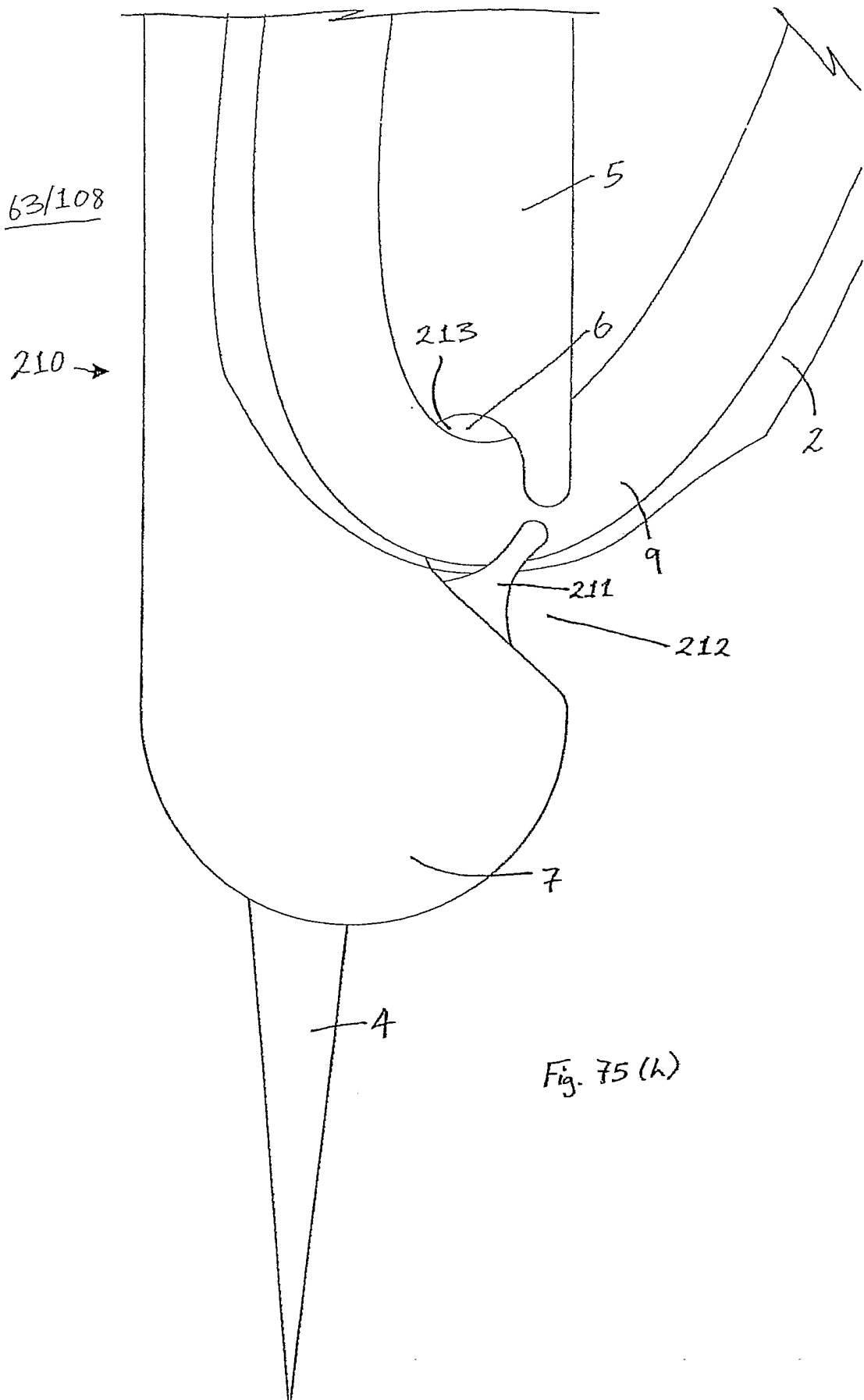


Fig. 75(e)



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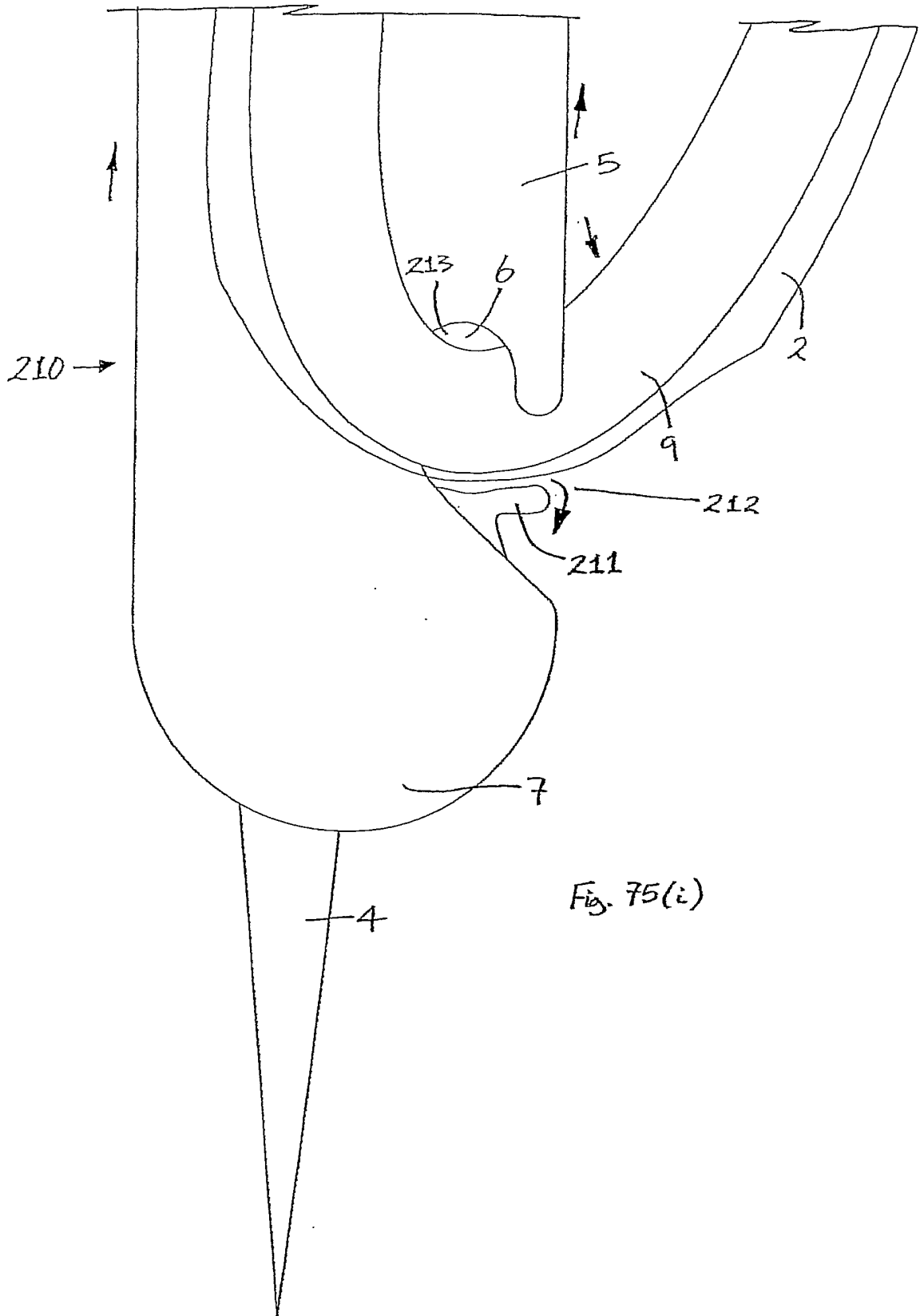


Fig. 75(i)

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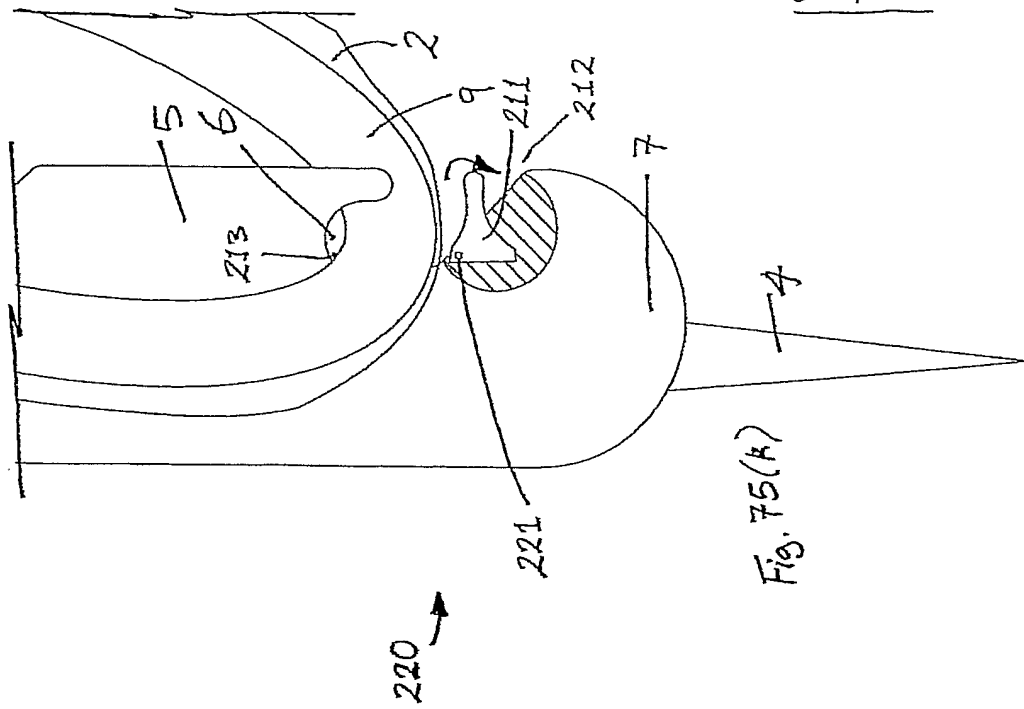


Fig. 75(K)

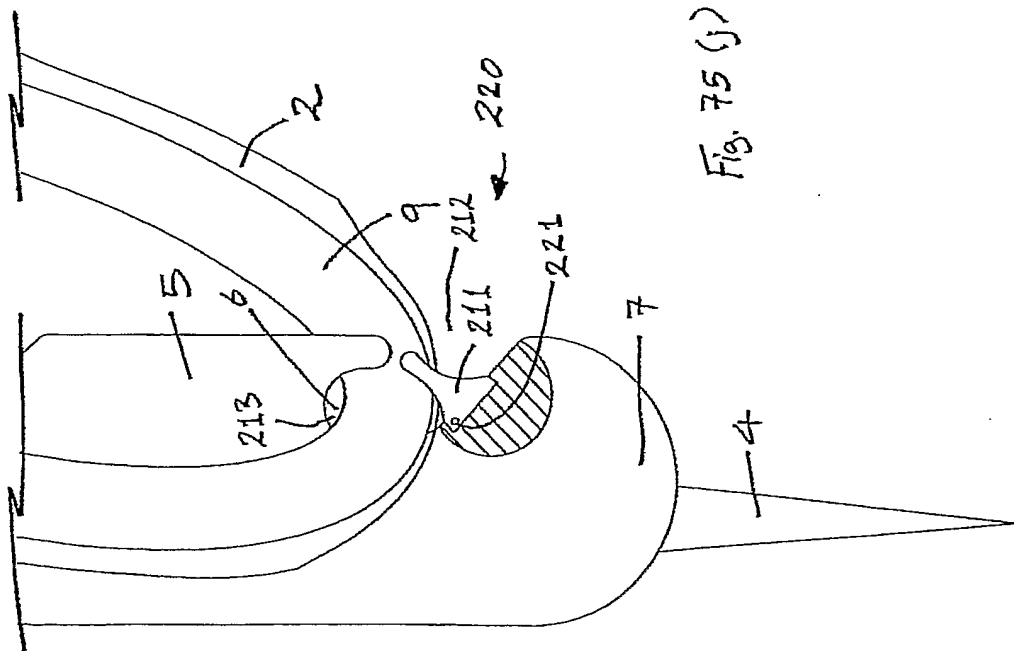


Fig. 75(J)

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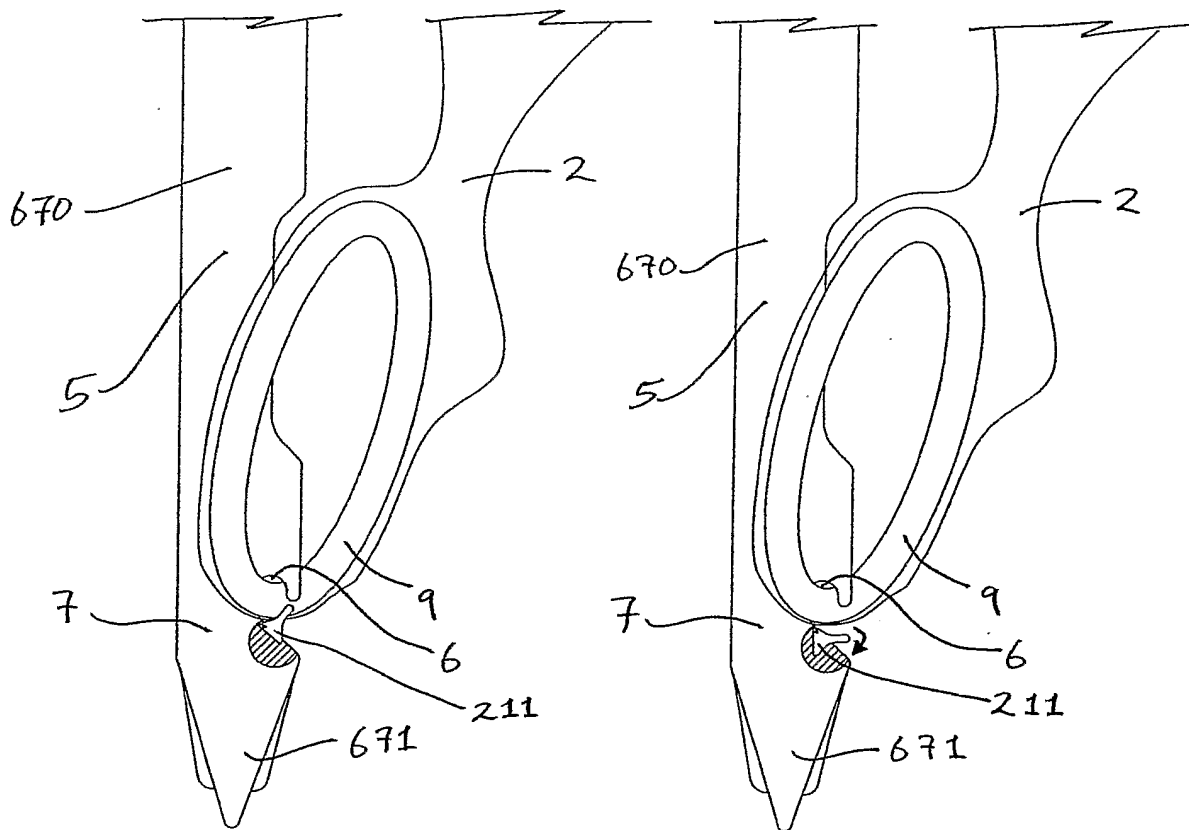


Fig. 75(k)(i)

Fig. 75(k)(ii)

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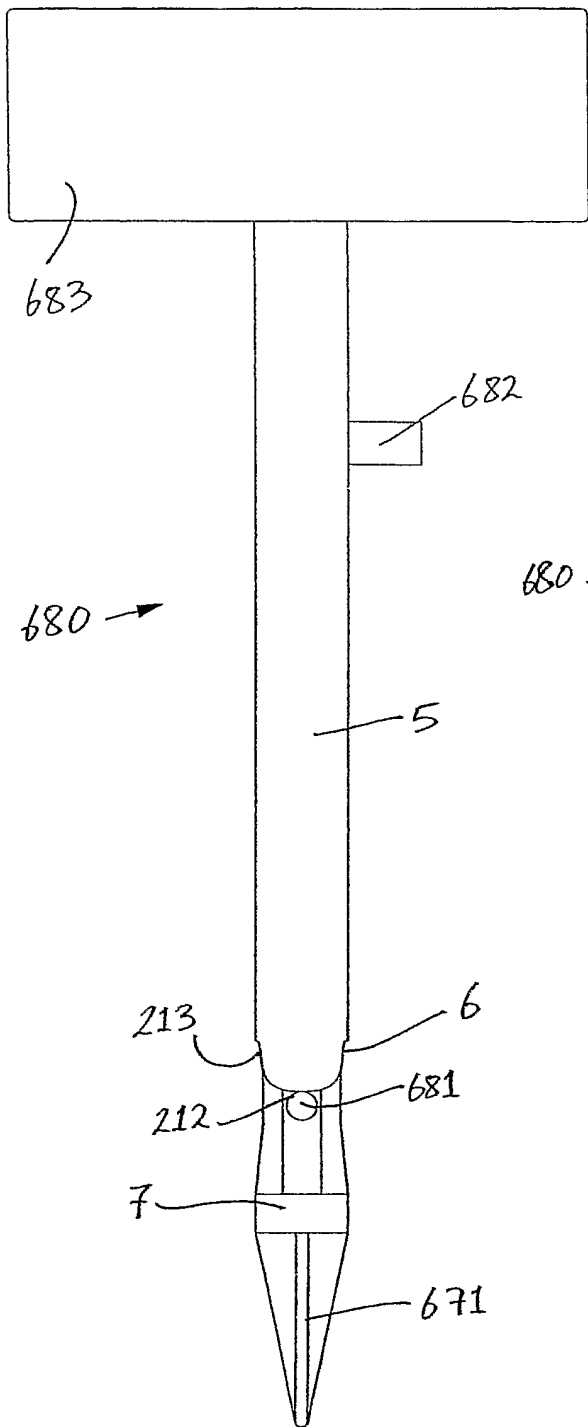


Fig. 75(k)(iii)

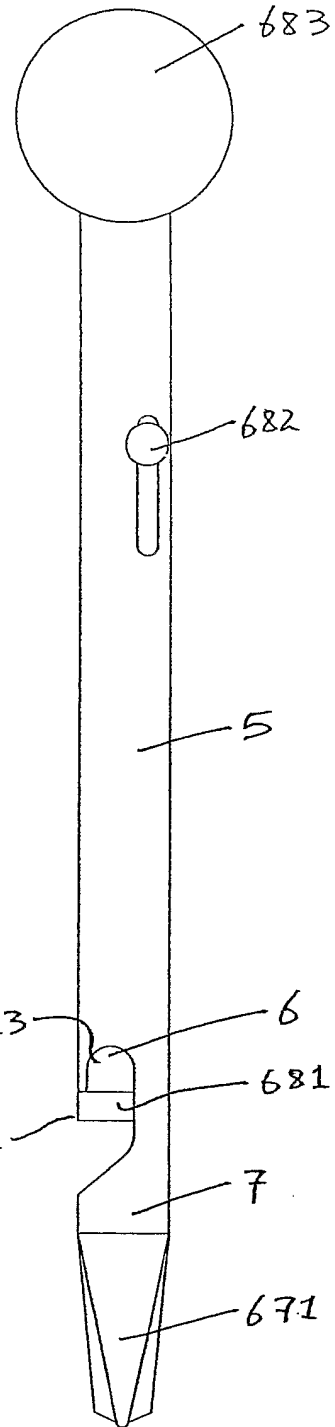


Fig. 75(k)(iv)

