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(54) LAPAROSCOPIC SURGICAL LIGATION CLIP APPLIER

LAPAROSKOPISCHER APPLIKATOR FÜR CHIRURGISCHE LIGATURKLAMMERN

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Description

BACKGROUND

Technical Field

[0001] The present disclosure relates generally to a medical instrument for use with a surgical ligation clip. More particularly, the present disclosure is directed to a modular applier for positioning, securing, and closing a surgical ligation clip (from a plurality of ligation clips loaded into a clip cartridge or clip pack) around a vessel to be occluded.

Description of Related Art

[0002] Endoscopic staplers and clip appliers are known in the art and are used for a number of distinct and useful surgical procedures. In the case of a laparoscopic surgical procedure, access to the interior of an abdomen is achieved through narrow tubes or cannulas inserted through a small entrance incision in the skin. Minimally invasive procedures performed elsewhere in the body are often generally referred to as endoscopic procedures. Typically, a tube or cannula device is extended into the patient's body through the entrance incision to provide an access port. The port allows the surgeon to insert a number of different surgical instruments therethrough using a trocar and for performing surgical procedures far removed from the incision.

[0003] During a majority of these procedures, the surgeon must often terminate the flow of blood or another fluid through one or more vessels. The surgeon will often apply a surgical clip to a blood vessel or another duct to prevent the flow of body fluids therethrough during the procedure. An endoscopic clip applier is known in the art for applying a single clip during an entry to the body cavity. Such clips are typically fabricated from a biocompatible material and are usually compressed over a vessel. Once applied to the vessel, the compressed clip terminates the flow of fluid therethrough.

[0004] Endoscopic clip appliers including movable jaws that are able to apply multiple clips in endoscopic or laparoscopic procedures during a single entry into the body cavity are described in commonly-assigned U.S. Pat. Nos. 5,084,057 and 5,100,420 to Green et al.. Another multiple endoscopic clip applier is disclosed in commonly-assigned U.S. Pat. No. 5,607,436 by Pratt et al.. These devices are typically, though not necessarily, used during a single surgical procedure. U.S. Pat. No. 5,695,502 to Pier et al., discloses a resterilizable surgical clip applier. The clip applier advances and forms multiple clips during a single insertion into the body cavity. This resterilizable clip applier is configured to receive and cooperate with an interchangeable clip magazine so as to advance and form multiple clips during a single entry into a body cavity.

[0005] Other clip appliers include fixed jaws that apply

a single clip in an endoscopic or laparoscopic procedure and which then have to be withdrawn from the body cavity in order to be loaded with an additional single clip, for further application within the body cavity. U.S. Pat. No. 5,354,304 to Allen et al., discloses such a fixed jaw surgical clip applier. Generally, use of these appliers includes actuation by a surgeon of the applier to fire the single clip, withdrawal of the applier from the body cavity of the patient, removal of the expired clip cartridge (having contained the single clip) from the handle assembly of the applier, and loading of a new clip cartridge onto the handle assembly in order to fire another surgical clip. Document WO01/65997 discloses a repeating multi-clip applier according to the preamble of claim 1.

[0006] Accordingly, a need exists for laparoscopic surgical clip appliers that include reusable handle assemblies, reusable shaft assemblies, and disposable clip cartridge assemblies, with each clip cartridge assembly being loaded with a plurality of surgical ligation clips.

SUMMARY

[0007] The present disclosure relates to laparoscopic modular surgical clip appliers capable of positioning, securing, and closing a surgical ligation clip (from a plurality of ligation clips loaded into a clip cartridge or clip pack) around a vessel to be occluded.

[0008] According to an aspect of the present disclosure, a ligation clip applier is provided. The ligation clip applier includes a handle assembly, and a clip module.

[0009] The handle assembly includes a barrel housing defining a cavity therein; a fixed handle extending from the barrel housing; a trigger pivotably connected to the fixed handle, the trigger including a proximal end extending into the cavity of the barrel housing; an elongate neck portion supported on and extending from the barrel housing, the elongate neck portion includes a tubular shaft defining a lumen therethrough, wherein the lumen of the tubular shaft of the neck portion extends into the cavity of the barrel housing; and an advancing mechanism removably and slidably supported within the barrel housing and the lumen of the tubular shaft of the neck portion, wherein the advancing mechanism is actuatable by the trigger.

[0010] The advancing mechanism includes an advancing shaft having a proximal end and a distal end; an actuator supported at the distal end of the advancing shaft; and a biasing member urging the advancing shaft in a proximal direction.

[0011] The clip module is removably and selectively connected to a distal end of the tubular shaft of the neck portion. The clip module includes a housing defining a proximal end, a distal end and a lumen therethrough, the proximal end of the clip module housing being configured for selective connection to the distal end of the tubular shaft of the neck portion, the clip module housing including an annular flange extending radially into the lumen thereof.

[0012] The clip module includes a jaw blade slidably supported within the lumen of the clip module housing. The jaw blade includes a pair of jaws disposed within the distal end of the clip module housing, the pair of jaws being biased to an open condition, wherein each jaw includes a respective cam tooth projecting therefrom, wherein the cam teeth are in operative registration with, and proximal of, the annular flange of the clip module housing; and a stem extending proximally from the pair of jaws, wherein a proximal end of the stem is engagable by the distal end of the actuator of the advancing mechanism.

[0013] The clip module may further include a biasing member configured to maintain the jaw blade in a retracted position relative to the clip module housing.

[0014] The jaw blade of the clip module may be movable between an advanced position and the retracted position, wherein in the advanced position, the cam teeth of the pair of jaws of the jaw blade engage the annular flange of the clip module housing, wherein the pair of jaws are approximated to a closed condition; and in the retracted position, the cam teeth of the pair of jaws of the jaw blade are disengaged from the annular flange of the clip module housing, wherein the pair of jaws are in the open condition.

[0015] The biasing member of the clip module may be a coil spring including a first end secured to a relatively distal portion of the jaw blade, and a second end secured to a relatively proximal end of the clip module housing.

[0016] In use, during an actuation of the trigger of the handle assembly, the proximal end of the trigger may engage the proximal end of the advancing shaft of the advancing mechanism to distally advance the advancing shaft.

[0017] In use, during the distal advancement of the advancing shaft, the actuator of the advancing assembly may engage the proximal end of the stem of the jaw blade to distally advance the jaw blade.

[0018] The clip module housing may define a radial groove formed in an outer surface thereof, wherein the radial groove is located adjacent a proximal end of the clip module housing.

[0019] The tubular shaft of the elongate neck portion may include a latch pivotally supported adjacent a distal end thereof, wherein the latch includes a proximal end and a distal end, wherein the distal end of the latch includes a radially inwardly extending pawl.

[0020] The pawl of the latch of the tubular shaft may be configured to selectively engage the radial groove of the clip module housing, to selectively secure the clip module to the elongate shaft.

[0021] In use, upon an actuation of the trigger, the proximal end of the trigger may act on a proximal end of the actuator of the advancing mechanism to distally advance the actuator.

[0022] Also in use, upon distal advancement of the actuator, the distal end of the actuator may act on the proximal end of the stem of the jaw blade to distally advance

the jaw blade.

[0023] Further, in use, upon distal advancement of the jaw blade, the cam teeth of the pair of jaws of the jaw blade may engage the annular flange of the clip module housing, whereby the pair of jaws are approximated to the closed condition.

[0024] According to another aspect of the present disclosure, a clip module for selective connection to a handle assembly and actuatable by an advancing mechanism of the handle assembly, is provided. The clip module includes a housing defining a proximal end, a distal end and a lumen therethrough, the proximal end of the clip module housing being configured for selective connection to a distal end of a tubular shaft of the handle assembly, the clip module housing including an annular flange extending radially into the lumen thereof.

[0025] The clip module also includes a jaw blade slidably supported within the lumen of the clip module housing. The jaw blade includes a pair of jaws disposed within the distal end of the clip module housing, the pair of jaws being biased to an open condition, wherein each jaw includes a respective cam tooth projecting therefrom, wherein the cam teeth are in operative registration with, and proximal of, the annular flange of the clip module housing; and a stem extending proximally from the pair of jaws. A proximal end of the stem is engagable by the advancing mechanism of the handle assembly.

[0026] The clip module may further include a biasing member configured to maintain the jaw blade in a retracted position relative to the clip module housing.

[0027] The jaw blade of the clip module may be movable between an advanced position and the retracted position, wherein in the advanced position, the cam teeth of the pair of jaws of the jaw blade engage the annular flange of the clip module housing, wherein the pair of jaws are approximated to a closed condition; and in the retracted position, the cam teeth of the pair of jaws of the jaw blade are disengaged from the annular flange of the clip module housing, wherein the pair of jaws are in the open condition.

[0028] The biasing member of the clip module may be a coil spring including a first end secured to a relatively distal portion of the jaw blade, and a second end secured to a relatively proximal end of the clip module housing.

