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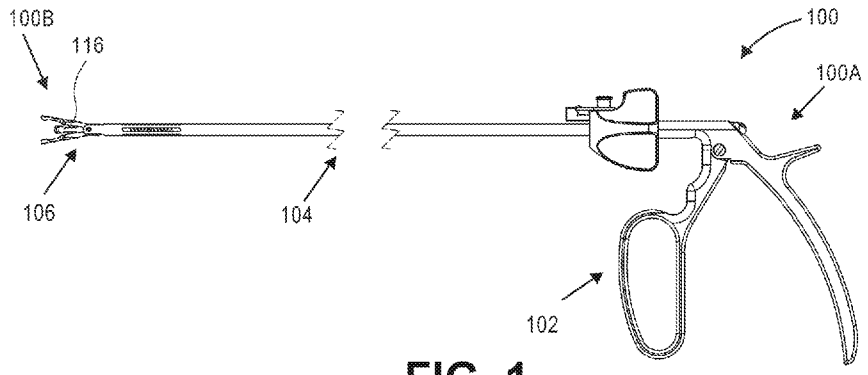


FIG. 1

(57) Abstract: A clip applier may be configured to apply a surgical clip to tissue. The clip applier may include a first jaw member, a second jaw member, and a stabilizing member, each configured to engage the surgical clip. The stabilizing member may be configured to move longitudinally with respect to the clip applier from a first position at least partially between the first and second jaw members to a second position at least partially between the first and second jaw members. The longitudinal movement of the stabilizing member may be constrained to longitudinal movement between the first and second positions. The stabilizing member may include first and second sidewalls on a distal end portion, where the first and second sidewalls are configured to stabilize the surgical clip in a lateral direction. The clip applier may include a hinge pin received in a longitudinal channel of the stabilizing member.

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CLIP APPLIER WITH STABILIZING MEMBER

Priority

[0001] The present non-provisional patent application claims priority to Provisional Patent Application No. 62/474,523, filed on March 21, 2017 and entitled "CLIP APPLIER WITH STABILIZING MEMBER", the entirety of the disclosure of which is incorporated herein by reference.

Technical Field

[0002] The present disclosure relates generally to clip appliers, and more particularly, to clip appliers with a stabilizing member biased into engagement with a surgical clip.

Background

[0003] Surgical clips are often applied by clip appliers with a pair of opposing jaws. Currently available clip appliers often secure the clip with two points of contact, for example, the opposing jaws may engage bosses on distal ends of the surgical clip. However, the two points of contact do not provide sufficient stability to the surgical clip, which may cause the surgical clip to become misaligned relative to the clip applier during a surgical procedure, or even fall out.

[0004] Therefore, there is a need for improved clip applier systems that address one or more of these problems.

Summary

[0005] The disclosed methods and systems are directed to mitigating or overcoming one or more of the problems set forth above and/or other problems in the prior art.

[0006] A first aspect of the present invention is directed to a clip applier configured to apply a surgical clip to tissue. The clip applier may include a first jaw member, a second jaw member, and a stabilizing member, each configured to engage the surgical clip. The stabilizing member may be configured to move longitudinally with respect to the clip applier from a first position at least partially between the first and second jaw members to a second position at least partially between the first and second jaw members. The longitudinal movement of the stabilizing member may be constrained to longitudinal movement between the first and second positions.

[0007] In some embodiments, the stabilizing member may include first and second sidewalls on a distal end portion, the first and second sidewalls being configured to stabilize the surgical clip in a lateral direction. In some embodiments, the clip applier may further include a hinge pin configured to pivotably secure the first and second jaw members, where the stabilizing member may have a longitudinal channel configured to receive the hinge pin, and the hinge pin may be configured to constrain the movement of the stabilizing member between the first and second positions. In some embodiments, the stabilizing member may further include a tubular portion proximal of the elongate slot and a shaft portion distal of the tubular portion. A width of a distal end portion of the stabilizing member may be greater than a width of the shaft portion. In some embodiments, the clip applier may further include a spring positioned on a proximal end of the stabilizing member, where the spring is configured to bias the stabilizing member to the first position, the first position being distal of the second position. In some embodiments, the clip applier may further include a shaft secured to proximal ends of the first and second jaw members, the shaft having at least one elongated slot along its length, the spring being visible through the at least one elongated slot of the shaft. In some embodiments, the clip applier may further include a tubular member abutting a proximal end portion of the spring, where a distal end portion of the spring abuts a tubular portion on a proximal end portion of the stabilizing member. In some embodiments, the stabilizing member may include a plurality of protrusions on the distal end portion, the plurality of protrusions being configured to stabilize the surgical clip in a vertical direction. In some embodiments, the first jaw member may be configured to engage a distal end portion of a first leg member of the surgical clip, the second jaw member may be configured to engage a distal end portion of a second leg member of the surgical clip, and the stabilizing member may be configured to engage a proximal end portion of the surgical clip. In some embodiments, the first jaw member may be configured to engage a first substantially flat surface on the distal end portion of the first leg member, and the second jaw member may be configured to engage a second substantially flat surface on the distal end portion of the second leg member.

[0008] A second aspect of the present invention is directed to a method of loading a clip applier with a surgical clip. The method may include receiving a proximal end of the surgical clip between first and second jaw members of the clip applier, and then engaging a stabilizing

member with the proximal end of the surgical clip with the stabilizing member in a first position at least partially between the first and second jaw members. The method may include retracting the stabilizing member to a second position at least partially between the first and second jaw members. The method may further include stabilizing the surgical clip between the stabilizing member and the first and second jaw members.

[0009] In some embodiments, the longitudinal movement of the stabilizing member may be constrained to longitudinal movement between the first position and the second position. In some embodiments, stabilizing the surgical clip may include stabilizing the surgical clip in a lateral direction with first and second walls extending from a distal end of the stabilizing member. In some embodiments, stabilizing the surgical clip may include stabilizing the surgical clip in a vertical direction with a plurality of protrusions on a distal surface of the stabilizing member. In some embodiments, the method further includes picking the surgical clip up from a cartridge.

