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RAPIDLY INSERTABLE CENTRAL CATHETERS, INTRODUCERS, AND INSERTION DEVICES INCLUDING COMBINATIONS AND METHODS THEREOF

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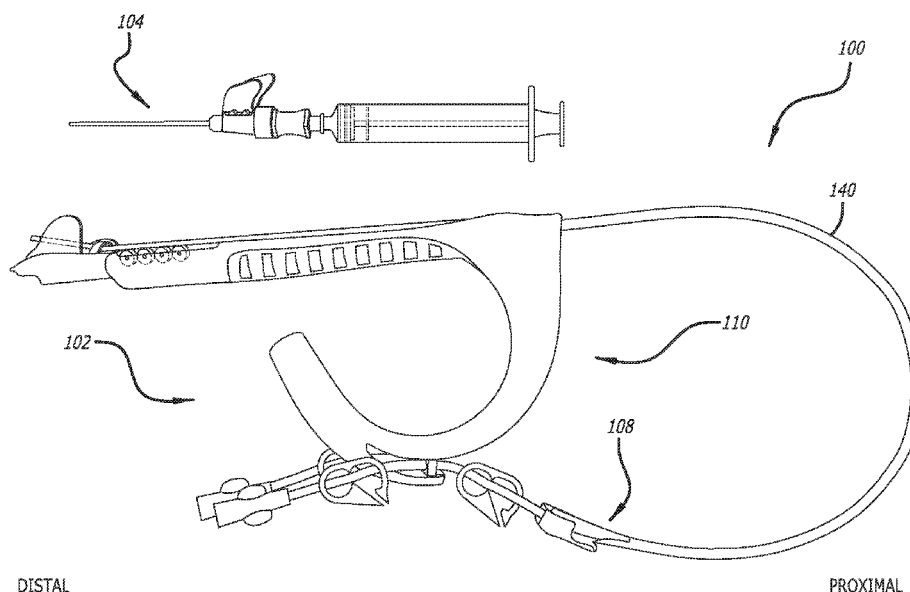


FIG. 1

(57) Abstract: Rapidly insertable central catheters ("RICCs"), introducers, and insertion devices including combinations and methods thereof are disclosed. For example, a RICC system can include an introducer and a RICC insertion assembly including a RICC assembly disposed in a RICC insertion device. The RICC assembly can include a RICC, an access guidewire, and a splittable casing over a catheter tube of the RICC and the access guidewire forming a longitudinal composite. The RICC insertion device can include a frame and a nose cover forming a split channel that splits away from a through channel of a nose of the frame. The RICC insertion device can be configured for advancing the RICC assembly by rolling the longitudinal composite across roller wheels disposed in the frame. The through channel can be configured for advancing the catheter tube therethrough while the split channel can be configured for both



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splitting and passing the splittable casing therethrough.

**RAPIDLY INSERTABLE CENTRAL CATHETERS, INTRODUCERS, AND
INSERTION DEVICES INCLUDING COMBINATIONS AND METHODS
THEREOF**

PRIORITY

[0001] This application claims the benefit of priority to U.S. Provisional Patent Application No. 63/191,207, filed May 20, 2021, and U.S. Provisional Patent Application No. 63/284,533, filed November 30, 2021, each of which is incorporated by reference in its entirety into this application.

BACKGROUND

[0002] Central venous catheter ("CVCs") are commonly introduced into patients and advanced through their vasculatures by way of the Seldinger technique. The Seldinger technique utilizes a number of steps and medical devices (e.g., a needle, a scalpel, a guidewire, an introducer sheath, a dilator, a CVC, etc.). While the Seldinger technique is effective, the number of steps are time consuming, handling the number of medical devices is awkward, and both of the foregoing can lead to patient trauma. In addition, there is a relatively high potential for touch contamination due to the number of medical devices that need to be interchanged during the number of steps of the Seldinger technique. As such, there is a need to reduce the number of steps and medical devices involved in introducing a catheter such as a CVC into a patient and advancing the catheter through a vasculature thereof.

[0003] Disclosed herein are rapidly insertable central catheters ("RICCs"), introducers, and insertion devices including combinations and methods thereof that address the foregoing.

[0003A] Any discussion of documents, acts, materials, devices, articles or the like which has been included in the present specification is not to be taken as an admission that any or all of these matters form part of the prior art base or were common general knowledge in the field relevant to the present disclosure as it existed before the priority date of each of the appended claims.

SUMMARY

[0004] Disclosed herein is a RICC insertion system including a RICC assembly, a RICC insertion device, and an introducer. The RICC assembly includes a RICC, an access guidewire, and a keeper. The RICC includes a catheter tube, a catheter hub coupled to a proximal portion of the catheter tube, and one or more extension legs. Each extension leg of the one-or-more extension legs is coupled to the catheter hub by a distal portion thereof. The access guidewire is disposed in a primary lumen of the RICC. The keeper includes a splittable casing over both the catheter tube and a distal portion of the access guidewire extending from a distal end of the RICC forming a longitudinal composite thereof. The RICC insertion device includes a frame, one or more roller wheels, and a nose cover over a nose of the frame. The frame includes a longitudinal handle, the nose, and a curved cradle. The handle includes a wheel well. The nose extends from a distal portion of the handle distal of the wheel well. The nose includes a through channel configured for advancing the catheter tube of the RICC therethrough. The cradle extends from a proximal portion of the handle. The one-or-more roller wheels are disposed in the wheel well. The nose cover and nose form a split channel configured for both splitting and passing the splittable casing therethrough. The RICC insertion device is configured for advancing the RICC assembly from an initial position in the frame to a final position in the frame. This is accomplished by repeatedly pushing the longitudinal composite into the one-or-more roller wheels and rolling the longitudinal composite across the one or more roller wheels.

[0005] In some embodiments, the keeper further includes a catheter-hub holder to which a proximal end of the splittable casing is attached. The catheter-hub holder is configured to hold the catheter hub therein as well as keep the splittable casing in position over the catheter tube and the access guidewire.

[0006] In some embodiments, the catheter-hub holder includes a perimetrical wall around at least a portion of a perimeter of the catheter-hub holder. The perimetrical wall defines a recess into which the catheter hub fits with an engineering fit.

[0007] In some embodiments, the cradle includes a curved extension over a distal portion of the cradle. The extension substantially follows a same curve as the cradle.

[0008] In some embodiments, the cradle includes an enclosure over the distal portion of the cradle with the extension extending therefrom. The enclosure is configured to enclose therein an otherwise exposed proximal portion of the access guidewire in the initial position of the RICC assembly in the frame.

[0009] In some embodiments, the RICC insertion device further includes a retaining clip. The retaining clip is configured to clip on to a proximal portion of the RICC and retain the RICC assembly in the RICC insertion device. The retaining clip is also configured to keep the catheter tube from prematurely advancing over the access guidewire. The retaining clip includes a post configured to engage with a slot in the extension that faces an open face of the cradle.

[0010] In some embodiments, the retaining clip is configured to disengage with the slot in the extension when any remaining slack of the longitudinal composite is removed upon advancing the RICC assembly from the initial position to the final position in the frame.

[0011] In some embodiments, the frame further includes a retaining arch over the cradle proximate the proximal portion of the handle from which the cradle extends. The retaining arch is configured to retain the RICC assembly in the RICC insertion device. The retaining arch is also configured to hold the longitudinal composite over the handle as the RICC assembly transitions over the proximal portion of the handle from which the cradle extends upon advancing the RICC assembly from the initial position to the final position in the frame.

[0012] In some embodiments, the nose cover and the nose further form a retaining clamp configured to slidably clamp the longitudinal composite therein. The nose cover is rotatable over the nose. The nose cover includes a longitudinal gap configured to rotatably align with the through channel in the nose for removal of the longitudinal composite, the splittable casing, or the catheter tube therefrom.

[0013] In some embodiments, the RICC insertion device further includes a retractable nicking blade. The retractable nicking blade is disposed in a nicking-blade carriage slidably integrated into the nose. The nicking-blade carriage has a nicking position with the retractable nicking blade extending beyond a distal end of the nose. The nicking-blade carriage also has a safety position with the retractable nicking blade short of the distal end of the nose.

[0014] In some embodiments, the introducer includes an introducer needle and a splittable introducer sheath. The introducer needle includes a needle shaft and a needle hub. The needle shaft includes a needle tip in a distal portion of the needle shaft. The needle hub is coupled to a proximal portion of the needle shaft. The introducer sheath is configured to accept therein the introducer needle. The introducer sheath includes a splittable sheath body and a splittable sheath hub coupled to a proximal portion of the sheath body. The sheath hub includes a pair of outwardly extending wings along a length of the sheath hub. The wings

have an internal angle of about 90° or less between the wings. The wings are configured for splitting the sheath hub by pinching the wings together with a single hand.

[0015] In some embodiments, the sheath hub includes a single longitudinal fault along a side of the sheath hub opposite a vertex of the internal angle formed by the wings. The sheath hub is configured to split along the fault for propagation along a same side of the sheath body when the wings are pinched together.

[0016] In some embodiments, the sheath hub includes a pair of longitudinal faults including a primary fault and a secondary fault. The primary fault extends along a primary side of the sheath hub opposite a vertex of the internal angle formed by the wings. The secondary fault extends along a secondary side of the sheath hub opposite the primary fault. The sheath hub is configured to split along the primary fault for propagation along the primary side of the sheath body when the wings are pinched together. The sheath hub is also configured to split along the secondary fault for propagation along the secondary side of the sheath body when the wings are pulled apart.

[0017] In some embodiments, the sheath hub further includes a valved cap disposed in a proximal portion of the sheath hub. The valved cap includes a tapered female valved-cap connector and a septum distal of a proximal opening in the female valved-cap connector. The female valved-cap connector is configured to accept therein a tapered male needle-hub connector extending from a distal portion of the needle hub. The septum is configured to accept therethrough the needle shaft.

[0018] In some embodiments, the valved cap is partially or fully split such that the valved cap splits with the sheath hub when the wings are pinched together.

[0019] In some embodiments, the sheath hub further includes an overmolded nicking blade and a hinged nicking-blade cover. The overmolded nicking blade distally extends from the sheath hub. The nicking-blade cover has an opened state with the nicking-blade cover opened away from the overmolded nicking blade. The nicking-blade cover also has a closed state with the nicking-blade cover closed over the overmolded nicking blade.

[0020] In some embodiments, the introducer further includes a syringe. The syringe includes a tapered male syringe tip extending from a distal portion of the syringe. The syringe tip is configured to insert into a tapered female needle-hub connector in a proximal portion of the needle hub.

[0021] Also disclosed herein is a RICC insertion assembly including, in some embodiments, a RICC assembly and a RICC insertion device. The RICC assembly includes a

RICC, an access guidewire, and a keeper. The RICC includes a catheter tube, a catheter hub coupled to a proximal portion of the catheter tube, and one or more extension legs. Each extension leg of the one-or-more extension legs is coupled to the catheter hub by a distal portion thereof. The access guidewire is disposed in a primary lumen of the RICC. The keeper includes a splittable casing over both the catheter tube and a distal portion of the access guidewire extending from a distal end of the RICC forming a longitudinal composite thereof. The RICC insertion device includes a frame, one or more roller wheels, and a nose cover over a nose of the frame. The frame includes a longitudinal handle, the nose, and a curved cradle. The handle includes a wheel well. The nose extends from a distal portion of the handle distal of the wheel well. The nose includes a through channel configured for advancing the catheter tube of the RICC therethrough. The cradle extends from a proximal portion of the handle. The one-or more roller wheels are disposed in the wheel well. The nose cover and nose form a split channel configured for both splitting and passing the splittable casing therethrough. The RICC insertion device is configured for advancing the RICC assembly from an initial position in the frame to a final position in the frame. This is accomplished by repeatedly pushing the longitudinal composite into the one-or-more roller wheels and rolling the longitudinal composite across the one-or-more roller wheels.

[0022] In some embodiments, a distal end of the longitudinal composite, the splittable casing, or the access guidewire is substantially commensurate with a distal end of the frame in the initial position of the RICC assembly in the frame.

[0023] In some embodiments, a slack loop of the longitudinal composite extends away from both the handle and the cradle in the initial position of the RICC assembly in the frame.

[0024] In some embodiments, the longitudinal composite is substantially split in the final position of the RICC assembly in the frame.

[0025] In some embodiments, a proximal end of an extension leg or a Luer connector coupled to the extension leg of the one-or-more extension legs of the RICC is substantially commensurate with a proximal end of the cradle in the initial position of the RICC assembly in the frame.

[0026] In some embodiments, a proximal end of the access guidewire is coupled to the proximal end of the cradle in the initial position of the RICC assembly in the frame.

[0027] In some embodiments, the one-or-more extension legs of the RICC lie substantially over the handle in the final position of the RICC assembly in the frame.

[0028] In some embodiments, the catheter hub of the RICC lies over the wheel well in the final position of the RICC assembly in the frame.

[0029] Also disclosed herein is a method for inserting a RICC into a blood-vessel lumen of a patient. The method includes, in some embodiments, an obtaining step, a needle tract-establishing step, an introducer needle-removing step, an access guidewire-advancing step, an introducer sheath-removing step, and a catheter tube-advancing step. The obtaining step includes obtaining a RICC insertion system. The RICC insertion system includes an introducer, a RICC insertion device, and a RICC assembly including the RICC. The RICC assembly is optionally already disposed in the RICC insertion device in a substantially ready to- operate state of a RICC insertion assembly. The needle tract-establishing step includes establishing a needle tract from an area of skin into the blood-vessel lumen of the patient with an introducer needle of the introducer. The introducer needle is disposed in a splittable introducer sheath of the introducer for the establishing of the needle tract. The introducer needle-removing step includes removing the introducer needle from the introducer sheath leaving the introducer sheath in the blood-vessel lumen. The access guidewire-advancing step includes advancing an access guidewire through a nose and nose cover of the RICC insertion device, through a splittable sheath hub of the introducer, through the introducer sheath, and into the blood-vessel lumen. The access guidewire-advancing step is accomplished, in part, by splitting a splittable casing away from a longitudinal composite of the RICC assembly. A distal portion of the access guidewire that extends from a primary-lumen aperture of a catheter tube of the RICC is freed from the longitudinal composite with the splitting of the splittable casing for the advancing of the access guidewire. The introducer sheath-removing step includes removing the introducer sheath leaving the access guidewire in the blood-vessel lumen. The catheter tube-advancing step includes advancing the catheter tube over the access guidewire and into the blood-vessel lumen. The catheter tube-advancing step is accomplished, in part, by further splitting the splittable casing away from the longitudinal composite of the RICC assembly. The catheter tube is freed from the longitudinal composite with the splitting of the splittable casing, which allows the catheter tube to be advanced over the access guidewire upon removal of any remaining slack of the longitudinal composite in the RICC insertion assembly.

[0030] In some embodiments, needle tract-establishing step includes ensuring blood flashes back into a needle hub of the introducer needle for confirmation the needle tract extends into the blood-vessel lumen.

[0031] In some embodiments, the method further includes a blood-aspirating step. The blood-aspirating step includes aspirating blood with a syringe coupled to the introducer

needle for confirmation the needle tract extends into the blood-vessel lumen. The blood-aspirating step is performed before the introducer needle-removing step.

[0032] In some embodiments, the method further includes an introducer sheath advancing step. The introducer sheath-advancing step includes advancing the introducer sheath over the introducer needle and farther into the blood-vessel lumen. The introducer sheath advancing step is performed before the introducer needle-removing step.

[0033] In some embodiments, the method further includes a connector-connecting step. The connector-connecting step includes inserting a male nose connector of the nose of the RICC insertion device into a female valved-cap connector of the sheath hub of the introducer sheath. The connector-connecting step is performed before the access guidewire-advancing step.

[0034] In some embodiments, the method further includes a skin-nicking step. The skin-nicking step includes nicking the area of skin around the needle tract with a nicking blade extending from the sheath hub. The skin-nicking step is performed when the catheter tube is 7 Fr or larger. The skin-nicking step is also performed before the access guidewire-advancing step.

[0035] In some embodiments, the method further includes a cover-opening step and a cover-closing step. The cover-opening step includes opening a hinged nicking-blade cover away from the nicking blade and into a nicking position away from the nicking blade. The cover-opening step is performed before the skin-nicking step. The cover-closing step includes closing the nicking-blade cover over the nicking blade into a safety position over the nicking blade. The cover-closing step is performed after the skin-nicking step.

[0036] In some embodiments, the method further includes an alternative skin-nicking step. The alternative skin-nicking step includes nicking the area of skin around the needle tract with a retractable nicking blade integrated into the nose of the RICC insertion device. The alternative skin-nicking step is performed when the catheter tube is 7 Fr or larger. The alternative skin-nicking step is also performed before the catheter tube-advancing step.