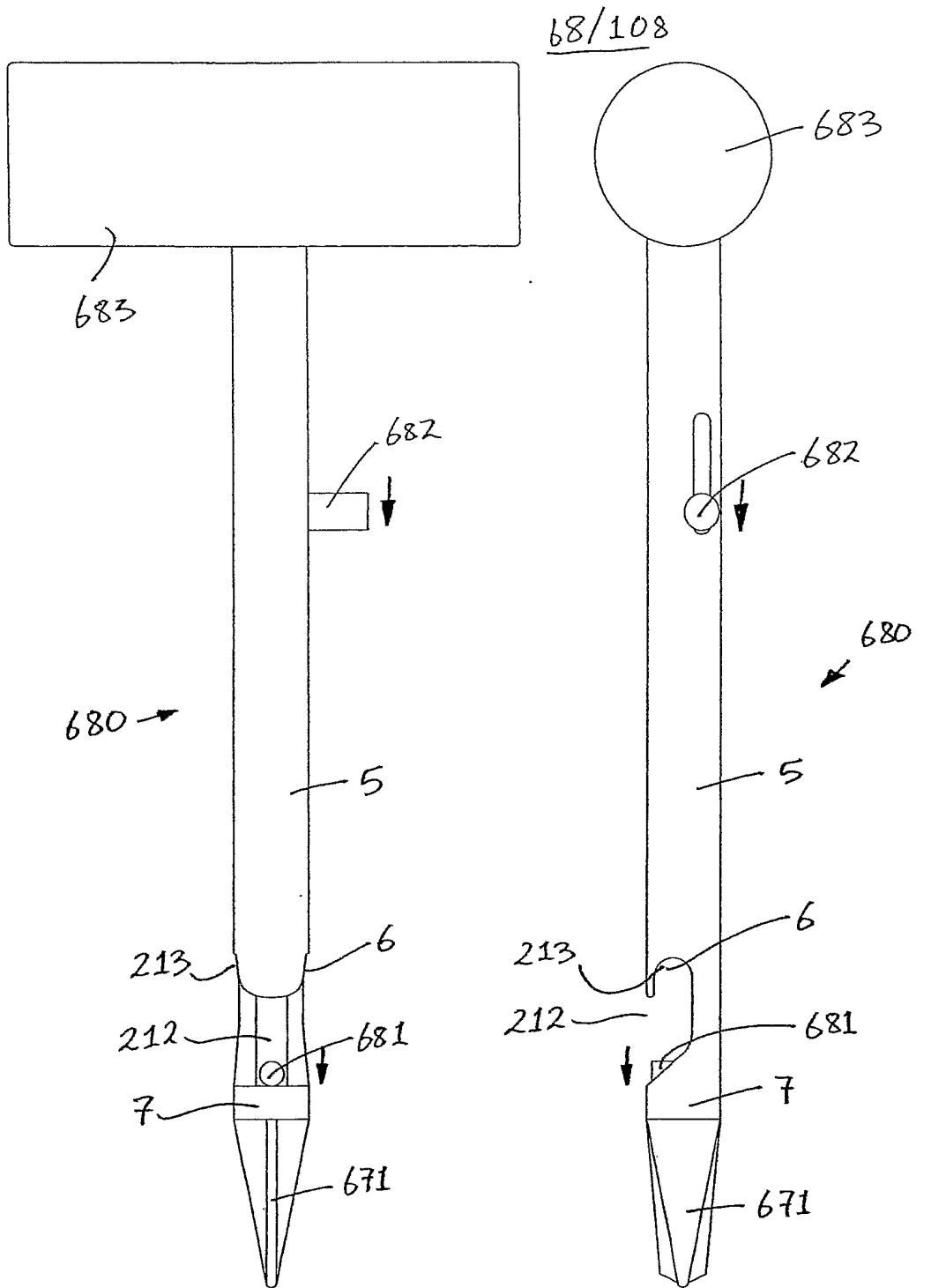
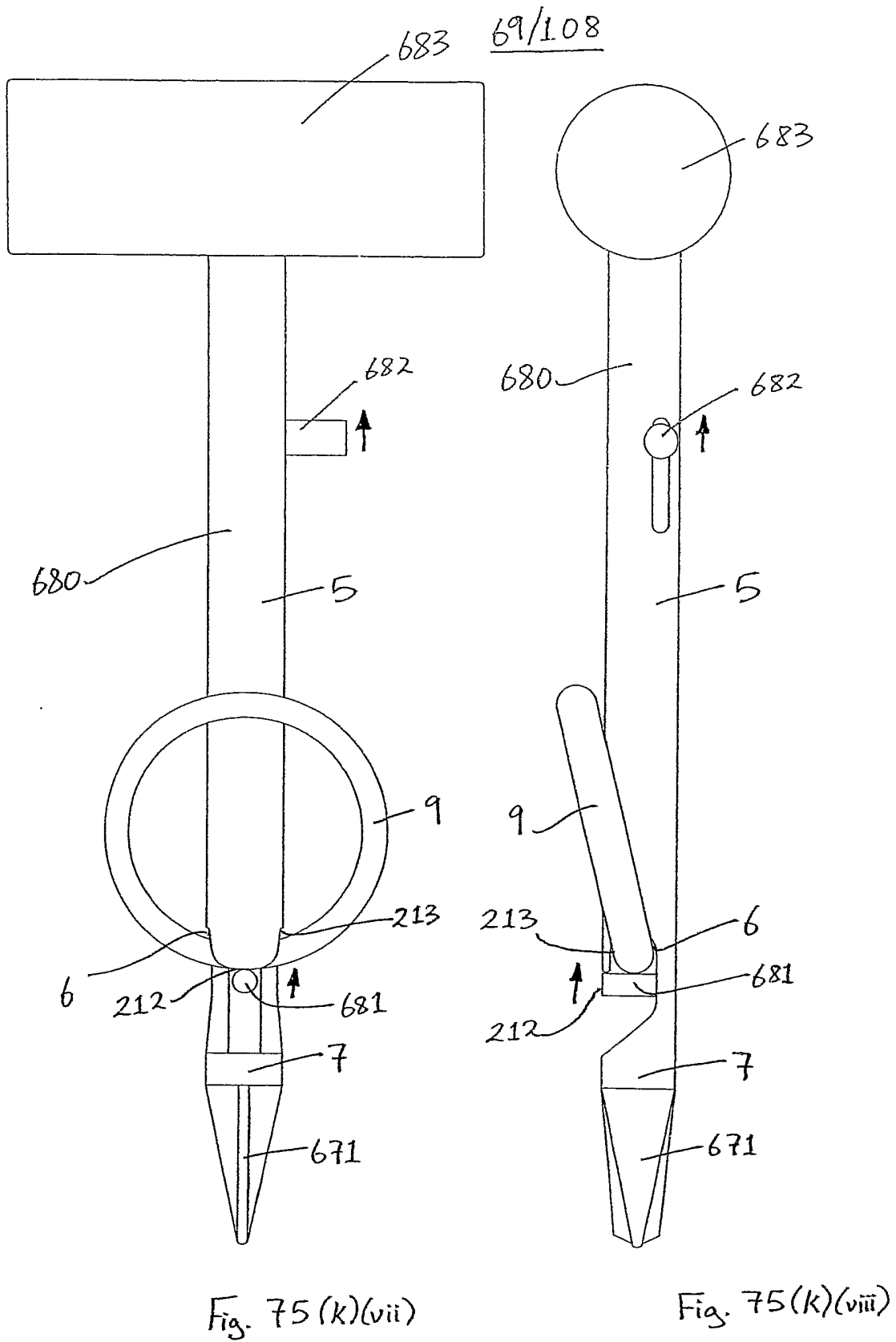


Fig. 75(k)(v)

Fig. 75(k)(vi)



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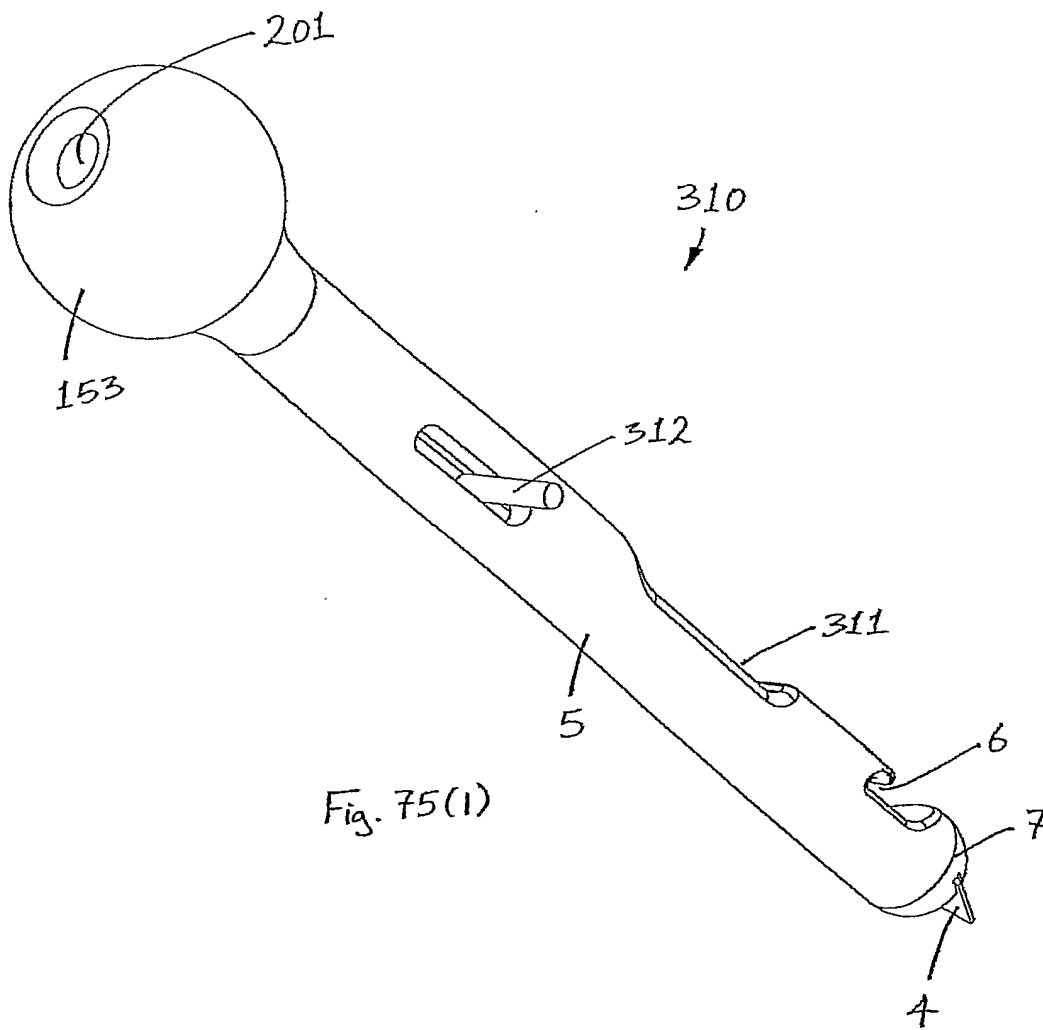
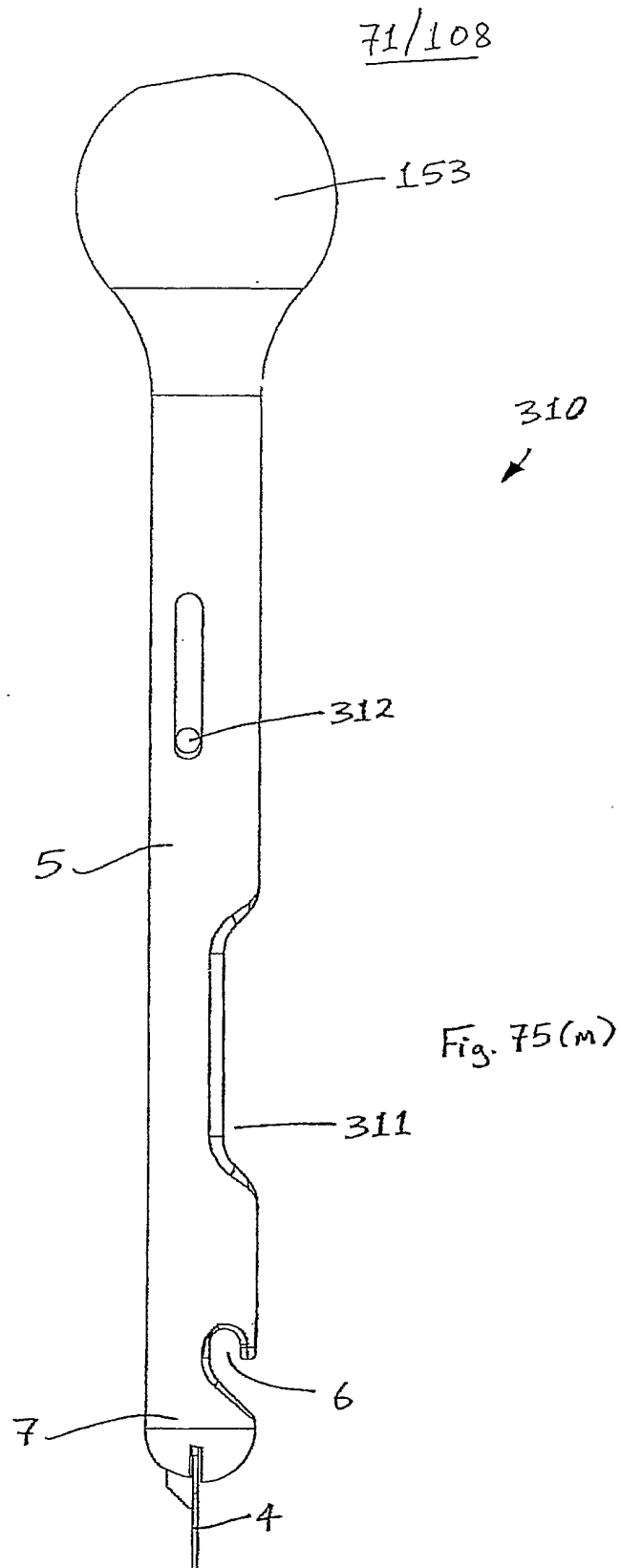
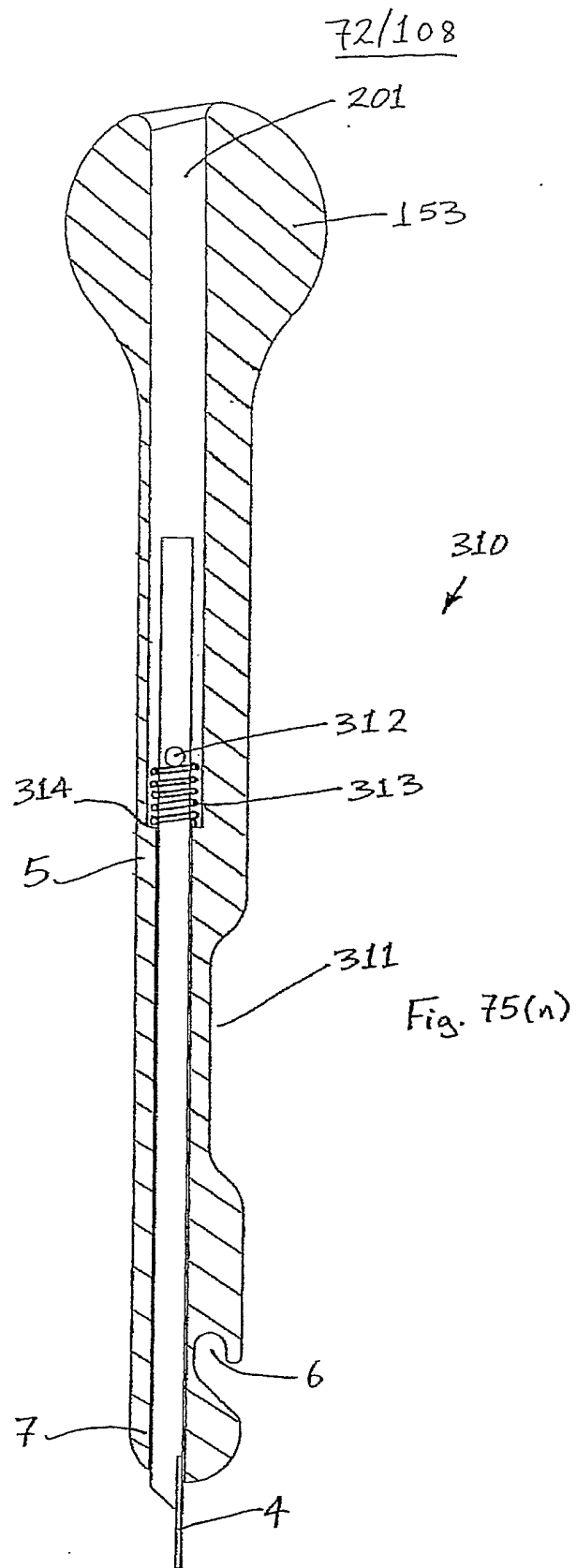
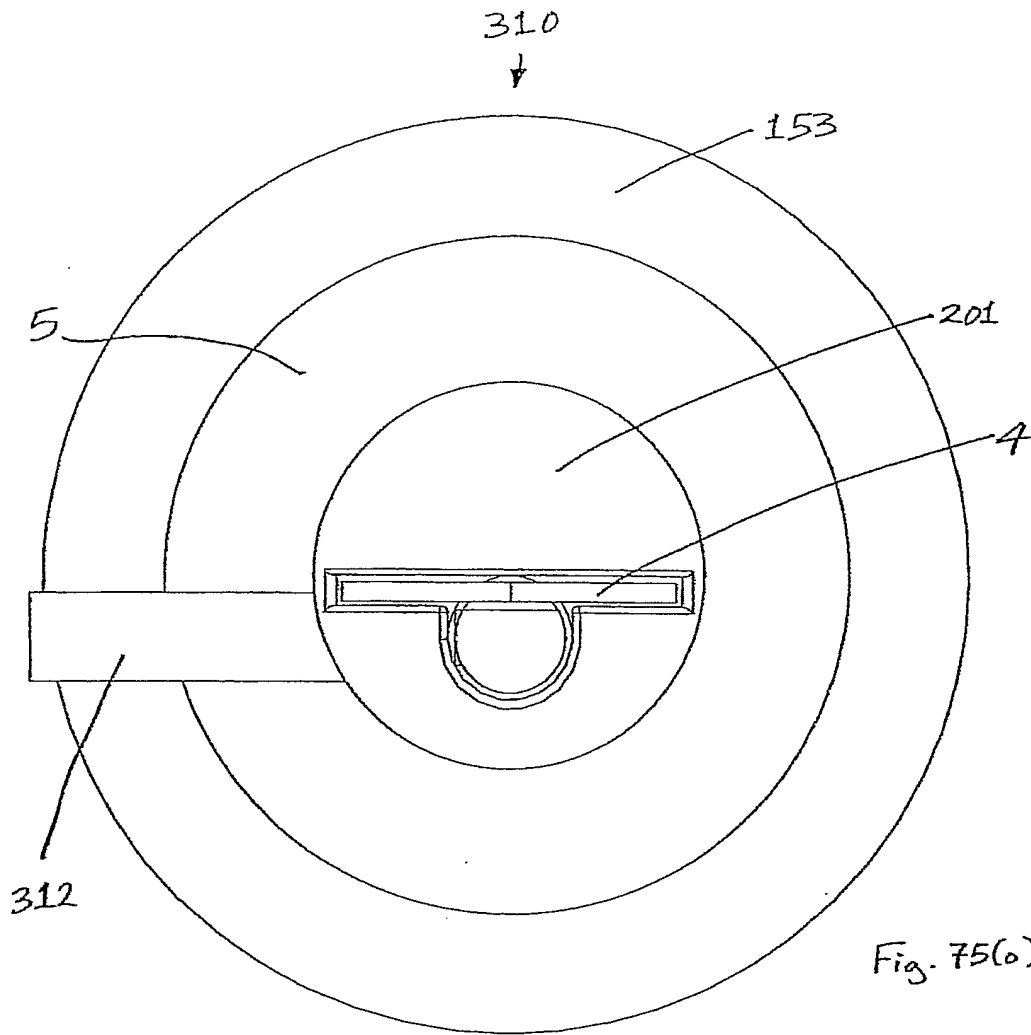