[0010] A third aspect of the present invention is directed to a stabilizing member for a clip applier. The stabilizing member may include an elongated body having a proximal end portion and a distal end portion. The stabilizing member may include first and second sidewalls on the distal end portion of the elongated body that may be configured to stabilize a proximal end of a surgical clip in a lateral direction. The stabilizing member may further include a shaft portion extending from the distal end portion, where a width of the distal end portion including the first and second walls is greater than a width of the shaft portion.

[0011] In some embodiments, the stabilizing member may further include a longitudinal channel extending through the elongated body. In some embodiments, the shaft portion may have a substantially rectangular cross-section. In some embodiments, the stabilizing member may include a tubular portion on the proximal end portion of the elongated body. In some embodiments, the stabilizing member may include a plurality of protrusions on the distal end portion that may be configured to stabilize the proximal end of the surgical clip in a vertical direction.

Brief Description of the Drawings

[0012] In order that the disclosure may be readily understood, aspects of this disclosure are illustrated by way of examples in the accompanying drawings.

[0013] FIG. 1 illustrates a side view of an exemplary clip applier of the present disclosure.

[0014] FIG. 2 illustrates a side view of an exemplary distal portion of the exemplary clip applier of FIG. 1 loaded with an exemplary surgical clip.

[0015] FIG. 3 illustrates a perspective view of the exemplary distal portion of the exemplary clip applier of FIGS. 1 and 2.

[0016] FIG. 4 illustrates an exploded view of the exemplary distal portion of the exemplary clip applier of FIGS. 1-3.

[0017] FIG. 5 illustrates a perspective view of an exemplary stabilizing member of the exemplary clip applier of FIGS. 1-4.

[0018] FIG. 6 illustrates a perspective view of a first exemplary embodiment of a surgical clip that may be applied with the exemplary clip applier of FIGS. 1-5.

[0019] FIG. 7 illustrates a perspective view of a second exemplary embodiment of a surgical clip that may be applied with the exemplary clip applier of FIGS. 1-5.

[0020] FIGS. 8A-B illustrate an exemplary method of loading an exemplary clip into the exemplary clip applier of FIGS. 1-5.

[0021] The same or similar reference numbers are used in the drawings and the following detailed description to refer to the same or similar parts.

Detailed Description

[0022] The invention will now be described with reference to the figures, in which like reference numerals refer to like parts throughout. In accordance with conventional practice, as used herein, and unless otherwise indicated herein, the term "proximal portion" refers to the specified portion of a device or its component which is generally closer to the medical personnel handling or manipulating the device as it is intended to be used, and the term "distal portion" shall refer to the specified portion of a device or its component which is opposite of the proximal portion.

[0023] The present invention is generally directed to a clip applier configured to increase stability of surgical clips during a medical procedure. The clip applier may include a stabilizing member disposed between first and second jaw members. The stabilizing member and the first and second jaw members may provide at least three points of contact with the surgical clip to prevent relative movement of the surgical clip during the medical procedure. The stabilizing member may have vertical walls extending from a distal portion. The vertical walls may be positioned on opposing sides of a proximal end of the surgical clip to reduce

lateral movement of the surgical clip. A distal end portion of the stabilizing member with the vertical walls may have width greater than a shaft extending from the distal end portion. The increased width of the distal end portion may increase stability of the surgical clip between the jaw members, and prevent retraction of the distal end portion through the shaft of the clip applier. The stabilizing member may further have lateral protrusions extending between the vertical walls and being configured to reduce vertical movement.

[0024] The stabilizing member may be biased into a first, distal position at least partially between the first and second jaw members to facilitate front-loading of the clip applier. The stabilizing member may engage the surgical clip as it is loaded between the first and second jaw members. The stabilizing member may also retract as the surgical clip is fed between the first and second jaw members to a second, proximal position. The second, proximal position may be at least partially positioned between the first and second jaw members. The stabilizing member may be constrained between the first and second positions, for example, through a pin and channel configuration and/or the greater width of the distal end portion. The pin may be provided by a pivot pin of the first and second jaw members, and the channel may extend longitudinally through a shaft of the stabilizing member. The stabilizing member may move from the first position to the second position and from the second position to the first position, but the stabilizing member cannot move distally of the first position or proximally of the second position. The stabilizing member may therefore be configured to apply a sufficient stabilizing force when the surgical clip is received between the first and second jaw members of the clip applier during front-loading of the surgical clip from a cartridge. The clip applier may also be configured hold the surgical clip without any bosses. The clip applier may stabilizing the surgical clip while being applied to tissue (*e.g.*, to ligate a blood vessel) preventing the surgical clip from fish-tailing.

[0025] FIGS. 1-4 illustrate a clip applier 100 configured to apply a surgical clip 200 according to the present disclosure. The clip applier 100 may include a proximal portion 100A and a distal portion 100B. The clip applier 100 may further include a handle mechanism 102, a shaft 104, and a jaw structure 106. The jaw structure 106 may be pivotally connected to the shaft 104 and actuated by the handle mechanism 102.

[0026] The jaw structure 106 may include a first jaw member 108 and a second jaw member 110 pivotally coupled at a hinge mechanism 112 having a pivot pin 114. The jaw

structure 106 may receive the surgical clip 200 between the first and second jaw members 108, 110, and the first and second jaw members 108, 110 may stabilize the surgical clip 200 at points of contact on distal portions of first and second leg members 202, 204. The jaw members 108, 110 may have engaging surfaces 111 at distal ends. The engaging surfaces 111 may be substantially flat and/or hook shaped and may be configured to releasably engage distal ends of leg members 202, 204 of the surgical clip 200 without bosses.

[0027] The jaw structure 106 may also be configured to compress the surgical clip 200 by applying opposing forces on the first and second leg members 202, 204. The jaw structure 106 may be actuated by an actuator 140 advanced and retracted by the handle mechanism 102, as illustrated in FIG. 4. The actuator 140 may have projections 142 on a distal end configured to be received within linear, angled slots 144 on proximal ends of each of the first and second jaw members 108, 110. The actuator 140 may open the jaw structure 106 when the projections 142 are in a proximal position within the slots 144, and the actuator 140 may close the jaw structure 106 when the projections are in a distal position within the slots 144. The actuator 140 may be biased into the proximal position to open the jaw members 108, 110.