[0037] In some embodiments, the method further includes a pair of carriage-sliding steps including a first carriage-sliding step and a second carriage-sliding step. The first carriage-sliding step includes distally sliding a nicking-blade carriage including the nicking blade overmolded therein into a nicking position such that the nicking blade extends beyond a distal end of the nose of the RICC insertion device. The second carriage-sliding step includes

proximally sliding the nicking-blade carriage into a safety position such that the nicking blade is short of the distal end of the nose of the RICC insertion device.

[0038] In some embodiments, the introducer sheath-removing step includes splitting the introducer sheath to form a split along a side of the introducer sheath by pinching together a pair of wings outwardly extending from the sheath hub. The introducer sheath-removing step also includes propagating the split in a side of the sheath hub along a same side of a sheath body of the introducer.

[0039] In some embodiments, the access guidewire-advancing step or the catheter tube advancing step includes repeatedly pushing the longitudinal composite into one or more roller wheels disposed in a wheel well of a longitudinal handle of the RICC insertion device and rolling the longitudinal composite across the one-or-more roller wheels with a single hand to split the splittable casing away from the longitudinal composite.

[0040] In some embodiments, the access guidewire-advancing step or the catheter tube advancing step includes pulling the splittable casing of the longitudinal composite out of a split channel formed between the nose of the RICC insertion device and the nose cover thereover to split the splittable casing away from the longitudinal composite.

[0041] In some embodiments, a retaining clip clipped on to a proximal portion of the RICC disengages with a curved extension over a cradle of the RICC insertion device upon removal of any remaining slack of the longitudinal composite in the RICC insertion assembly, thereby allowing the catheter tube to advance over the access guidewire.

[0042] In some embodiments, the method further includes an access guidewire removing step. The access guidewire-removing step includes removing the access guidewire leaving the catheter tube in the blood-vessel lumen.

[0043] In some embodiments, the method further includes a keeper-removing step. The keeper-removing step includes removing a keeper including a proximal end of the splittable casing attached to a catheter-hub holder from the RICC assembly. The keeper-removing step is accomplished, in part, by removing a catheter hub of the RICC from the catheter-hub holder and splitting any remaining splittable casing of the longitudinal composite away from the catheter tube.

[0044] In some embodiments, the method further includes a catheter tube-freeing step. The catheter tube-freeing step includes freeing the catheter tube of the RICC from a retaining clamp formed of the nose and nose cover of the RICC insertion device. The catheter tube freeing step is accomplished, in part, by rotating the nose cover over the nose to align a

longitudinal gap of the nose cover with a through channel in the nose and pulling the catheter tube away from the RICC insertion device.

[0045] Also disclosed herein is a catheter insertion system for a RICC assembly including, in some embodiments, an insertion assembly having a housing including a bloodflash nozzle and a catheter nozzle; a blood-flash indicator in fluid communication with the blood-flash nozzle; a RICC disposed within an interior cavity of the housing and slidably engaged with the catheter nozzle; and an introducer including an introducer needle and an introducer sheath, the introducer releasably engaged with one of the blood-flash nozzle or a catheter nozzle.

[0046] In some embodiments, the catheter insertion system further includes a needle retraction system coupled with the introducer needle. The needle-retraction system is configured to withdraw the introducer needle from the introducer sheath proximally through the blood-flash nozzle.

[0047] In some embodiments, the blood-flash indicator is in fluid communication with a needle lumen of the needle.

[0048] In some embodiments, a sheath hub of the introducer sheath is configured to releasably engage the catheter nozzle and longitudinally align a sheath lumen of the sheath with the RICC.

[0049] In some embodiments, the catheter insertion system further includes a catheter advancement assembly configured to slidably engage with the RICC with the catheter nozzle.

[0050] In some embodiments, the catheter insertion system further includes an access guidewire coupled to a guidewire-advancement assembly. The guidewire-advancement assembly is configured to slidably engage the access guidewire with the catheter nozzle.

[0051] Also disclosed herein is a method of placing a catheter within a vasculature of a patient including, in some embodiments, accessing a vasculature with an introducer needle of an introducer; withdrawing the introducer needle from a sheath lumen of an introducer sheath of the introducer through a blood-flash nozzle of an insertion assembly; detaching a sheath hub of the introducer sheath from the blood-flash nozzle and engaging the sheath hub with a catheter nozzle of the insertion assembly; advancing an access guidewire through the catheter nozzle and the sheath lumen; splitting the introducer sheath longitudinally to disengage the introducer sheath from the access guidewire; and advancing the catheter through the catheter nozzle over the access guidewire.

[0052] In some embodiments, the method further includes actuating a blood-flash indicator to draw a fluid flow proximally through a needle lumen of the introducer needle and through the blood-flash nozzle.

[0053] In some embodiments, the method further includes actuating a needle-retraction assembly, disposed within the insertion assembly, to withdraw the introducer needle through the blood-flash nozzle and into an interior cavity of the insertion assembly.

[0054] In some embodiments, the catheter includes one of a rapidly insertable central catheter, a central venous catheter, a peripherally inserted central catheter, or a dialysis catheter.

[0055] These and other features of the concepts provided herein will become more apparent to those of skill in the art in view of the accompanying drawings and following description, which describe particular embodiments of such concepts in greater detail.

[0055A] Throughout this specification the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated element, integer or step, or group of elements, integers or steps, but not the exclusion of any other element, integer or step, or group of elements, integers or steps.

DRAWINGS

[0056] FIG. 1 provides a RICC insertion system including a RICC insertion assembly and an introducer in accordance with some embodiments.

[0057] FIG. 2 provides a RICC in accordance with some embodiments.

[0058] FIG. 3 provides a distal portion of the RICC in accordance with some embodiments.

CLAIMS

What is claimed is:

1. A rapidly insertable central catheter ("RICC") insertion system, comprising:
a RICC assembly including:
a RICC including:
a catheter tube;
a catheter hub coupled to a proximal portion of the catheter tube; and
one or more extension legs, each extension leg of the one-or-more extension legs coupled to the catheter hub by a distal portion thereof;
an access guidewire disposed in a primary lumen of the RICC; and
a keeper including a splittable casing over both the catheter tube and a distal portion of the access guidewire extending from a distal end of the RICC forming a longitudinal composite thereof;
a RICC insertion device including:
a frame including:
a longitudinal handle including a wheel well;
a nose extending from a distal portion of the handle distal of the wheel well, the nose including a through channel configured for advancing the catheter tube of the RICC therethrough; and
a curved cradle extending from a proximal portion of the handle;
one or more roller wheels disposed in the wheel well; and
a nose cover over the nose, the nose cover and nose forming a split channel configured for both splitting and passing the splittable casing therethrough, the RICC insertion device configured for advancing the RICC assembly from an initial position in the frame to a final position in the frame by repeatedly pushing

the longitudinal composite into the one-or-more roller wheels and rolling the longitudinal composite across the one-or-more roller wheels; and

an introducer.

2. The RICC insertion system of claim 1, wherein the keeper further includes a catheter-hub holder to which a proximal end of the splittable casing is attached, the catheter-hub holder configured to hold the catheter hub therein and keep the splittable casing in position over the catheter tube and the access guidewire.

3. The RICC insertion system of claim 2, wherein the catheter-hub holder includes a perimetrical wall around at least a portion of a perimeter of the catheter-hub holder, the perimetrical wall defining a recess into which the catheter hub fits with an engineering fit.

4. The RICC insertion system of any claim of claims 1-3, wherein the cradle includes a curved extension over a distal portion of the cradle, the extension substantially following a same curve as the cradle.

5. The RICC insertion system of claim 4, wherein the cradle includes an enclosure over the distal portion of the cradle with the extension extending therefrom, the enclosure configured to enclose therein an otherwise exposed proximal portion of the access guidewire in the initial position of the RICC assembly in the frame.

6. The RICC insertion system of either claim 4 or 5, further comprising a retaining clip configured to clip on to a proximal portion of the RICC, retain the RICC assembly in the RICC insertion device, and keep the catheter tube from prematurely advancing over the access guidewire, the retaining clip including a post configured to engage with a slot in the extension that faces an open face of the cradle.

7. The RICC insertion system of claim 6, wherein the retaining clip is configured to disengage with the slot in the extension when any remaining slack of the longitudinal composite is removed upon advancing the RICC assembly from the initial position to the final position in the frame.

8. The RICC insertion system of any claim of claims 1-7, the frame further including a retaining arch over the cradle proximate the proximal portion of the handle from which the cradle extends, the retaining arch configured to retain the RICC assembly in the

RICC insertion device and hold the longitudinal composite over the handle as the RICC assembly transitions over the proximal portion of the handle from which the cradle extends upon advancing the RICC assembly from the initial position to the final position in the frame.

9. The RICC insertion system of any claim of claims 1-8, wherein the nose cover and the nose further form a retaining clamp configured to slidably clamp the longitudinal composite therein, the nose cover rotatable over the nose, and the nose cover including a longitudinal gap configured to rotatably align with the through channel in the nose for removal of the longitudinal composite, the splittable casing, or the catheter tube therefrom.

10. The RICC insertion system of any claim of claims 1-9, further comprising a retractable nicking blade, the retractable nicking blade disposed in a nicking-blade carriage slidably integrated into the nose, the nicking-blade carriage having a nicking position with the retractable nicking blade extending beyond a distal end of the nose and a safety position with the retractable nicking blade short of the distal end of the nose.

11. The RICC insertion system of any claim of claims 1-10, the introducer including:

an introducer needle including:

a needle shaft including a needle tip in a distal portion of the needle shaft;

and

a needle hub coupled to a proximal portion of the needle shaft; and

a splittable introducer sheath configured to accept therein the introducer needle, the introducer sheath including:

a splittable sheath body; and

a splittable sheath hub coupled to a proximal portion of the sheath body, the sheath hub including a pair of outwardly extending wings along a length of the sheath hub having an internal angle of about 90° or less between the wings configured for splitting the sheath hub by pinching the wings together with a single hand.

12. The RICC insertion system of claim 11, wherein the sheath hub includes a single longitudinal fault along a side of the sheath hub opposite a vertex of the internal angle

formed by the wings, the sheath hub configured to split along the fault for propagation along a same side of the sheath body when the wings are pinched together.

13. The RICC insertion system of claim 11, wherein the sheath hub includes a pair of longitudinal faults including a primary fault along a primary side of the sheath hub opposite a vertex of the internal angle formed by the wings and a secondary fault along a secondary side of the sheath hub opposite the primary fault, the sheath hub configured to split along the primary fault for propagation along the primary side of the sheath body when the wings are pinched together, and the sheath hub configured to split along the secondary fault for propagation along the secondary side of the sheath body when the wings are pulled apart.

14. The RICC insertion system of any claim of claims 11-13, the sheath hub further including a valved cap disposed in a proximal portion of the sheath hub, the valved cap including a tapered female valved-cap connector and a septum distal of a proximal opening in the female valved-cap connector, the female valved-cap connector configured to accept therein a tapered male needle-hub connector extending from a distal portion of the needle hub, and the septum configured to accept therethrough the needle shaft.

15. The RICC insertion system of claim 14, wherein the valved cap is partially or fully split such that the valved cap splits with the sheath hub when the wings are pinched together.

16. The RICC insertion system of any claim of claims 11-15, the sheath hub further including:

an overmolded nicking blade distally extending from the sheath hub; and

a hinged nicking-blade cover having an opened state with the nicking-blade cover opened away from the overmolded nicking blade and a closed state with the nicking-blade cover closed over the nicking blade.

17. The RICC insertion system of any claim of claims 11-16, further comprising a syringe including a tapered male syringe tip extending from a distal portion of the syringe, the syringe tip configured to insert into a tapered female needle-hub connector in a proximal portion of the needle hub.

18. A rapidly insertable central catheter ("RICC") insertion assembly, comprising:
a RICC assembly including:

a RICC including:

a catheter tube;

a catheter hub coupled to a proximal portion of the catheter tube; and

one or more extension legs, each extension leg of the one-or-more extension legs coupled to the catheter hub by a distal portion thereof;

an access guidewire disposed in a primary lumen of the RICC; and

a keeper including a splittable casing over both the catheter tube and a distal portion of the access guidewire extending from a distal end of the RICC forming a longitudinal composite thereof; and

a RICC insertion device including:

a frame including:

a longitudinal handle including a wheel well;

a nose extending from a distal portion of the handle distal of the wheel well, the nose including a through channel configured for advancing the catheter tube of the RICC therethrough; and

a curved cradle extending from a proximal portion of the handle;

one or more roller wheels disposed in the wheel well; and

a nose cover over the nose, the nose cover and nose forming a split channel configured for both splitting and passing the splittable casing therethrough, the RICC insertion device is configured for advancing the RICC assembly from an initial position in the frame to a final position in the frame by repeatedly pushing the longitudinal composite into the one-or-more roller wheels and rolling the longitudinal composite across the one-or-more roller wheels.

19. The RICC insertion assembly of claim 18, wherein a distal end of the longitudinal composite, the splittable casing, or the access guidewire is substantially commensurate with a distal end of the frame in the initial position of the RICC assembly in the frame.

20. The RICC insertion assembly of either claim 18 or 19, wherein a slack loop of the longitudinal composite extends away from both the handle and the cradle in the initial position of the RICC assembly in the frame.

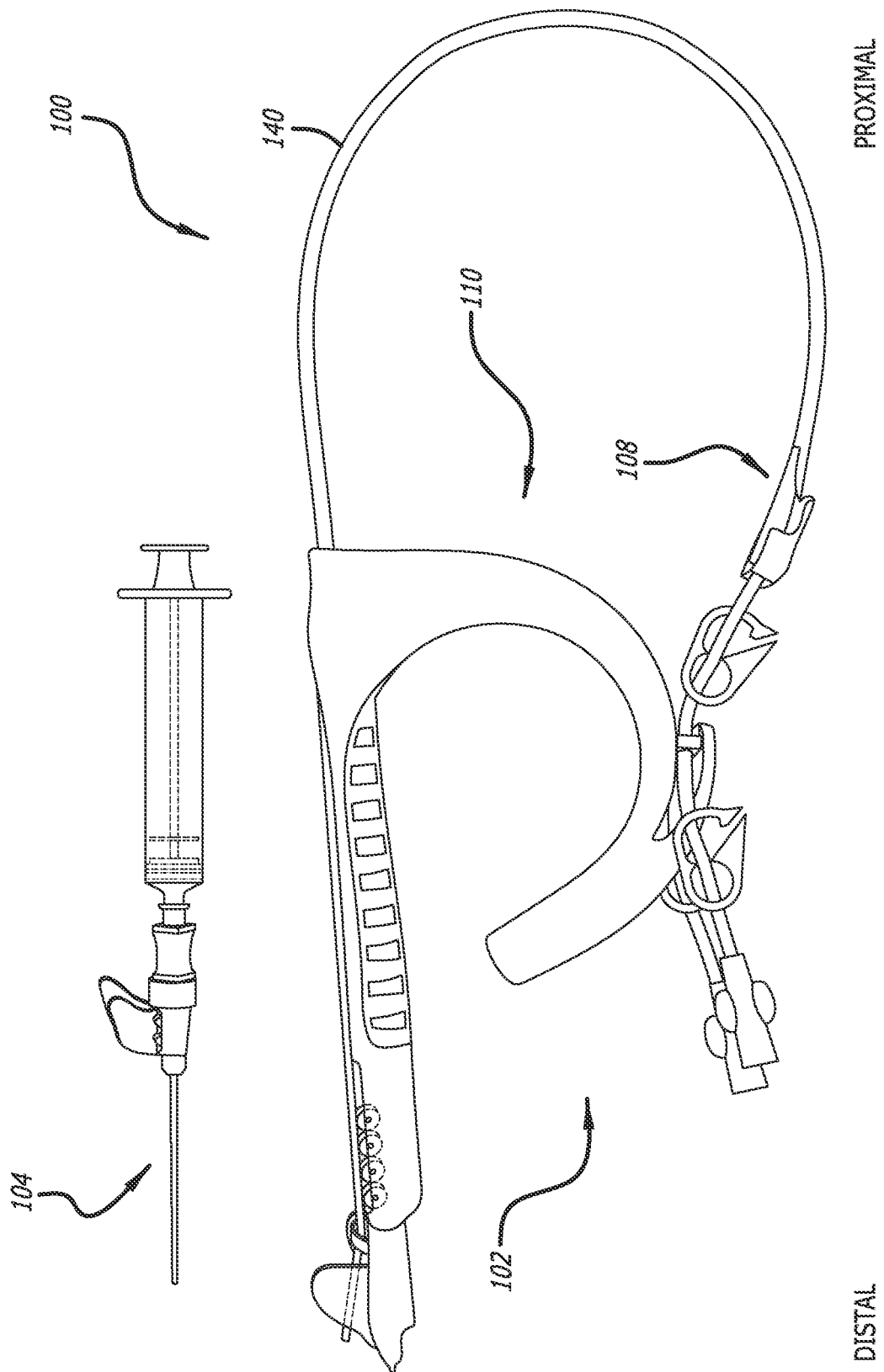
21. The RICC insertion assembly of any claim of claims 18-20, wherein the longitudinal composite is substantially split in the final position of the RICC assembly in the frame.