[0029] In use, during an actuation of the advancing mechanism of the handle assembly, the stem of the jaw blade may be acted on to distally advance the jaw blade.

[0030] The clip module housing may define a radial groove formed in an outer surface thereof, wherein the radial groove is located adjacent a proximal end of the clip module housing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] A particular embodiment of a laparoscopic surgical clip applier is disclosed herein with reference to the drawings wherein:

FIG. 1 is a side elevational view of a ligation surgical clip applier in accordance with the present disclosure;

FIG. 2 is a perspective view, with parts separated, of a handle assembly and a proximal end of a neck portion of the ligation surgical clip applier of FIG. 1; FIG. 3 is a perspective view of an advancing mechanism of the ligation surgical clip applier of FIG. 1; FIG. 4 is a schematic, side elevational view of a distal end of the neck portion of the ligation surgical clip applier of FIG. 1, with a loaded laparoscopic clip module attached thereto;

FIG. 5 is a schematic, cross-sectional, side elevational view of the distal end of the neck portion of the ligation surgical clip applier and the laparoscopic clip module shown in FIG. 4;

FIG. 6 is a cross-sectional, elevational view of the proximal end of the ligation surgical clip applier illustrating the handle assembly in three different positions;

FIG. 7 is a schematic, side elevational view of the distal end of the neck portion of the ligation surgical clip applier of FIG. 1, illustrating a firing of the loaded laparoscopic clip module attached thereto; and

FIG. 8 is a schematic, side elevational view of the distal end of the neck portion of the ligation surgical clip applier of FIG. 1, illustrating an expired laparoscopic clip module attached thereto.

DETAILED DESCRIPTION OF EMBODIMENTS

[0032] Embodiments of ligation surgical clip appliers, in accordance with the present disclosure, will now be described in detail with reference to the drawing figures wherein like reference numerals identify similar or identical structural elements. As shown in the drawings and described throughout the following description, as is traditional when referring to relative positioning on a surgical instrument, the term "proximal" refers to the end of the apparatus which is closer to the user and the term "distal" refers to the end of the apparatus which is further away from the user.

[0033] As shown in FIG. 1, a ligation surgical clip applier, in accordance with an embodiment of the present disclosure, is generally designated as 100. Clip applier 100 includes a handle assembly 110, an elongated and round or cylindrical neck portion or assembly 120 projecting from or extending from handle assembly 110, and a ligation clip module 140 that can be removably and selectively mounted on a distal end of neck portion 120. As will be described in greater detail below, a plurality of surgical ligation clips "C" (FIGS. 5 and 7) are loaded into ligation clip module 140. Also, as will be described in greater detail below, in operation, as handle assembly 110 is actuated, a single ligation clip "C" is fired and formed around a vessel to be ligated.

[0034] Handle assembly 110, as shown in FIGS. 1 and 2, includes a fixed handle 112 and a squeezable trigger

114 pivotally attached to fixed handle 112 at pivot shaft 116. Squeezable trigger 114 includes a proximal actuating end 114a.

[0035] Handle assembly 110 include a housing, in the form of a barrel, 118 supported on fixed handle 112. Barrel 118 is configured to receive a proximal end of neck portion 120. A threaded end cap 119 closes a proximal end of barrel 118. As shown in FIG. 2, barrel 118 is formed of a first barrel portion 118a, a second barrel portion 118b and a third barrel portion 118c of progressively smaller diameters, that together form a telescope-like appearing structure. Third barrel portion 118c includes a radially projecting lip at its distal end.

[0036] The proximal end of elongated neck portion or assembly 120, as shown in FIG. 2, includes a hollow tube or shaft 122 and a collar 124 secured thereto and open at its proximal end. The proximal end of hollow shaft 122 has two oppositely disposed J-shaped notches 122a (e.g., "bayonet locks" or channels), to secure elongated neck portion 120 to handle assembly 110.

[0037] The shaft 122 and collar 124, as well as the entire handle assembly 110, may be made of high grade surgical steel, such as, for example, stainless steel, or from a high strength autoclavable polymer or the like.

[0038] To assemble neck portion 120 and handle assembly 110, a resilient wave washer and a first bushing are placed over the proximal end of shaft 122. The shaft 122 is inserted into the open distal end of the barrel assembly 118 until a rim on the first bushing abuts the circumferential lip on third barrel portion 118c, as illustrated in FIG. 6. A second bushing, having a cylindrical portion and a circumferential rim, and a bayonet ring lock are then inserted into the open proximal end of barrel 118 and over the proximal end of shaft 122. Referring momentarily to FIG. 6, the second bushing is inserted until a rim thereof abuts a radially projecting ridge formed between second barrel portion 118b and third barrel portion 118c of barrel 118. The bayonet ring lock may include a pair of opposed pins, protruding inwardly from its inner cylindrical surface, that are configured to fit into the J-shaped notches 122a and lock elongated neck portion 120 in handle assembly 110.

[0039] With reference to FIGS. 3 and 6, neck portion 120 includes an advancing mechanism 130 slidably disposed within hollow shaft 122 thereof. Advancing mechanism 130 includes an advancing shaft 132 supports, at its distal end, an actuator 134. As shown in FIG. 3, actuator 134 has a cylindrical portion 134a and tapers to a flat blade-like portion 134b having a substantially rectangular cross-sectional profile.

[0040] Advancing shaft 132 is urged toward the proximal end of neck portion 120 by a compression return spring 136. A proximal end of spring 136 may abut against a shaft adapter 138.

[0041] With the neck portion 120 connected to barrel 118 of handle assembly 110, advancing shaft 132 is assembled in neck portion 120 by inserting advancing shaft 132 in the proximal end of barrel 118. As shown in FIG.

6, a short stop pin 122a extends inwardly from the inner surface of hollow shaft 122 in an intermediate region thereof. When advancing shaft 132 is inserted through the hollow shaft 132, the sliding bushing abuts against stop pin 122a and becomes arrested at that position. Further insertion of advancing shaft 132 causes spring 136 to engage shaft adapter 138, thereby biasing advancing shaft 132 in the rearward direction against proximal actuating end 114a of squeezable trigger 114. When advancing shaft 132 is fully inserted into neck portion 120, the end cap 119 may be placed or screwed onto proximal end of barrel 118.

[0042] With reference to FIG. 6, when squeezable trigger 114 is pivoted in the counterclockwise direction about the pivot shaft 116, the top or actuating end 114a of squeezable trigger 114 engages the proximal end of the shaft adapter 138 thereby urging advancing shaft 132 distally against the biasing force of spring 136.

[0043] FIG. 5 illustrates how ligation clip module 140 is attached to the distal end of hollow shaft 122. Specifically, a spring-loaded latch 126 is pivotably mounted in a wall of hollow shaft 122. A distal end of latch 126 is provided with a pawl 126a. The ligation clip module 140 has a reduced diameter housing section 142b which fits into the open distal end of hollow shaft 122. To secure ligation clip module 140 in hollow shaft 122, a proximal end of latch 126 is pressed down (in the direction of arrow "A") to raise pawl 126a. The reduced diameter housing section 142b of ligation clip module 140 is then inserted into the open distal end of hollow shaft 122, and the proximal end of latch 126 is released so that pawl 126a catches a transverse or radial groove 142c in the reduced diameter housing section 142b of ligation clip module 140 to securely lock ligation clip module 140 in neck portion 120. Advantageously, pawl 126a of latch 126 may be provided with a cam surface that rides up on the proximal extreme of reduced diameter housing section 142b of ligation clip module 140. In this way, the cam surface of pawl 126a is automatically guided to groove 142c of ligation clip module 140 when ligation clip module 140 is inserted into neck portion 120.

[0044] As a safety feature, when latch 126 is pivoted to the open position, the proximal end of latch 126 abuts flat blade-like portion 134b of actuator 134 and prevents advancing shaft 132 from moving farther forwardly in hollow shaft 122.

[0045] Similarly, when ligation clip module 140 is properly mounted in neck portion 120 and advancing shaft 132 is advanced to apply a ligation clip, as described below, cylindrical section 134a of actuator 134 prevents the proximal end of latch 126 from being depressed to release ligation clip module 140.

[0046] With reference to FIGS. 4, 5, 7 and 8, the individual components of ligation clip module 140 are shown. Ligation clip module 140 includes a housing 142 having a distal housing section 142a of a first diameter, and proximal housing section 142b having a second diameter that is reduced from the first diameter. Proximal housing sec-

tion 142b defines an outer annular groove or recess 142c therein. A lumen 142d extends longitudinally through housing 142. Housing 142 includes an annular flange 142e defining a camming surface that extends radially inward, at a distal end of housing 142.