[0028] The clip applier 100 may further include a stabilizing member 116 configured to be received between the first and second jaw members 108, 110 and to provide additional stability to the surgical clip 200. The stabilizing member 116 may be spring-loaded to apply a distal force on a proximal portion of the surgical clip 200, applying distal pressure to the surgical clip 200 against the first and second jaw members 108, 110. The stabilizing member 116 may be configured to move longitudinally between a first, distal position at least partially between the first and second jaw members 108, 110 and a second, proximal position at least partially between the first and second jaw members 108, 110. The stabilizing member 116 may be constrained to longitudinal movement between the first and second positions to ensure that suitable pressure is applied by the stabilizing member 116 to the surgical clip 200. The stabilizing member 116 may be positioned symmetrically between the first and second jaw members 108, 110. The positioning of the stabilizing member 116 may allow a user to pick up the surgical clip 200 from a cartridge 400 with the clip applier 100 in either of two opposite orientations. For example, the first jaw member 108 may engage with of the first leg member 202 or the second leg member 204 of the surgical clip 200. The clip applier 100

may also pick up the surgical clip 200 with bosses, rather the surgical clip 200 may be engaged between the stabilizing member 116 and the engaging surfaces 111.

[0029] The stabilizing member 116 may be biased distally by a spring member 118 disposed between the stabilizing member 116 and a tubular member 120. The spring member 118 may be compressed as the stabilizing member 116 is retracted when the surgical clip 200 is received within the first and second jaw members 108, 110. The spring member 118 may provide a distal force to the stabilizing member 116 to engage the surgical clip 200. The spring member 118 may also be further compressed as the surgical clip 200 is compressed, allowing lengthening of the leg members 202, 204 when latching in a closed configuration. As depicted in FIGS. 2, 4, internal components (*e.g.*, the spring member 118) may be exposed and/or visible through elongated slots 122 extending through the shaft 104. The elongated slots 122 may allow for inspection, cleaning, and/or flushing of the internal components without disassembly of the clip applier 100. The actuator 140 may extend through the tubular member 120 and the spring member 118 to engage the slots 144 of each of the first and second jaw members 108, 110.

[0030] As further depicted in FIGS. 4-5, the stabilizing member 116 may include an elongated body having a tubular portion 124 on a proximal portion and a shaft portion 126 distal of the tubular portion 124. The tubular portion 124 may be received in the shaft 104 and have a proximal end that abuts the spring member 118. The tubular portion 124 may comprise a lumen configured to receive the actuator 140. The shaft portion 126 may have a substantially rectangular cross-section having substantially flat side surfaces configured to be received through longitudinal slot 128 on inner surfaces of the first and second jaw members 108, 110. The shaft portion 126 may therefore extend into an opening between the first and second jaw members 108, 110. The distal face 132 distal of the shaft member 126 may engage the proximal portion (*e.g.*, a hinge portion 206) of the surgical clip 200. The distal face 132 may be on a distal end portion of the stabilizing member 116 and have a width greater than a width of the longitudinal slot 128, preventing retraction of the distal face 132 past the second position and passage through the first and second jaw members 108, 110.

[0031] The shaft portion 126 may comprise a longitudinal channel 130 that receives the pivot pin 114. The pivot pin 114 may constrain the longitudinal movement of the stabilizing member 116 to longitudinal movement between the first and second positions. For example,

the pivot pin 114 may contact a proximal surface of the longitudinal channel 130 when the stabilizing member 116 is in the first, distal position, and the pivot pin 114 may contact a distal surface of the longitudinal channel 130 when the stabilizing member 116 is in the second, proximal position. The pivot pin 114 may also prevent rotation of the stabilizing member 116. The longitudinal channel 130 may be in communication with the lumen of the tubular member 124. The shaft portion 126 may have a neck region with a height less than a height of proximal and distal end portions of the shaft portion 126.

[0032] As further depicted in FIG. 5, the distal face 132 may have a distal surface 134 comprising lateral protrusions 138 configured to engage with the proximal portion of the surgical clip 200. The distal surface 134 may grip the surgical clip 200 and/or stabilize the surgical clip 200 when positioned between the first and second jaw members 108, 110. The distal face 132 may include vertical walls 136 extending on opposing sides of the stabilizing member 116. The vertical walls 136 may be configured to receive the proximal end of the surgical clip 200 therebetween, reducing lateral movement of the surgical clip 200. The distal face 132 including the vertical walls 136 may have a width greater than the shaft portion 126 and the longitudinal slot 128 of the first and second jaw members 108, 110, preventing retraction of the distal face 132 through the first and second jaw members 108, 110. The vertical walls 136 may be substantially parallel, and the protrusions 138 may extend therebetween. The vertical walls 136 may each have a substantially flat distal surface and a tapered proximal surface joining the shaft member 126. The vertical walls 136 may not extend the entire height of the distal surface 134.

[0033] FIG. 6 illustrates the surgical clip 200 according to a first embodiment of the disclosure. The surgical clip 200 may include the first leg member 202 and the second leg member 204 joined at the hinge portion 206. Each of the first and second leg members 202, 204 may include an inner surface 208, 210 and an outer surface 212, 214. Each of the inner surfaces 208, 210 may include a convex portion 216, 218 and a concave portion 220, 222, the concave portions 220, 222 being configured to receive the convex portions 216, 218 in a closed and/or latched configuration. The convex portions 216, 218 may be configured to pinch tissue proximate the hinge portion 206 prior to full closure of the surgical clip 200, to allow manipulation and/or retraction of the tissue. Each of the inner surfaces 208, 210 may

further include a plurality of teeth 224, 226 configured to further secure the tissue between the first and second leg members 202, 204.