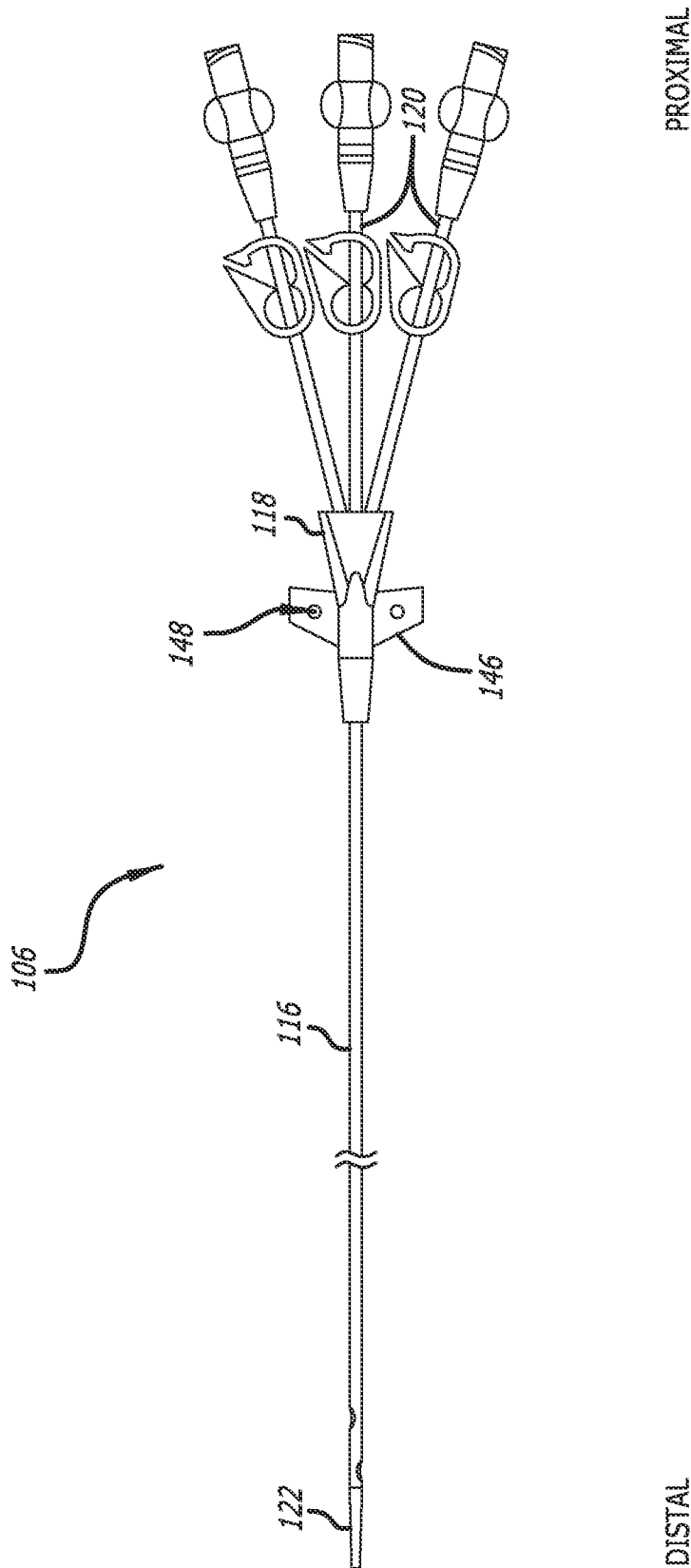
22. The RICC insertion assembly of any claim of claims 18-21, wherein a proximal end of an extension leg or a Luer connector coupled to the extension leg of the one-or-more extension legs of the RICC is substantially commensurate with a proximal end of the cradle in the initial position of the RICC assembly in the frame.

23. The RICC insertion assembly of claim 22, wherein a proximal end of the access guidewire is coupled to the proximal end of the cradle in the initial position of the RICC assembly in the frame.

24. The RICC insertion assembly of either claim 22 or 23, wherein the one-or-more extension legs of the RICC lie substantially over the handle in the final position of the RICC assembly in the frame.

25. The RICC insertion assembly of any claim of claims 18-24, wherein the catheter hub of the RICC lies over the wheel well in the final position of the RICC assembly in the frame.





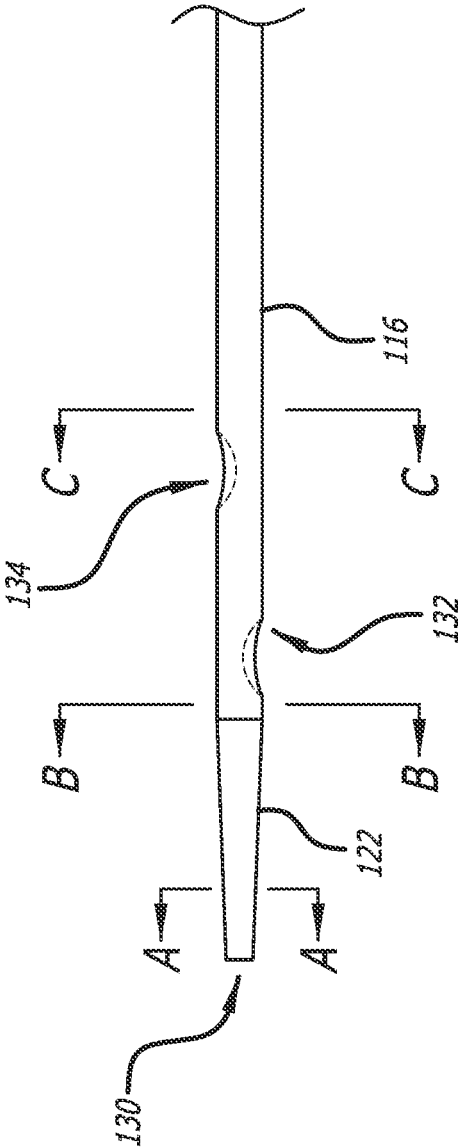


FIG. 3

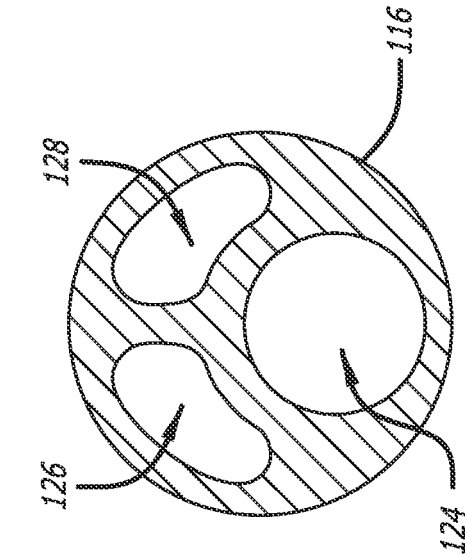


FIG. 5

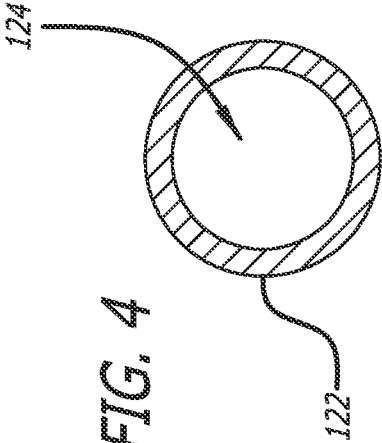
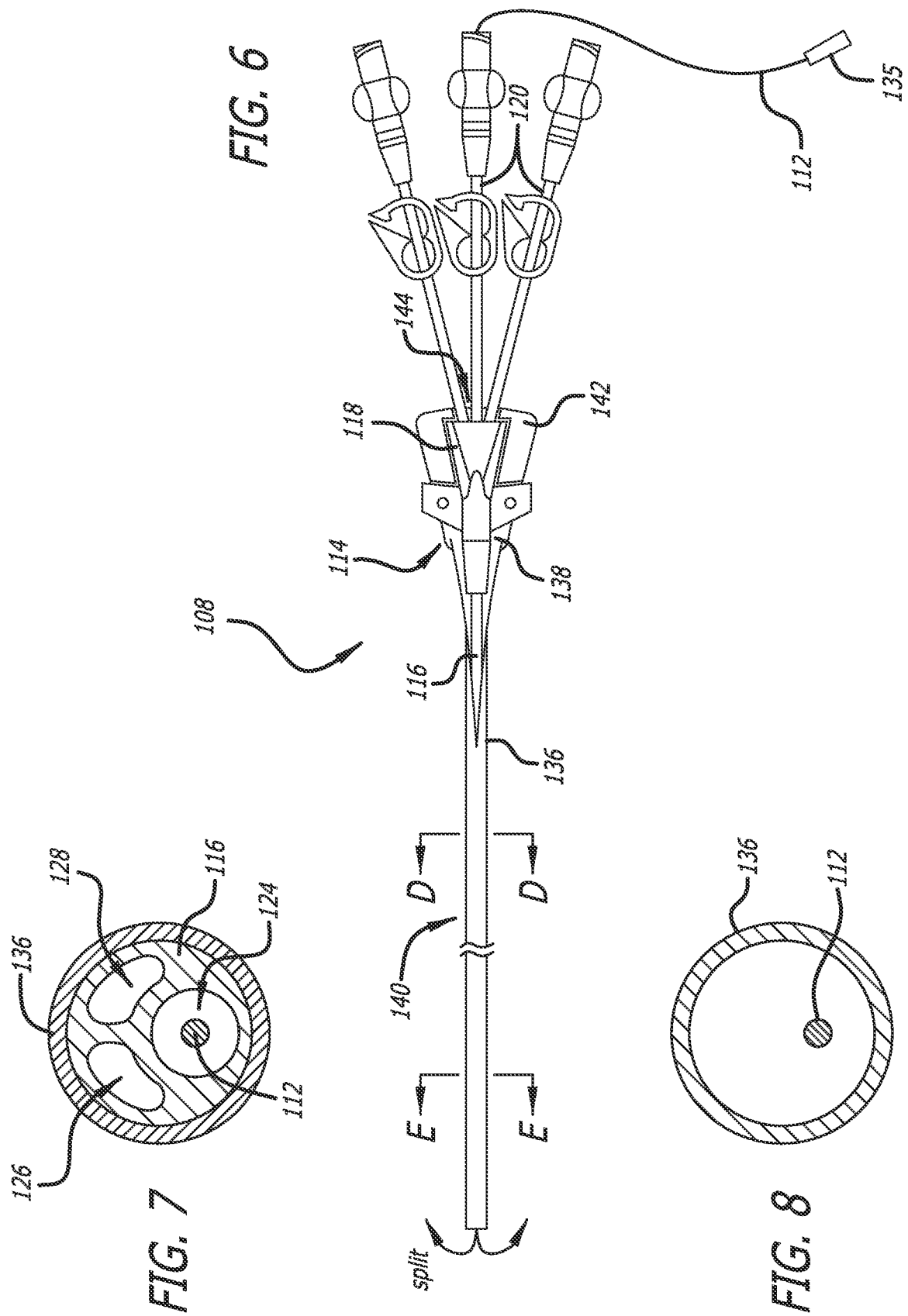


FIG. 4

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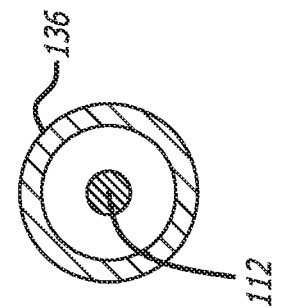
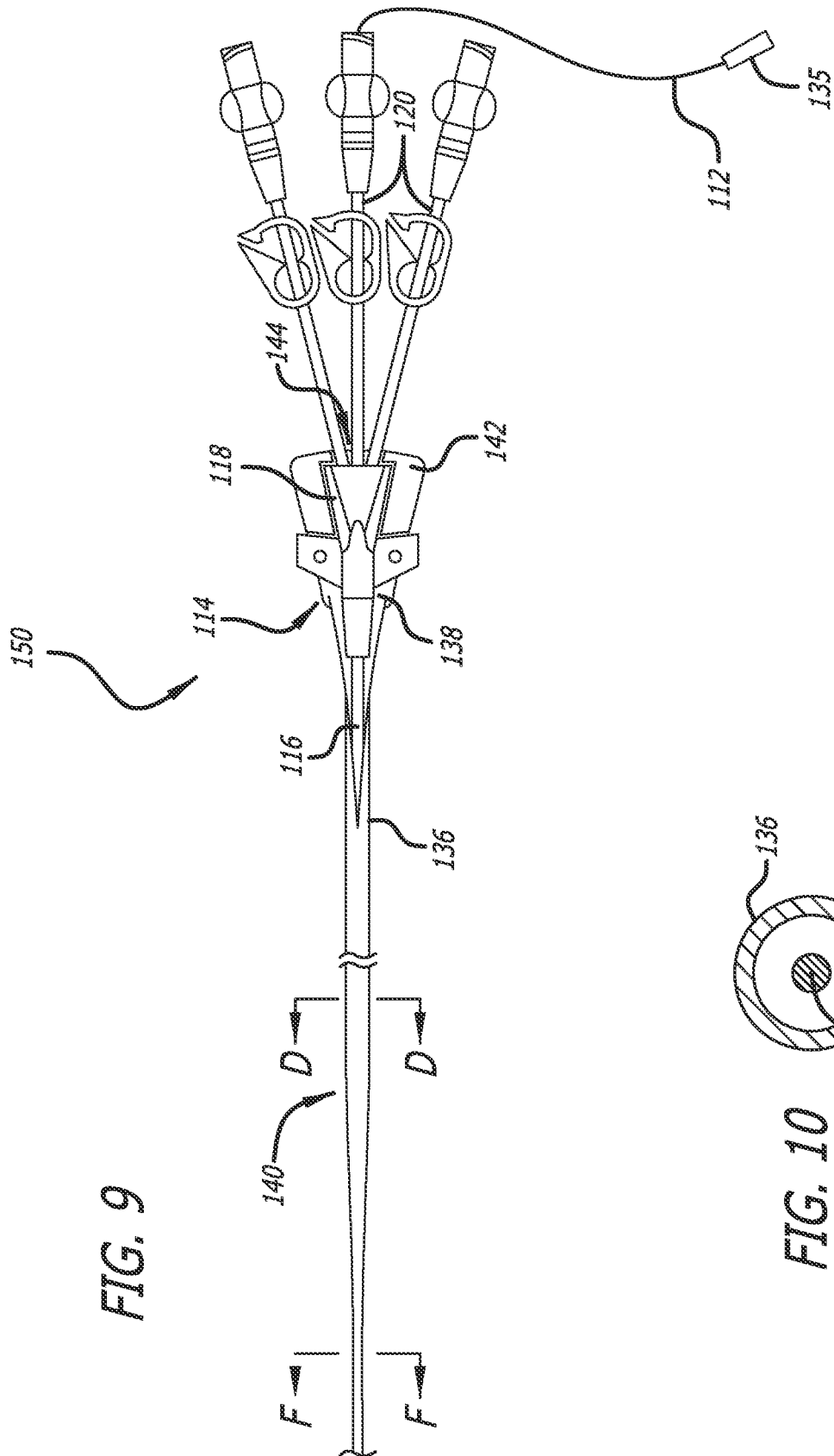
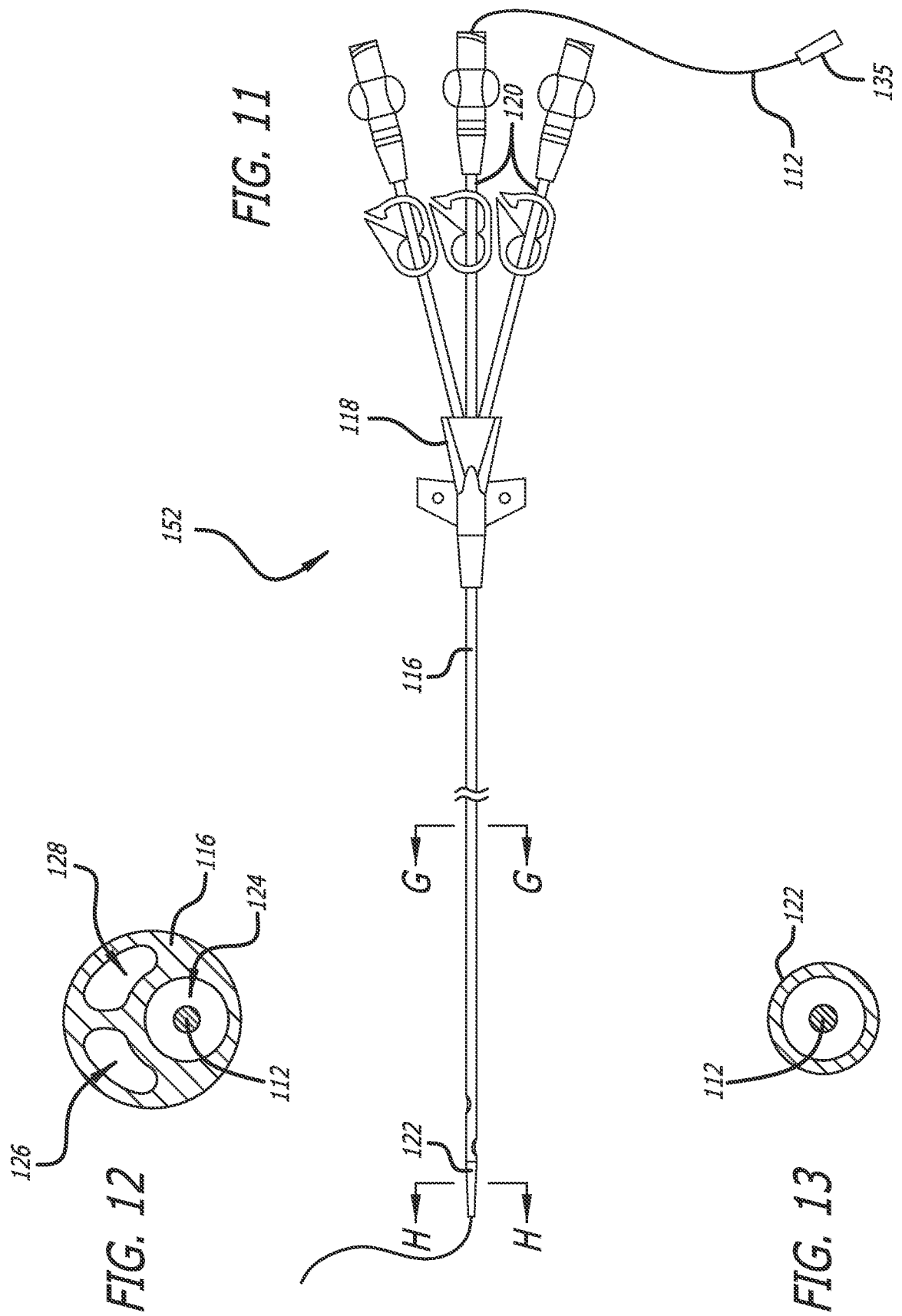