Fig. 75(1)





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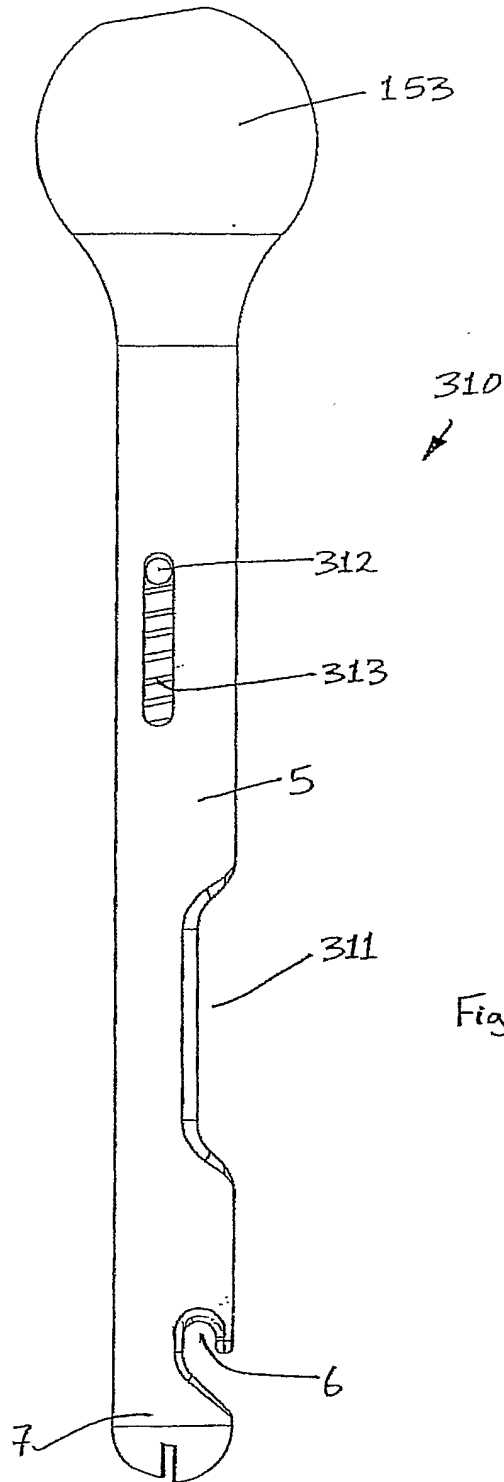


Fig. 75 (p)

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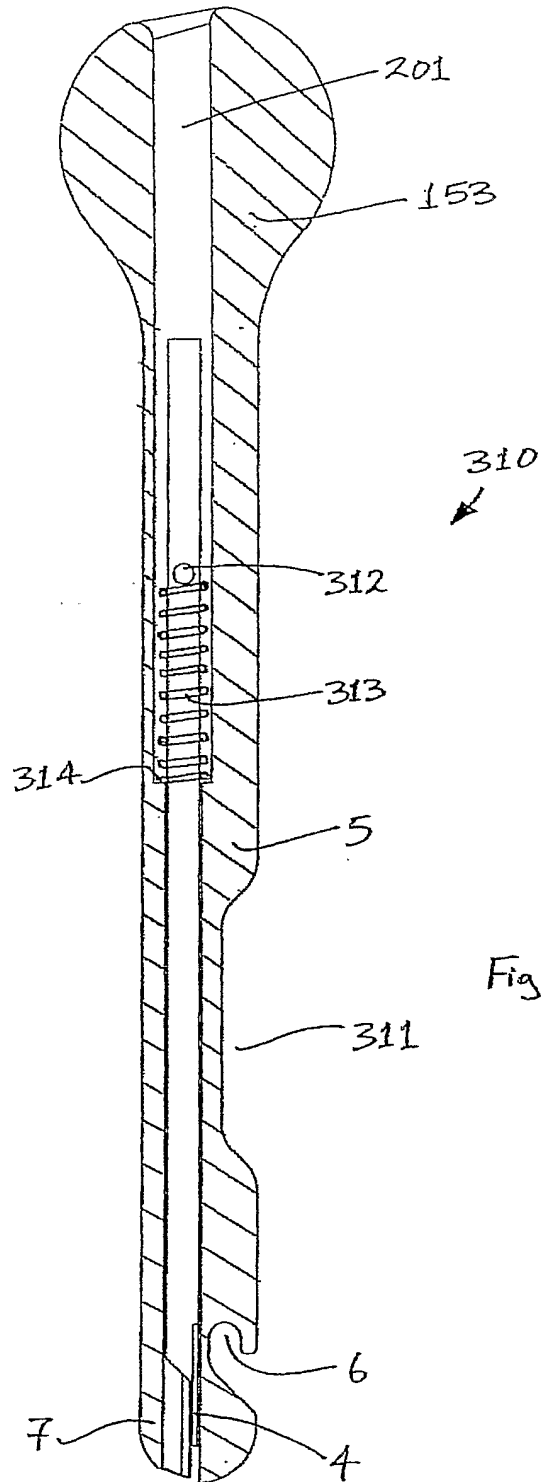


Fig. 75(q)

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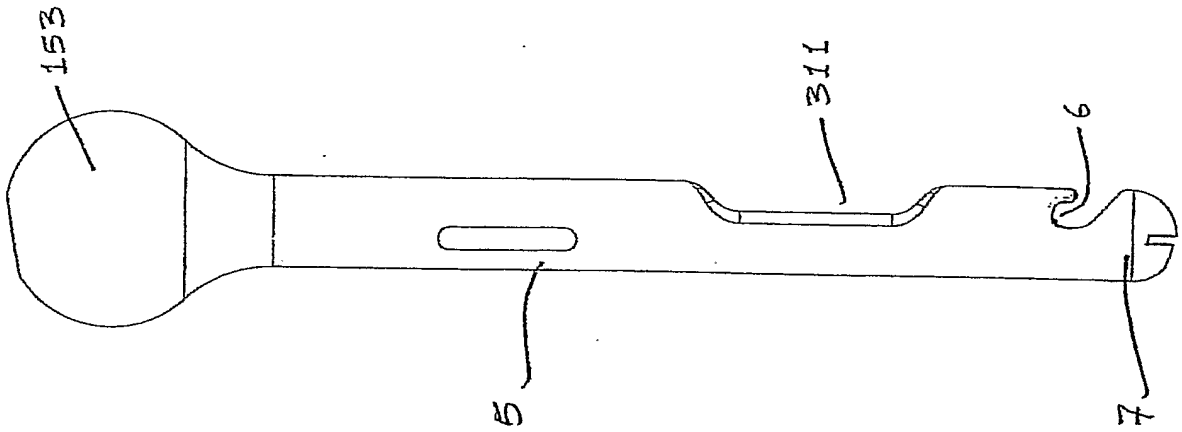


Fig. 75 (r)

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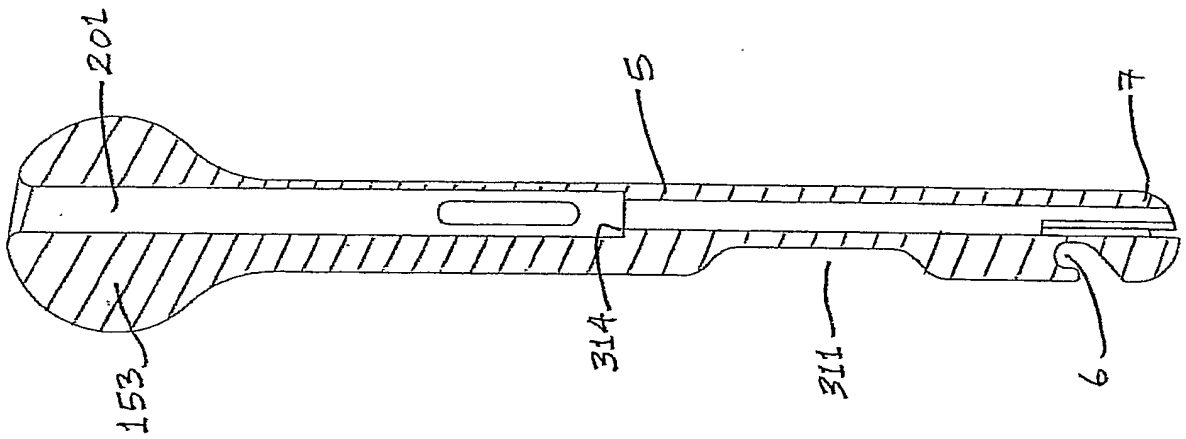


Fig. 75(s)

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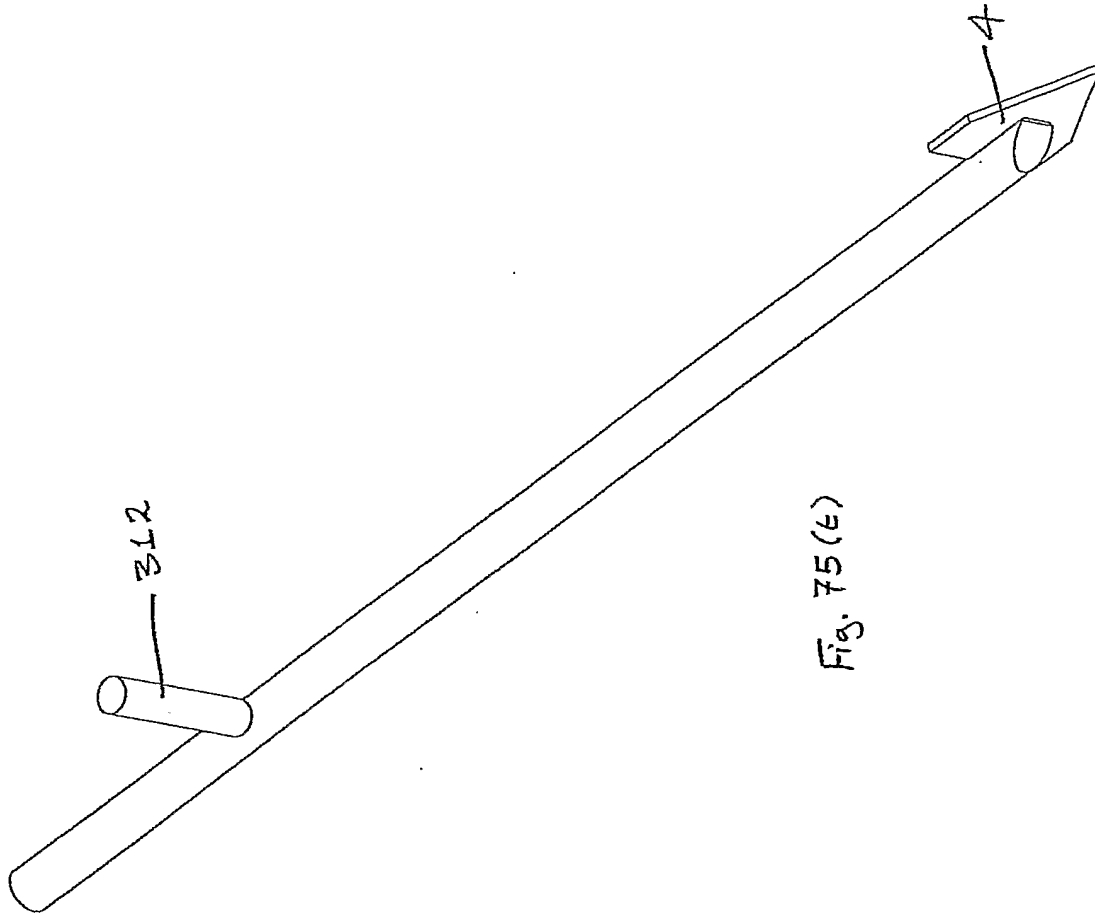
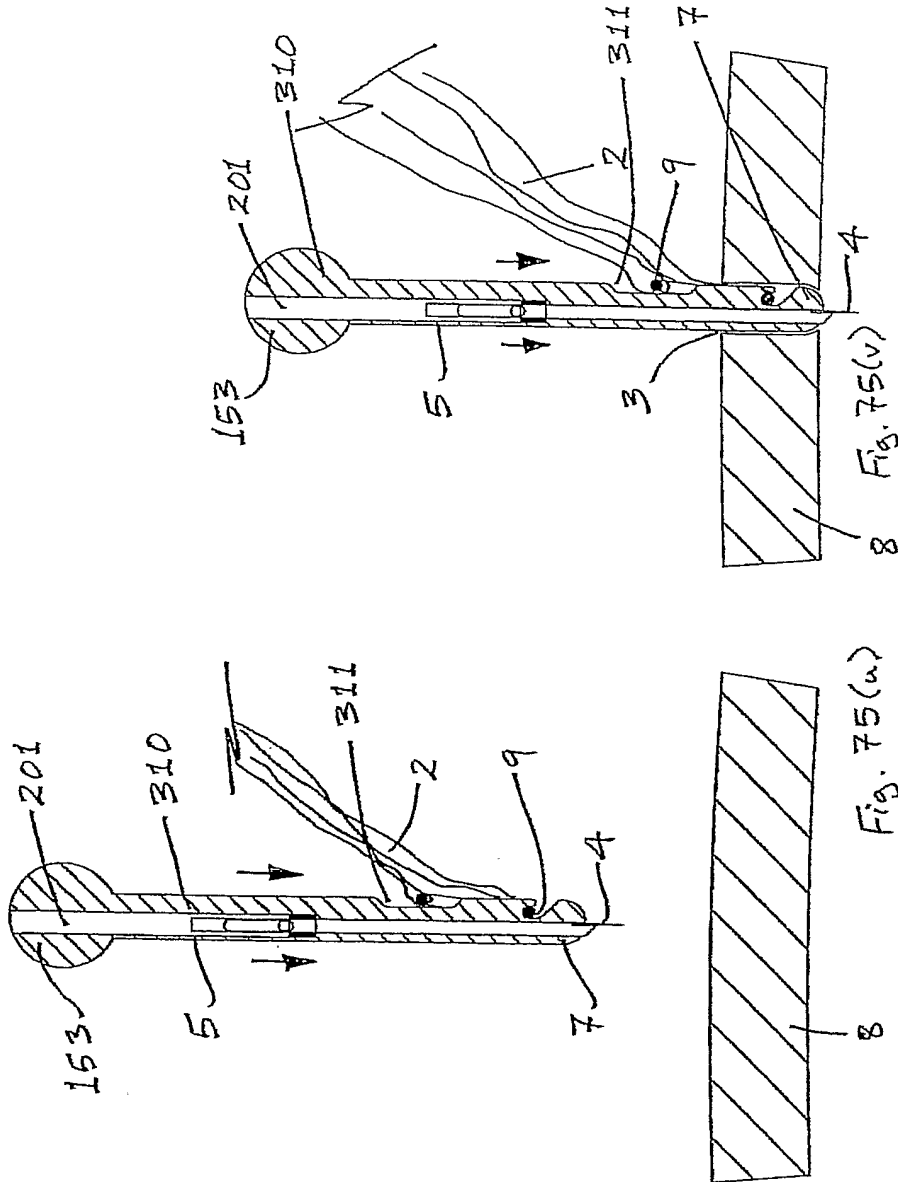
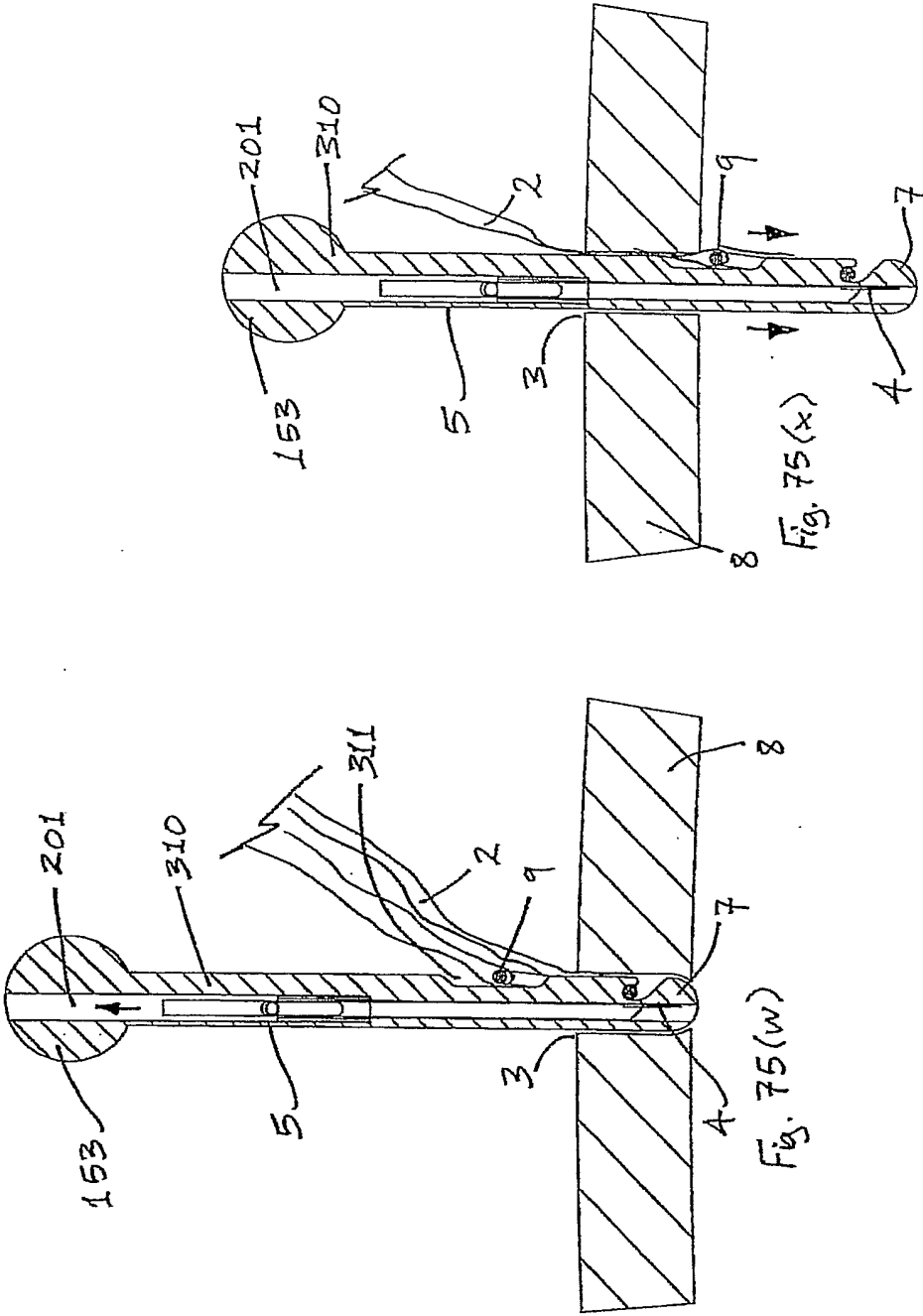