[0047] Ligation clip module 140 includes a jaw blade 144 slidably supported within lumen 142d of housing 142. Jaw blade 144 includes a pair of jaws 144a projecting from or extending distally from within housing 142, and a proximal stem 144b extending proximally through lumen 142d of housing 142. Jaw blade 144 is fabricated from a resilient material, such as, for example, stainless steel, and is formed such that the pair of jaws 144a are spaced apart from one another or are biased apart from one another. Each jaw 144a includes a cam tooth 144c projecting therefrom and configured to engage annular flange 142e of housing 142 when jaw blade 144 is advanced distally. In operation, with reference to FIGS. 7 and 8, as jaw blade 144 is advanced distally, cam teeth 144c of the pair of jaws 144a engage annular flange 142e of housing 142 thereby resulting in a closure or approximation of the pair of jaws 144.

[0048] Ligation clip module 140 further includes a biasing member 146 functioning to maintain jaw blade 144 in a retracted position relative to housing 142, whereby the pair of jaws 144a are maintained in an open condition due to a natural spring bias thereof. Alternatively, biasing member 146 may function to act on jaw blade 144 such that an outer surface of the pair of jaws 144a cam against a distal edge of annular flange 142e of housing 142. In an embodiment for example, biasing member 146 may be a coil spring disposed about stem 144b of jaw blade 144, and may include a first end secured to a relatively distal portion of jaw blade 144 (e.g., secured to a collar or flange of jaw blade 144), and a second end secured to a relatively proximal portion of housing 142.

[0049] As can be appreciated, ligation clip module 140 is disposable. In addition, different size modules for mounting various size ligation clips can be easily connected to the same hollow shaft 122 by using a standard size reduced diameter proximal section 142b of housing 142.

[0050] With reference to FIGS. 5-8, an exemplary operation of clip applier 100 is described. As illustrated in FIG. 5, with ligation clip module 140 secured onto neck portion 120, a ligation clip "C" (FIGS. 5 and 7) is loaded in the pair of jaws 144a of ligation clip module 140, and is ready to be fired. With clip applier 100 loaded with a ligation clip module 140 holding ligation clip "C" between the pair of jaws 144a, and ready to be fired, the ligation clip "C" may be positioned around a vessel to be ligated.

[0051] With reference to FIGS. 6 and 7, with the ligation clip "C" in position around the vessel to be ligated, squeezing or actuation of trigger 114 causes advancing shaft 132 (FIGS. 3 and 6) of neck portion 120 to be advanced distally, as indicated by arrow "B" of FIG. 7. As advancing shaft 132 of neck portion 120 is advanced distally, flat blade-like portion 134b of actuator 134 is ad-

vanced into abutment with stem 144b of jaw blade 144. Additionally, as advancing shaft 132 of neck portion 120 is advanced distally, return spring 136 of advancing mechanism 130 is compressed.

[0052] The flat blade-like portion 134b of actuator 134 forces jaw blade 144 in a distal direction, thereby driving the cam teeth 144c of the pair of jaws 144a against annular flange 142e of housing 142 of ligation clip module 140, and thereby closing or approximating the pair of jaws 144a, against a spring bias thereof, to form ligation clip "C". As jaw blade 144 is advanced distally, biasing member 146 is stretched or lengthened.

[0053] Following formation of ligation clip "C", with reference to FIG. 8, trigger 114 is released, whereby return spring 136 is free to expand and thus withdraw advancing shaft 132 of neck portion 120. As advancing shaft 132 of neck portion 120 is withdrawn from flat blade-like portion 134b of actuator 134 is retracted from contact with stem 144b of jaw blade 144. As actuator 134 is retracted from stem 144b of jaw blade 144, biasing member 146 is free to recompress or retract, thereby withdrawing cam teeth 144c of the pair of jaws 144a away from annular flange 142e of housing 142 of ligation clip module 140, and thereby permitting the pair of jaws 144a to open due to the spring bias thereof.

[0054] With continued reference to FIG. 8, with actuator 134 retracted, flat blade-like portion 134b of actuator 134 is in registration with the proximal end of latch 126 of neck portion 120. As so positioned, the proximal end of latch 126 may be pressed down (in the direction of arrow "A" of FIG. 5) to raise and disengage pawl 126a from the transverse or radial groove 142c of the reduced diameter proximal housing section 142b of ligation clip module 140 to thereby permit disconnection of spent ligation clip module 140 from neck portion 120. Alternatively, the spent ligation clip module 140 may be reloaded with a new ligating clip (contained in a clip pack), prior to disconnection of ligation clip module 140 from neck portion 120 and discarding thereof.

[0055] A new ligation clip module 140 can then be inserted and secured in the hollow shaft 122 of neck portion 120, and clip applicator 100 is once again ready to fire another ligating clip "C".

[0056] Ligation clips "C" may be contained in clip packs containing a plurality of clips, such as, for example, six (6) clips of the like. Clip packs may be loaded with a full set of metal clips (e.g., titanium, stainless steel or metal alloys), a full set of polymer clips (e.g., biocompatible or bioabsorbable), or a combination thereof.

[0057] Although a specific embodiment of the present disclosure has been described above in detail, it will be understood that this description is merely for purposes of illustration. Various modifications of and equivalent structures corresponding to the disclosed aspects of the preferred embodiments in addition to those described above may be made by those skilled in the art without departing from the scope of the present disclosure which is defined in the following claims, the scope of which is

to be accorded the broadest interpretation so as to encompass such modifications and equivalent structures.

5 Claims

1. A ligation clip applicator (100), comprising:

a handle assembly (110) including:

a barrel housing (118) defining a cavity therein;
a fixed handle (112) extending from the barrel housing;
a trigger (114) pivotably connected to the fixed handle, the trigger including a proximal end (114a) extending into the cavity of the barrel housing;
an elongate neck portion (120) supported on and extending from the barrel housing, the elongate neck portion includes a tubular shaft (122) defining a lumen therethrough, wherein the lumen of the tubular shaft of the neck portion extends into the cavity of the barrel housing; and
an advancing mechanism (130) removably and slidably supported within the barrel housing and the lumen of the tubular shaft of the neck portion, wherein the advancing mechanism is actuatable by the trigger, the advancing mechanism including:

an advancing shaft (132) having a proximal end and a distal end;
an actuator (134) supported at the distal end of the advancing shaft; and
a biasing member (136) urging the advancing shaft in a proximal direction; and

a clip module (140) removably and selectively connected to a distal end of the tubular shaft of the neck portion, the clip module including:

a housing (142) defining a proximal end, a distal end and a lumen therethrough, the proximal end of the clip module housing being configured for selective connection to the distal end of the tubular shaft of the neck portion, the clip module housing including an annular flange (142e) extending radially into the lumen thereof; and
a jaw blade (144) supported within the lumen of the clip module housing, the jaw blade including:

a pair of jaws (144a) disposed within the distal end of the clip module hous-

- ing, the pair of jaws being biased to an open condition, wherein each jaw includes a respective cam tooth (144c) projecting therefrom, wherein the cam teeth are in operative registration with, and proximal of, the annular flange of the clip module housing; and a stem (144b) extending proximally from the pair of jaws, wherein a proximal end of the stem is engagable by the distal end of the actuator of the advancing mechanism, said clip module being **characterized in that** said jaw blade is slidably supported within the lumen of the clip module housing such that upon distal advancement of the jaw blade, the cam teeth of the pair of jaws of the jaw blade engage the annular flange of the clip module housing, whereby the pair of jaws are approximated to the closed condition.
2. The ligation clip applier according to claim 1, wherein the clip module further includes a biasing member (146) configured to maintain the jaw blade in a retracted position relative to the clip module housing; preferably wherein the jaw blade of the clip module is movable between an advanced position and the retracted position, wherein:

in the advanced position, the cam teeth of the pair of jaws of the jaw blade engage the annular flange of the clip module housing, wherein the pair of jaws are approximated to a closed condition; and

in the retracted position, the cam teeth of the pair of jaws of the jaw blade are disengaged from the annular flange of the clip module housing, wherein the pair of jaws are in the open condition.
 3. The ligation clip applier according to claim 2, wherein the biasing member of the clip module is a coil spring including a first end secured to a relatively distal portion of the jaw blade, and a second end secured to a relatively proximal end of the clip module housing; and/or wherein, during an actuation of the trigger of the handle assembly, the proximal end of the trigger engages the proximal end of the advancing shaft of the advancing mechanism to distally advance the advancing shaft.
 4. The ligation clip applier according to claim 3, wherein, during the distal advancement of the advancing shaft, the actuator of the advancing assembly engages the proximal end of the stem of the jaw blade to distally advance the jaw blade.
 5. The ligation clip applier according to any preceding claim, wherein the clip module housing defines a radial groove (142c) formed in an outer surface thereof, wherein the radial groove is located adjacent a proximal end of the clip module housing.
 6. The ligation clip applier according to claim 5, wherein the tubular shaft of the elongate neck portion includes a latch (126) pivotally supported adjacent a distal end thereof, wherein the latch includes a proximal end and a distal end, wherein the distal end of the latch includes a radially inwardly extending pawl (126a); preferably wherein the pawl of the latch of the tubular shaft is configured to selectively engage the radial groove of the clip module housing, to selectively secure the clip module to the elongate shaft.
 7. The ligation clip applier according to any preceding claim, wherein upon an actuation of the trigger, the proximal end of the trigger acts on a proximal end of the actuator of the advancing mechanism to distally advance the actuator.
 8. The ligation clip applier according to claim 7, wherein upon distal advancement of the actuator, the distal end of the actuator acts on the proximal end of the stem of the jaw blade to distally advance the jaw blade.
 9. A clip module (140) for selective connection to a handle assembly (110) and actuatable by an advancing mechanism (130) of the handle assembly, the clip module comprising:

a housing (142) defining a proximal end, a distal end and a lumen therethrough, the proximal end of the clip module housing being configured for selective connection to a distal end of a tubular shaft of the handle assembly, the clip module housing including an annular flange (142e) extending radially into the lumen thereof;

a jaw blade (144) supported within the lumen of the clip module housing, the jaw blade including:

a pair of jaws (144a) disposed within the distal end of the clip module housing, the pair of jaws being biased to an open condition, wherein each jaw includes a respective cam tooth (144c) projecting therefrom, wherein the cam teeth are in operative registration with, and proximal of, the annular flange of the clip module housing; and

a stem (144b) extending proximally from the pair of jaws, wherein a proximal end of the stem is engagable by the advancing mechanism of the handle assembly; said clip module being **characterized in that** said jaw blade is slidably supported within the lumen of the clip module housing such that upon distal advancement of the jaw blade, the cam teeth of the pair of jaws of the jaw

blade engage the annular flange of the clip module housing, whereby the pair of jaws are approximated to the closed condition.

10. The clip module according to claim 9, further comprising a biasing member (146) configured to maintain the jaw blade in a retracted position relative to the clip module housing. 5
11. The clip module according to claim 10, wherein the jaw blade of the clip module is movable between an advanced position and the retracted position, wherein: 10
- in the advanced position, the cam teeth of the pair of jaws of the jaw blade engage the annular flange of the clip module housing, wherein the pair of jaws are approximated to a closed condition; and 15
- in the retracted position, the cam teeth of the pair of jaws of the jaw blade are disengaged from the annular flange of the clip module housing, wherein the pair of jaws are in the open condition. 20
12. The clip module according to claim 11, wherein the biasing member of the clip module is a coil spring including a first end secured to a relatively distal portion of the jaw blade, and a second end secured to a relatively proximal end of the clip module housing. 25
13. The clip module according to any of claims 9 to 12, wherein, during an actuation of the advancing mechanism of the handle assembly, the stem of the jaw blade is acted on to distally advance the jaw blade. 30
14. The clip module according to any of claims 9 to 13, wherein the clip module housing defines a radial groove (142c) formed in an outer surface thereof, wherein the radial groove is located adjacent a proximal end of the clip module housing. 35
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Patentansprüche

1. Ligationsclipapplikator (100), der Folgendes umfasst: 45

eine Griffanordnung (110), folgendes umfassend: 50

ein zylindrisches Gehäuse (118), darin einen Hohlraum definierend;
einen fixierten Griff (112), der sich von dem zylindrischen Gehäuse erstreckt; 55
einen Trigger (114), schwenkbar an den fixierten Griff angeschlossen, wobei der Trigger ein proximales Ende (114a) umfasst,

das sich in den Hohlraum des zylindrischen Gehäuses erstreckt;
ein länglicher Halsteil (120), der auf dem zylindrischen Gehäuse gelagert ist und sich von diesem erstreckt; wobei der längliche Halsteil einen rohrförmigen Schaft (122) umfasst, dadurch ein Lumen definierend, wobei das Lumen des rohrförmigen Schafts des Halsteils sich in den Hohlraum des zylindrischen Gehäuses erstreckt; und
einen Vorrückmechanismus (130), der abnehmbar und gleitfähig innerhalb des zylindrischen Gehäuses und des Lumens des rohrförmigen Schafts des Halsteils gelagert ist, wobei der Vorrückmechanismus durch den Trigger auslösbar ist; und

wobei der Vorrückmechanismus folgendes umfasst:

einen Vorrückschaft (132) mit einem proximalen Ende und einem distalen Ende;
einen Auslöser (134), der auf dem distalen Ende des Vorrückschafts gelagert ist; und
ein Vorspannglied (136), das den Vorrückschaft in eine proximale Richtung drängt; und

ein Clipmodul (140), abnehmbar und wahlweise angeschlossen an ein distales Ende des rohrförmigen Schafts des Halsteils, wobei das Clipmodul folgendes umfasst:

ein Gehäuse (142), ein proximales Ende, ein distales Ende und ein Lumen dadurch definierend, wobei das proximale Ende des Clipmodulgehäuses für wahlweises Anschließen an das distale Ende des rohrförmigen Schafts des Halsteils konfiguriert ist; und wobei das Clipmodulgehäuse einen Ringflansch (142e) umfasst, der sich radial in das Lumen davon erstreckt; und
eine Backenklinge (144), die innerhalb des Lumens des Clipmodulgehäuses gelagert ist, wobei die Backenklinge folgendes umfasst:

ein Backenpaar (144a), innerhalb des distalen Ende des Clipmodulgehäuses angeordnet, wobei das Backenpaar in einen offenen Zustand vorgespannt ist; wobei jede Backe jeweils eine Zahnnocke (144c) umfasst, die davon hervorsticht, wobei die Zahnnocken in operativem Einrasten mit, und proximal zu, dem Ringflansch des Clipmodulgehäuses sind; und
einen Stamm (144b), der sich proximal

von dem Backenpaar erstreckt, wobei ein proximales Ende des Stamms durch das distale Ende des Auslösers des Vorrückmechanismus einrastbar ist;

das genannte Clipmodul **dadurch gekennzeichnet, dass** die Backenklinge gleitfähig innerhalb des Lumens des Clipmodulgehäuses gelagert ist, derart dass bei distalem Vorrücken der Backenklinge die Zahnnocken des Backenpaares der Backenklinge den Ringflansch des Clipmodulgehäuses einrasten, wodurch das Backenpaar an den geschlossenen Zustand angenähert wird.

2. Ligationsclipapplikator nach Anspruch 1, wobei das Clipmodul ferner ein Vorspannglied (146) umfasst, das zum Halten der Backenklinge in einer zurückgezogenen Position relativ zu dem Clipmodulgehäuse konfiguriert ist; wobei vorzugsweise die Backenklinge des Clipmoduls zwischen einer vorgerückten Position und der zurückgezogenen Position beweglich ist; wobei:

in der vorgerückten Position die Zahnnocken des Backenpaares der Backenklinge den Ringflansch des Clipmodulgehäuses einrasten, wobei das Backenpaar an einen geschlossenen Zustand angenähert wird; und
in der zurückgezogenen Position die Zahnnocken des Backenpaares der Backenklinge aus dem Ringflansch des Clipmodulgehäuses austragen, wobei das Backenpaar in dem offenen Zustand ist.

3. Ligationsclipapplikator nach Anspruch 2, wobei das Vorspannglied des Clipmoduls eine Sprungfeder ist, die ein erstes Ende umfasst, das an einem relativ distalen Teil der Backenklinge gesichert ist, sowie ein zweites Ende, das an einem relativ proximalen Ende des Clipmodulgehäuses gesichert ist; und/oder wobei während einer Betätigung des Triggers der Griffanordnung, das proximale Ende des Triggers das proximale Ende des Vorrückschafts des Vorrückmechanismus einrastet, um den Vorrückschaft distal vorzurücken.
4. Ligationsclipapplikator nach Anspruch 3, wobei, während des distalen Vorrückens des Vorrückschafts, der Auslöser der Vorrückanordnung das proximale Ende des Stamms der Backenklinge einrastet, um die Backenklinge distal vorzurücken.
5. Ligationsclipapplikator nach einem der vorstehenden Ansprüche, wobei das Clipmodulgehäuse eine radiale Nut (142c) definiert, die in einer Außenfläche davon gebildet wird, wobei die radiale Nut einem pro-

ximalen Ende des Clipmodulgehäuses benachbart angeordnet ist.

6. Ligationsclipapplikator nach Anspruch 5, wobei der rohrförmige Schaft des länglichen Halsteils einen Riegel (126) umfasst, der schwenkbar gelagert ist, einem distalen Ende davon benachbart, wobei der Riegel ein proximales Ende und ein distales Ende umfasst; wobei das distale Ende des Riegels eine sich radial einwärts erstreckende Klinke (126a) umfasst; wobei vorzugsweise die Klinke des Riegels des rohrförmigen Schafts zum wahlweisen Einrasten der radialen Nut des Clipmodulgehäuses konfiguriert ist, um das Clipmodul wahlweise an dem länglichen Schaft zu sichern.

7. Ligationsclipapplikator nach einem der vorstehenden Ansprüche, wobei nach einer Betätigung des Triggers das proximale Ende des Triggers auf ein proximales Ende des Auslösers von dem Vorrückmechanismus einwirkt, um den Auslöser distal vorzurücken.