FIG. 10

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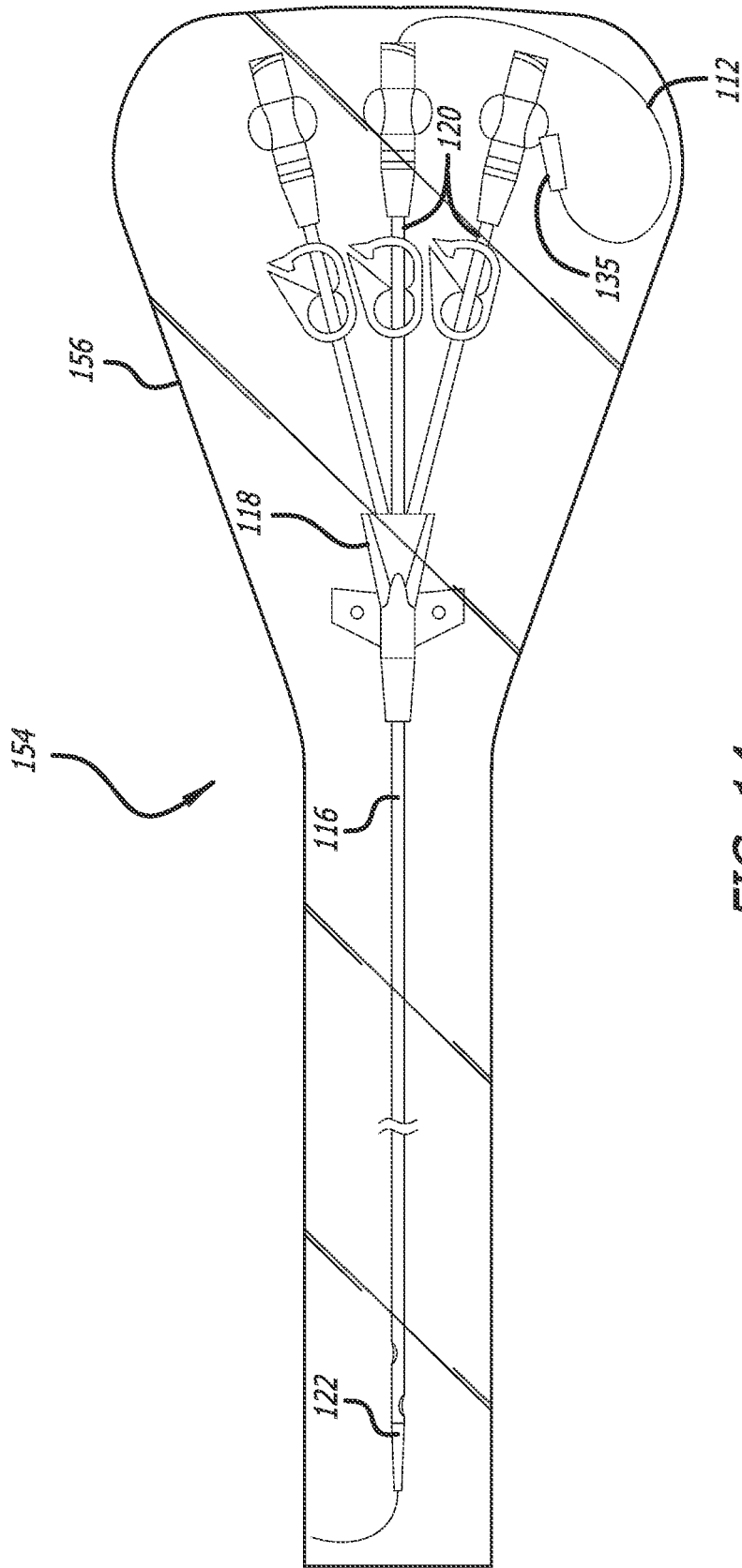
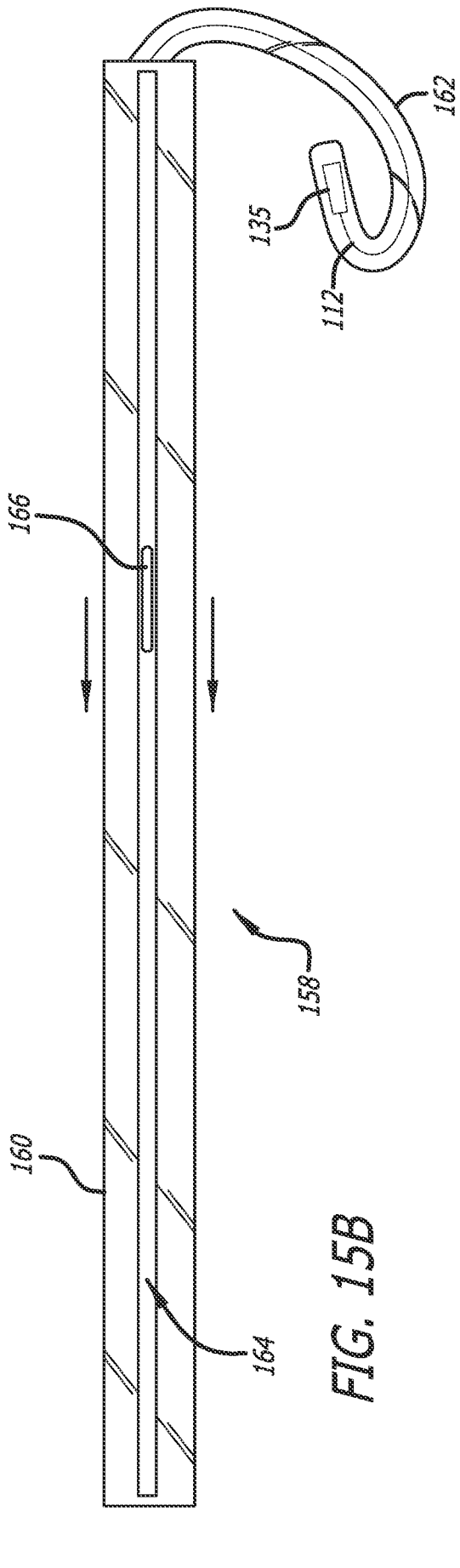
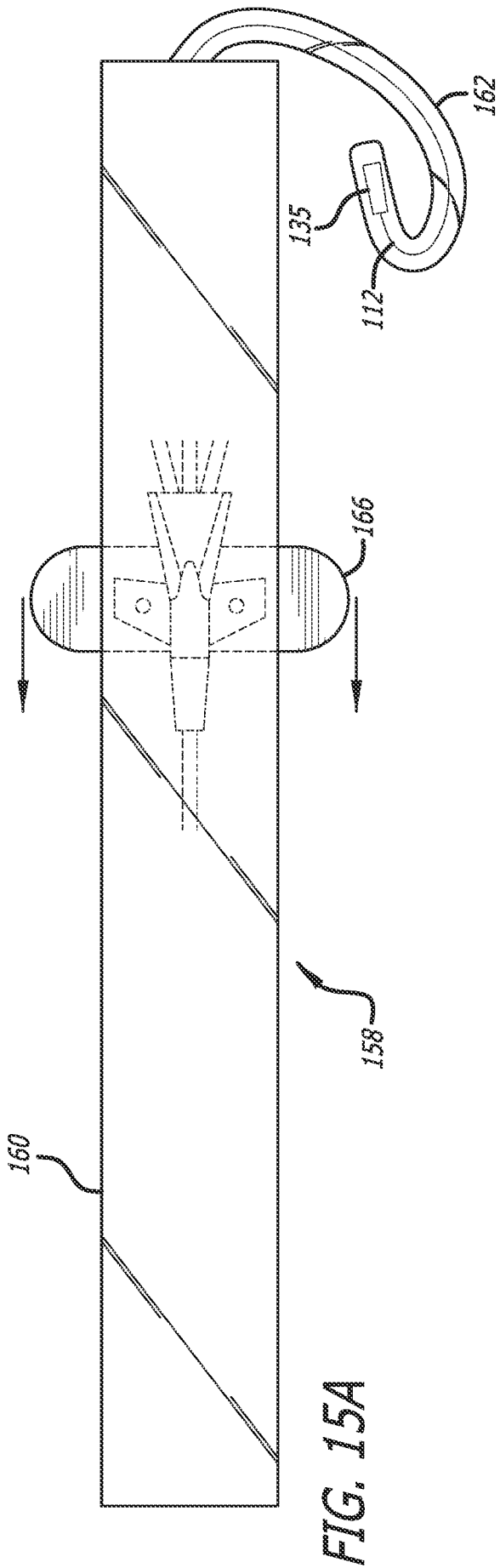


FIG. 14



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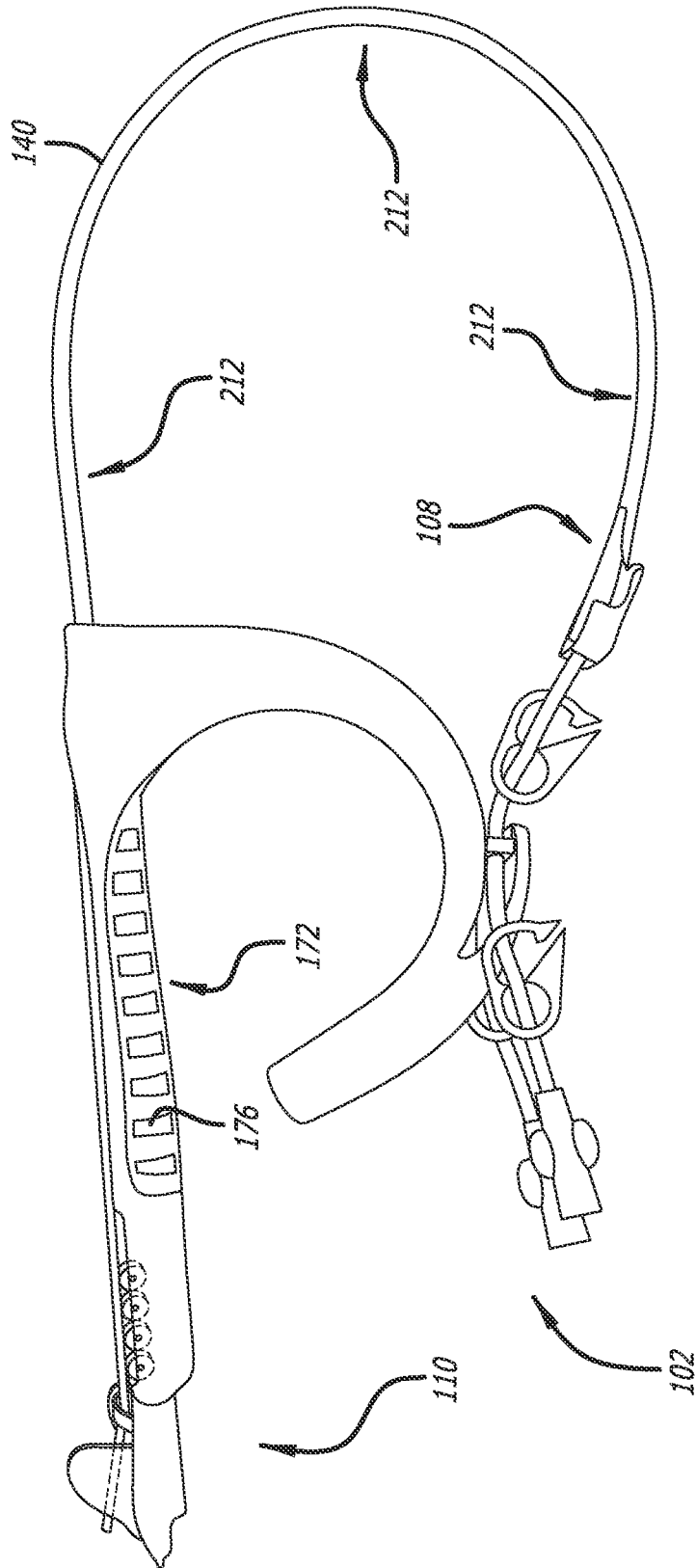