Fig. 75 (e)

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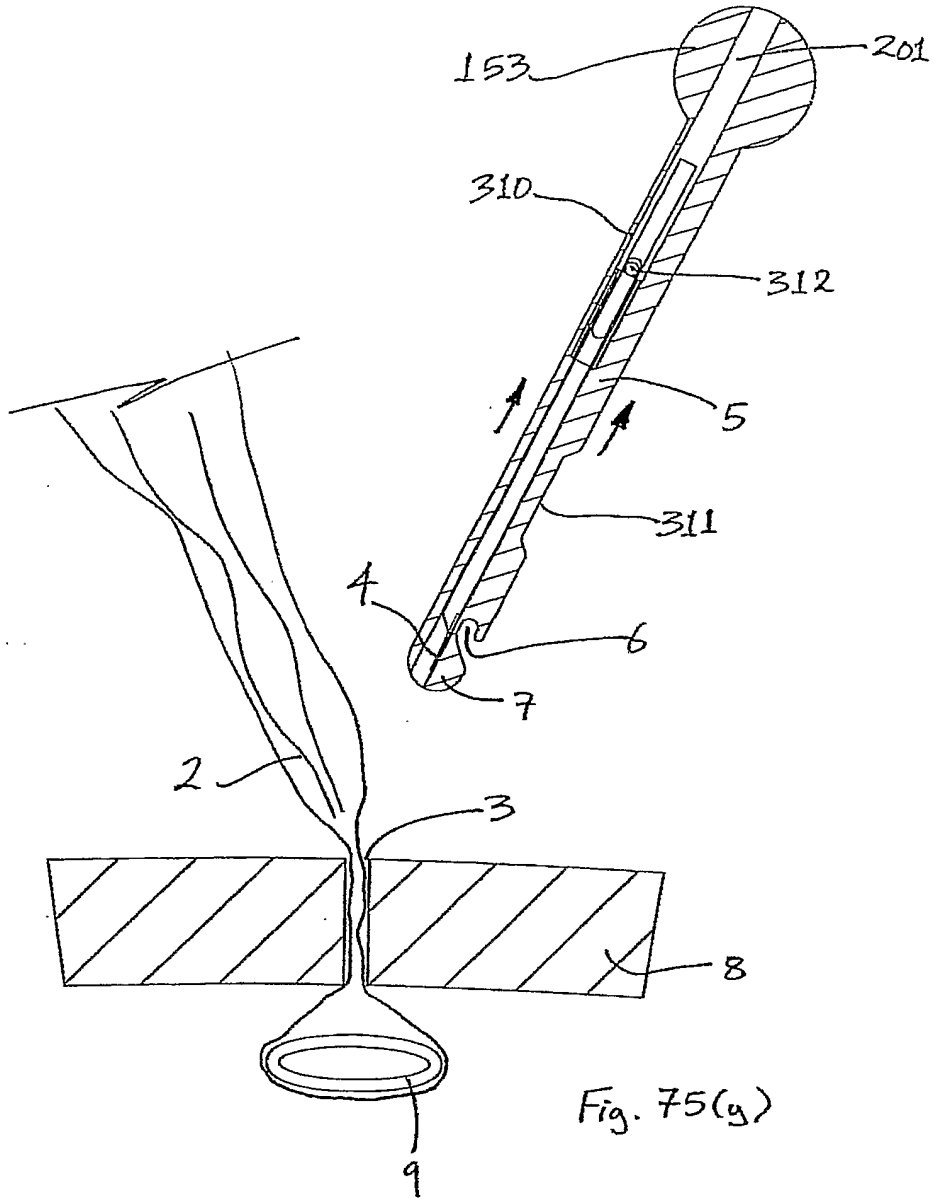


Fig. 75(y)

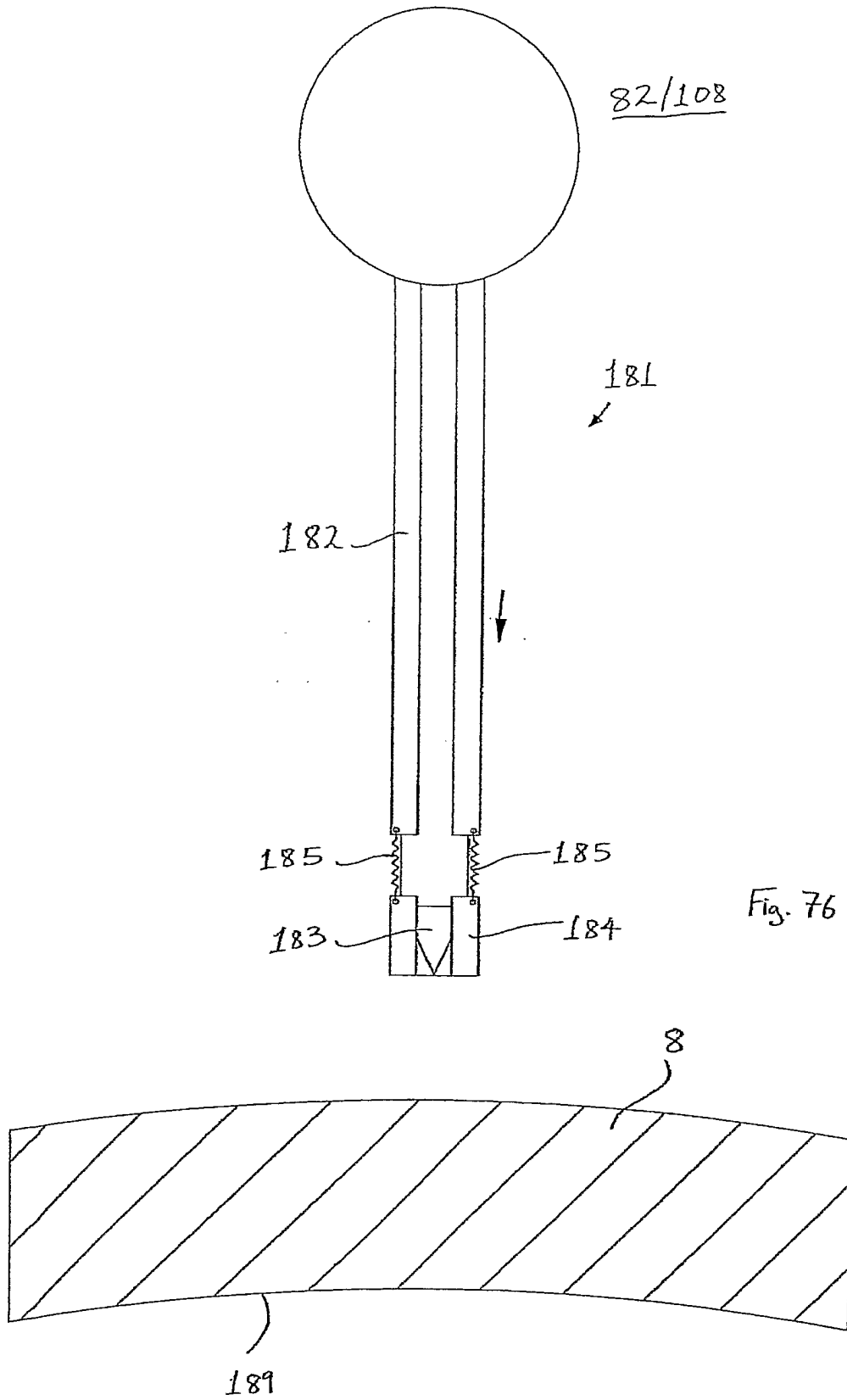
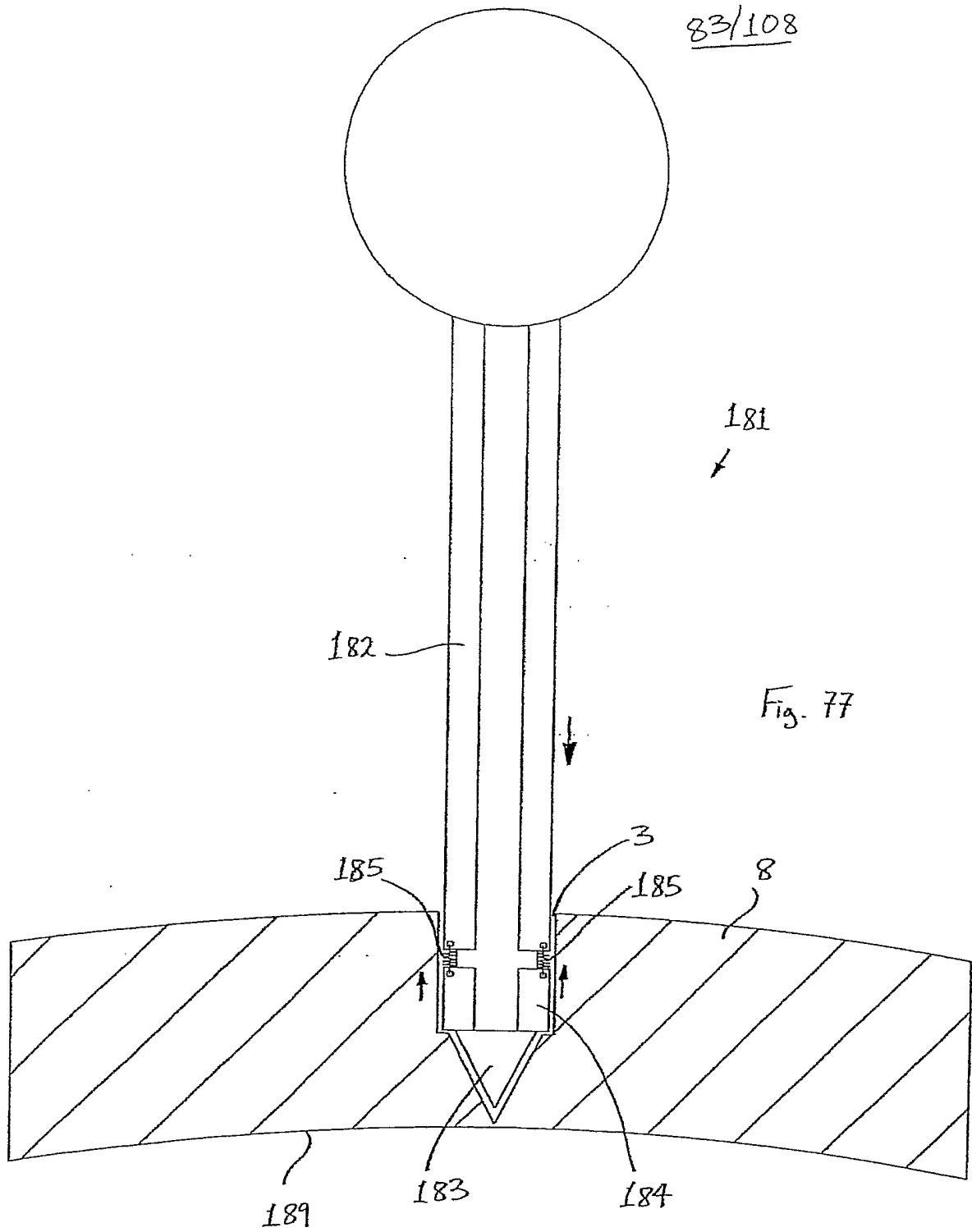
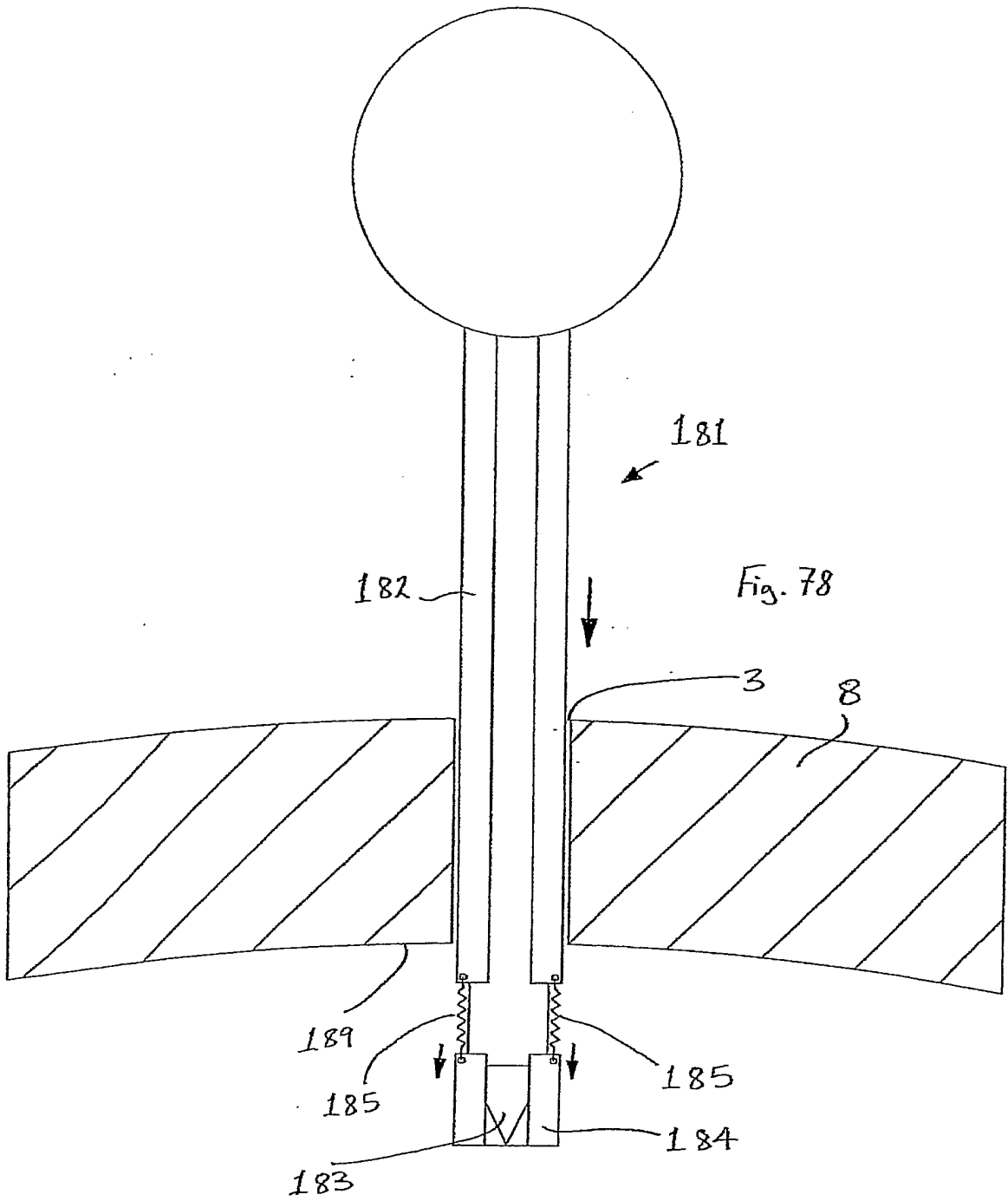
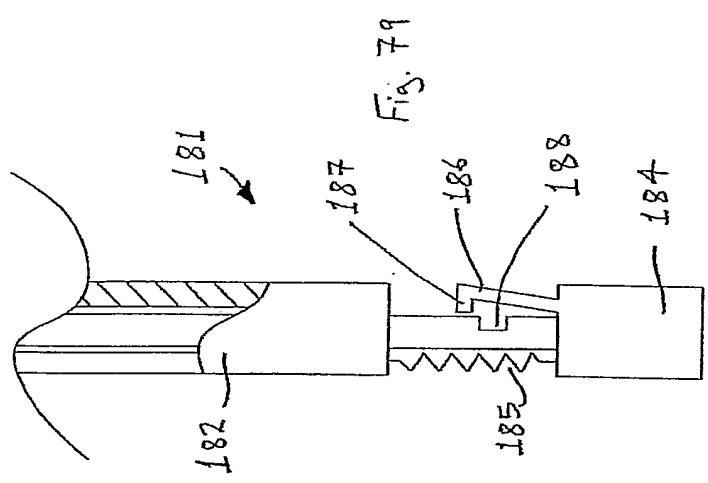
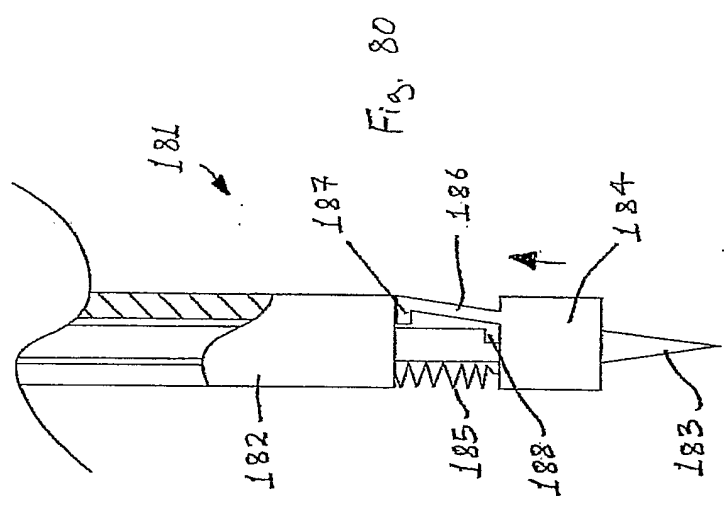
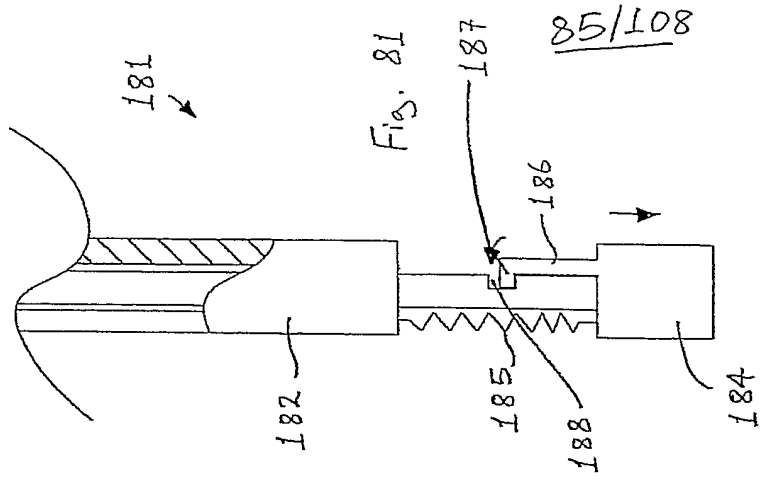


