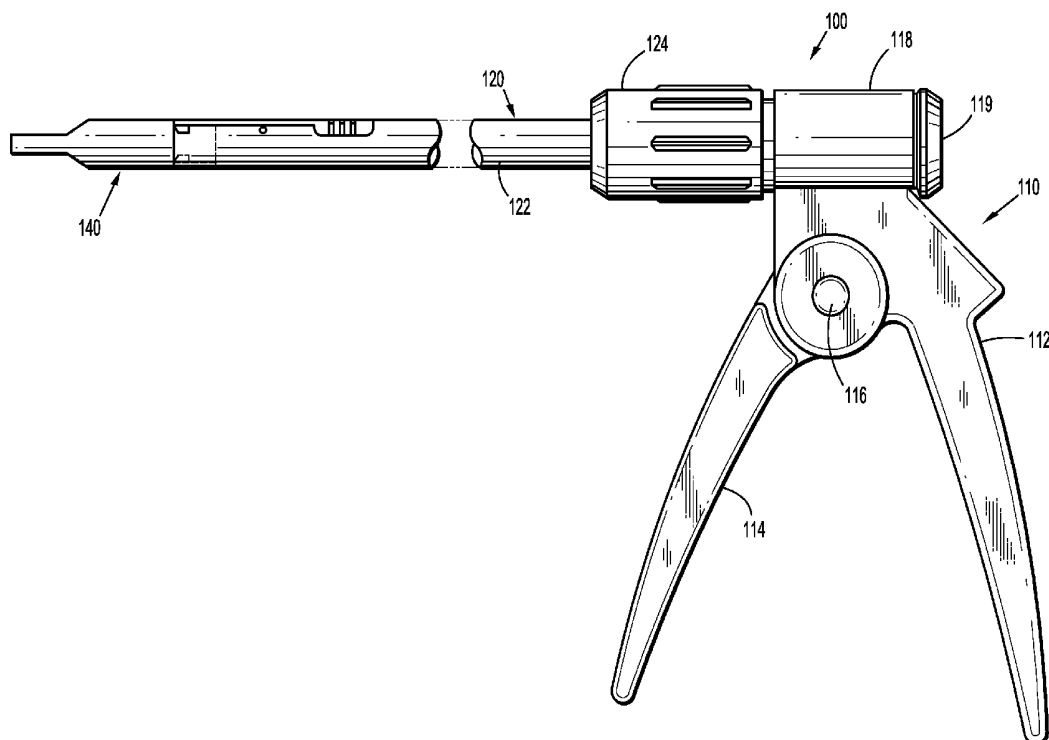


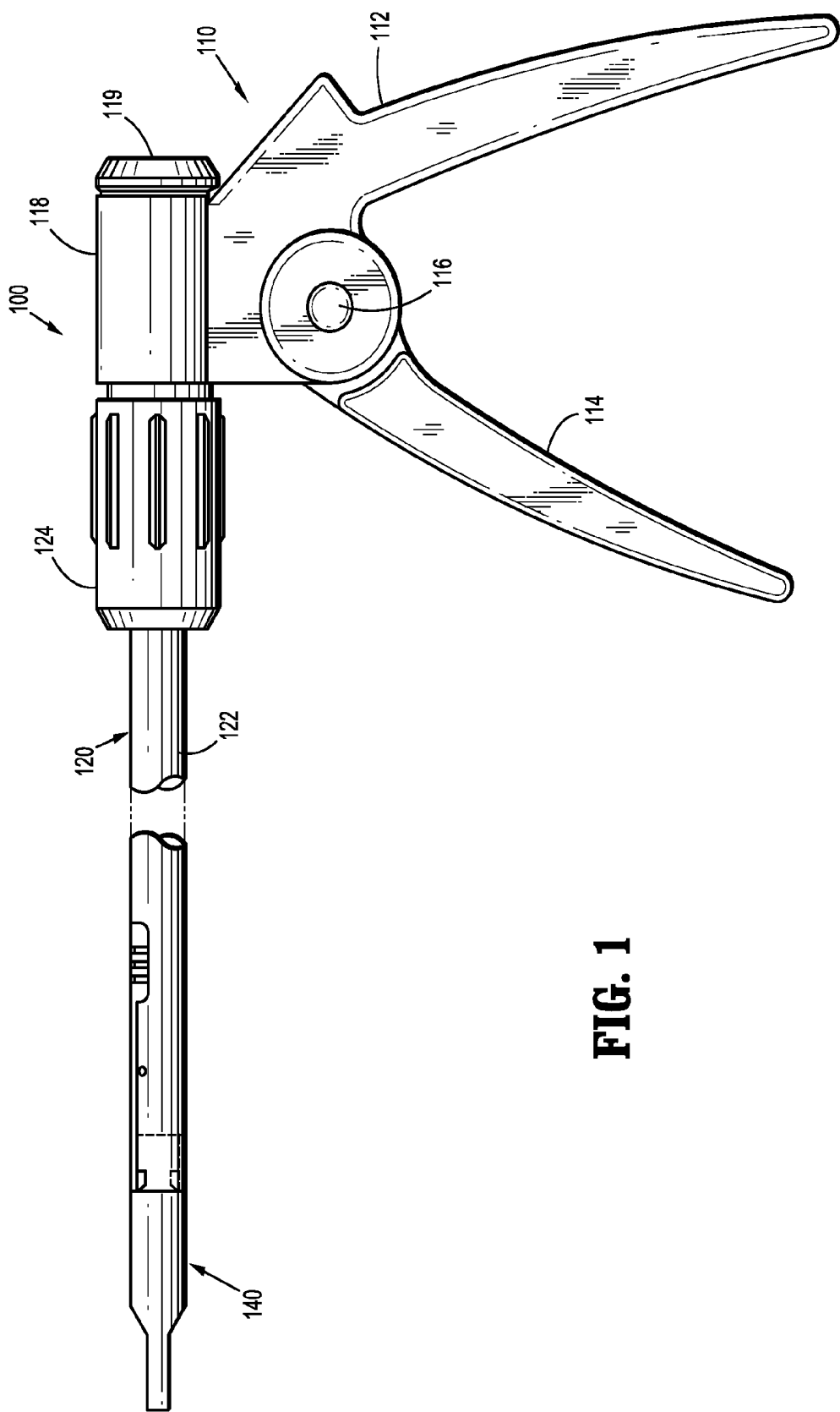


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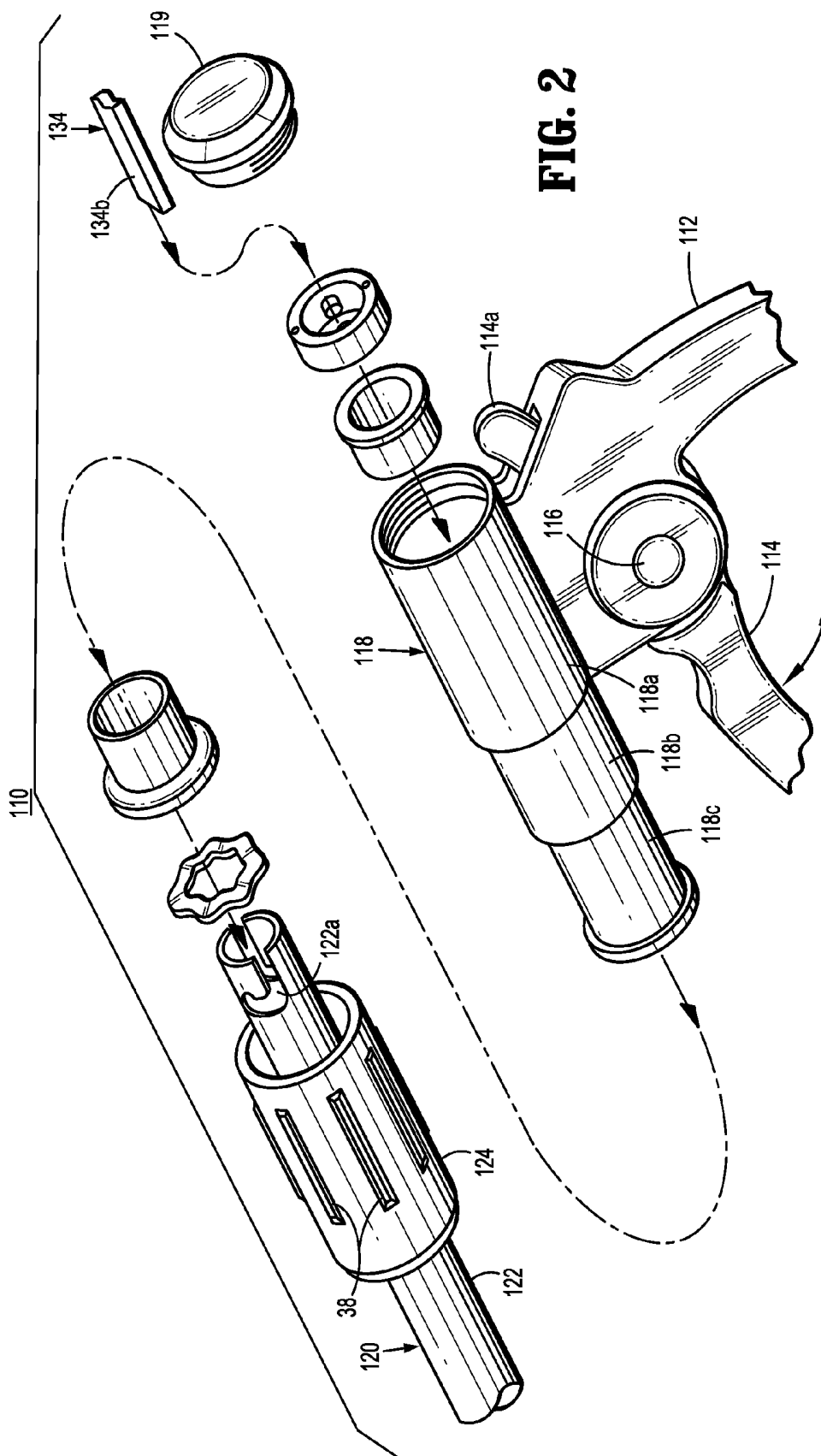
(19) **United States**(12) **Patent Application Publication**  
**Tokarz et al.**(10) **Pub. No.: US 2016/0151071 A1**(43) **Pub. Date: Jun. 2, 2016**(54) **LAPAROSCOPIC SURGICAL LIGATION CLIP**  
**APPLIER**(52) **U.S. CL.**  
**CPC ... A61B 17/1285 (2013.01); A61B 2017/00477**  
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(US)(21) Appl. No.: **14/941,714**(22) Filed: **Nov. 16, 2015****Related U.S. Application Data**(60) Provisional application No. 62/086,250, filed on Dec.  
2, 2014.**Publication Classification**(51) **Int. Cl.**  
**A61B 17/128 (2006.01)**(57) **ABSTRACT**

A ligation clip applier is provided and includes a handle assembly supporting an advancing mechanism removably and slidably supported within a barrel housing of the handle assembly, and a clip module removably and selectively connected to the handle assembly. The clip module includes a housing defining a proximal end, a distal end and a lumen therethrough, the clip module housing including an annular flange extending radially into the lumen thereof; and 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.