FIG. 16

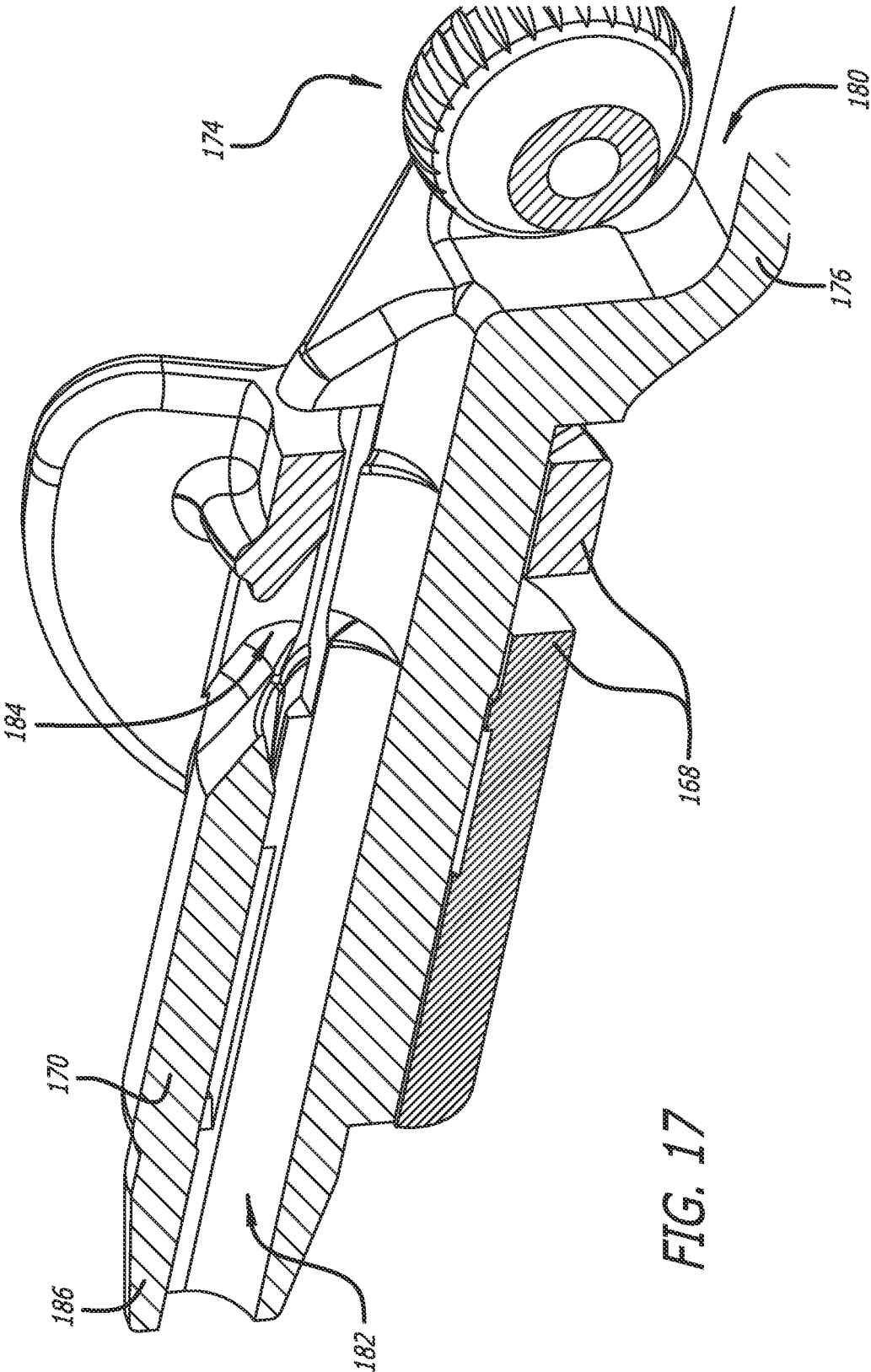


FIG. 17

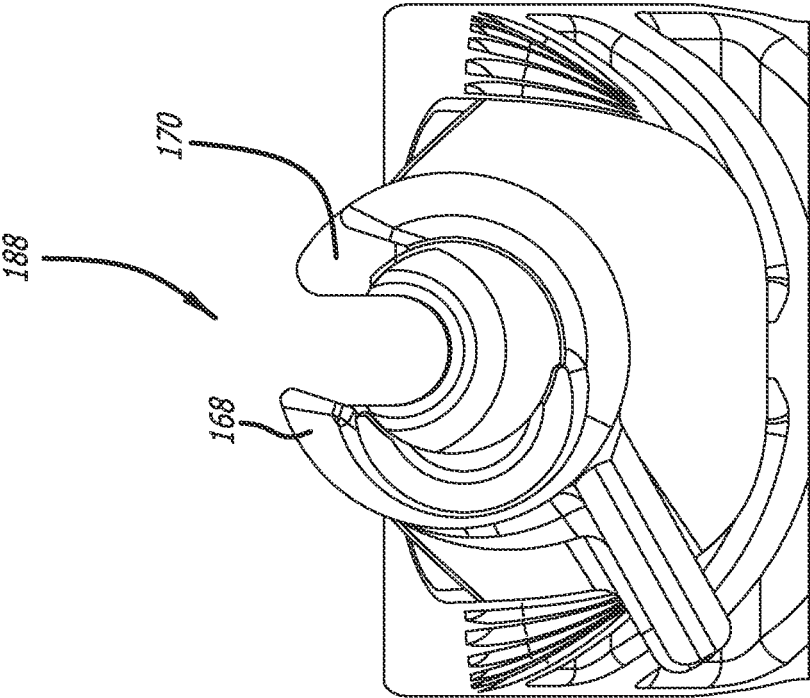


FIG. 18B

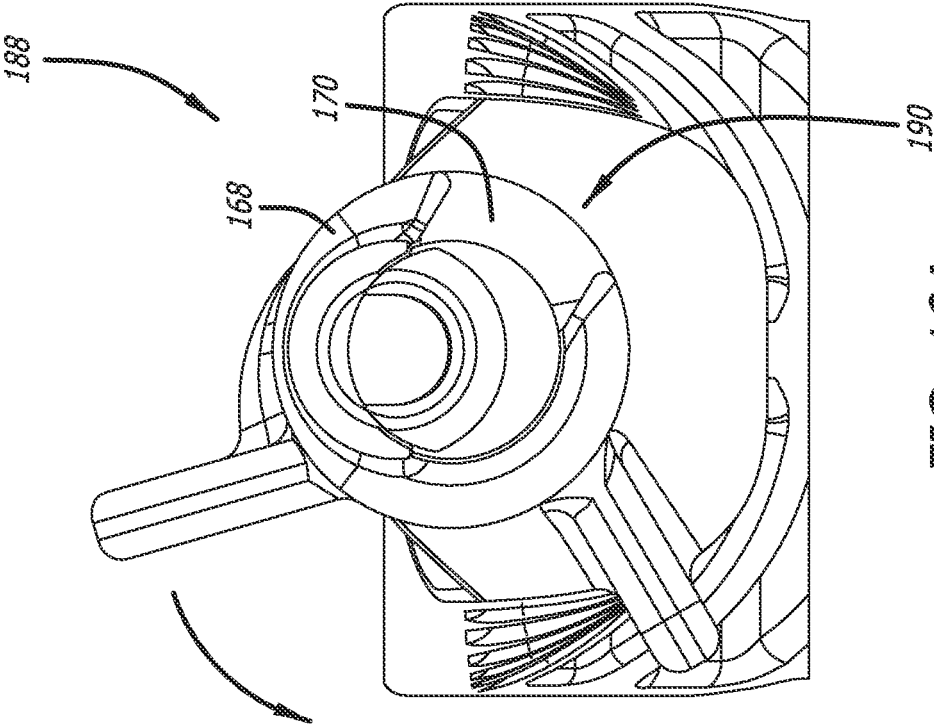


FIG. 18A

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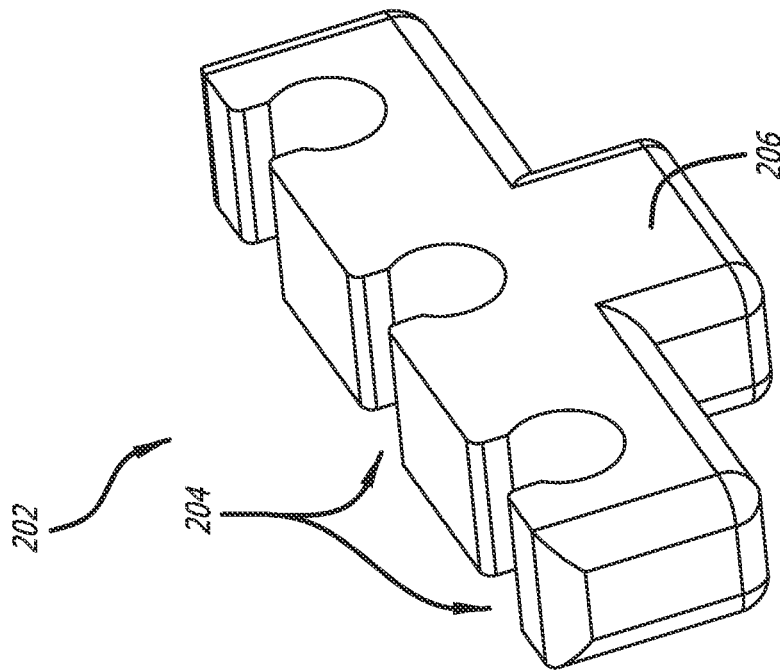


FIG. 20

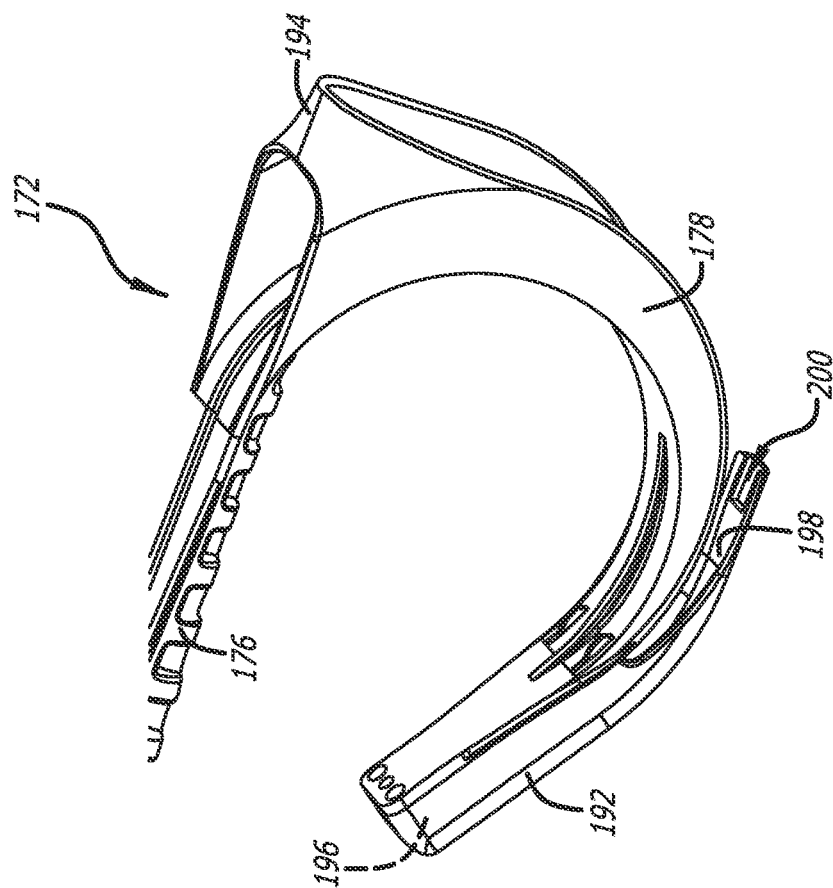


FIG. 19

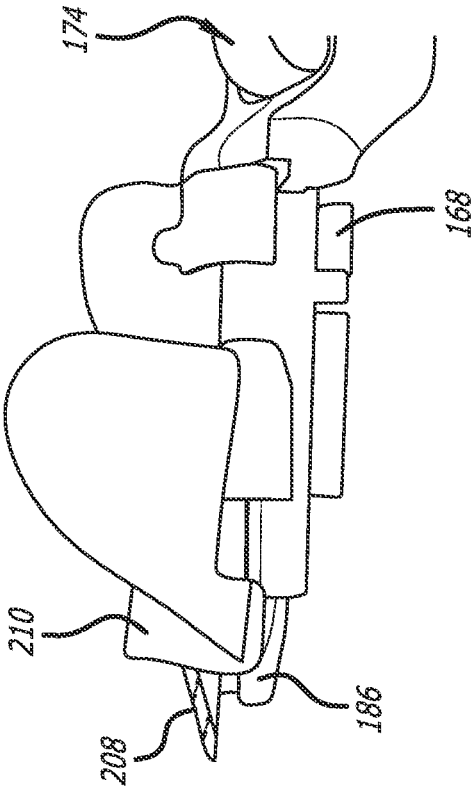


FIG. 21A

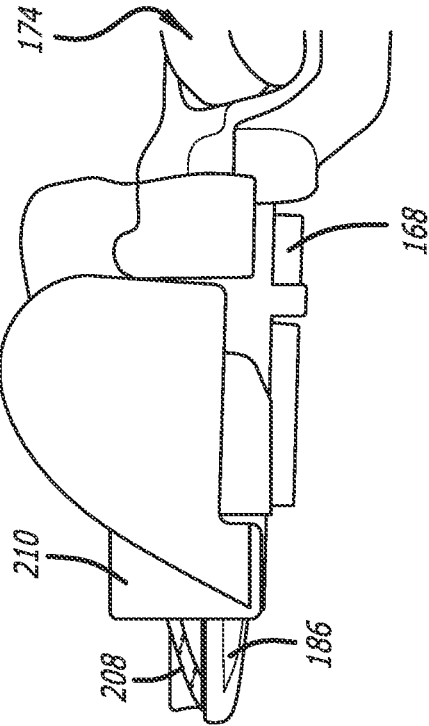
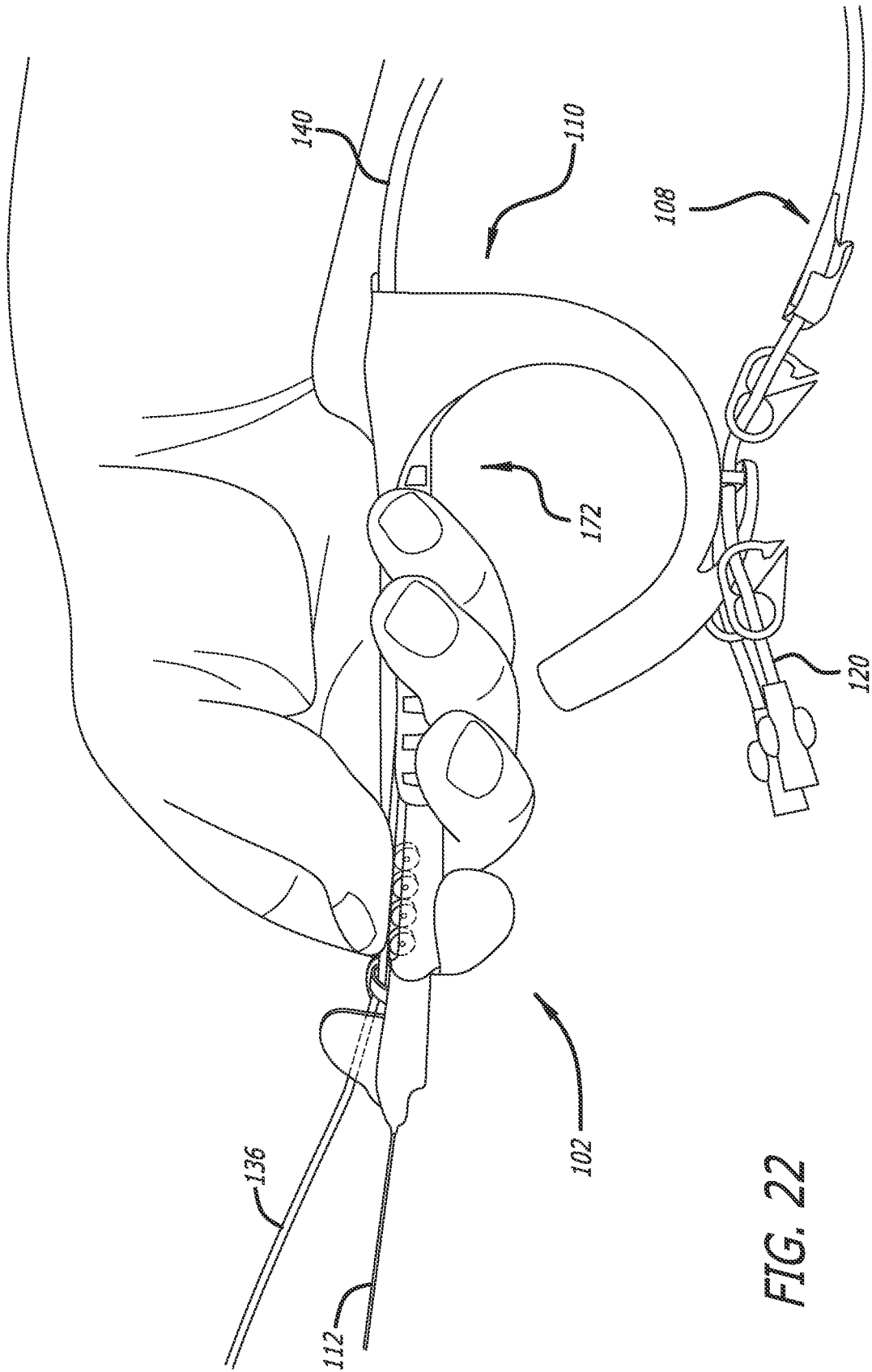