[0034] Each of the first and second leg members 202, 204 may also include an engaging surface 228, 230 configured to engage the first and second jaw members 108, 110 of the clip applier 100. As depicted in FIG. 6, the engaging surfaces 228, 230 may include substantially flat, distally-facing surfaces, formed on the outer surfaces 212, 214 of the first and second leg members 202, 204. The engaging surfaces 228, 230 may be configured to engage the engaging surfaces 111 of the jaw members 108, 110 when secured in the clip applier 100. Therefore, the surgical clip 200 may be secured by the clip applier 100 without any circularly, round and/or laterally protruding bosses. The clip applier 100 does not require the bosses at the distal end of the surgical clip 100, due to positive locking of the surgical clip 100 caused by the distal force applied by the stabilizing member 116. Eliminating the bosses on the surgical clip 200 reduces the vertical and/or lateral profile of the surgical clip 200, reducing the space needed and/or trauma caused by the surgical clip 200.

[0035] The first leg member 202 may include a tip member 232, and the second leg member 204 may include a hook member 234. As the surgical clip 200 is closed, the hook member 234 may deflect around the tip member 232 to secure the surgical clip 200 in a latched configuration. The first and/or second leg members 202, 204 may straighten and/or elongate during the latching process. The engaging surface 228 of the first leg member 202 may be positioned immediately proximal of the tip member 232, and the engaging surface 230 of the second leg member 204 may be positioned immediately proximal of the hook member 234.

[0036] FIG. 7 illustrates a surgical clip 300 according to a second embodiment of the disclosure. The surgical clip 300 may include a first leg member 302 and a second leg member 304 joined at a hinge portion 306. The first leg member 302 may have an inner surface 308 with a convex curvature, and the second leg member 304 may have an inner surface 210 with a concave curvature. The concave curvature of the second leg member 304 may be configured to receive the convex curvature of the first leg member 302 in a latched and/or closed configuration. Each of the inner surfaces 308, 310 may further include a plurality of teeth 324, 326 configured to further secure the tissue between the first and second leg members 302, 304.

[0037] Each of the first and second leg members 302, 304 may also include an engaging surface 328, 330 configured to engage the first and second jaw members 108, 110 of the clip applier 100. As depicted in FIG. 6, the engaging surfaces 328, 330 may include substantially flat, distally-facing surfaces, formed on the outer surfaces 312, 314 of the first and second leg members 302, 304. The engaging surfaces 328, 330 may be configured to engage the engaging surfaces 111 of the jaw members 108, 110 when secured in the clip applier 100. Therefore, the surgical clip 200 may be secured by the clip applier 100 without any bosses, as further discussed above.

[0038] The first leg member 302 may include a tip member 332, and the second leg member 304 may include a hook member 334. As the surgical clip 300 is closed, the hook member 334 may deflect around the tip member 332 to secure the surgical clip 300 in a latched configuration. The first and/or second leg members 302, 304 may straighten and/or elongate during the latching process. The engaging surface 328 of the first leg member 302 may be positioned immediately proximal of the tip member 332, and the engaging surface 330 of the second leg member 304 may be positioned immediately proximal of the hook member 334.

[0039] FIGS. 8A-B illustrate the clip applier 100 being loaded with the surgical clip 200 from a cartridge 400. FIG. 8A illustrates a cutaway view of the clip applier 100 as it engages the surgical clip 200 positioned in the cartridge 400, and FIG. 8B illustrates an isometric view of the clip applier 100 shortly after removing the surgical clip 200 from the cartridge 400. As shown, the three point engagement between the clip applier 100 and the surgical clip 200 increases the security of the surgical clip 200. Two points of contact occur on the surgical clip 200 at distal surfaces of the first and second leg members 202, 204, and a third point of contact is at a proximal portion of the surgical clip 200 (*e.g.*, the hinge portion 206). Compression by the spring member 118 may provide a distal force the stabilizing member 116 as the surgical clip 200 is picked up, such that the surgical clip 200 remains positively engaged despite external forces. Only when the clip applier 100 fully closes and/or latches the surgical clip 200, does the surgical clip 200 become free of the first and second jaw members 108, 110. The first and second jaw members 108, 110 may then be opened and removed to leave the surgical clip 200 in place. Although FIGS. 2, 3, and 8A-B illustrate the

clip applier 100 loaded with the surgical clip 200, it should be readily understood that the clip applier 100 may be used with the surgical clip 300.

[0040] The many features and advantages of the invention are apparent from the detailed specification, and thus, it is intended by the appended claims to cover all such features and advantages of the invention which fall within the true spirit and scope of the invention. Further, since numerous modifications and variations will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation illustrated and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

What is claimed is:

1. A clip applier configured to apply a surgical clip to tissue, the clip applier comprising:

first and second jaw members configured to engage the surgical clip; and

a stabilizing member configured to engage the surgical clip, the stabilizing member being configured to move longitudinally with respect to the clip applier from a first position at least partially between the first and second jaw members to a second position at least partially between the first and second jaw members,

wherein longitudinal movement of the stabilizing member is constrained to longitudinal movement between the first and second positions.

2. The clip applier of claim 1, wherein the stabilizing member includes first and second sidewalls on a distal end portion, the first and second sidewalls being configured to stabilize the surgical clip in a lateral direction.

3. The clip applier of claim 1, further comprising:

a hinge pin configured to pivotably secure the first and second jaw members,

wherein the stabilizing member has a longitudinal channel configured to receive the hinge pin, and the hinge pin is configured to constrain the longitudinal movement of the stabilizing member.

4. The clip applier of claim 3, wherein the stabilizing member further comprises a tubular portion on a proximal end portion and a shaft portion distal of the tubular portion, and a width of a distal end portion of the stabilizing member is greater than a width of the shaft portion.

5. The clip applier of claim 1, further comprising a spring positioned on a proximal end of the stabilizing member, the spring being configured to bias the stabilizing member to the first position, the first position being distal of the second position.

6. The clip applier of claim 5, further comprising a shaft secured to proximal ends of the first and second jaw members, the shaft comprising at least one elongated slot along its length, the spring being visible through the at least one elongated slot.