Fig. 76

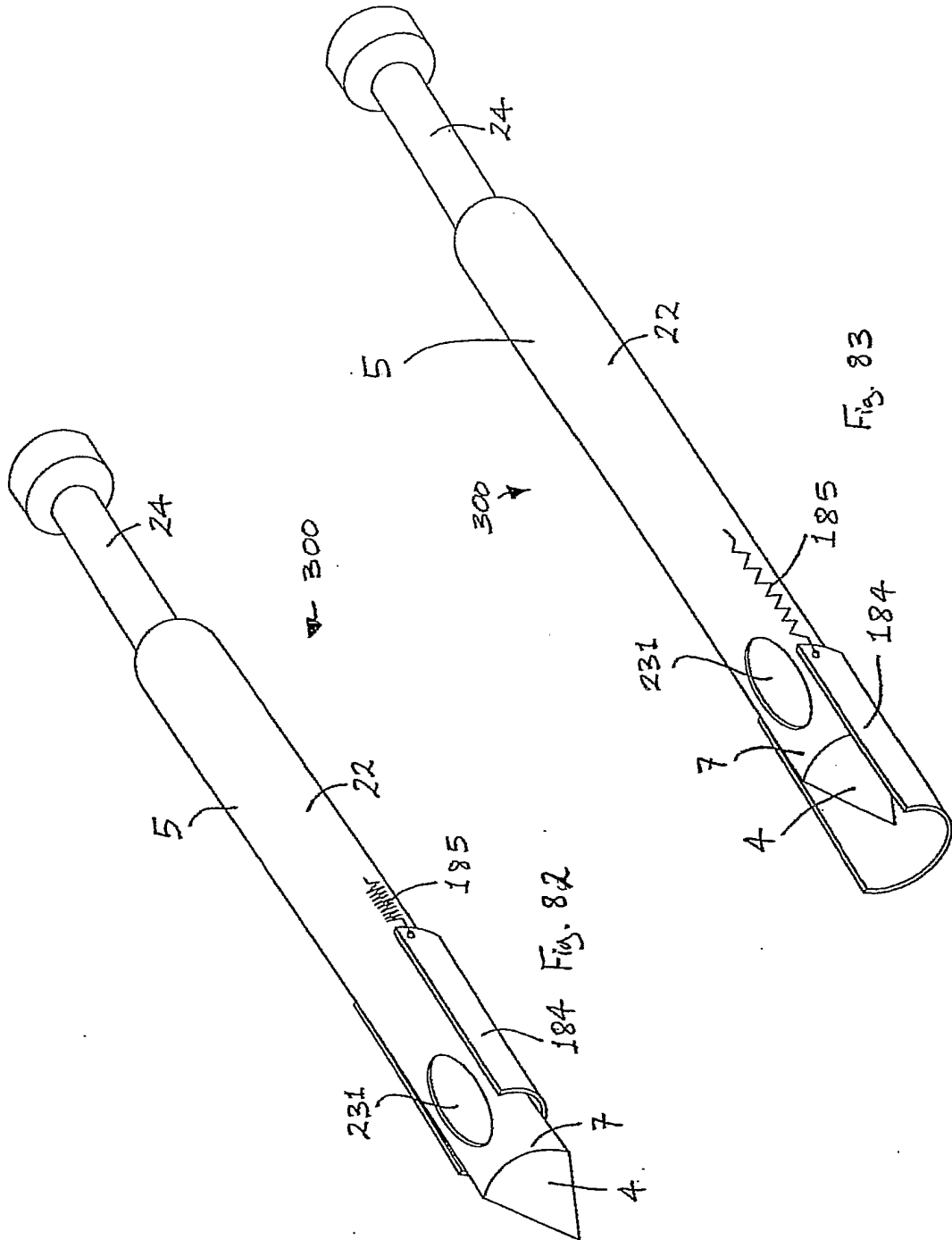


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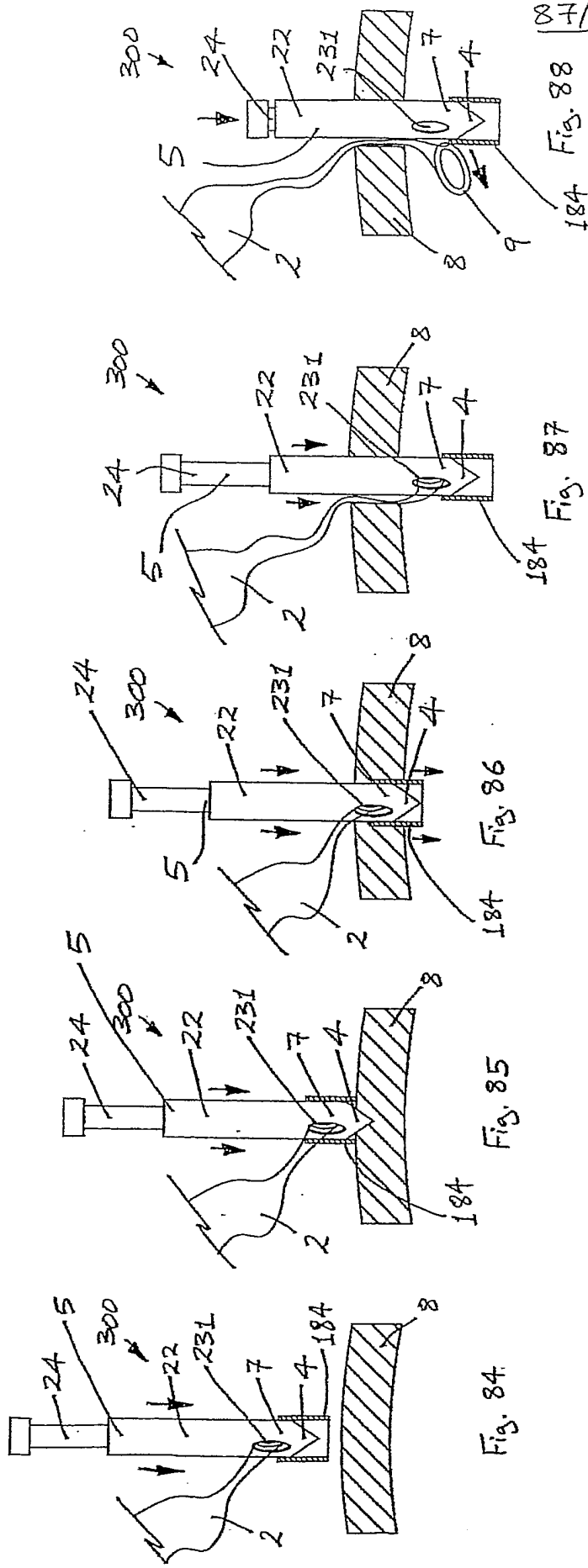


Fig. 84

Fig. 85

Fig. 86

Fig. 87

Fig. 88

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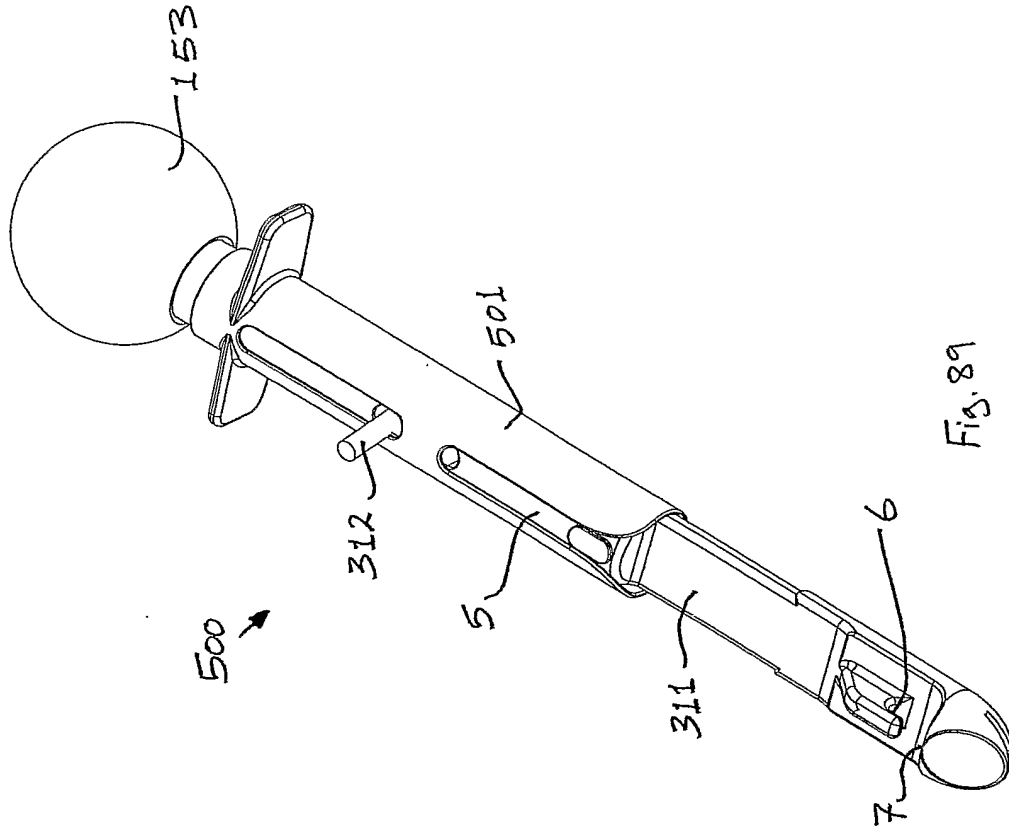


Fig. 89

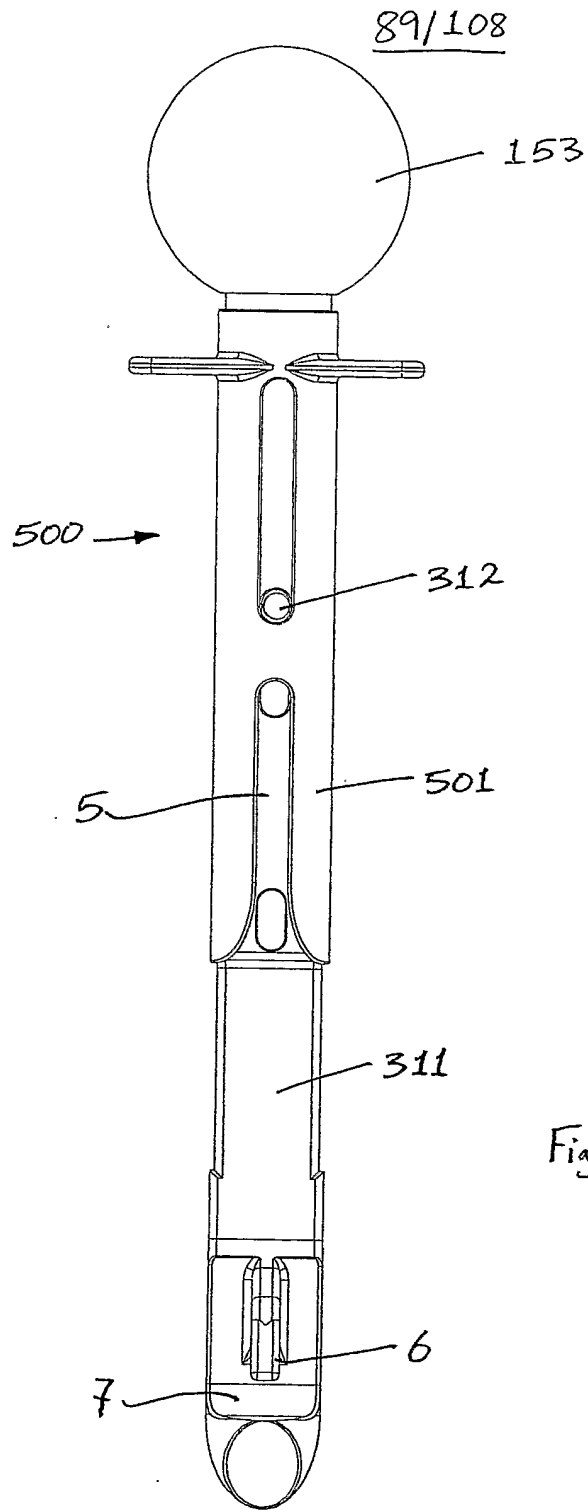
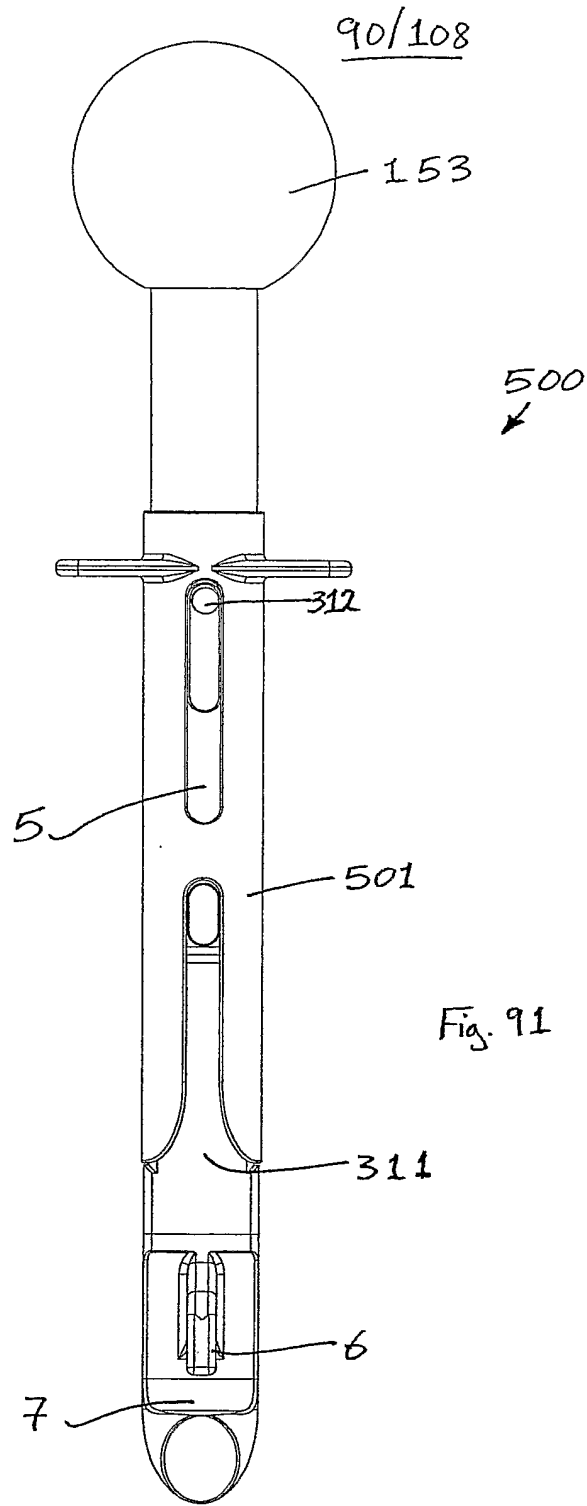


Fig. 90



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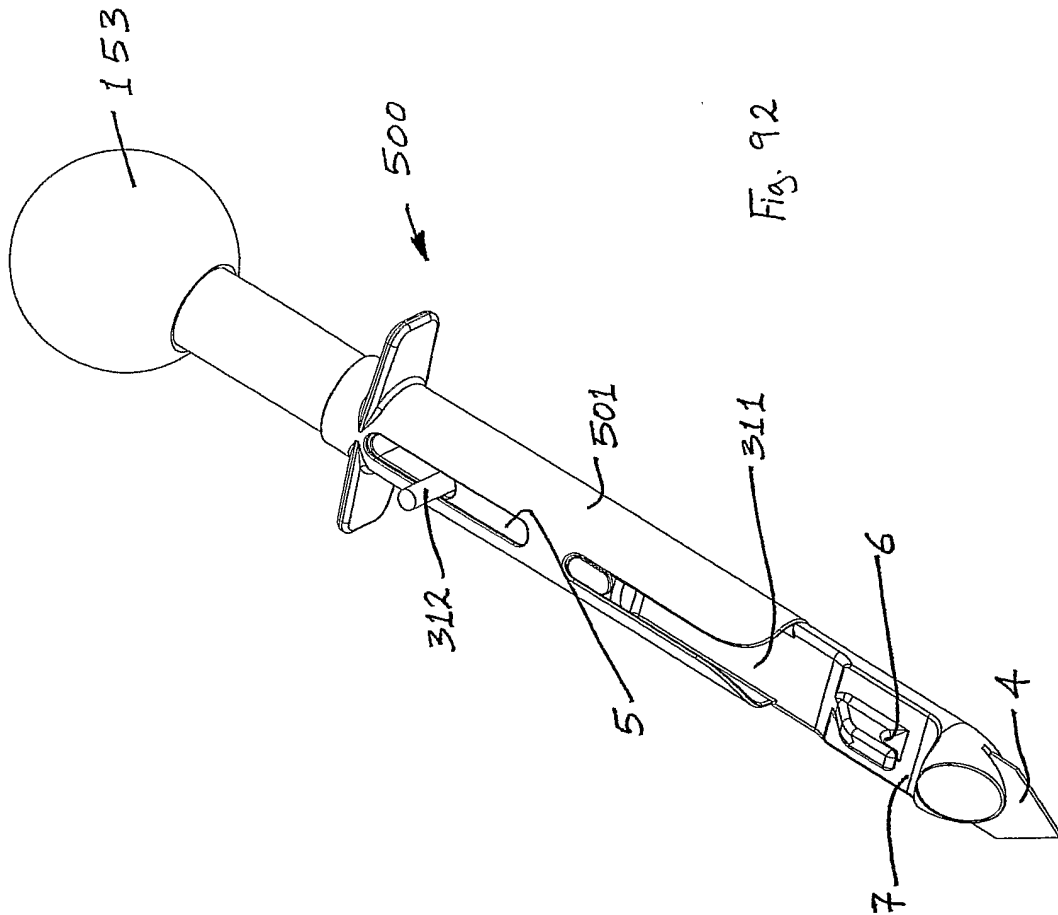