FIG. 21B



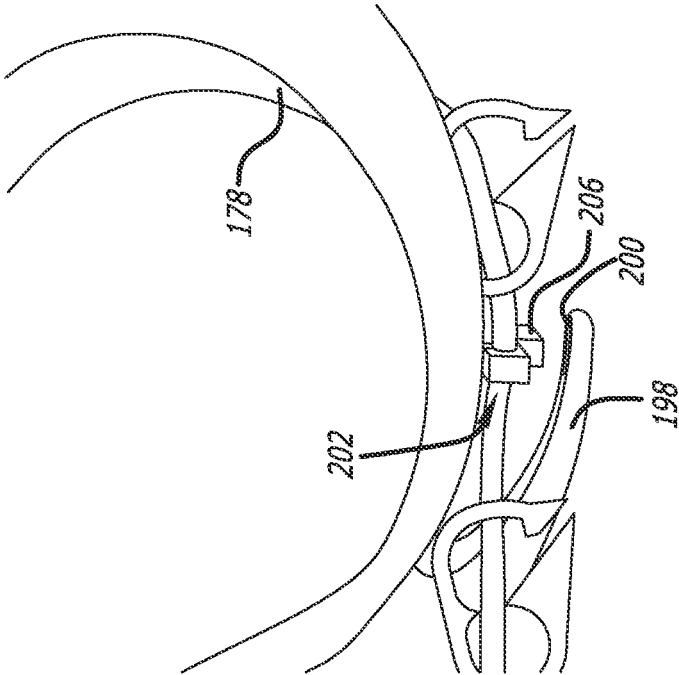


FIG. 23B

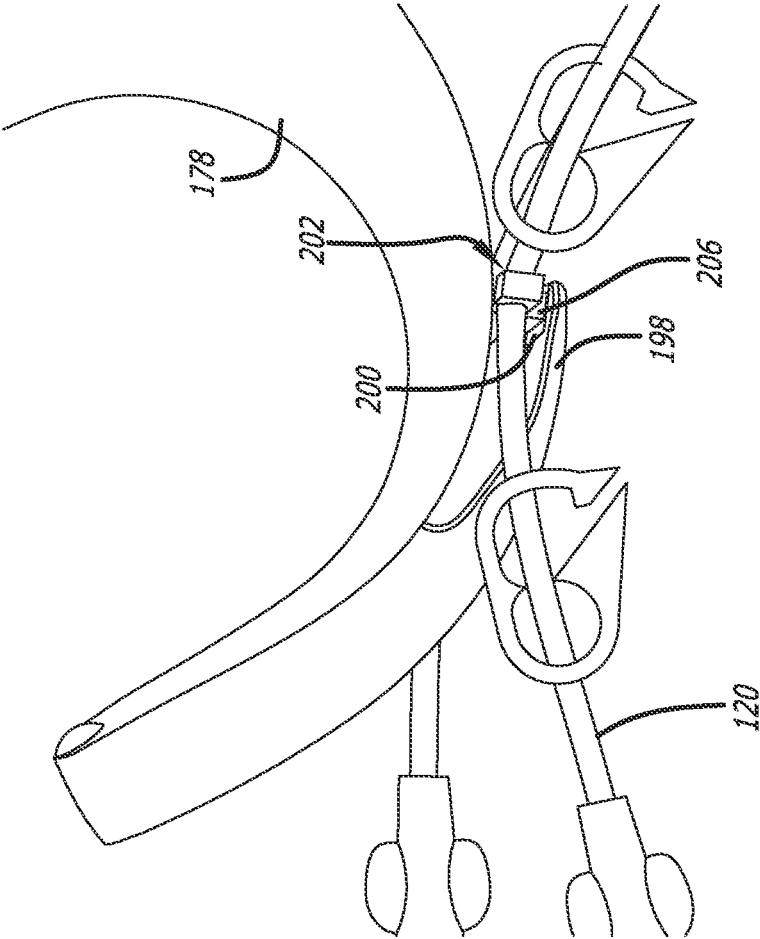


FIG. 23A

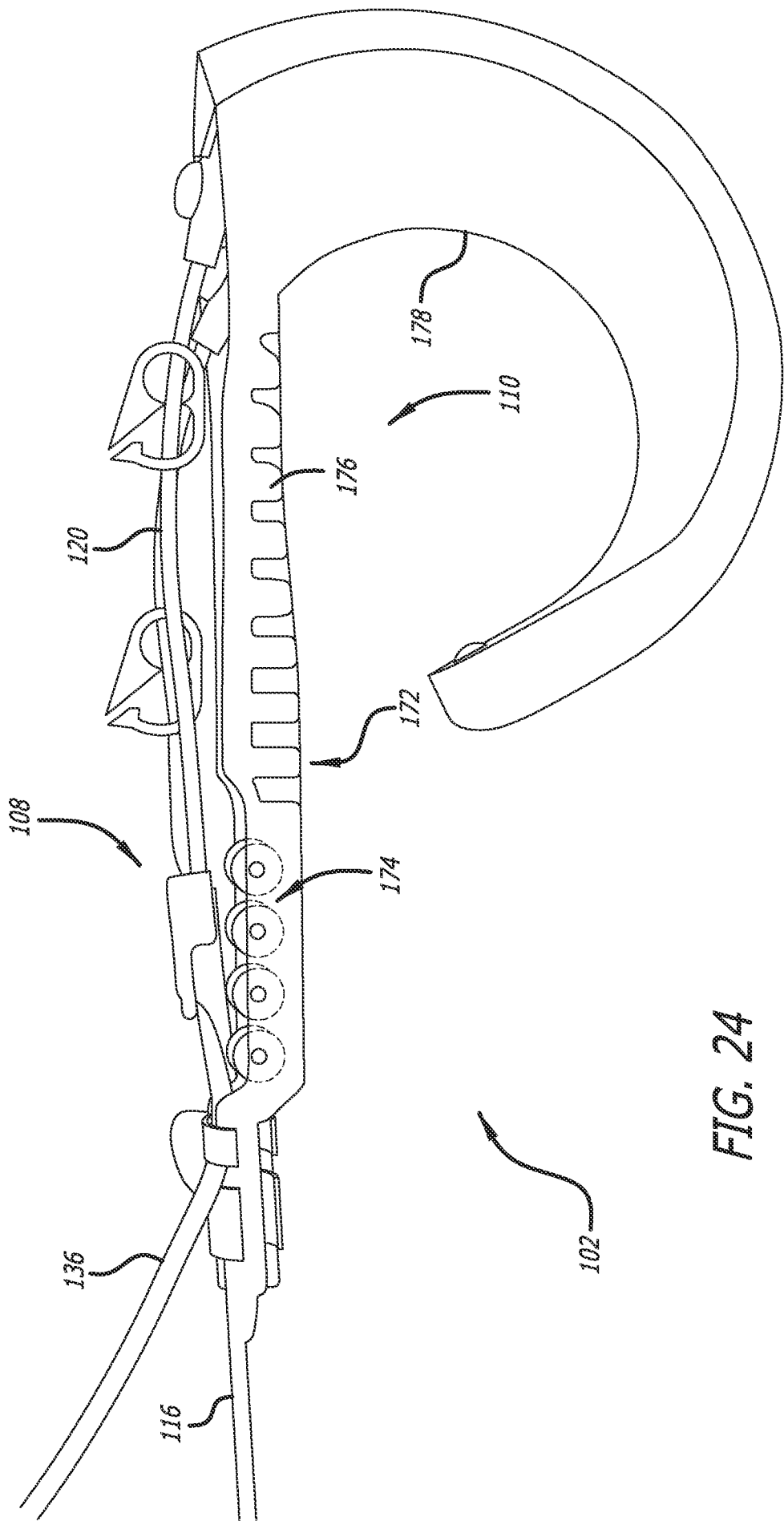


FIG. 24

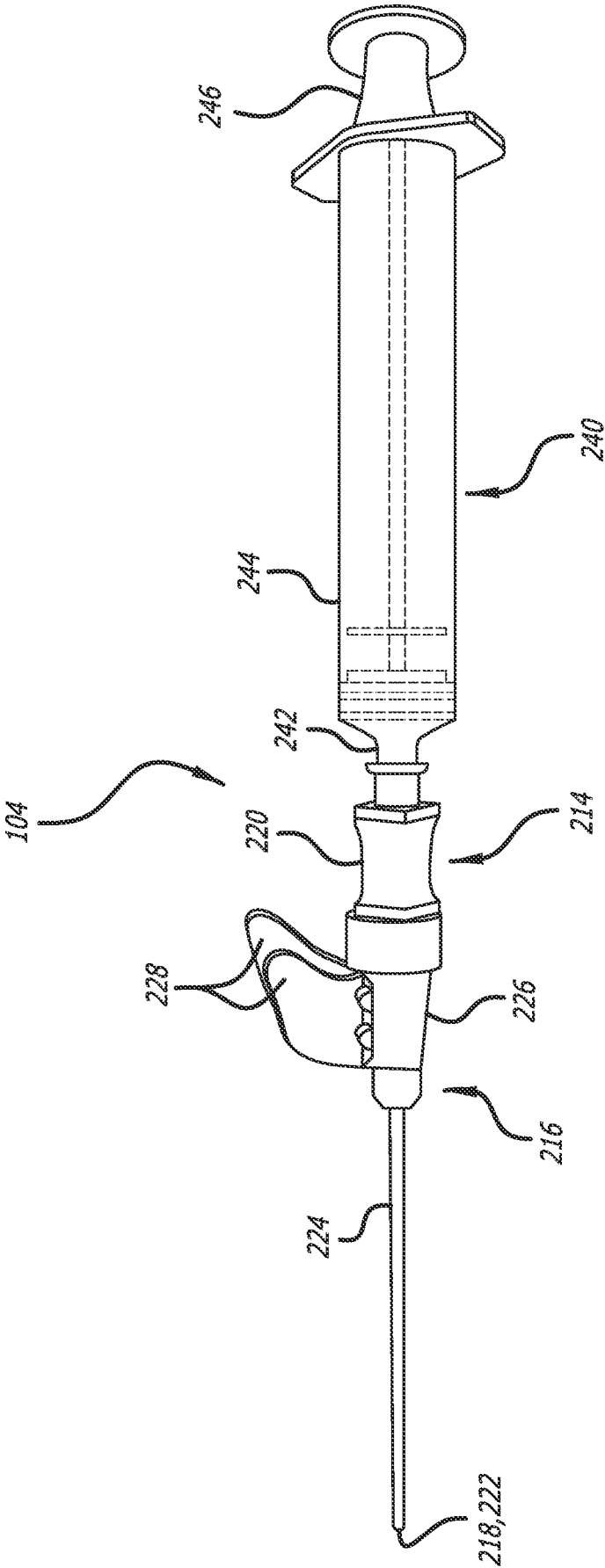
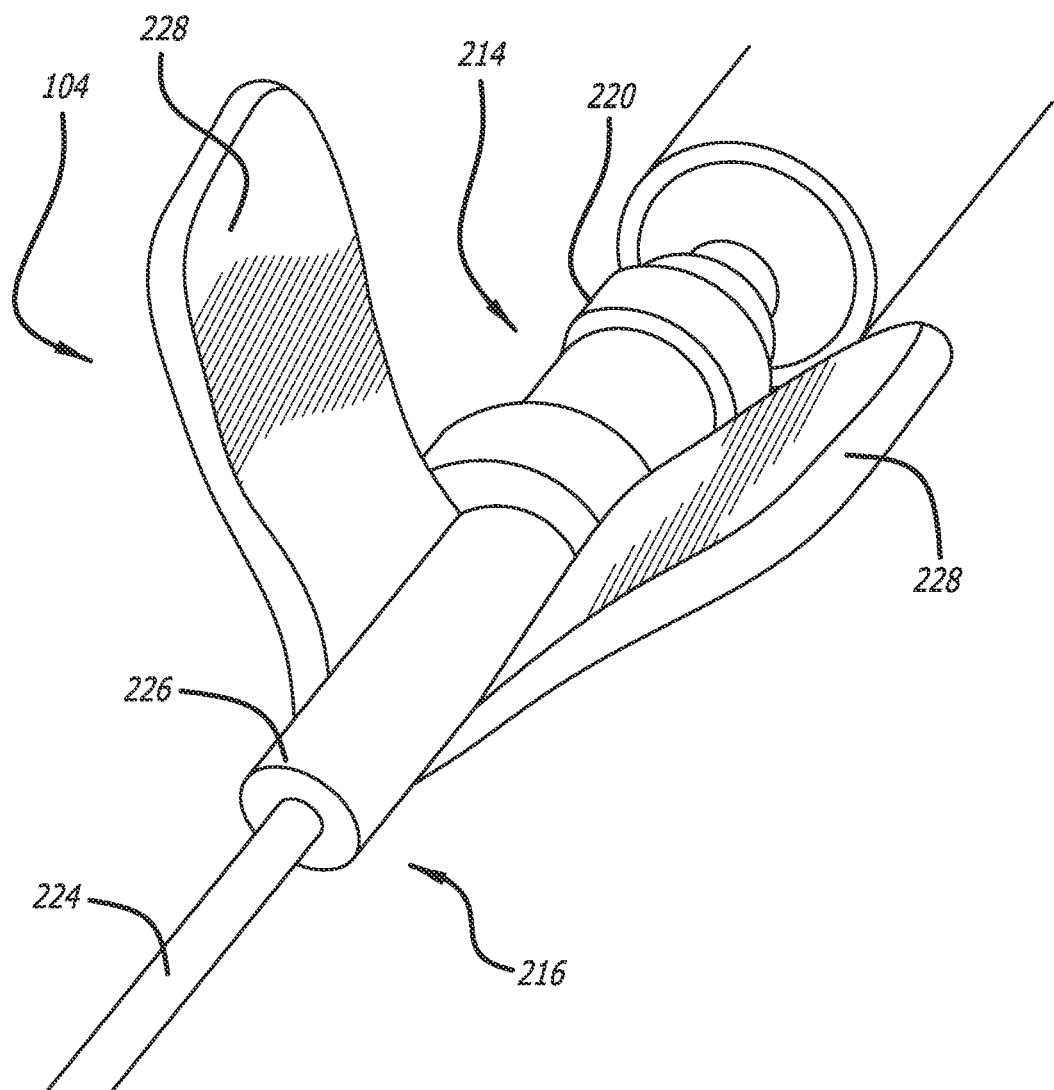