7. The clip applier of claim 5, further comprising a tubular member abutting a proximal end portion of the spring, wherein a distal end portion of the spring abuts a tubular portion on a proximal end portion of the stabilizing member.

8. The clip applier of claim 1, wherein the stabilizing member includes a plurality of protrusions on a distal end portion, the plurality of protrusions being configured to stabilize the surgical clip in a vertical direction.

9. The clip applier of claim 1, wherein the first jaw member is configured to engage a distal end portion of a first leg member of the surgical clip, the second jaw member is configured to engage a distal end portion of a second leg member of the surgical clip, and the stabilizing member is configured to engage a proximal end portion of the surgical clip.

10. The clip applier of claim 9, wherein the first jaw member is configured to engage a first substantially flat surface on the distal end portion of the first leg member, and the second jaw member is configured to engage a second substantially flat surface on the distal end portion of the second leg member.

11. A method of loading a clip applier with a surgical clip, the method comprising:

receiving a proximal end of the surgical clip between first and second jaw members of the clip applier;

engaging the proximal end of the surgical clip with a stabilizing member in a first position at least partially between the first and second jaw members;

retracting the stabilizing member longitudinally to a second position at least partially between the first and second jaw members; and

stabilizing the surgical clip between the stabilizing member and the first and second jaw members.

12. The method of claim 11, wherein longitudinal movement of the stabilizing member is constrained to longitudinal movement between the first position and a second position.

13. The method of claim 11, wherein stabilizing the surgical clip includes stabilizing the surgical clip in a lateral direction with first and second walls on a distal end portion of the stabilizing member.

14. The method of claim 11, wherein stabilizing the surgical clip comprising stabilizing the surgical clip in a vertical direction with a plurality of protrusions on a distal end portion of the stabilizing member.

15. The method of claim 11, further comprising picking the surgical clip up from a cartridge.

16. A stabilizing member for a clip applier, the stabilizing member comprising:

an elongated body having a proximal end portion and a distal end portion;

first and second sidewalls on the distal end portion of the elongated body, the first and second sidewalls being configured to stabilize a proximal end of a surgical clip in a lateral direction; and

a shaft portion extending from the distal end portion, wherein a width of the distal end portion including the first and second sidewalls is greater than a width of the shaft portion.

17. The stabilizing member of claim 16, further comprising a longitudinal channel extending through the elongated body.

18. The stabilizing member of claim 16, wherein the shaft portion has a substantially rectangular cross-section.

19. The stabilizing member of claim 16, further comprising a tubular portion on the proximal end portion of the elongated body.

20. The stabilizing member of claim 16, further comprising a plurality of protrusions on the distal end portion, the plurality of protrusions being configured to stabilize the proximal end of the surgical clip in a vertical direction.