**FIG. 1**



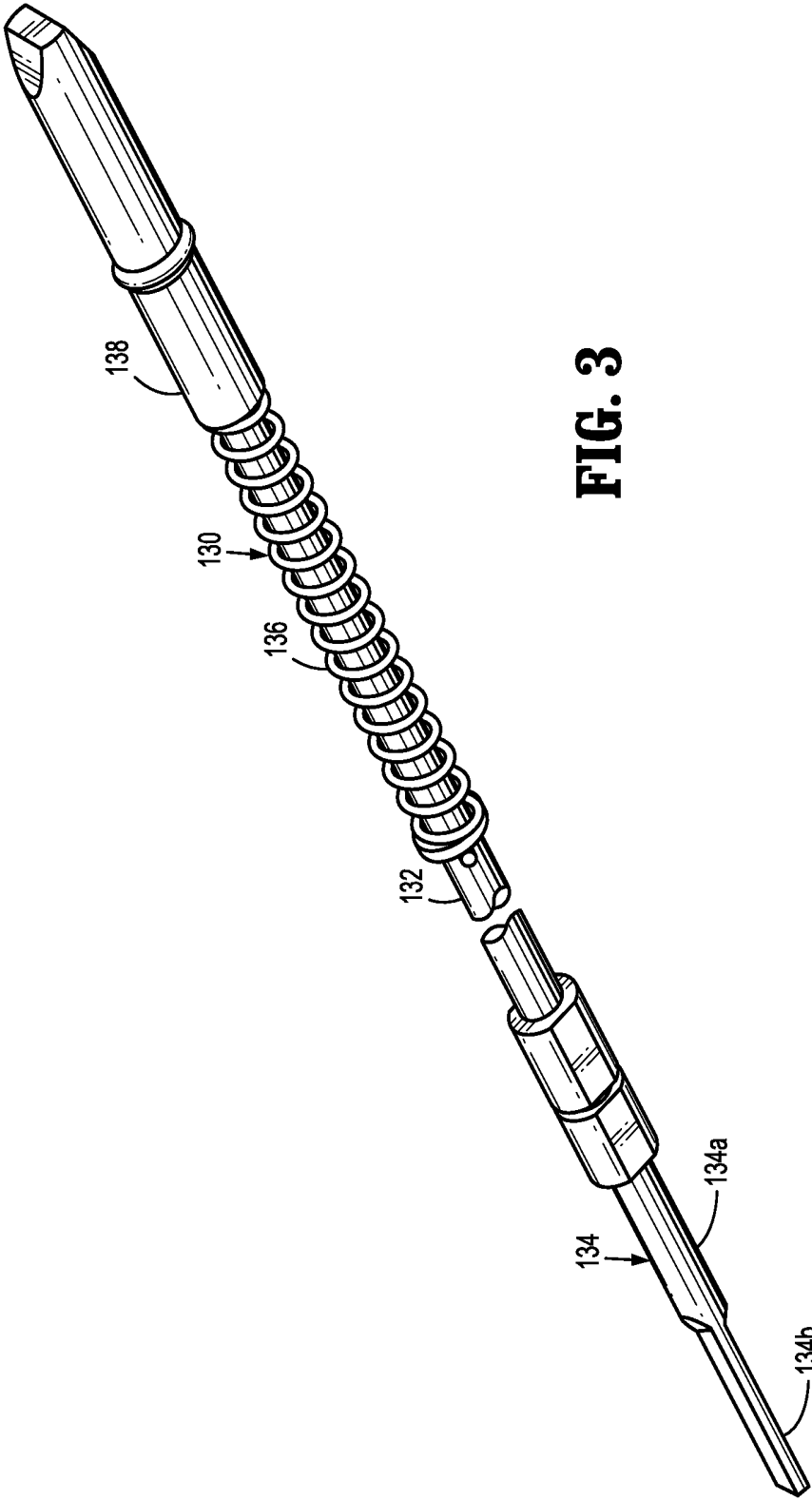
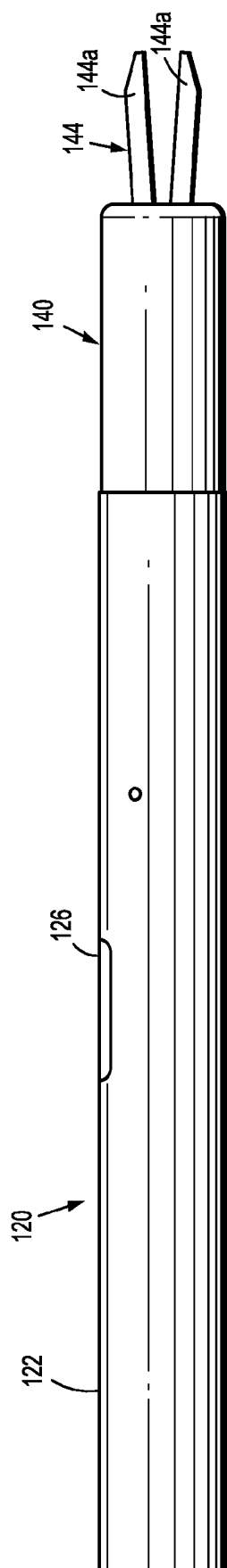
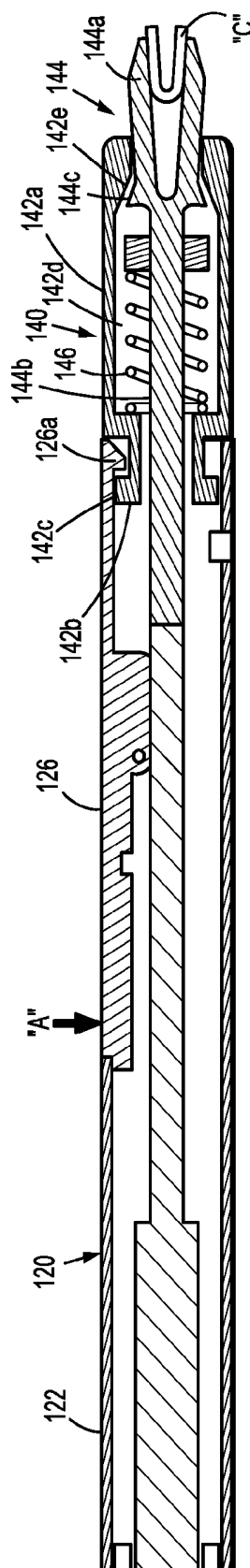