Fig. 92

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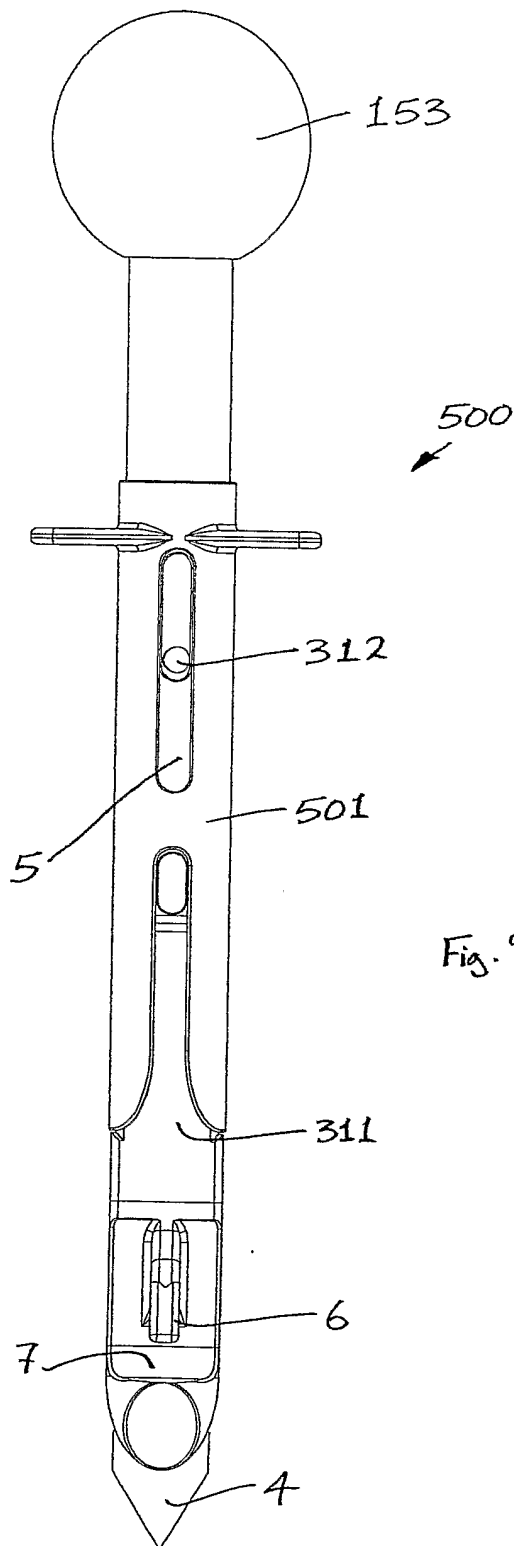


Fig. 93

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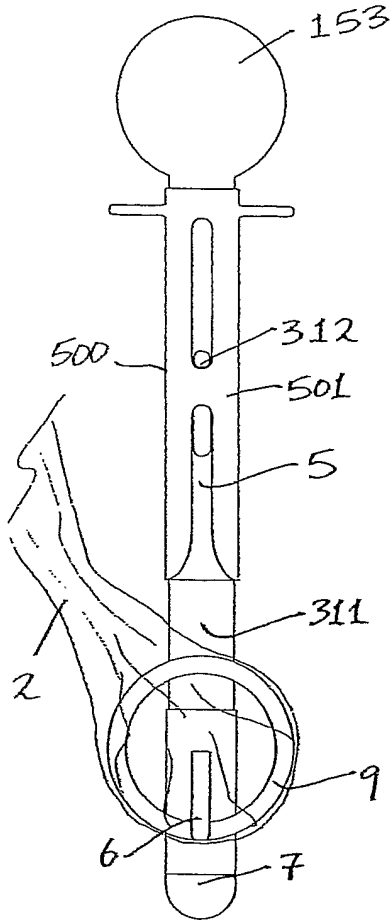


Fig. 94

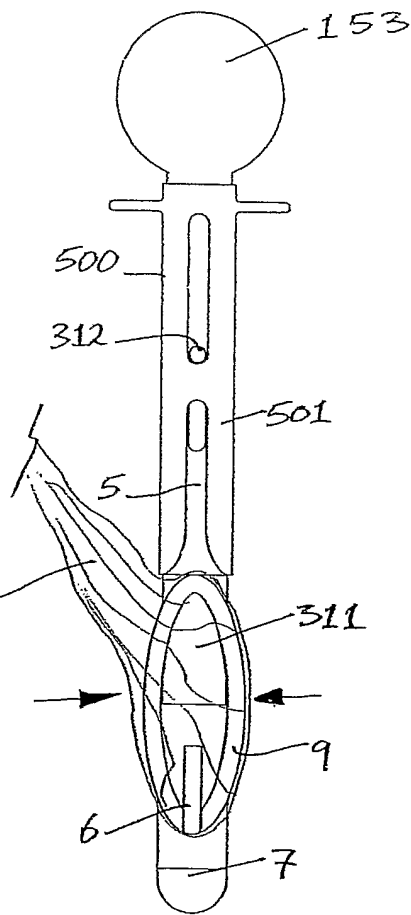


Fig. 95

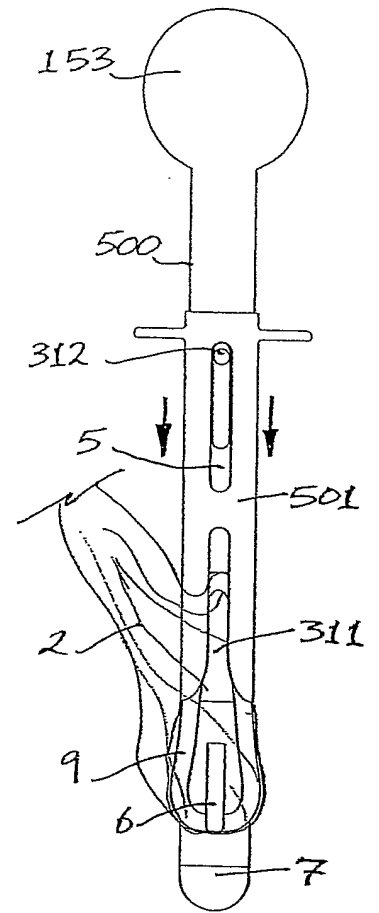


Fig. 96

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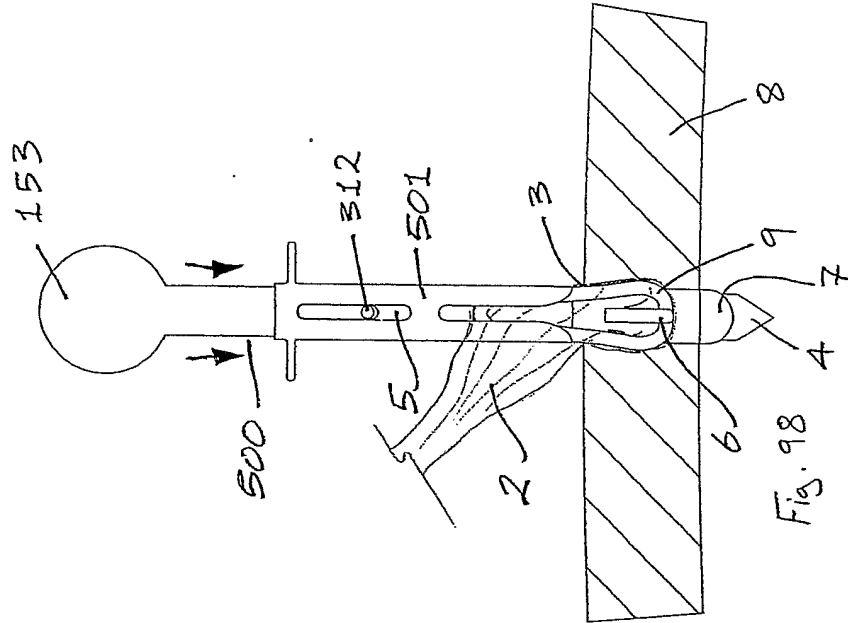


Fig. 98

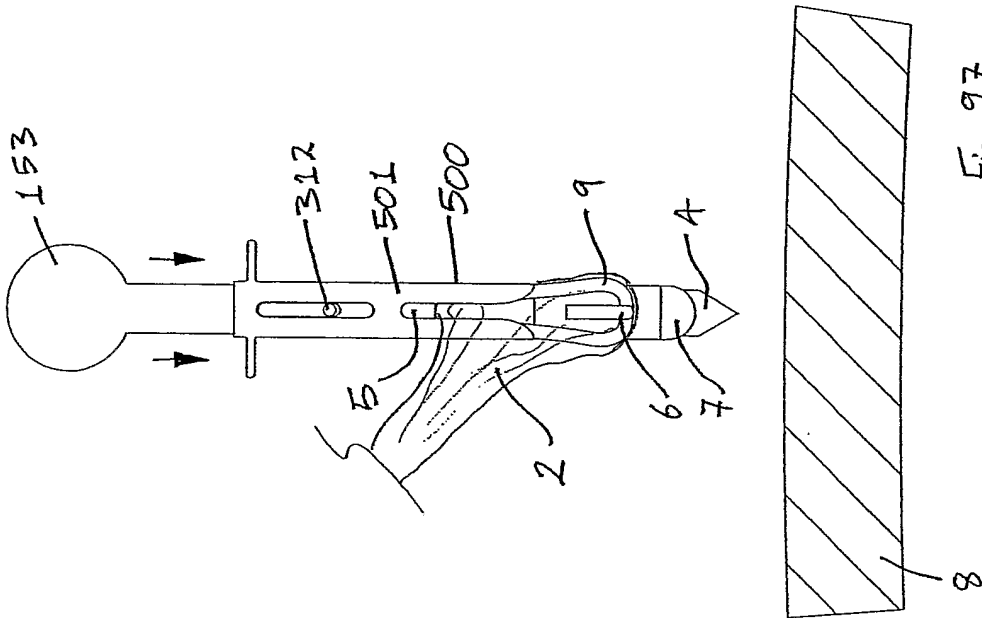


Fig. 97

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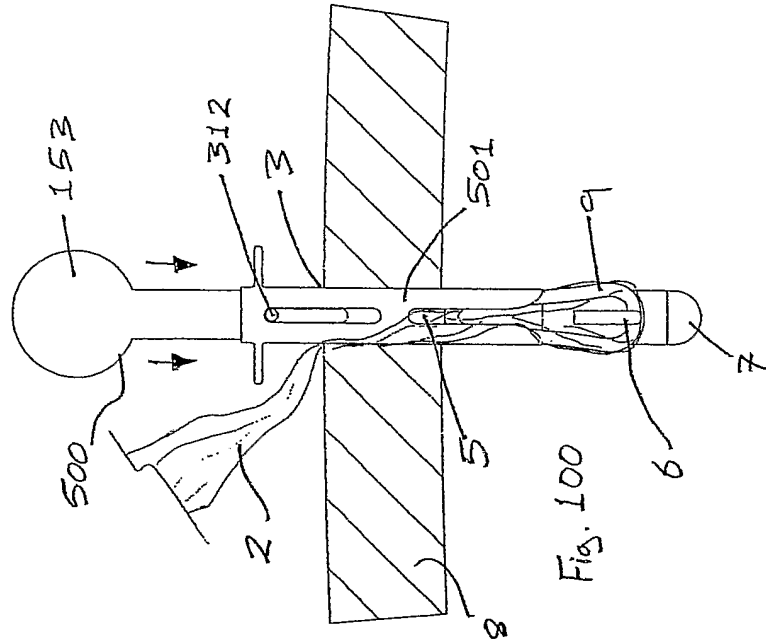


Fig. 100

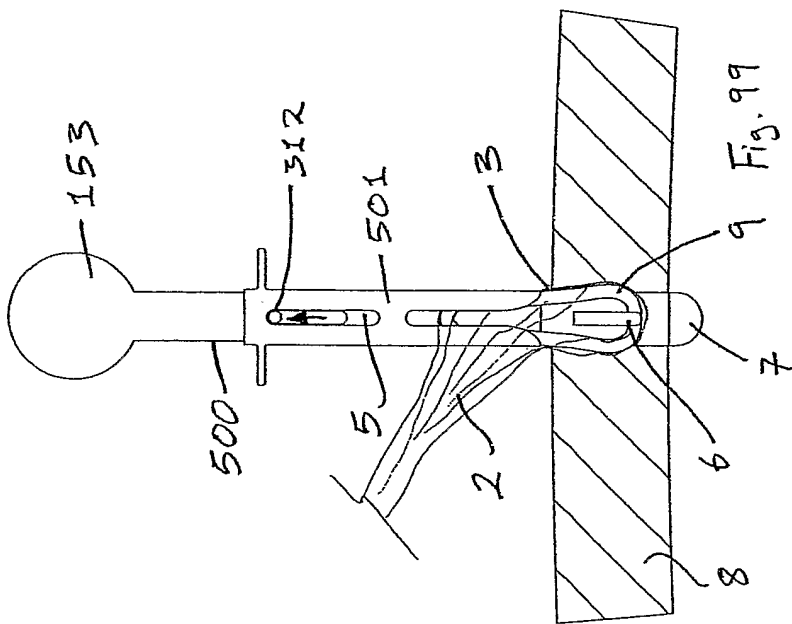
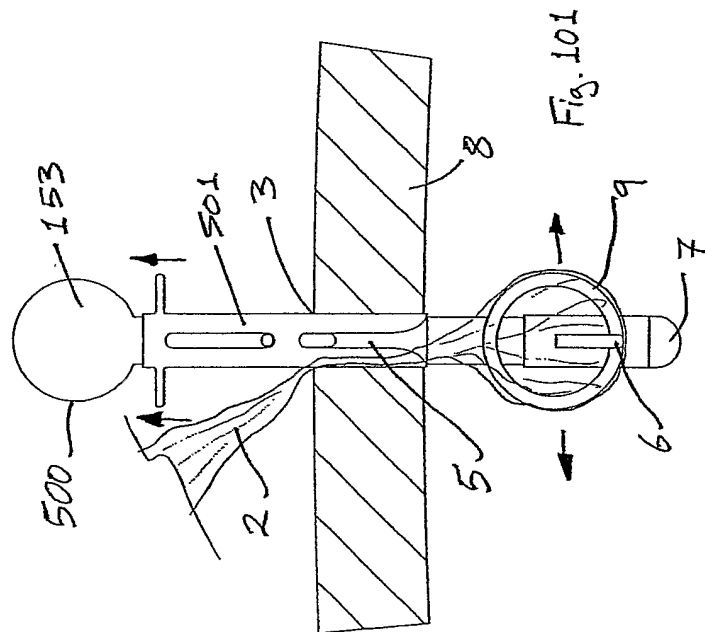
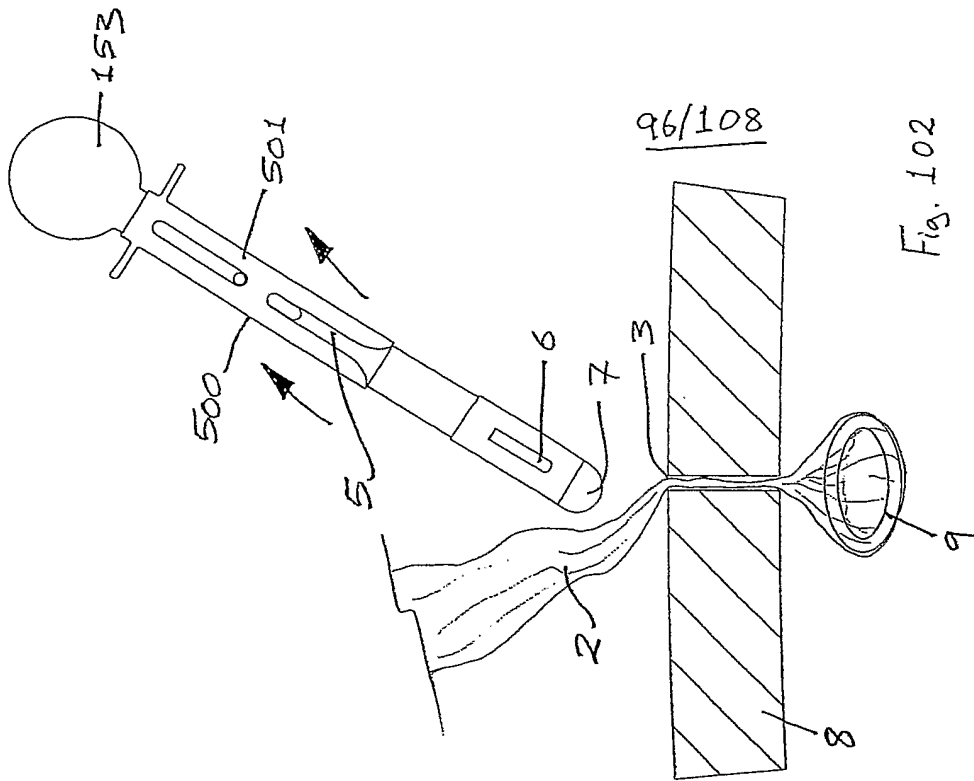


Fig. 99



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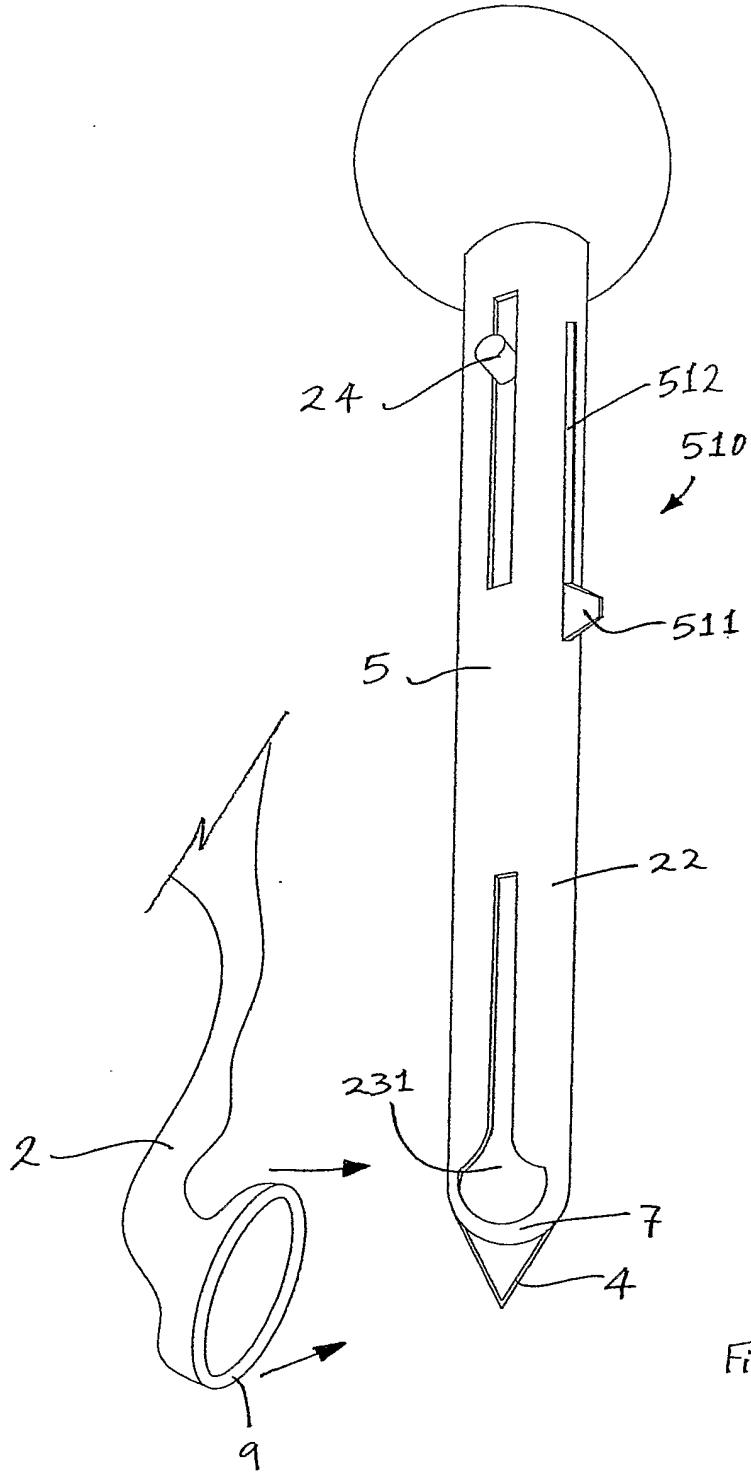