8. Ligationsclipapplikator nach Anspruch 7, wobei nach distalem Vorrücken des Auslösers das distale Ende des Auslösers auf das proximale Ende des Stamms der Backenklinge einwirkt, um die Backenklinge distal vorzurücken.

9. Clipmodul (140) für wahlweises Anschließen an eine Griffanordnung (110) und durch einen Vorrückmechanismus (130) der Griffanordnung auslösbar, wobei das Clipmodul folgendes umfasst:

ein Gehäuse (142), das ein proximales Ende, ein distales Ende, und ein Lumen dadurch definiert, wobei das proximale Ende des Clipmodulgehäuses für wahlweises Anschließen an ein distales Ende eines rohrförmigen Schafts der Griffanordnung konfiguriert ist; wobei das Clipmodulgehäuse einen Ringflansch (142e) umfasst, der sich radial in das Lumen davon erstreckt;
eine Backenklinge (144), innerhalb des Lumens des Clipmodulgehäuses gelagert; wobei die Backenklinge umfasst:

ein Backenpaar (144a), innerhalb des distalen Endes des Clipmodulgehäuses angeordnet, wobei das Backenpaar in einem offenen Zustand vorgespannt ist, wobei jede Backe jeweils eine Zahnnocke (144c) umfasst, die davon hervorsteht; wobei die Zahnnocken in operativem Einrasten mit, und proximal zu, dem Ringflansch des Clipmodulgehäuses sind; und
einen Stamm (144b), der sich proximal von dem Backenpaar erstreckt, wobei ein pro-

- ximales Ende des Stamms durch den Vorrückmechanismus der Griffanordnung einrastbar ist;
das Clipmodul **dadurch gekennzeichnet, dass** die Backenklinge gleitfähig innerhalb des Lumens des Clipmodulgehäuses gelagert ist, derart dass nach distalem Vorrücken der Backenklinge die Zahnnocken des Backenpaars der Backenklinge den Ringflansch des Clipmodulgehäuses einrasten, wodurch das Backenpaar an den geschlossenen Zustand angenähert wird. 5 10
10. Clipmodul nach Anspruch 9, ferner ein Vorstellglied (146) umfassend, das zum Halten der Backenklinge in einer zurückgezogenen Position relativ zu dem Clipmodulgehäuse konfiguriert ist. 15
11. Clipmodul nach Anspruch 10, wobei die Backenklinge des Clipmoduls zwischen einer vorgerückten Position und einer zurückgezogenen Position beweglich ist; wobei:
- in der vorgerückten Position die Zahnnocken des Backenpaars der Backenklinge den Ringflansch des Clipmodulgehäuses einrasten; wobei das Backenpaar an einen geschlossenen Zustand angenähert sind; und 25
- in der zurückgezogenen Position die Zahnnocken des Backenpaars der Backenklinge aus dem Ringflansch des Clipmodulgehäuses ausgerastet sind, wobei das Backenpaar in dem offenen Zustand ist. 30
12. Clipmodul nach Anspruch 11, wobei das Vorspann- glied des Clipmoduls eine Sprungfeder ist, welche ein erstes Ende umfasst, das an einem relativ distalen Teil der Backenklinge gesichert ist, sowie ein zweites Ende, das an einem relativ proximales Ende des Clipmodulgehäuses gesichert ist. 35 40
13. Clipmodul nach einem der Ansprüche 9 bis 12, wobei während eines Auslösens des Vorrückmechanismus der Griffanordnung auf den Stamm der Backenklinge eingewirkt wird, um die Backenklinge distal vorzurücken. 45
14. Clipmodul nach einem der Ansprüche 9 bis 13, wobei das Clipmodulgehäuse eine radiale Nut (142c) definiert, die in einer Außenfläche davon gebildet ist, wobei die radiale Nut einem proximalen Ende des Clipmodulgehäuses benachbart angeordnet ist. 50

Revendications 55

1. Applicateur d'agrafes de ligature (100), comprenant :

un ensemble de poignée (110) comportant :

un boîtier cylindrique (118) définissant une cavité;
une poignée fixe (112) s'étendant du boîtier cylindrique;
une gâchette (114) raccordée à pivotement à la poignée fixe, la gâchette comprenant une extrémité proximale (114a) s'étendant dans la cavité du boîtier cylindrique ;
une partie de col allongée (120) supportée et s'étendant depuis le boîtier cylindrique, la partie de col allongée comprenant un arbre tubulaire (122) à travers lequel est définie une lumière, dans lequel la lumière de l'arbre tubulaire de la partie de col s'étend dans la cavité du boîtier cylindrique; et

un mécanisme d'avancement (130) supporté à coulissement de manière amovible dans le boîtier cylindrique et la lumière de l'arbre tubulaire de la partie de col, dans lequel le mécanisme d'avancement peut être actionné par la gâchette, le mécanisme d'avancement comprenant :

un arbre d'avancement (132) ayant une extrémité proximale et une extrémité distale ;
un actionneur (134) supporté à l'extrémité distale de l'arbre d'avancement ; et
un élément de sollicitation (136) pressant l'arbre d'avancement dans une direction proximale ; et

un module d'agrafe (140) raccordé sélectivement de manière amovible à une extrémité distale de l'arbre tubulaire de la partie de col, le module d'agrafe comprenant :

un boîtier (142) définissant une extrémité proximale, une extrémité distale et une lumière à travers celle-ci, l'extrémité proximale du boîtier de module d'agrafe étant configurée pour un raccordement sélectif avec l'extrémité distale de l'arbre tubulaire de la partie de col, le boîtier de module d'agrafe comprenant une bride annulaire (142e) s'étendant radialement dans sa lumière ; et
une lame de mors (144) supportée dans la lumière du boîtier de module d'agrafe, la lame de mors comprenant :

une paire de mors (144a) disposée dans l'extrémité distale du boîtier de module d'agrafe, la paire de mors étant pressée vers un état ouvert, dans lequel chaque mors comprend une dent de came respective (144c) qui en fait saillie, dans lequel les dents de came

sont en registre opératoire avec la bride annulaire du boîtier de module d'agrafe et proximales avec celle-ci ; et une tige (144b) s'étendant de manière proximale de la paire de mors, dans lequel une extrémité proximale de la tige peut être engagée par l'extrémité distale de l'actionneur du mécanisme d'avancement,

ledit module d'agrafe étant **caractérisé en ce que** ladite lame de mors est supportée à coulissement dans la lumière du boîtier de module d'agrafe de sorte que, lors d'un avancement distal de la lame de mors, les dents de came de la paire de mors de la lame de mors s'engagent sur la bride annulaire du boîtier de module d'agrafe, en sorte que les deux mors soient rapprochés à l'état fermé.

2. Applicateur d'agrafe de ligature selon la revendication 1, dans lequel le module d'agrafe comprend en outre un élément de sollicitation (146) configuré pour maintenir la lame de mors en position rétractée par rapport au boîtier de module d'agrafe ; de préférence, dans lequel la lame de mors du module d'agrafe est mobile entre une position avancée et la position rétractée, dans lequel :

en position avancée, les dents de came de la paire de mors de la lame de mors s'engagent sur la bride annulaire du boîtier de module d'agrafe, dans lequel les deux mors sont rapprochés dans un état fermé ; et en position rétractée, les dents de came de la paire de mors de la lame de mors sont dégagées de la bride annulaire du boîtier de module d'agrafe, dans lequel les deux mors sont en état d'ouverture.

3. Applicateur d'agrafe de ligature selon la revendication 2, dans lequel l'élément de sollicitation du module d'agrafe est un ressort hélicoïdal comprenant une première extrémité fixée à une partie relativement distale de la lame de mors et une seconde extrémité fixée à une extrémité relativement proximale du boîtier de module d'agrafe ; et/ou dans lequel, au cours de l'actionnement de la gâchette de l'ensemble de poignée, l'extrémité proximale de la gâchette s'engage sur l'extrémité proximale de l'arbre d'avancement du mécanisme d'avancement afin de faire avancer de manière distale l'arbre d'avancement.
4. Applicateur d'agrafe de ligature selon la revendication 3, dans lequel, au cours de l'avancement distal de l'arbre d'avancement, l'actionneur de l'ensemble d'avancement s'engage sur l'extrémité proximale de la tige de la lame de mors pour faire avancer de

manière distale la lame de mors.