FIG. 25

**FIG. 26**

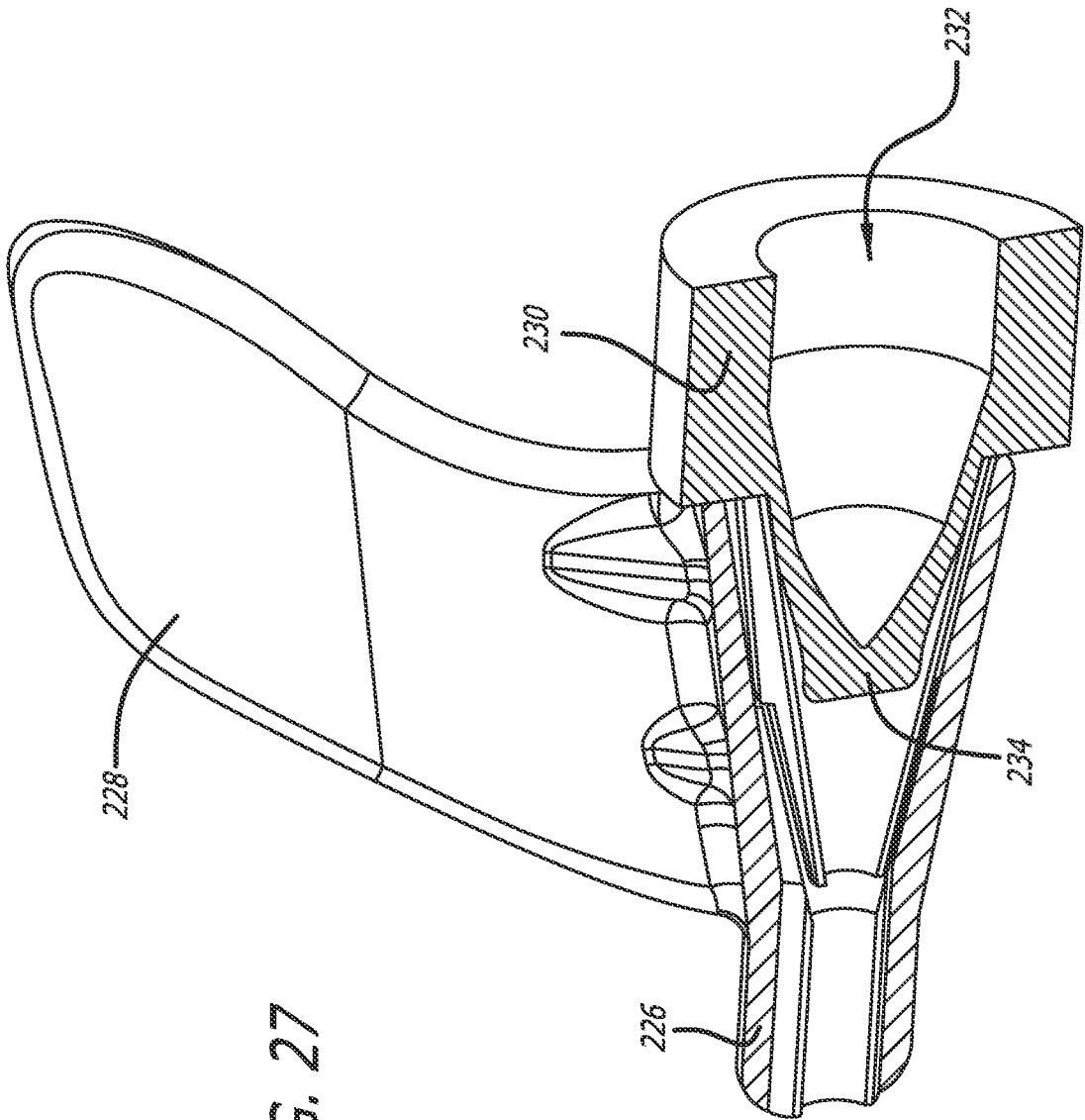


FIG. 27

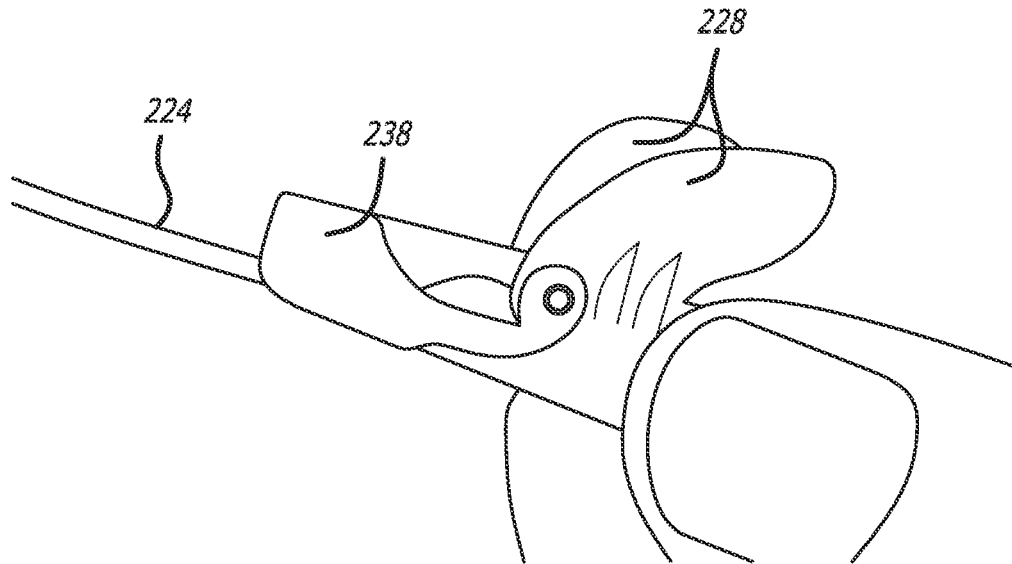


FIG. 28A

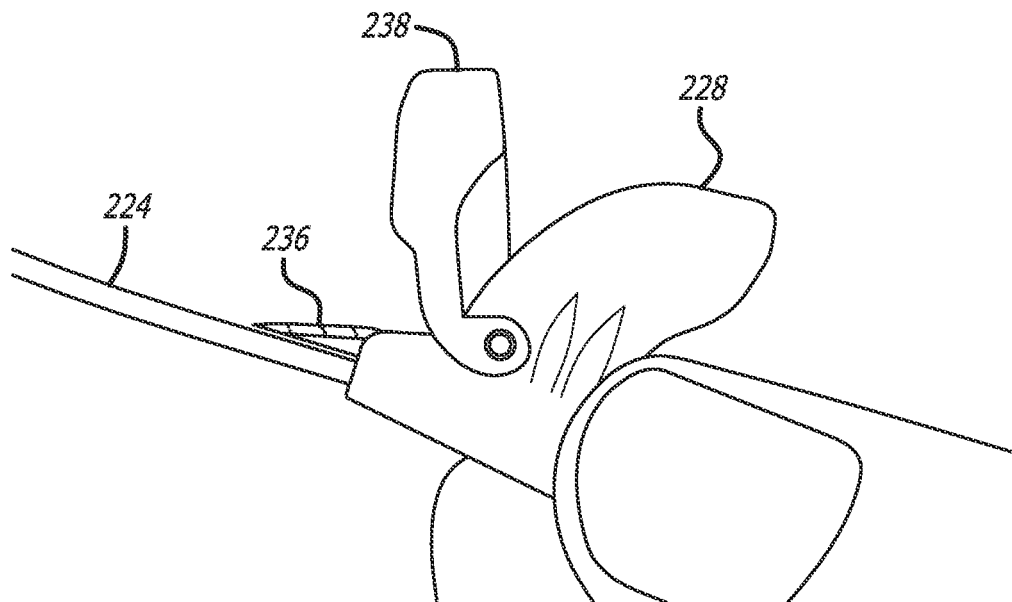


FIG. 28B

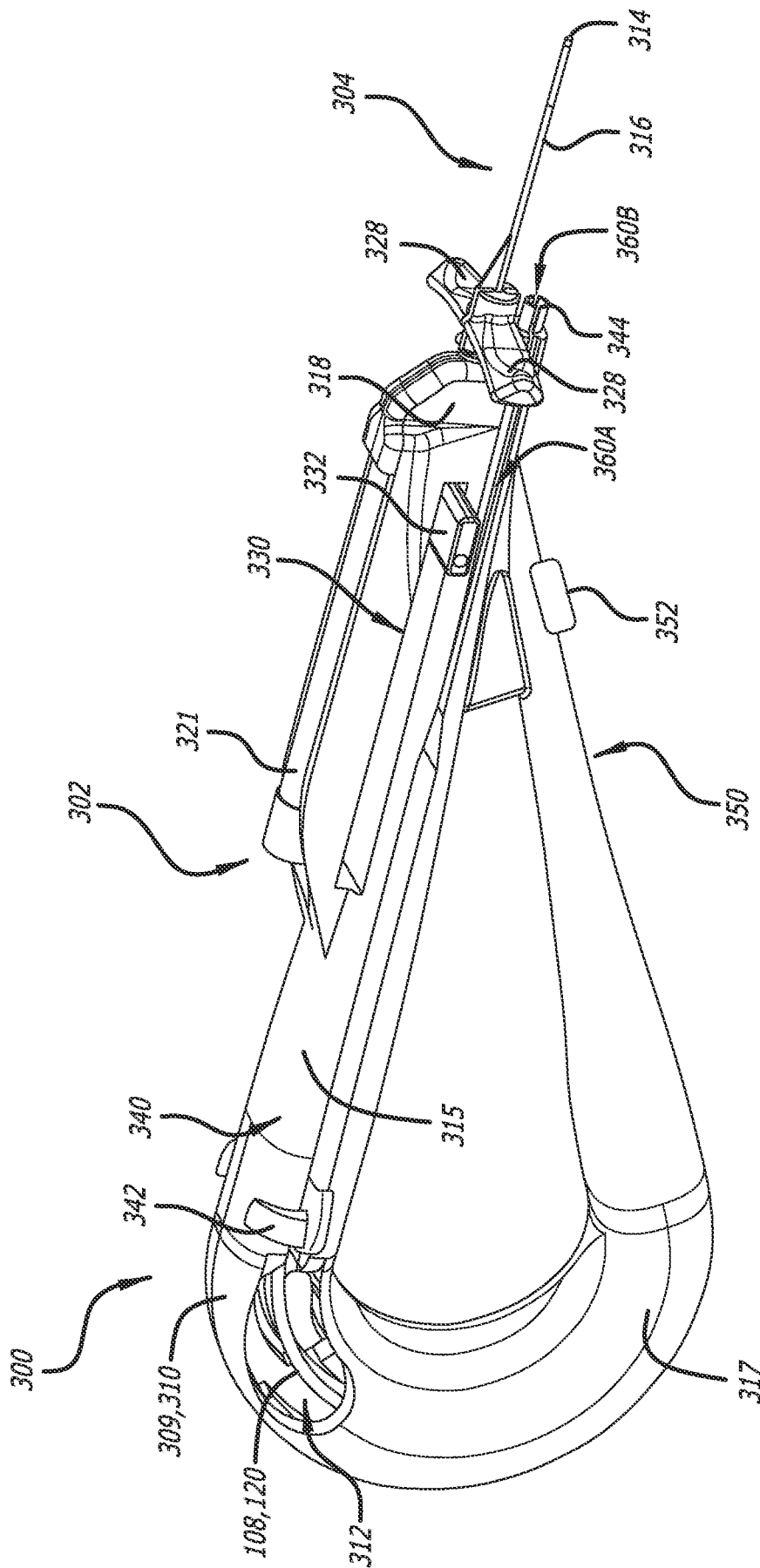


FIG. 29

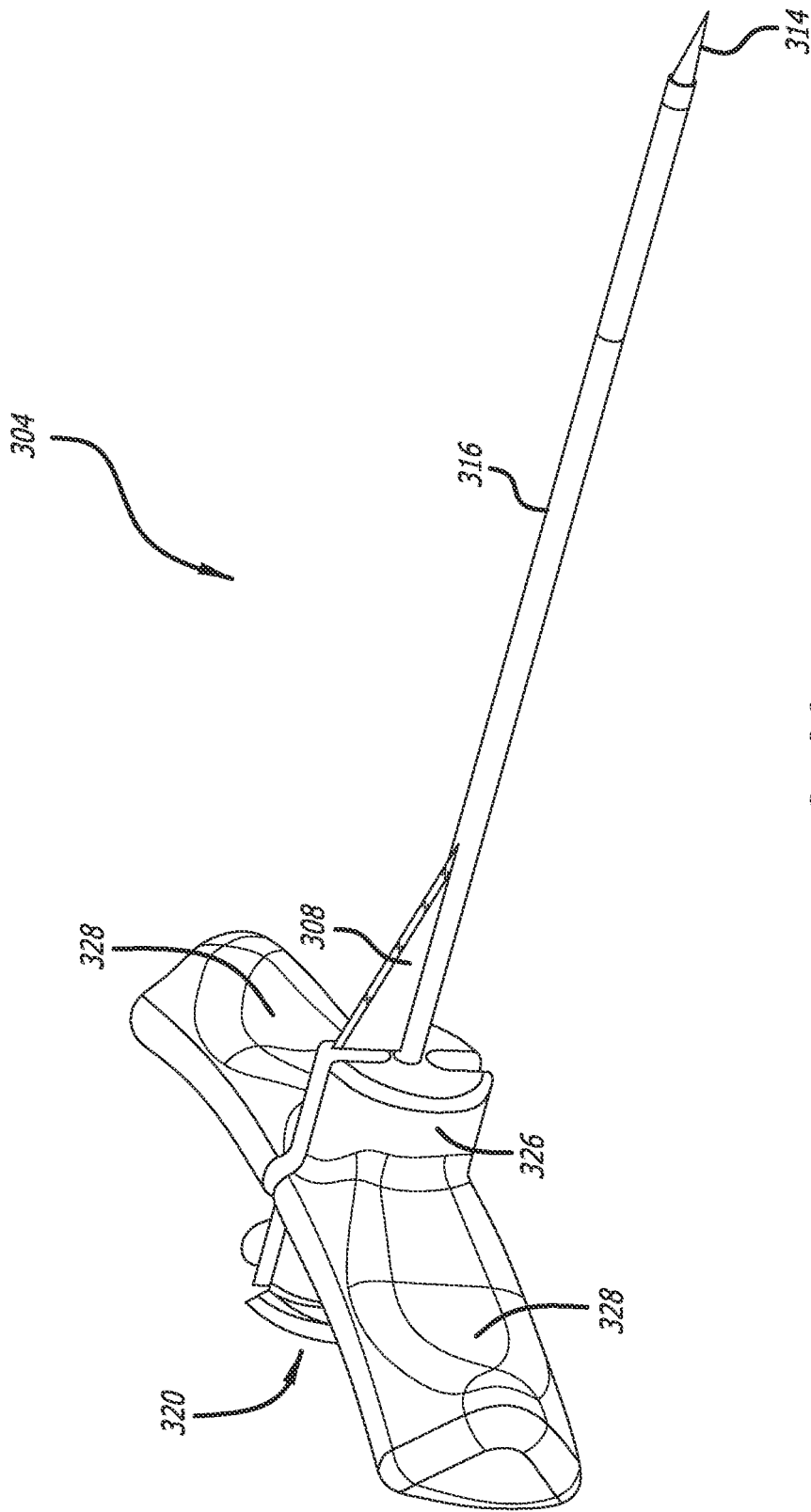


FIG. 30

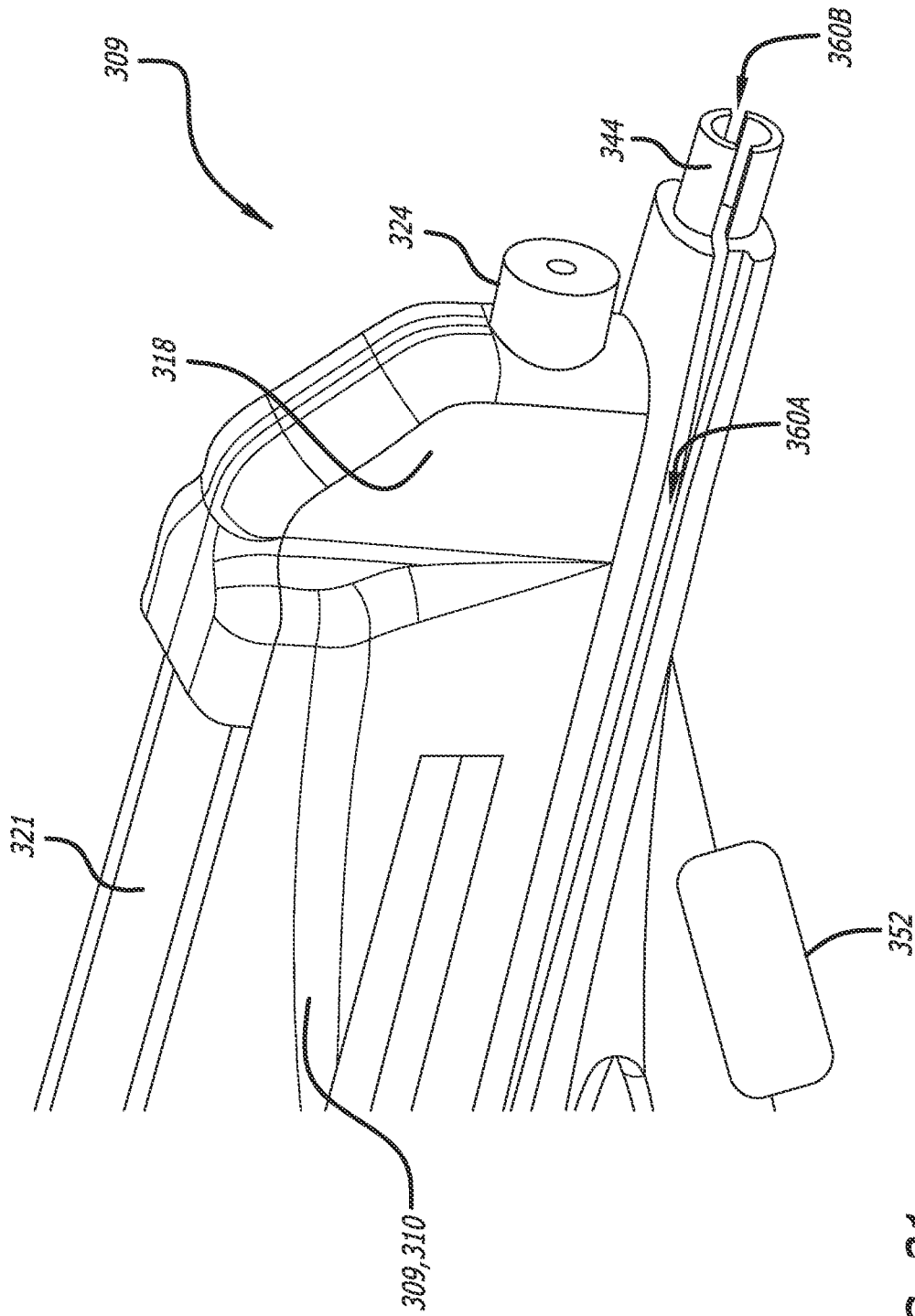


FIG. 31