Fig.103

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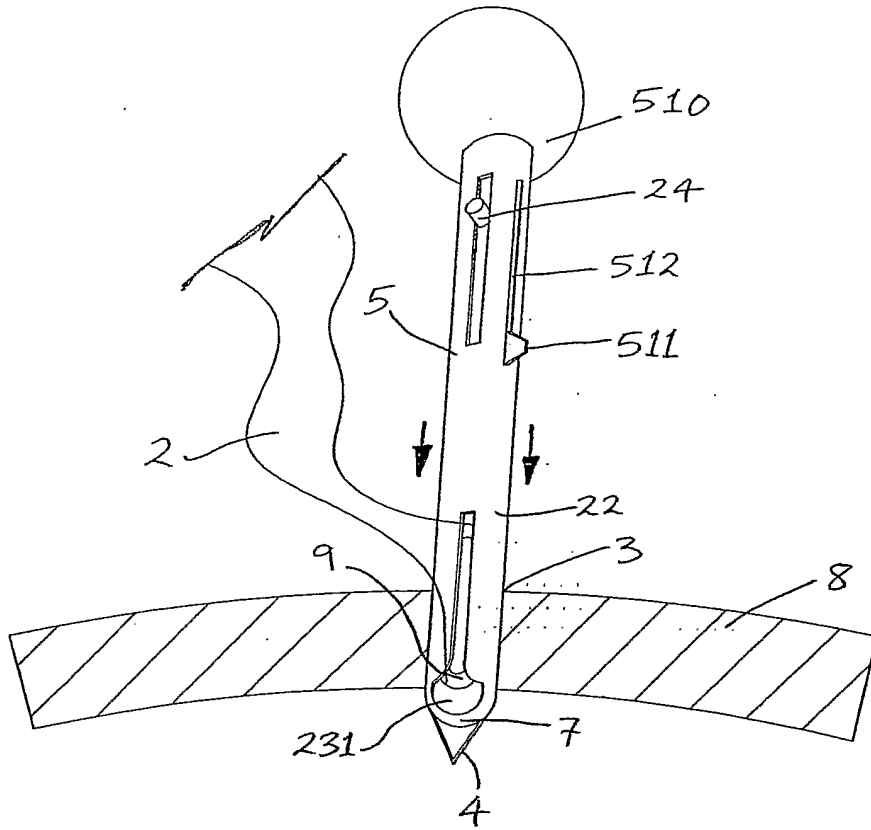


Fig. 104

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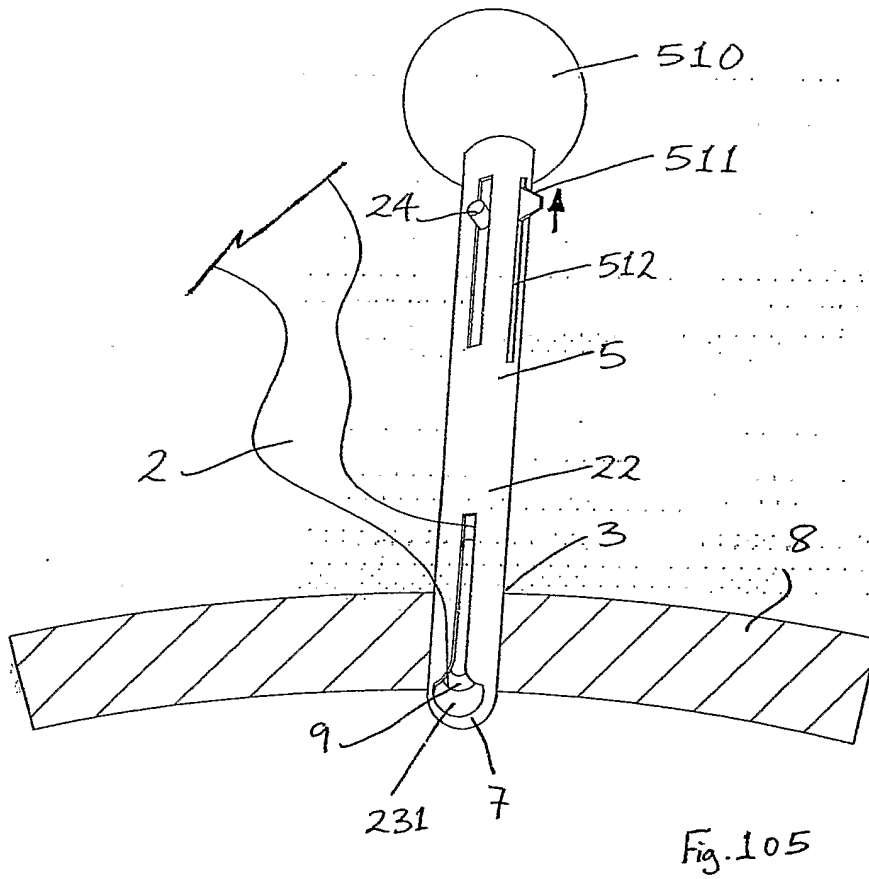
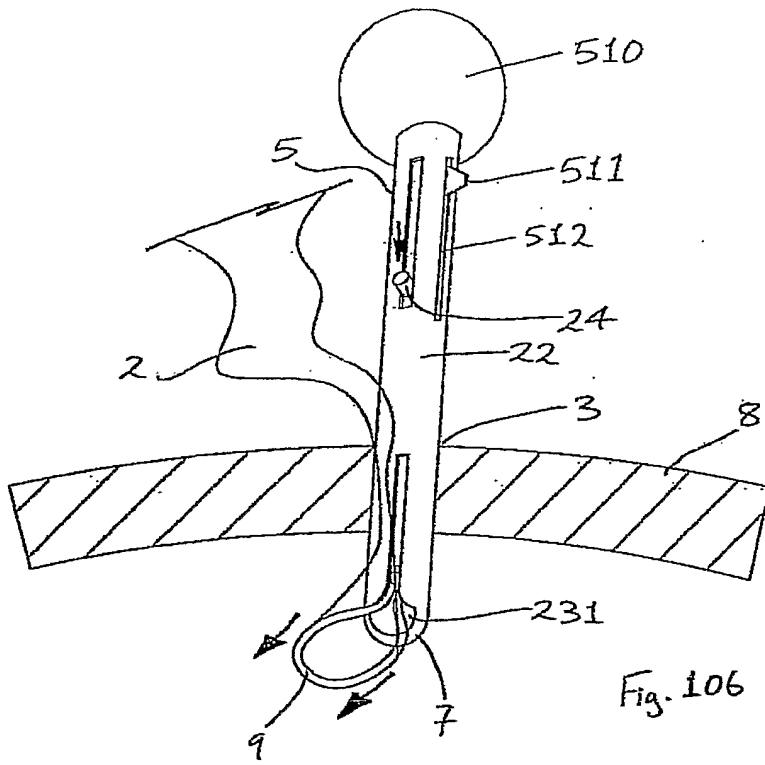


Fig. 105

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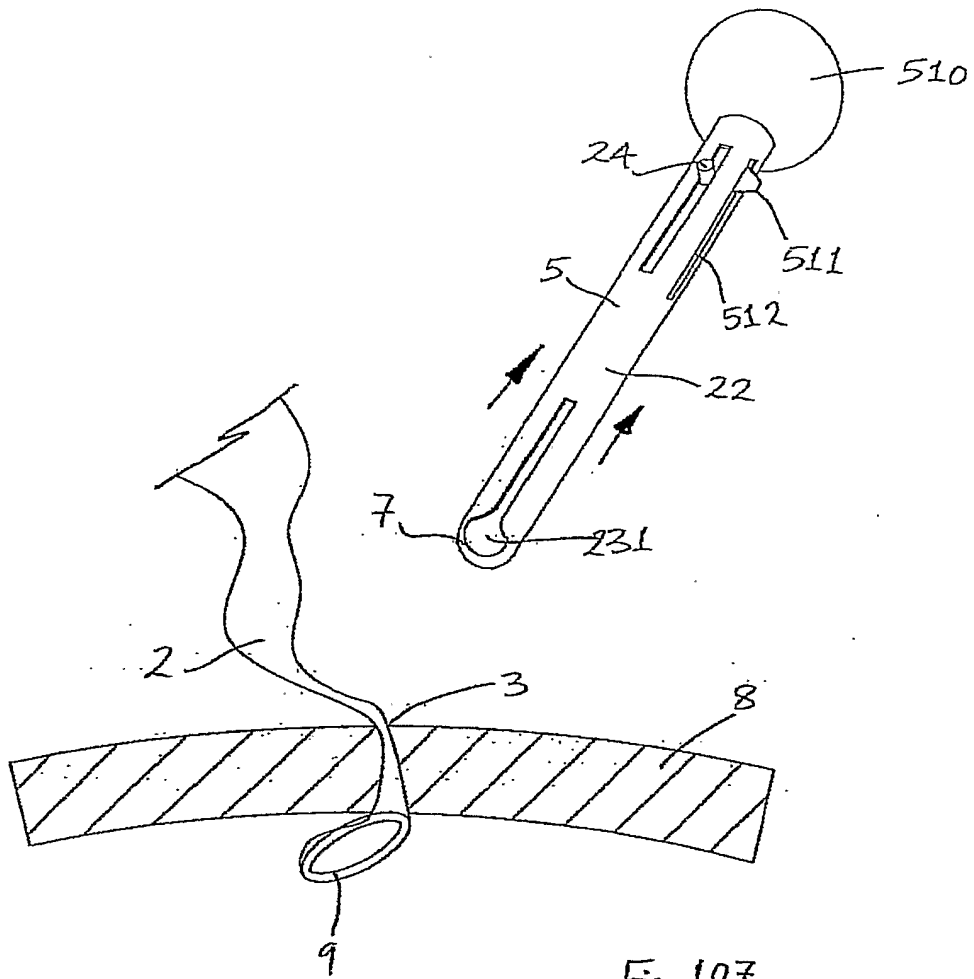
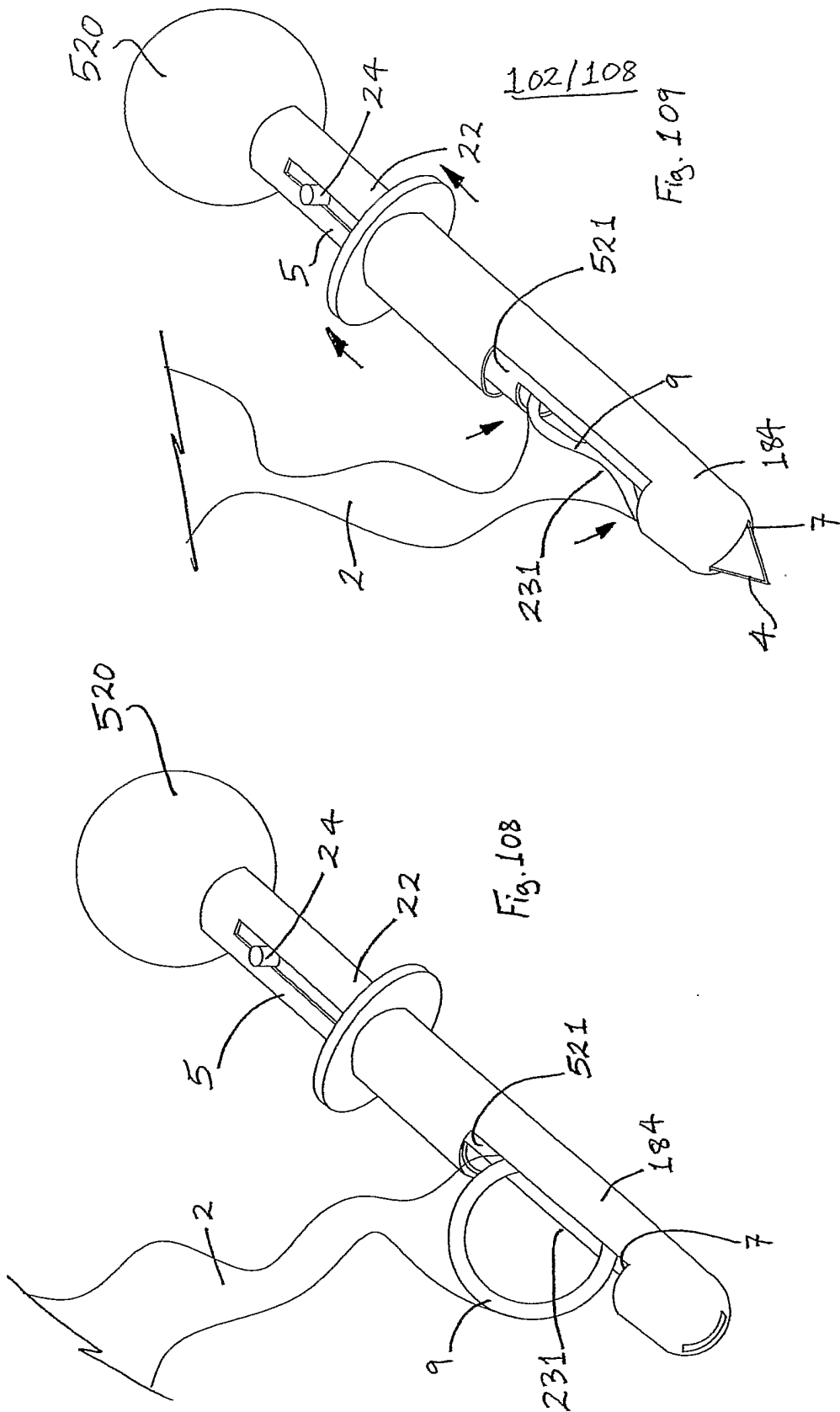
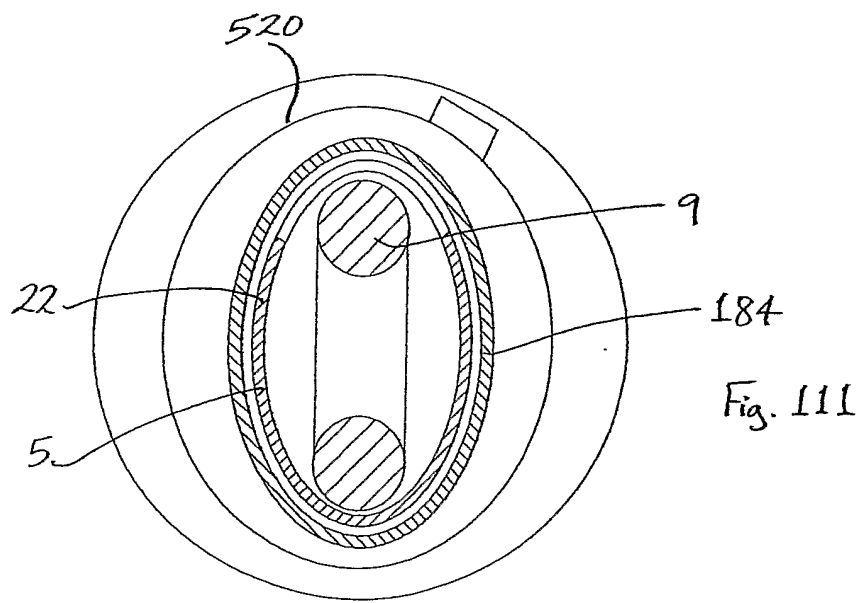
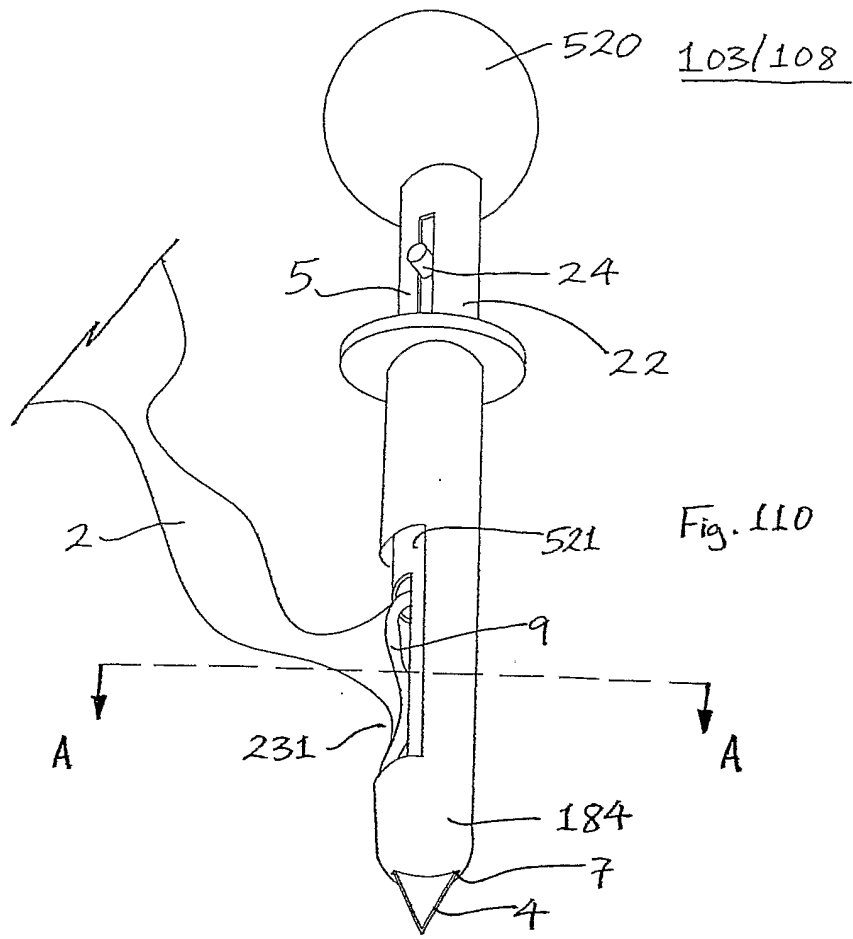