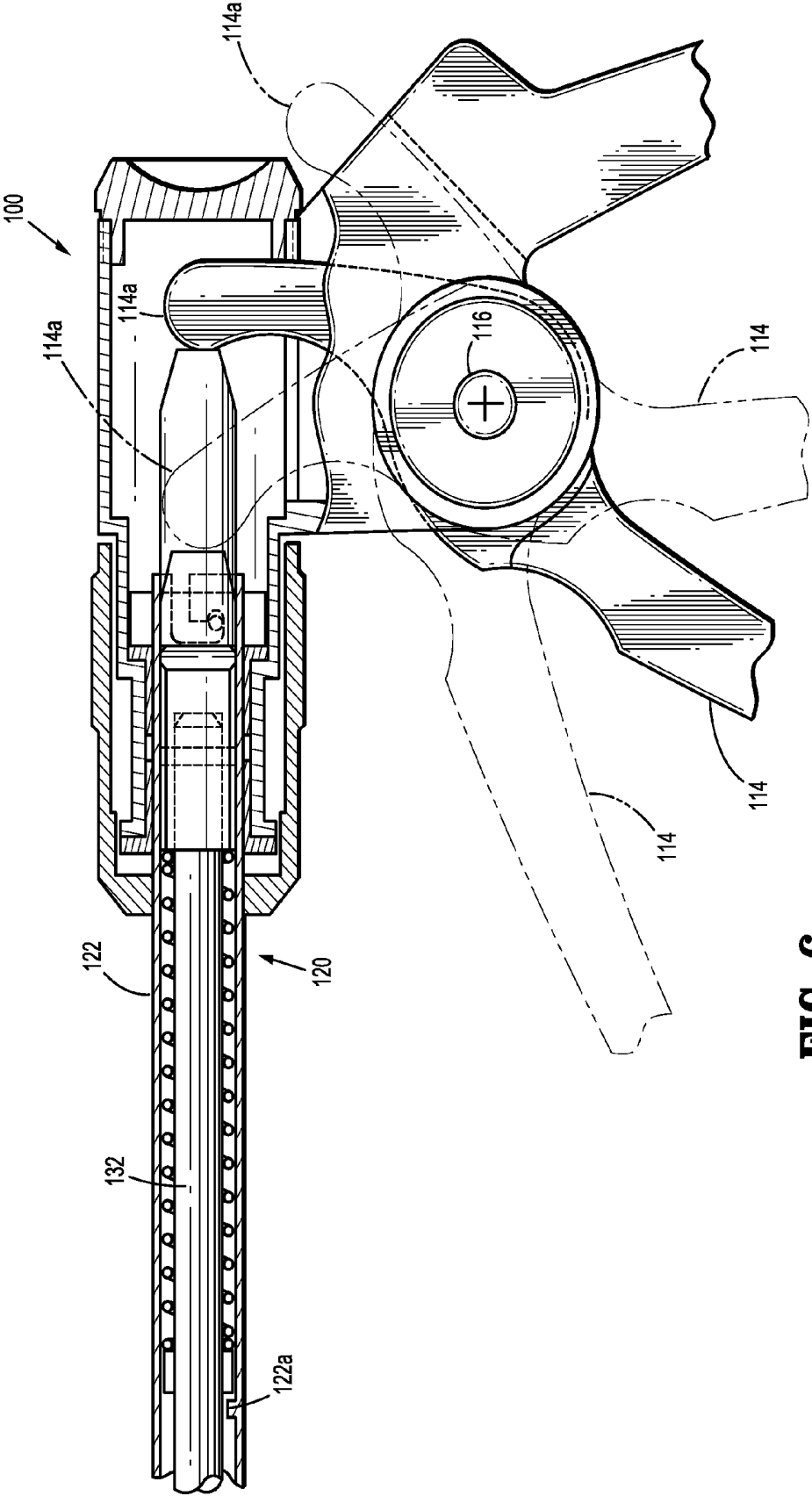
FIG. 3



**FIG. 4**



**FIG. 5**



**FIG. 6**

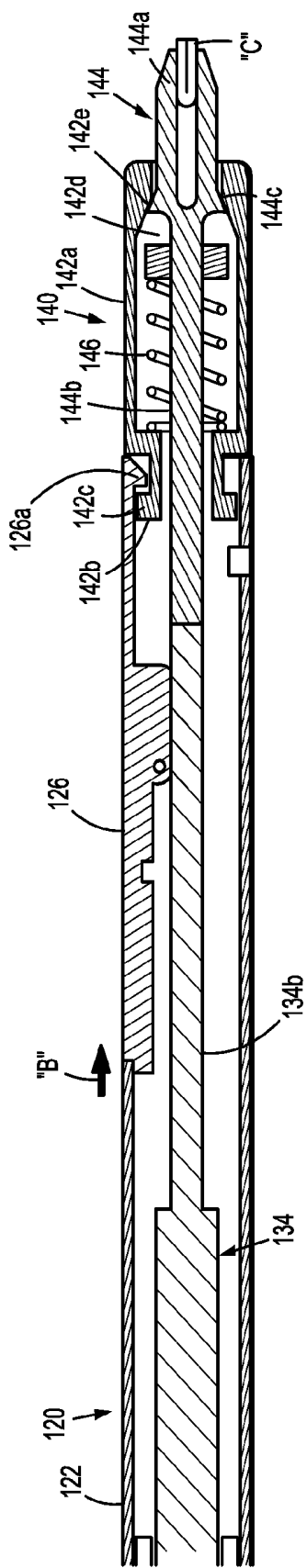


FIG. 7

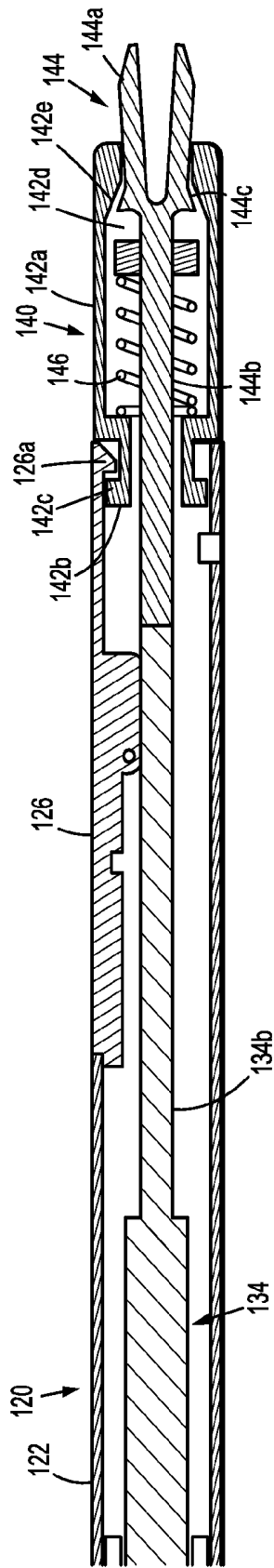


FIG. 8

## LAPAROSCOPIC SURGICAL LIGATION CLIP APPLIER

### CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application claims the benefit of and priority to U.S. Provisional Patent Application Ser. No. 62/086,250, filed on Dec. 2, 2014, the entire content of which is incorporated herein by reference.

### BACKGROUND

[0002] 1. Technical Field

[0003] 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.

[0004] 2. Description of Related Art

[0005] 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.

[0006] 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.

[0007] 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., which are both incorporated by reference in their entirety. Another multiple endoscopic clip applier is disclosed in commonly-assigned U.S. Pat. No. 5,607,436 by Pratt et al., the contents of which is also hereby incorporated by reference herein in its entirety. These devices are typically, though not necessarily, used during a single surgical procedure. U.S. Pat. No. 5,695,502 to Pier et al., the disclosure of which is hereby incorporated by reference herein, 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.