5. Applicateur d'agrafe de ligature selon l'une quelconque des revendications précédentes, dans lequel le boîtier de module d'agrafe définit une rainure radiale (142c) formée dans sa surface externe, dans lequel la rainure radiale est située adjacente à une extrémité proximale du boîtier de module d'agrafe.
6. Applicateur d'agrafe de ligature selon la revendication 5, dans lequel l'arbre tubulaire de la partie de col allongée comprend un verrou (126) supporté à pivotement adjacent à son extrémité distale, dans lequel le verrou comprend une extrémité proximale et une extrémité distale, dans lequel l'extrémité distale du verrou comprend un cliquet (126a) s'étendant radialement vers l'intérieur ; de préférence dans lequel le cliquet du verrou de l'arbre tubulaire est configuré pour s'engager sélectivement dans la rainure radiale du boîtier de module d'agrafe afin de fixer sélectivement le module d'agrafe à l'arbre allongé.
7. Applicateur d'agrafe de ligature selon l'une quelconque des revendications précédentes, dans lequel, lors d'un actionnement de la gâchette, l'extrémité proximale de la gâchette agit sur une extrémité proximale de l'actionneur du mécanisme d'avancement pour faire avancer l'actionneur de manière distale.
8. Applicateur d'agrafe de ligature selon la revendication 7, dans lequel, lors de l'avancement distal de l'actionneur, l'extrémité distale de l'actionneur agit sur l'extrémité proximale de la tige de la lame de mors pour faire avancer la lame de mors de manière distale.
9. Module d'agrafe (140) pour un raccordement sélectif à un ensemble de poignée (110) et qui peut être actionné par un mécanisme d'avancement (130) de l'ensemble de poignée, le module d'agrafe comprenant :
- un boîtier (142) définissant une extrémité proximale, une extrémité distale et une lumière qui le traverse, l'extrémité proximale du boîtier de module d'agrafe étant configurée pour un raccordement sélectif avec une extrémité distale d'un arbre tubulaire de l'ensemble de poignée, le boîtier de module d'agrafe comprenant une bride annulaire (142e) s'étendant radialement dans sa lumière ; une lame de mors (144) supportée dans la lumière du boîtier de module d'agrafe, la lame de mors comprenant :
- une paire de mors (144a) disposée dans l'extrémité distale du boîtier de module d'agrafe, la paire de mors étant pressée en

- position ouverte, dans lequel chaque mors comprend une dent de came respective (144c) qui en fait saillie, dans lequel les dents de came sont en registre opératoire avec la bride annulaire du boîtier de module d'agrafe et proximales vis-à-vis de celle-ci ; et
- une tige (144b) s'étendant de manière proximale de la paire de mors, dans lequel une extrémité proximale de la tige peut être engagée par le mécanisme d'avancement de l'ensemble de poignée ;
- ledit module d'agrafe étant **caractérisé en ce que** ladite lame de mors est supportée à coulissement dans la lumière du boîtier de module d'agrafe en sorte que, lors de l'avancement distal de la lame de mors, les dents de came de la paire de mors de la lame de mors s'engagent sur la bride annulaire du boîtier de module d'agrafe en sorte que les deux mors soient rapprochés à l'état fermé.
10. Module d'agrafe selon la revendication 9, comprenant en outre un élément de sollicitation (146) configuré pour maintenir la lame de mors en position rétractée par rapport au boîtier de module d'agrafe.
11. Module d'agrafe selon la revendication 10, dans lequel la lame de mors du module d'agrafe est mobile entre une position avancée et la position rétractée, dans lequel:
- en position avancée, les dents de came de la paire de mors de la lame de mors s'engagent sur la bride annulaire du boîtier de module d'agrafe, dans lequel les deux mors sont rapprochés à l'état fermé ; et
- en position rétractée, les dents de came de la paire de mors de la lame de mors sont dégagées de la bride annulaire du boîtier de module d'agrafe, dans lequel les deux mors sont à l'état ouvert.
12. Module d'agrafe selon la revendication 11, dans lequel l'élément de sollicitation du module d'agrafe est un ressort hélicoïdal comprenant une première extrémité fixé à une partie relativement distale de la lame de mors et une seconde extrémité fixée à une extrémité relativement proximale du boîtier de module d'agrafe.
13. Module d'agrafe selon l'une quelconque des revendications 9 à 12, dans lequel, au cours de l'actionnement du mécanisme d'avancement de l'ensemble de poignée, la tige de la lame de mors est sollicitée pour faire avancer de manière distale la lame de mors.
14. Module d'agrafe selon l'une quelconque des revendications 9 à 13, dans lequel le boîtier de module d'agrafe définit une rainure radiale (142c) formée dans sa surface externe, dans lequel la rainure radiale est située adjacente à une extrémité proximale du boîtier de module d'agrafe.

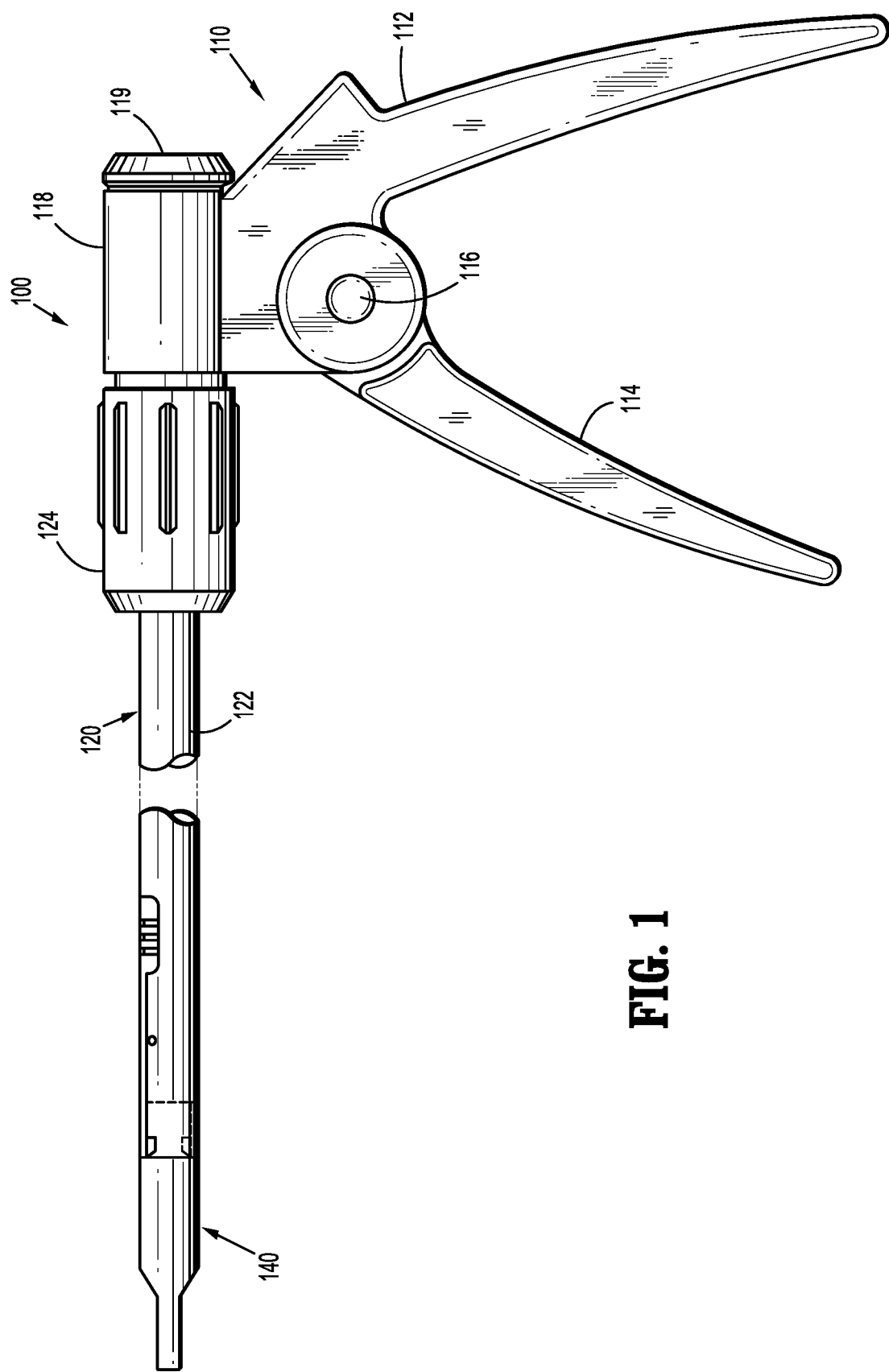
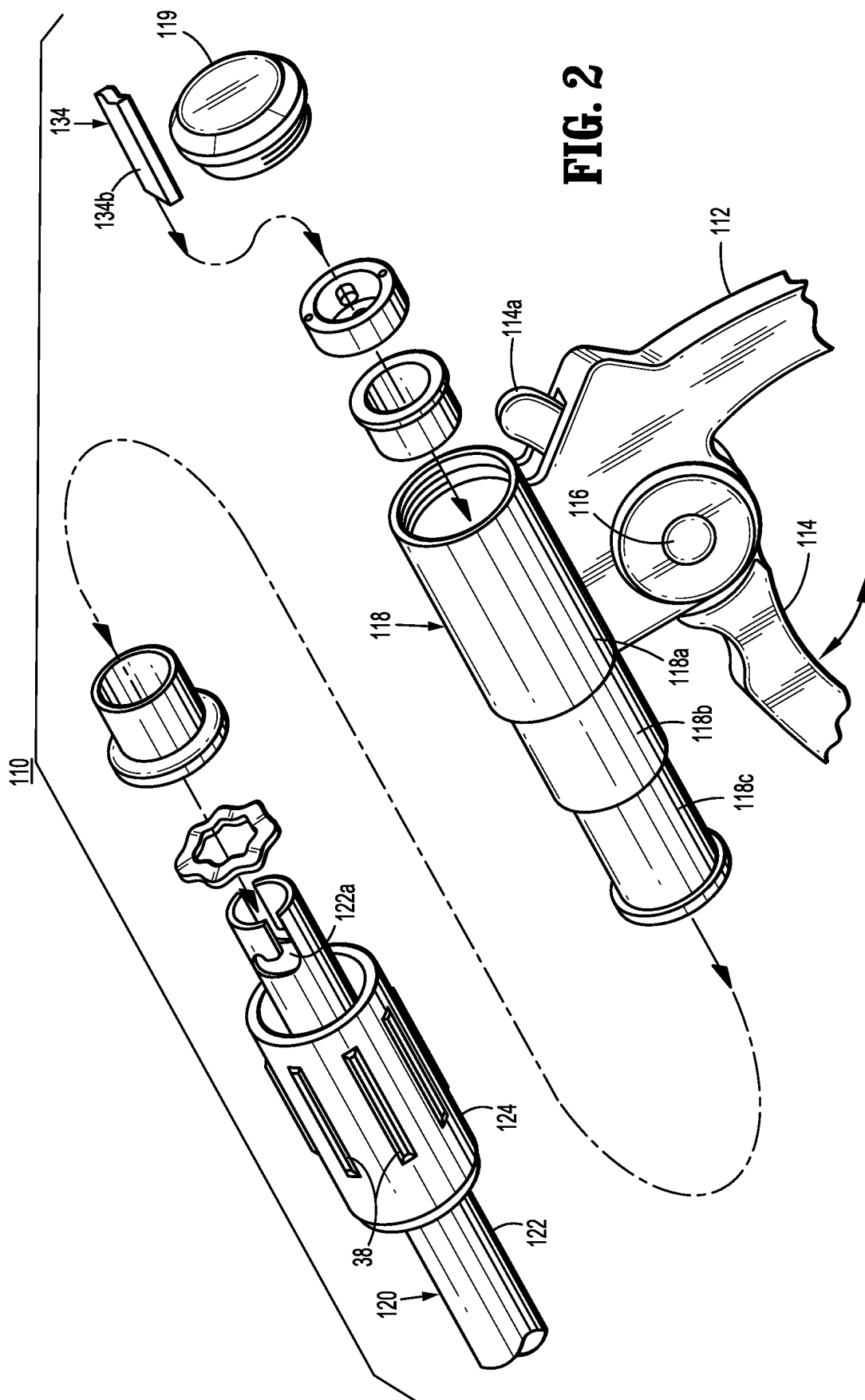