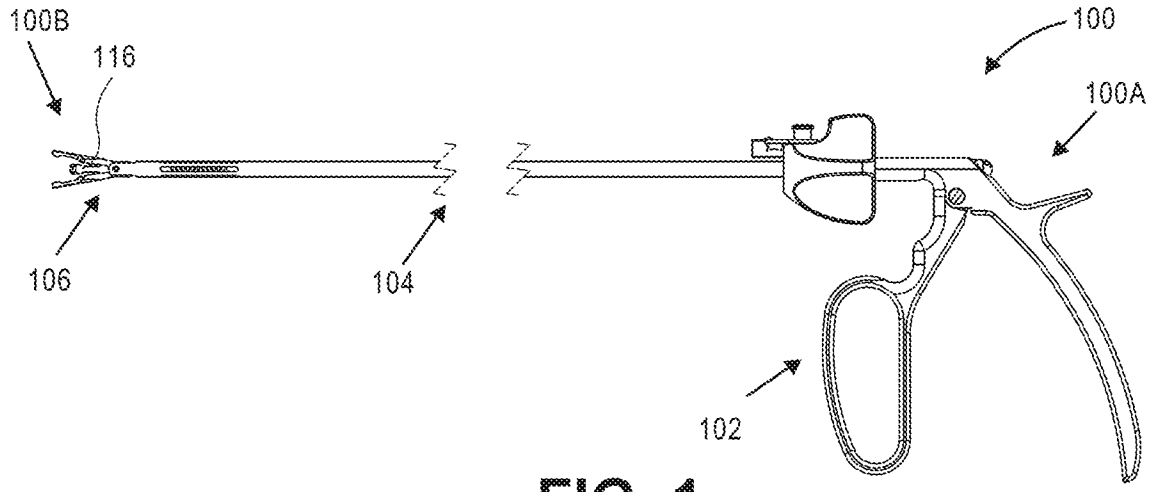


FIG. 1

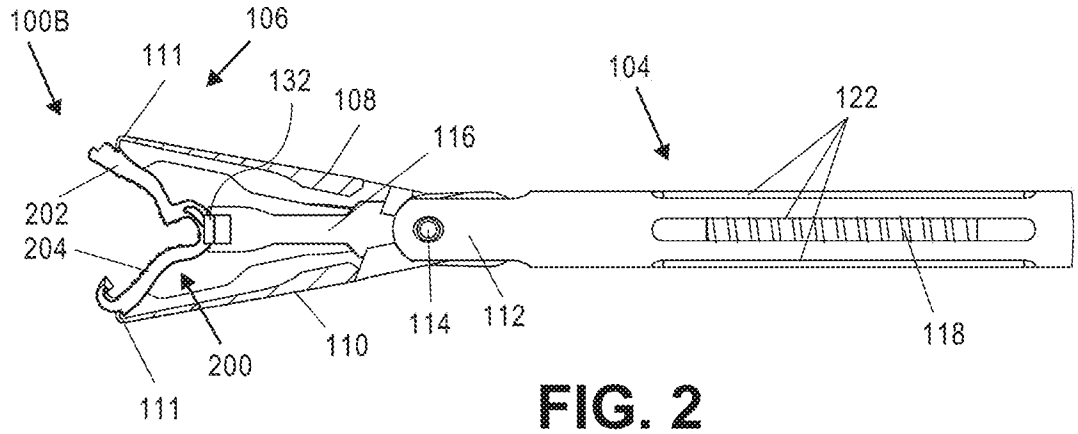


FIG. 2

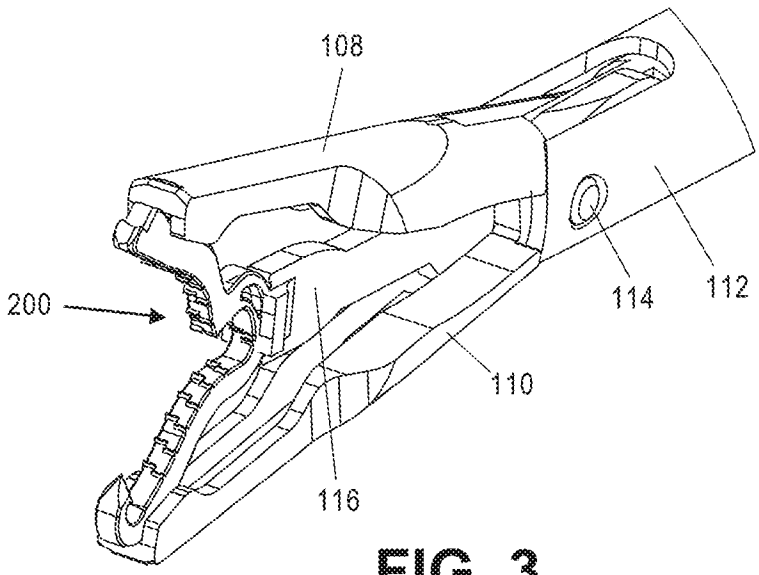


FIG. 3

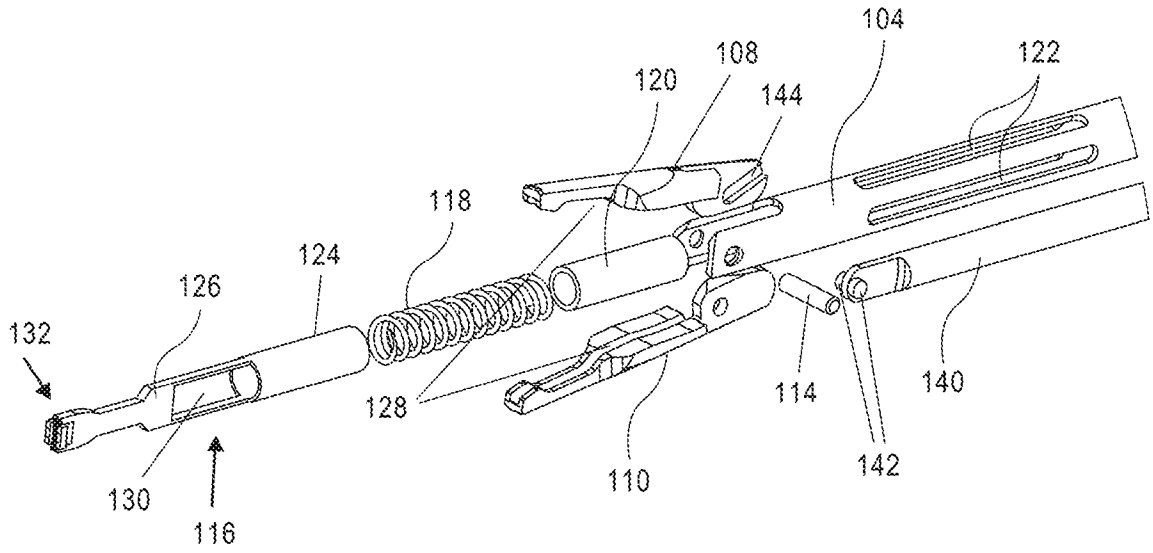

104
108
122
120
144
118
124
126
132
128
114
140
130
110
142
116

FIG. 4

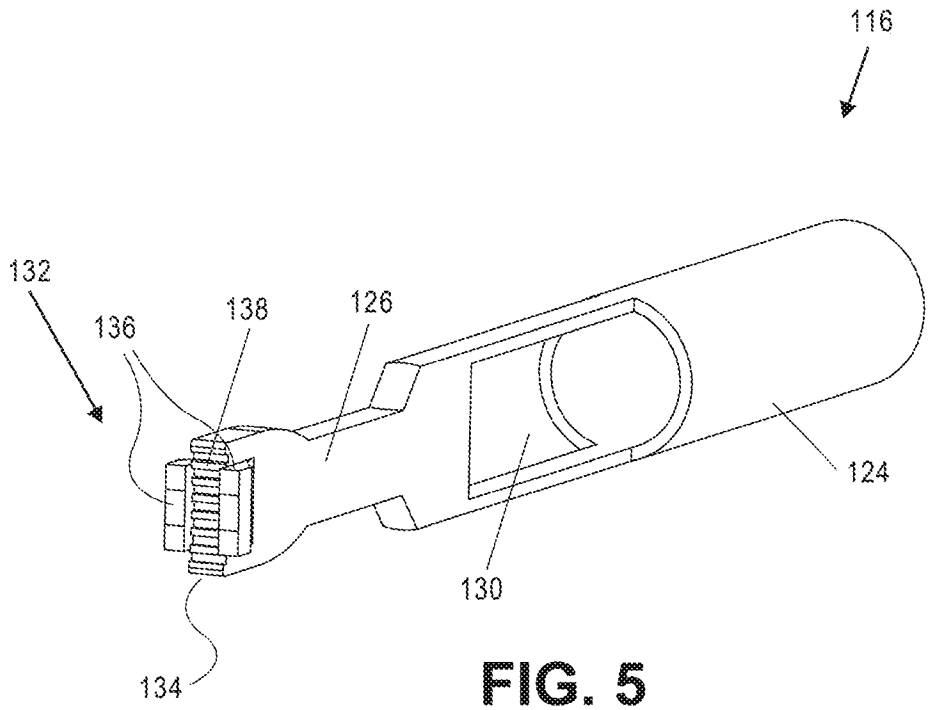

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FIG. 5

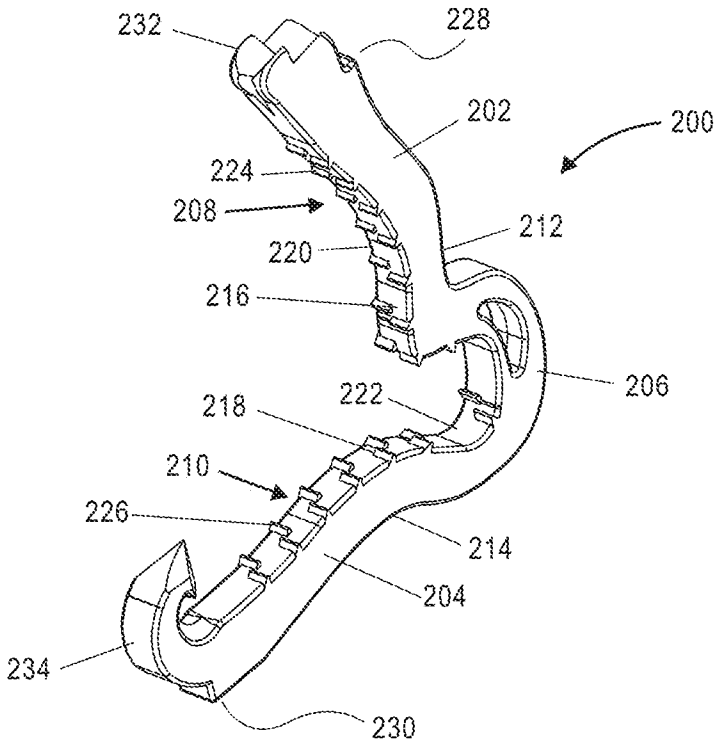

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FIG. 6

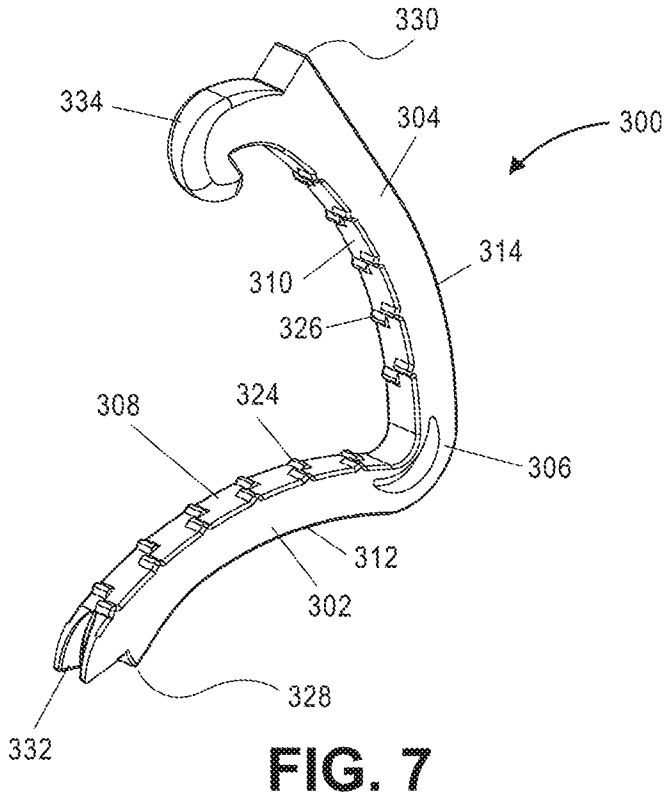

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FIG. 7

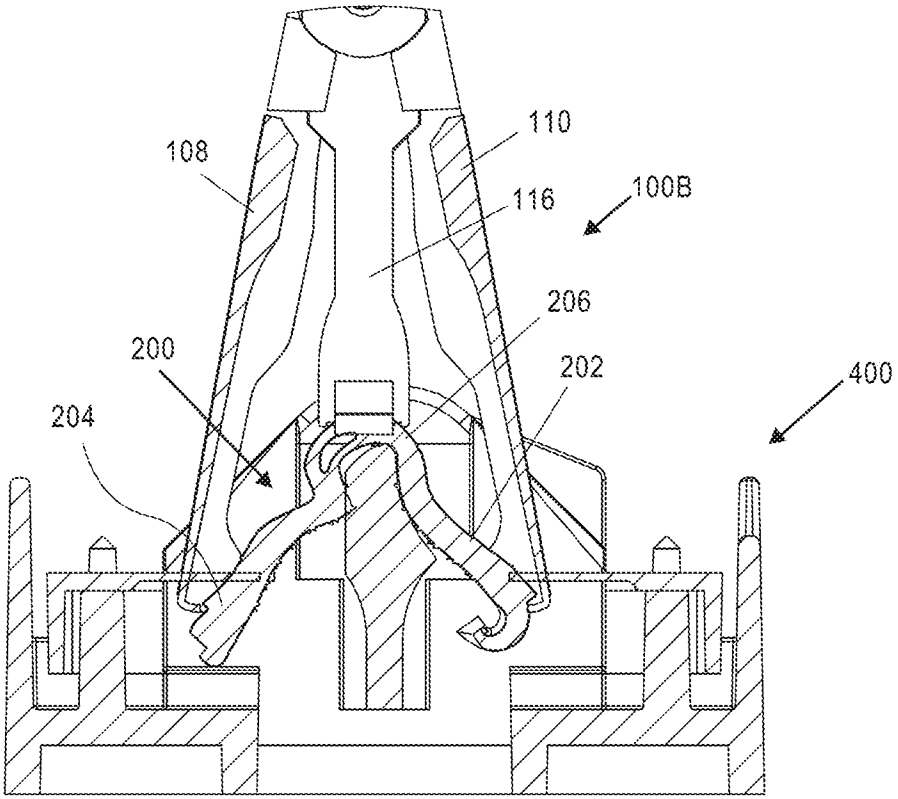


FIG. 8A

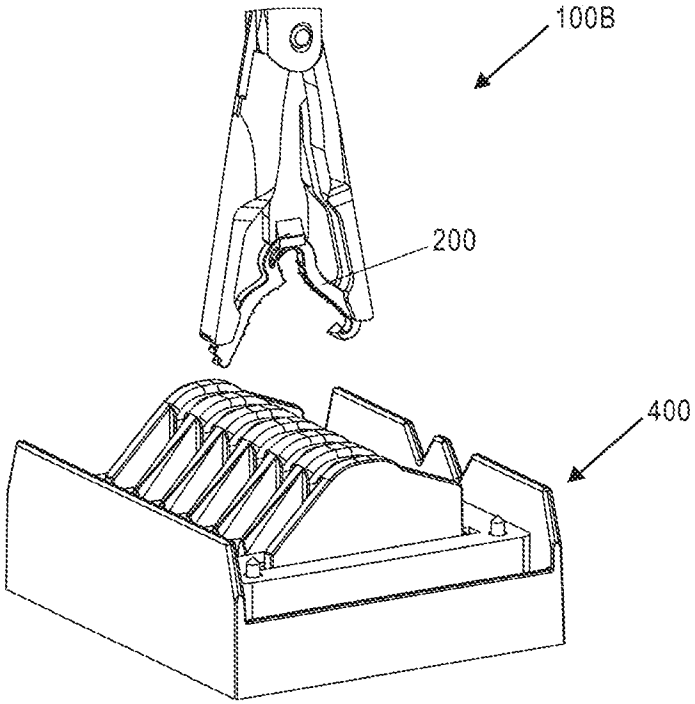


FIG. 8B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 18/23620

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: Claims 1-10 directed to a clip appler and stabilizer.

Group II: Claims 11-15 directed to a method of using a clip applier and stabilizer.

Group III: Claims 16-20 directed towards a stabilizing member.

The inventions listed as Groups I-III do not relate to a single inventive concept under PCT Rule 13.1 because under PCT Rule 13.2 they lack the same or corresponding technical features for the following reasons:

---------- see extra sheet --------

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-10

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 18/23620

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A61B 17/128 (2018.01)
CPC - A61B 17/128, A61B 17/1285, A61B 2017/0488

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
See Search History Document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
See Search History Document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
See Search History Document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y -- A	US 2013/0261642 A1 (WILLETT et al.) 03 October 2013 (03.10.2013) Entire document, especially Abstract, para[0302]-[0305] and FIGS. 115-120.	1, 3, 8 --------- 2 --------- 4-7
X	US 4,671,281 A (BEROFF et al.) 09 June 1987 (09.06.1987) Entire document, especially Abstract, col 3, ln 46- col 4, ln 2 and FIG. 6.	1, 9-10