[0008] 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., the disclosure of which is hereby incorporated by reference herein, 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.

[0009] 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

[0010] 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.

[0011] 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.

[0012] 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.

[0013] 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.

[0014] 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.

[0015] 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.



**[0016]** 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.

**[0017]** 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.

**[0018]** 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.

**[0019]** 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.

**[0020]** 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.

**[0021]** 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.

**[0022]** 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.

**[0023]** 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.

**[0024]** 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.

**[0025]** 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.

**[0026]** 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.

**[0027]** 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.

**[0028]** 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.

**[0029]** 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.

**[0030]** 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.

**[0031]** 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.

**[0032]** 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.

**[0033]** 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

**[0034]** A particular embodiment of a laparoscopic surgical clip applier is disclosed herein with reference to the drawings wherein:

**[0035]** FIG. 1 is a side elevational view of a ligation surgical clip applier in accordance with the present disclosure;

**[0036]** 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;

**[0037]** FIG. 3 is a perspective view of an advancing mechanism of the ligation surgical clip applier of FIG. 1;

**[0038]** 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;

**[0039]** 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;

**[0040]** 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;

**[0041]** 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

**[0042]** 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

**[0043]** 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.

**[0044]** 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.

**[0045]** 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**.

**[0046]** 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.

**[0047]** 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**.

**[0048]** 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.

**[0049]** 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**.

**[0050]** 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.

**[0051]** 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**.

**[0052]** 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**.

**[0053]** 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**.

**[0054]** 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 pivotally 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**.

**[0055]** 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**.

**[0056]** 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**.

**[0057]** 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 hous-

ing section **142a** of a first diameter, and proximal housing section **142b** having a second diameter that is reduced from the first diameter. Proximal housing section **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**.

[0058] 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**.

[0059] 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**.

[0060] 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**.

[0061] 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.

[0062] 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 advanced 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.

[0063] 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.

[0064] 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 re-compress 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.

[0065] 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.

[0066] A new ligation clip module **140** can then be inserted and secured in the hollow shaft **122** of neck portion **120**, and clip applier **100** is once again ready to fire another ligating clip “C”.

[0067] 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.

[0068] 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 spirit 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.

What is claimed is:

1. A ligation clip applier, comprising:

a handle assembly including:

- 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 there-through, 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, the advancing mechanism including:

- 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; and

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

- 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; and
- a jaw blade slidably supported within the lumen of the clip module housing, the jaw blade including:
  - 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.

2. The ligation clip applier according to claim 1, wherein the clip module further includes a biasing member configured to maintain the jaw blade in a retracted position relative to the clip module housing.

3. The ligation clip applier according to claim 2, 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.

4. The ligation clip applier according to claim 3, 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.

5. The ligation clip applier according to claim 3, 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.

6. The ligation clip applier according to claim 5, 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.

7. The ligation clip applier according to claim 1, wherein the clip module housing defines a radial groove formed in an

outer surface thereof, wherein the radial groove is located adjacent a proximal end of the clip module housing.

8. The ligation clip applier according to claim 7, wherein the tubular shaft of the elongate neck portion includes 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.

9. The ligation clip applier according to claim 8, 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.

10. The ligation clip applier according to claim 1, 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.

11. The ligation clip applier according to claim 10, 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.

12. The ligation clip applier according to claim 11, wherein 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.

13. A clip module for selective connection to a handle assembly and actuatable by an advancing mechanism of the handle assembly, the clip module comprising:

- 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;

- a jaw blade slidably supported within the lumen of the clip module housing, the jaw blade including:

- 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 advancing mechanism of the handle assembly.

14. The clip module according to claim 13, further comprising a biasing member configured to maintain the jaw blade in a retracted position relative to the clip module housing.

15. The clip module according to claim 14, 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.

16. The clip module according to claim 15, 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.

**17.** The clip module according to claim **16**, 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.

**18.** The clip module according to claim **13**, wherein the clip module housing defines a radial groove formed in an outer surface thereof, wherein the radial groove is located adjacent a proximal end of the clip module housing.

\* \* \* \* \*

专利名称(译)	腹腔镜手术结扎夹应用器		
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#### 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内部的推进机构，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。