Fig. 107





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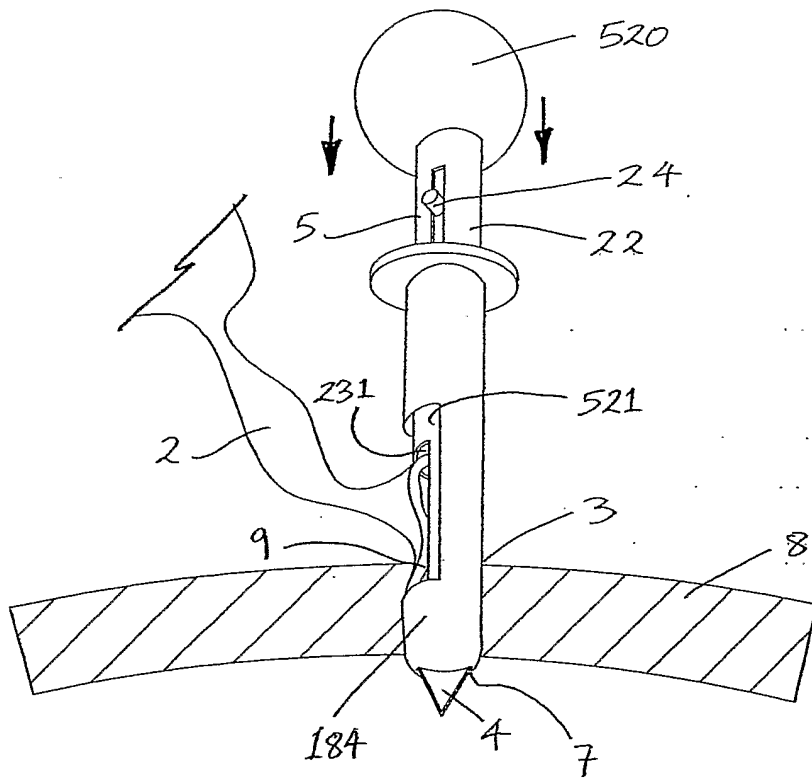


Fig. 112

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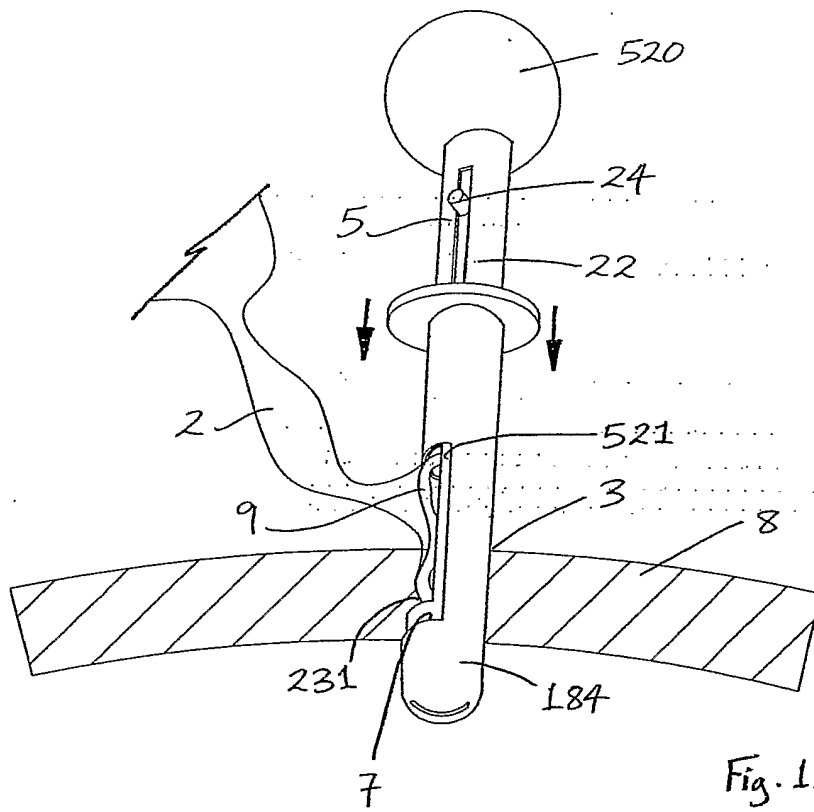
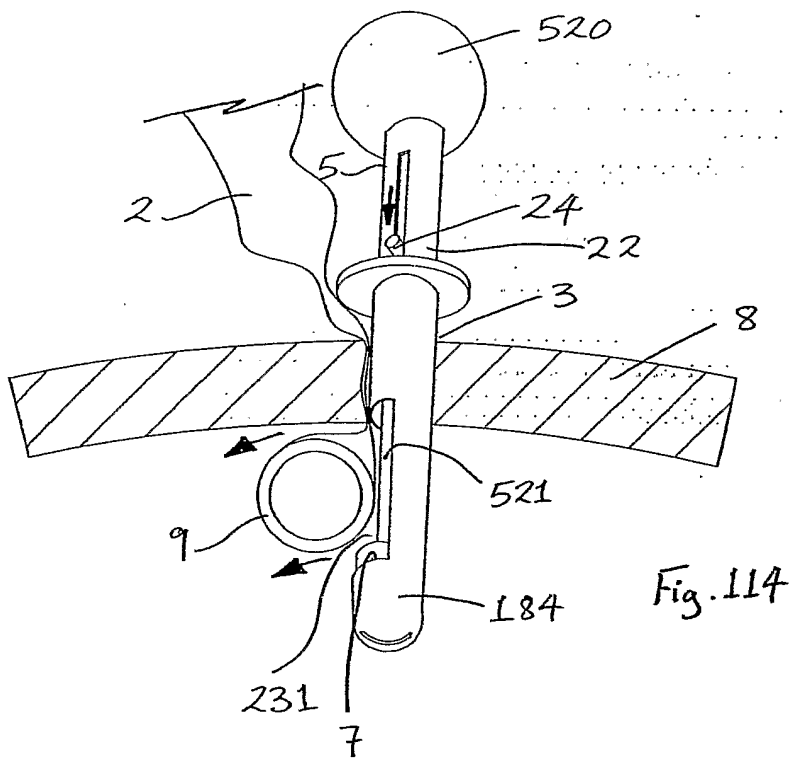


Fig. 113

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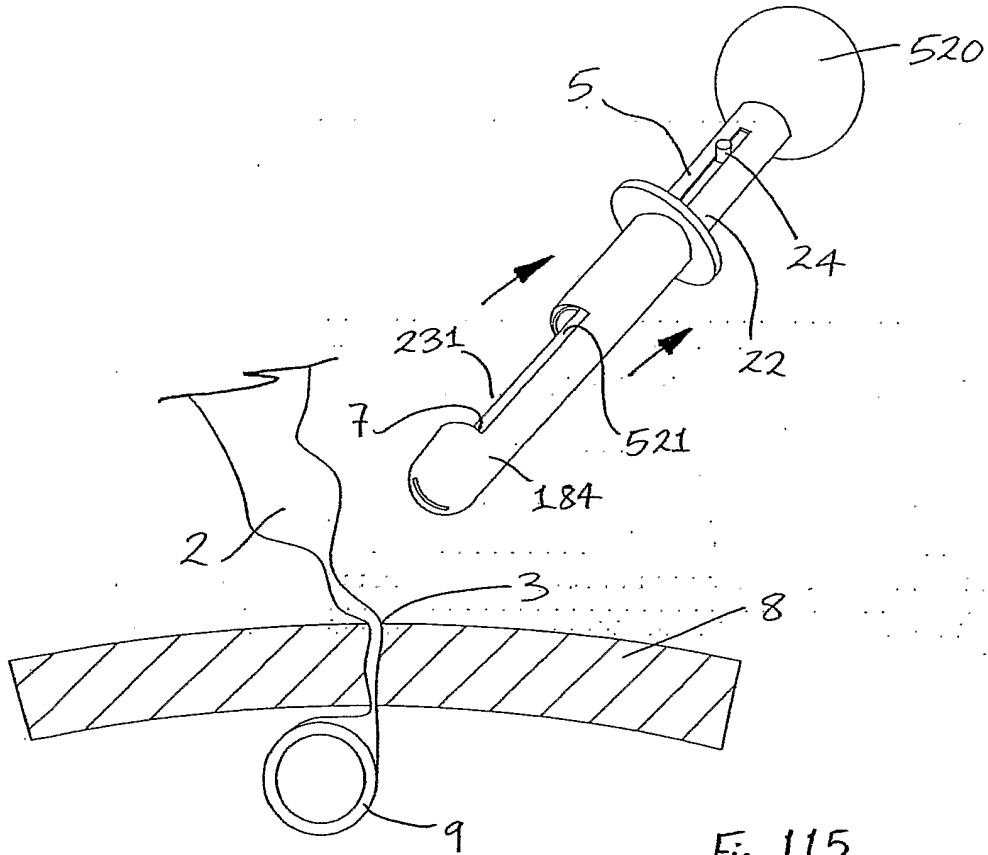
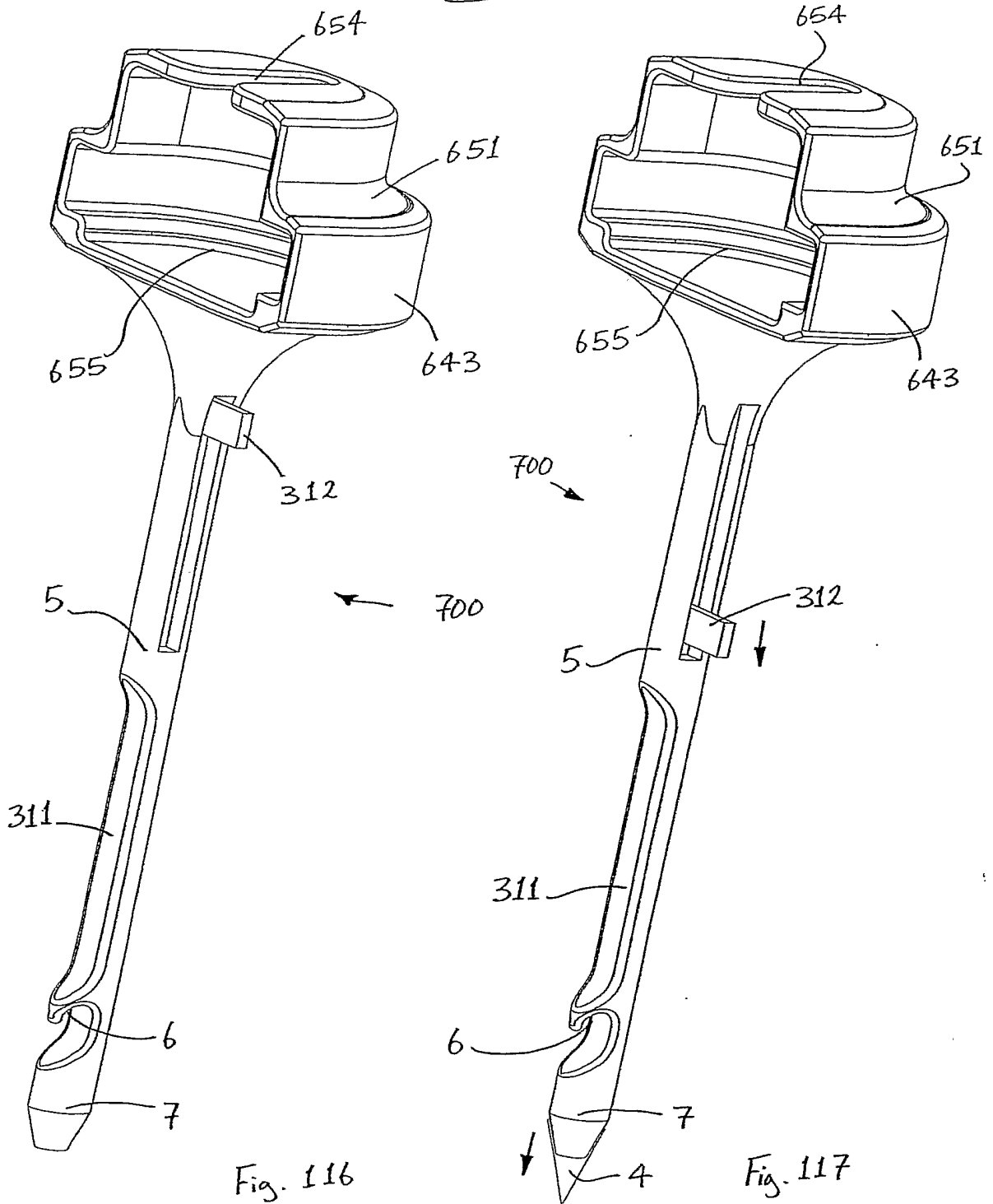


Fig. 115

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IE2006/000007

A. CLASSIFICATION OF SUBJECT MATTER INV. A61B17/34 A61B17/32 ADD. A61B17/06 A61B19/00 A61B18/04 A61B17/00 A61B17/28		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) A61B A61F		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2004/026153 A (ATROPOS LIMITED; BUTLER, JOHN; VAUGH, TREVOR; BONADIO, FRANK) 1 April 2004 (2004-04-01)	1-5, 126
X	page 13, line 28; page 17, lines 27-28; page 18	27-32, 36, 39, 43, 44
X	page 3, lines 1-8 - page 12, lines 16, 17; figures 15, 27, 31, 32, 34, 35, 43, 47	56-60, 62-65, 67-71, 77-80, 83, 84, 94, 172
X	----- US 5 817 111 A (RIZA ET AL) 6 October 1998 (1998-10-06)	1-6, 126
X	figures 2, 9, 26 -----	27-32
-/-		
<input checked="" 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 :		
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	Date of mailing of the international search report	
10 July 2006	18/07/2006	
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 Assion, J-C	

INTERNATIONAL SEARCH REPORT

International application No

PCT/IE2006/000007

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/009181 A1 (GELLMAN BARRY N ET AL) 9 January 2003 (2003-01-09) paragraphs [0252], [0253]; figures 13,23C,23E -----	1-6,126
X	US 2002/151954 A1 (BRENNEMAN RODNEY A) 17 October 2002 (2002-10-17)	1-3,126
X	figure 3 -----	27-32, 36,41,42
X	US 5 092 868 A (MEHDIAN ET AL) 3 March 1992 (1992-03-03) figures 9,10 -----	1-3,126
X	DE 199 15 061 A1 (ERBE ELEKTROMEDIZIN GMBH) 26 October 2000 (2000-10-26) figure 2 -----	1-3,126
X	US 2003/073883 A1 (STILES FRANK B) 17 April 2003 (2003-04-17)	1,27-32, 35,36, 38-42
X	paragraphs [0022], [0024]; figures 1,2 -----	56,57, 59,62, 64-68, 70,71, 77-79, 172
X	EP 1 500 382 A (MEDTRONIC VASCULAR CONNAUGHT) 26 January 2005 (2005-01-26) paragraphs [0076], [0082]; figures 11,12 -----	1,27-34, 36-42
X	US 2001/003791 A1 (BURBANK FRED H ET AL) 14 June 2001 (2001-06-14) paragraph [0062]; figures 5-7 -----	1,27-30, 33-44
X	US 5 395 309 A (TANAKA ET AL) 7 March 1995 (1995-03-07) column 4, lines 17-30; figures 1,7 -----	1,27-31, 33-44
X	US 5 904 699 A (SCHWEMBERGER.ET AL) 18 May 1999 (1999-05-18) abstract; figures 1,2,4,5 column 1, lines 26-49 - column 6, lines 29-37 -----	1,56-60, 62, 65-83, 85-96, 172-174
	----- -/--	

INTERNATIONAL SEARCH REPORT

International application No
PCT/IE2006/000007

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>WO 95/15123 A (LASER CENTERS OF AMERICA) 8 June 1995 (1995-06-08)</p> <p>-----</p> <p>page 16, lines 21-31; figure 12</p>	<p>1,56,57, 59,61, 62, 64-74, 77-82, 172</p>
A	<p>WO 01/54588 A (HEARTPORT, INC; GANNOE, JAMES, R; MOSHE, MEIR) 2 August 2001 (2001-08-02) column 7, lines 33,34; figure 2</p> <p>-----</p>	95-100
A	<p>US 2004/181246 A1 (HEPPLER J. SCOTT) 16 September 2004 (2004-09-16) abstract; figure 1</p> <p>-----</p>	60,65,69

Continuation of Box II.1

Claims Nos.: 130-169

Claims 130-169: Rule 39.1(iv) PCT - Method for treatment of the human or animal body by surgery

Continuation of Box II.2

Claims Nos.: 50,51,125,129

The present claims 50 and 51 encompass compounds defined only by their desired function, contrary to the requirements of clarity of Article 6 PCT, because the result-to-be-achieved type of definition does not allow the scope of the claim to be ascertained.

Present claims 125 and 129 do not disclose any clear technical feature, so that they encompass so many embodiments that a very large number of documents would be relevant to the issue of novelty.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IE2006/000007

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.: 130-169
because they relate to subject matter not required to be searched by this Authority, namely:
Claims 130-169: Rule 39.1(iv) PCT - Method for treatment of the human or animal body by surgery
2. Claims Nos.: 50, 51, 125, 129
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:

see additional sheet

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.:
1-6, 27-44, 56-100, 126, 172, 173, 174
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

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-6,126

conveying device having a distally facing hook

2. claims: 1,2,7-15,126

conveying device having a pivotable retaining element
obstructing the passageway

3. claims: 1,16-20,126

holder for a low-profile element

4. claims: 1,21-26,126

tensioning device for the surgical device

5. claims: 1,27-40,41-42,43,44,126

housing portion having openings

6. claims: 1,45-49,126

drawing element

7. claims: 1,52-53,101-102,111-112,126

conveying device having a maximum transverse dimension

8. claims: 1,54-55

apparatus having a blunt or round tip

9. claims: 1,56-100,126,172,173,174

opening device

10. claims: 1,103-110,124,126,170

guide device

11. claims: 1,113-124,126,171

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

removal device

12. claims: 1,126-128

wound retractor as a surgical instrument

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IE2006/000007

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 2004026153	A	01-04-2004	AU 2003273510 A1 EP 1610696 A1	08-04-2004 04-01-2006
US 5817111	A	06-10-1998	NONE	
US 2003009181	A1	09-01-2003	NONE	
US 2002151954	A1	17-10-2002	NONE	
US 5092868	A	03-03-1992	GB 2207055 A	25-01-1989
DE 19915061	A1	26-10-2000	WO 0059392 A1	12-10-2000
US 2003073883	A1	17-04-2003	NONE	
EP 1500382	A	26-01-2005	IE 20030539 A2 US 2005021124 A1	18-05-2005 27-01-2005
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