Y	US 4,934,364 A (GREEN) 19 June 1990 (19.06.1990) Entire document, especially Abstract, col 6, ln 4-29 and FIGS. 8-11.	2
A	US 2004/0097970 A1 (HUGHETT) 20 May 2004 (20.05.2004) Entire document, especially Abstract, para[0081]-[0082] and FIGS. 11.	4-7
A	US 5,591,178A (GREEN et al.) 07 January 1997 (07.01.1997) Entire document.	1-10
A	US 2014/0207156 A1 (COVIDIEN LP) 24 July 2015 (24.07.2014) Entire document.	1-10
A	US 2,594,102 A (VOLLMER) 25 April 1952 (25.04.1952) Entire document.	1-10
A	US 2,744,251 A (VOLLMER) 08 May 1956 (08.05.1956) Entire document.	1-10

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 May 2018	10 AUG 2018
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 18/23620

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

Special Technical Features
Groups I-II include the special technical features of first and second jaw members configured to engage the surgical clip; the stabilizing member being configured to move longitudinally with respect to the clip applier from a first position at least partially between the first and second jaw members to a second position at least partially between the first and second jaw members, wherein longitudinal movement of the stabilizing member is constrained to longitudinal movement between the first and second positions, not required in any other group.

Group II includes the special technical features of method steps including particular use steps (claim 11) retracting the stabilizing member longitudinally to a second position at least partially
between the first and second jaw members; and stabilizing the surgical clip between the stabilizing member and the first and second jaw members (claim 15) picking the surgical clip up from a
cartridge, not required by Group I.