FIG. 1



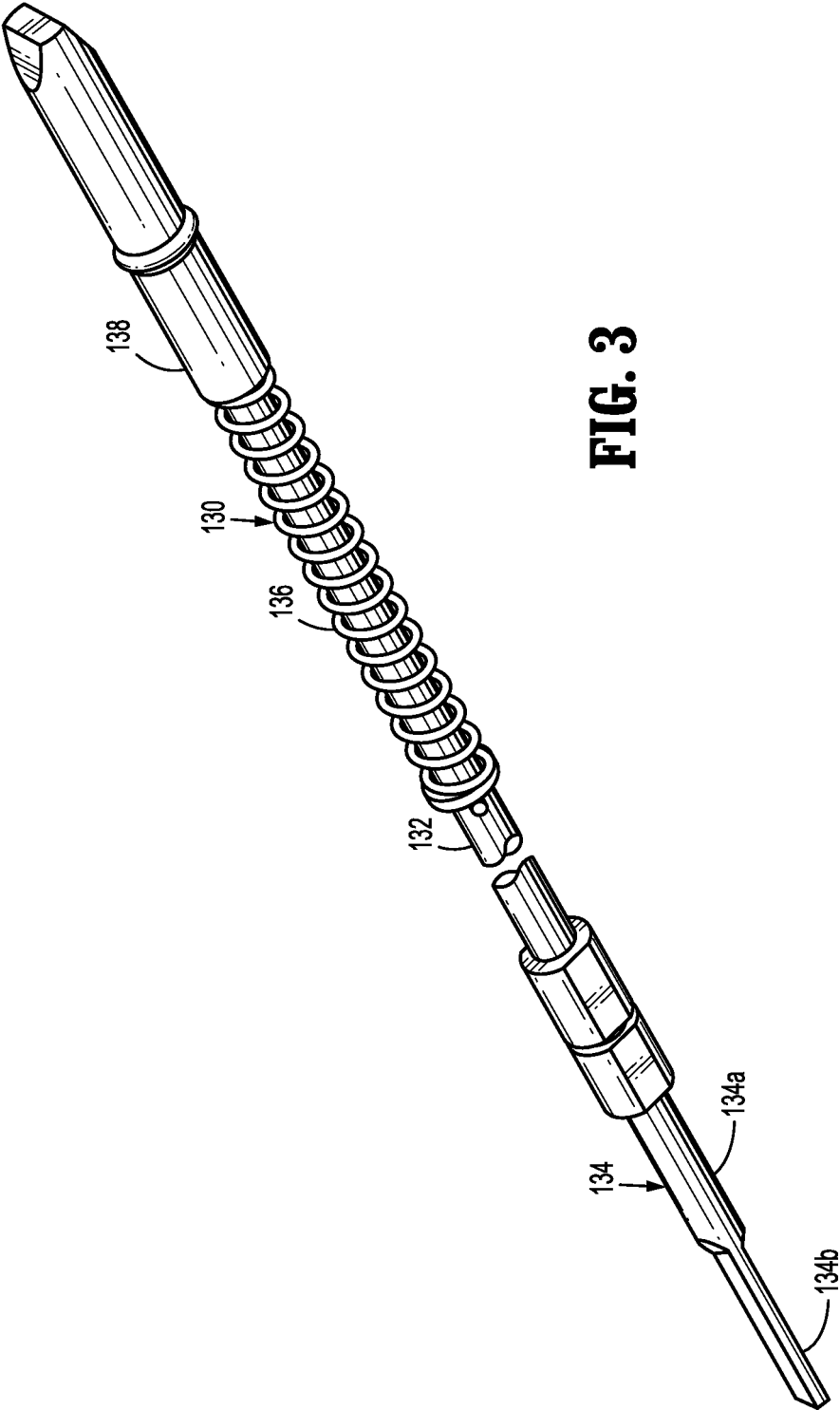


FIG. 3

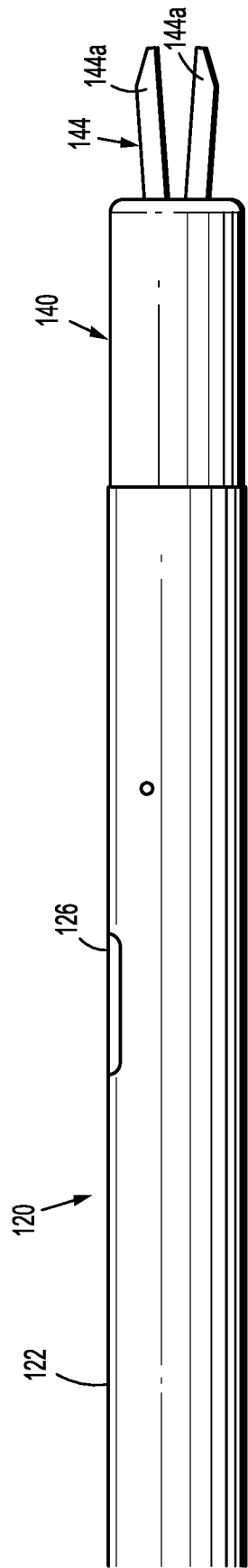


FIG. 4

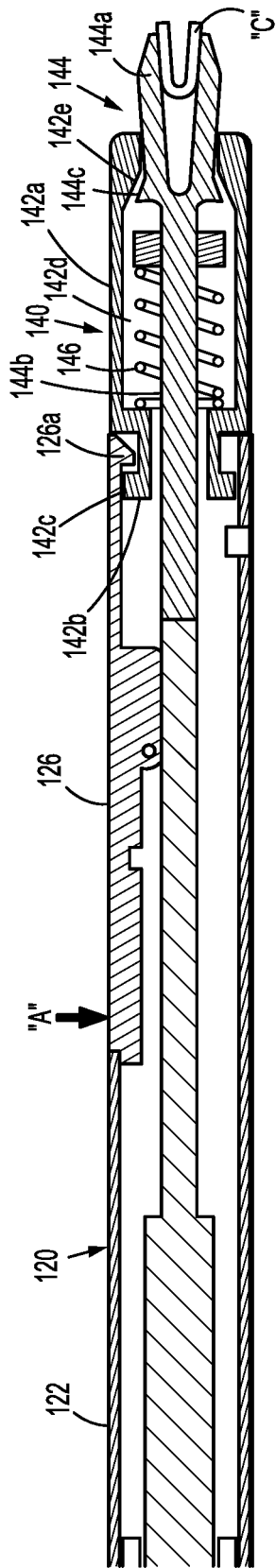


FIG. 5

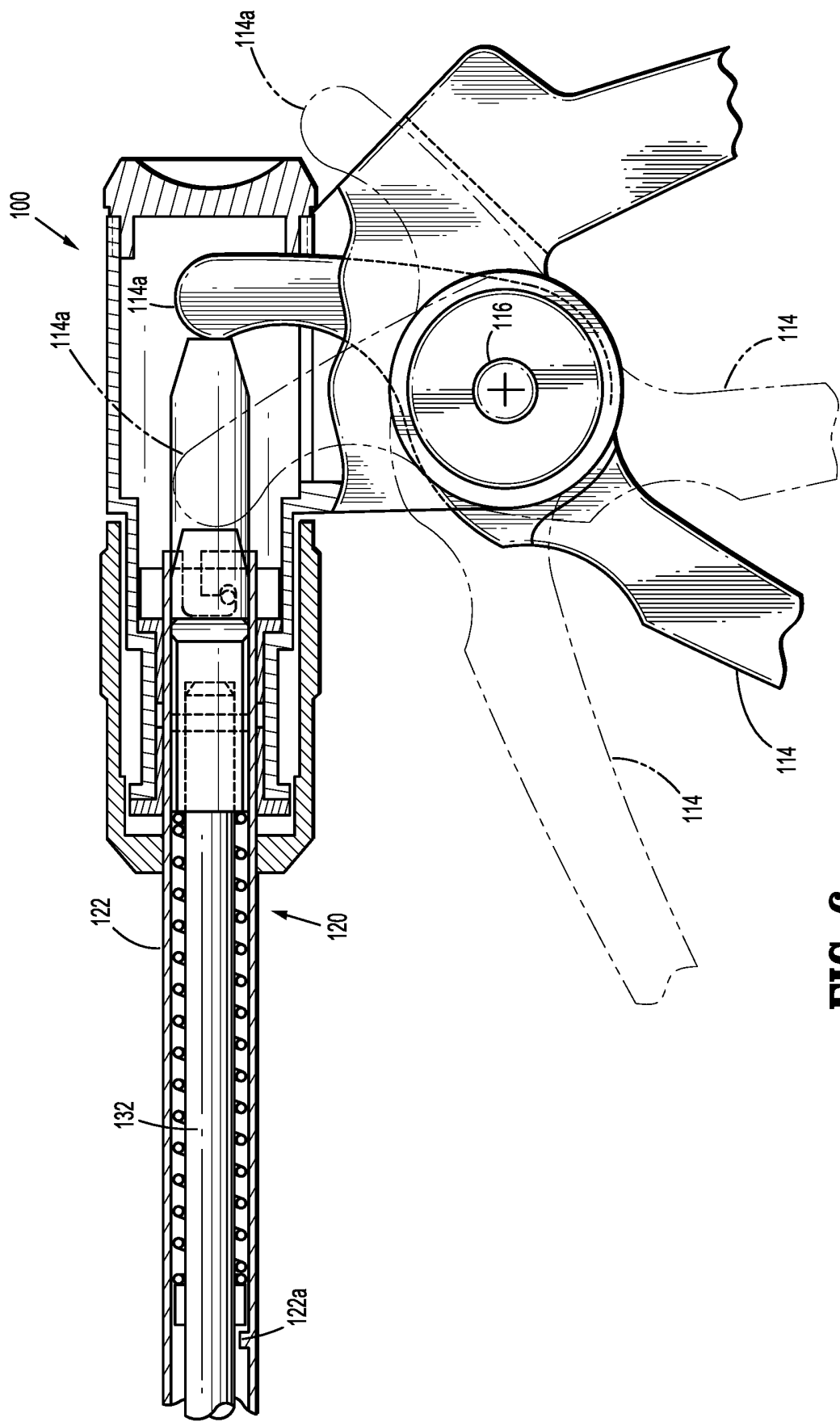
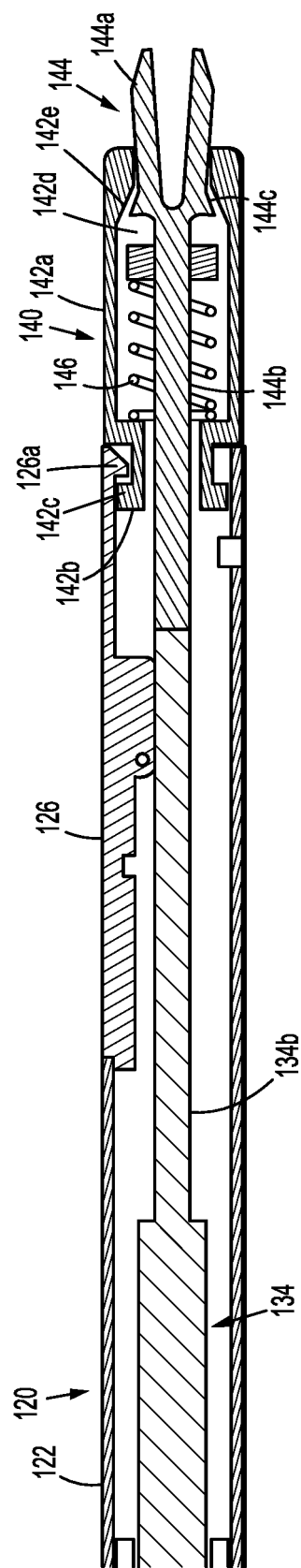
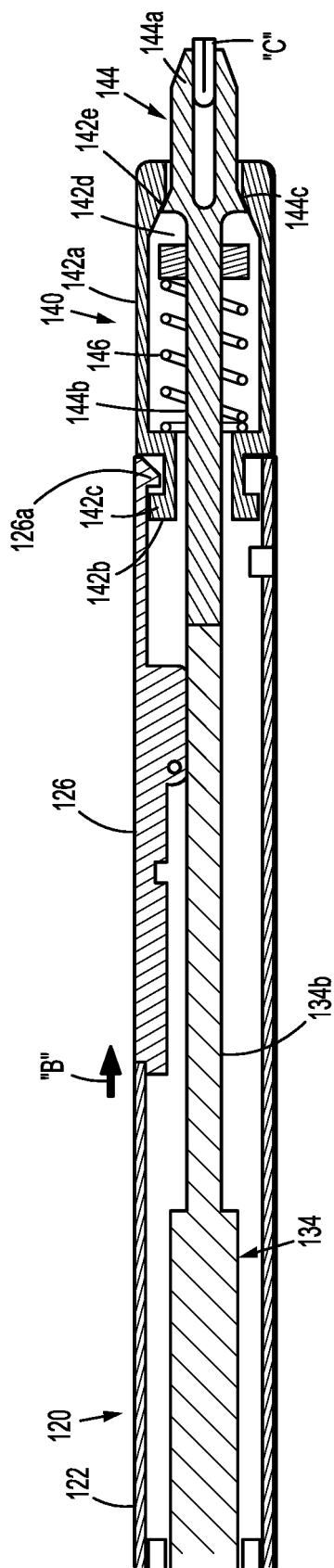


FIG. 6



REFERENCES CITED IN THE DESCRIPTION

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专利名称(译)	腹腔镜手术结扎夹应用器		
公开(公告)号	EP3028653B1	公开(公告)日	2017-10-04
申请号	EP2015197251	申请日	2015-12-01
[标]申请(专利权)人(译)	柯惠有限合伙公司		
申请(专利权)人(译)	COVIDIEN LP		
当前申请(专利权)人(译)	COVIDIEN LP		
[标]发明人	ASIDO NORVIN TOKARZ CHRISTOPHER A		
发明人	ASIDO, NORVIN TOKARZ, CHRISTOPHER A.		
IPC分类号	A61B17/128		
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优先权	62/086250 2014-12-02 US 14/941714 2015-11-16 US		
其他公开文献	EP3028653A1		
外部链接	Espacenet		

摘要(译)

提供了一种结扎夹具施放器，其包括手柄组件和夹子模块，所述手柄组件支撑可拆卸地且可滑动地支撑在手柄组件的枪管壳体內的推进机构，夹子模块可拆卸地且选择性地连接到手柄组件。夹子模块包括壳体，壳体限定近端，远端和穿过其中的内腔，夹子模块壳体包括径向延伸到其内腔中的环形凸缘；夹爪刀片可滑动地支撑在夹子模块壳体的内腔中。钳口刀片包括设置在夹子模块壳体的远端内的一对钳口，该对钳口被偏置到打开状态，其中每个钳口包括从其突出的相应凸轮齿，其中凸轮齿可操作地对准。夹子模块壳体的环形凸缘的近端部分。