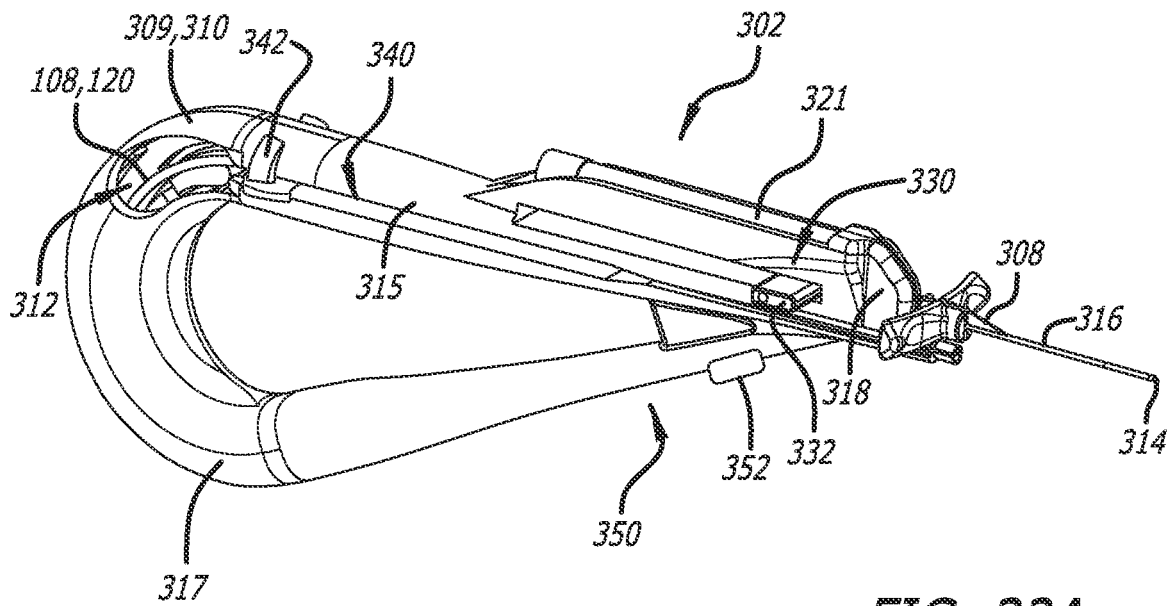


FIG. 32A

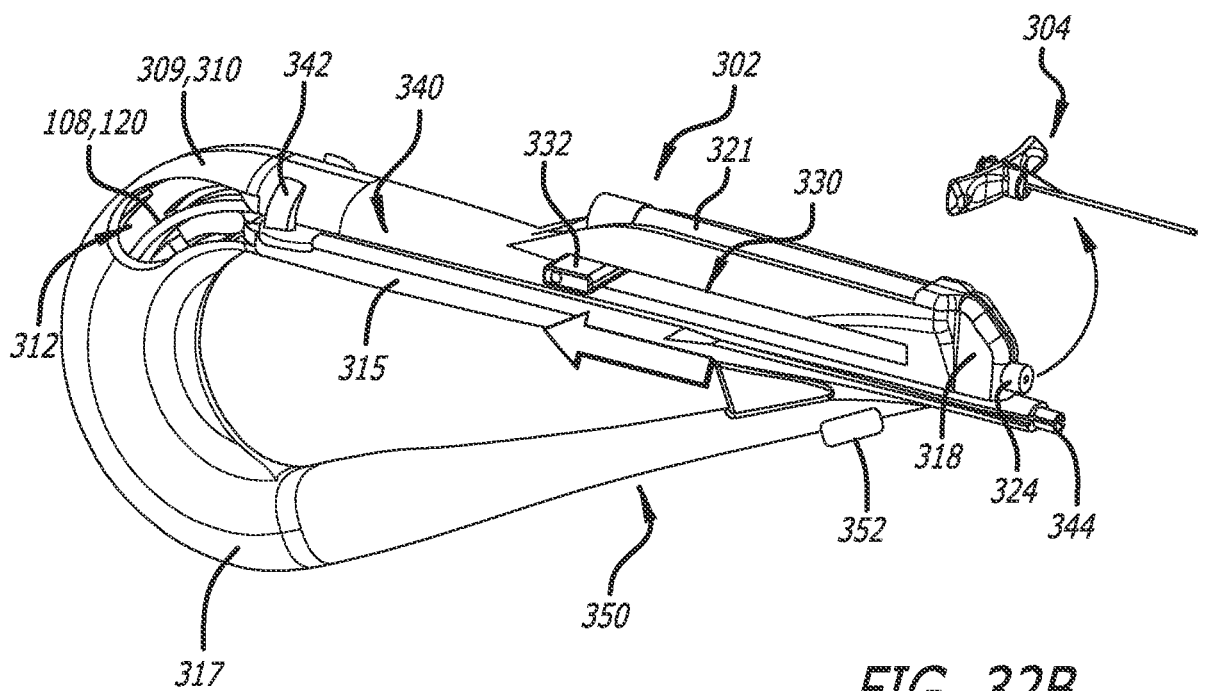


FIG. 32B

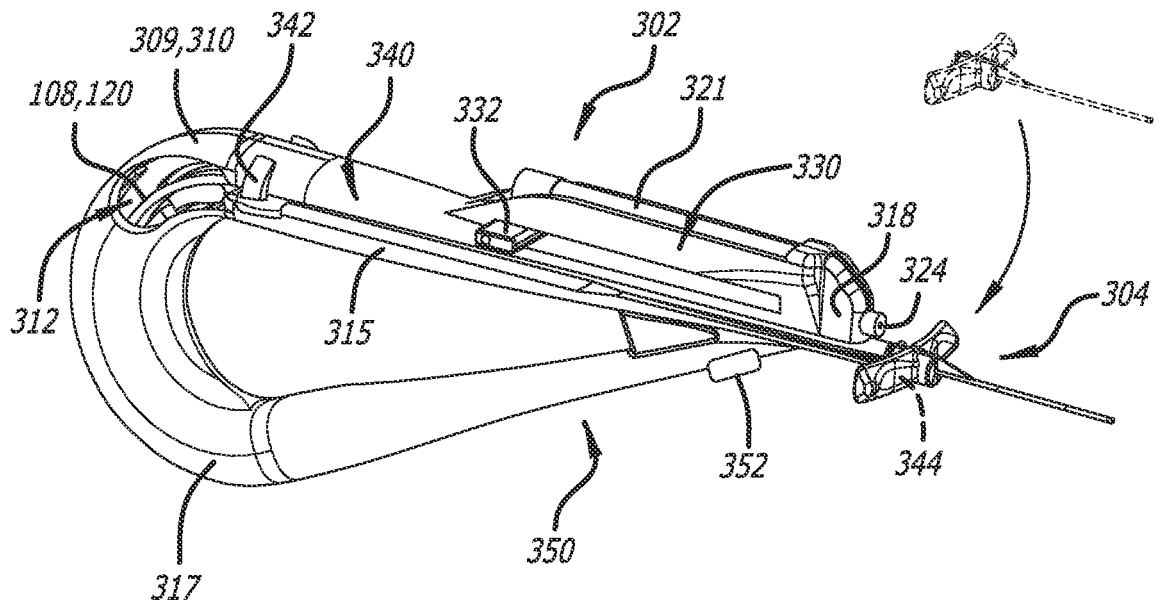


FIG. 32C

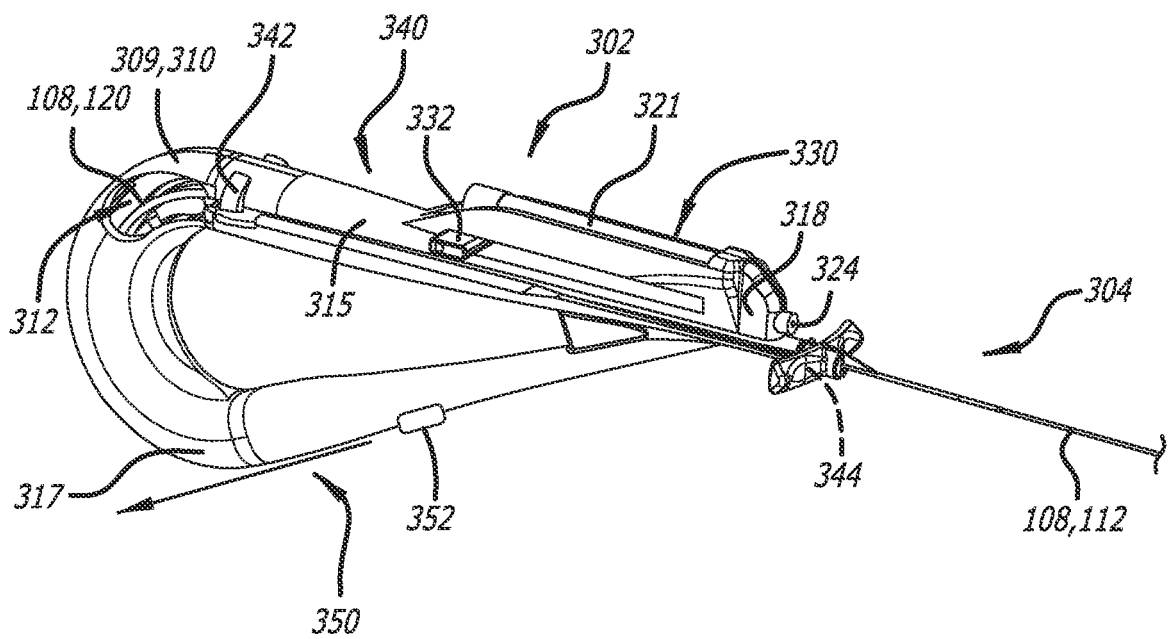


FIG. 32D

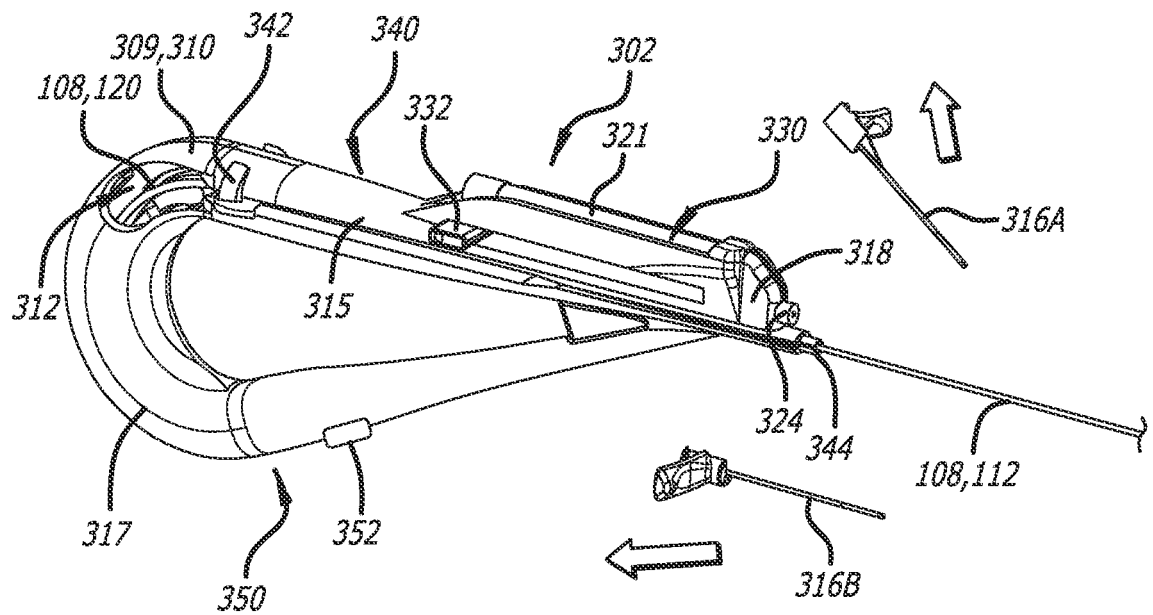


FIG. 32E

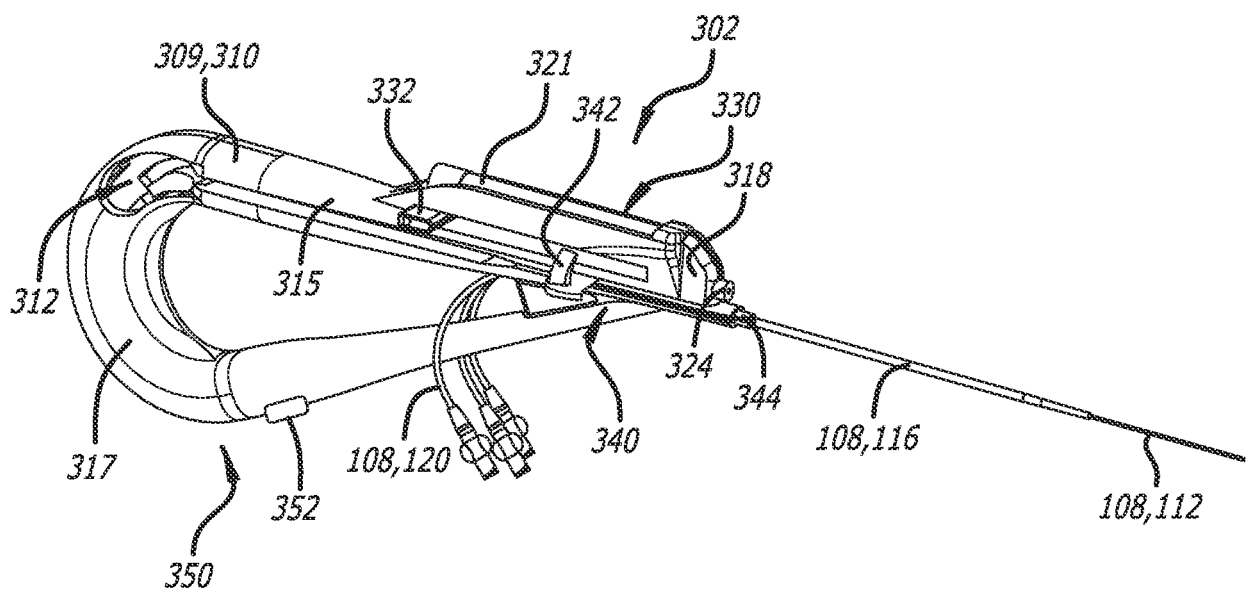


FIG. 32F

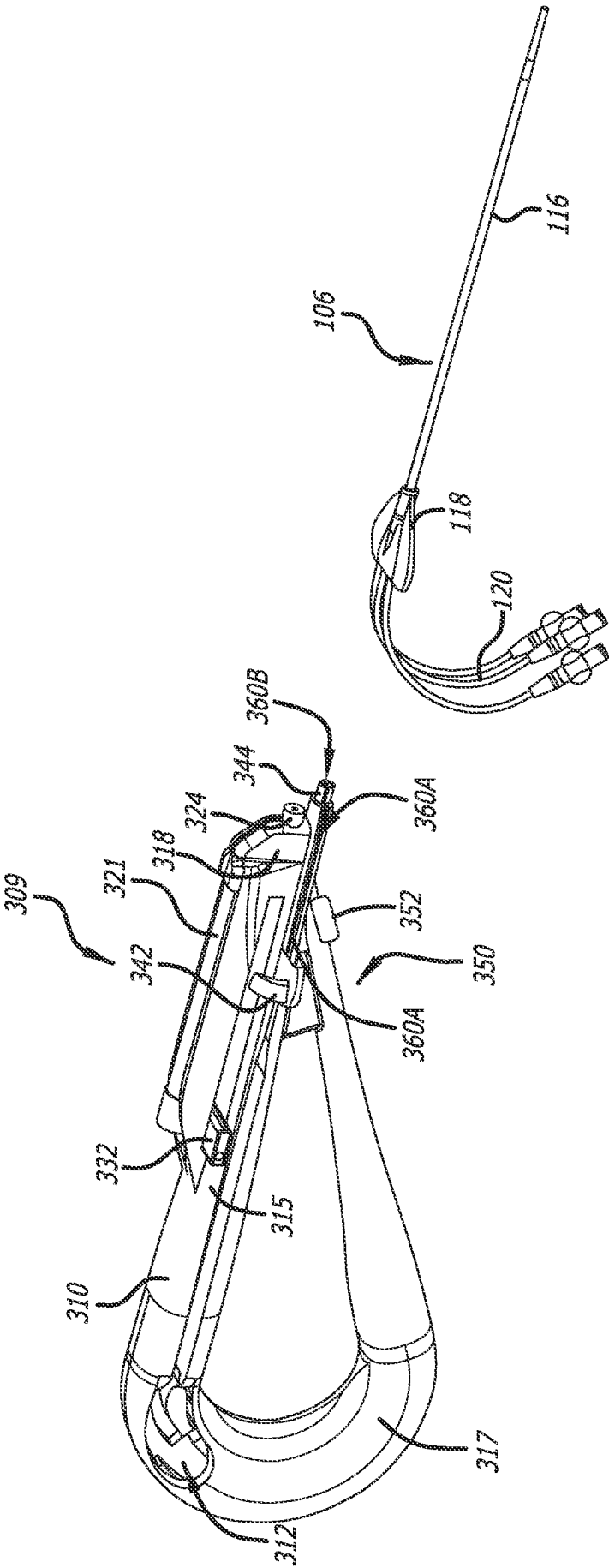


FIG. 32G