Group III includes the special technical features of an elongated body having a proximal end portion and a distal end portion; first and second sidewalls on the distal end portion of the elongated body, the first and second sidewalls being configured to stabilize a proximal end of a surgical clip in a lateral direction; and a shaft portion extending from the distal end portion, wherein a width of the distal end portion including the first and second sidewalls is greater than a width of the shaft portion, not required in any other group.

Common Technical Features
The groups generally share the features of a stabilizing member. However, stabilizing members are well known in the art to US 2013/0261642 A1 to WILLETT et al. (hereinafter: Willett). Willett describes a stabilizing member (portion comprising projection 12120, FIGS. 113, 118; para[0302]).

Finally, group I-II are related to an apparatus (Group I) and method(s) of using the apparatus (Group II). These groups therefore share the technical features of the apparatus of claim 1, however, these shared technical features fail to provide a contribution over the prior art of Willett. Willett describes a clip applier configured to apply a surgical clip to tissue (Abstract), the clip applier comprising:
first and second jaw members configured to engage the surgical clip (jaws 12042 containing clip 12000, FIGS. 115, 118; paa[0303]); and a stabilizing member (portion comprising projection 12120, FIGS. 113, 118; para[0302]) configured to engage the surgical clip (FIG. 118; para[0302]), the stabilizing member being configured to move longitudinally with respect to the clip applier from a first position at least partially between the first and second jaw members (FIG. 118) to a second position at least partially between the first and second jaw members (FIGS. 122; i.e. defined by ends slot 12112 against rivet 12056, FIG. 113; see also FIGS. 118, 115-116, 122 para[0302]-[305]: noting rivet defines end of jaws), wherein longitudinal movement of the stabilizing member is constrained to longitudinal movement between the first and second positions (by end of slots, FIG. 113,118,115-116; para[0302]-[0305]).

Thus, Groups I-III lack unity of invention because they do not share a same or corresponding special technical feature providing a contribution over the prior art.