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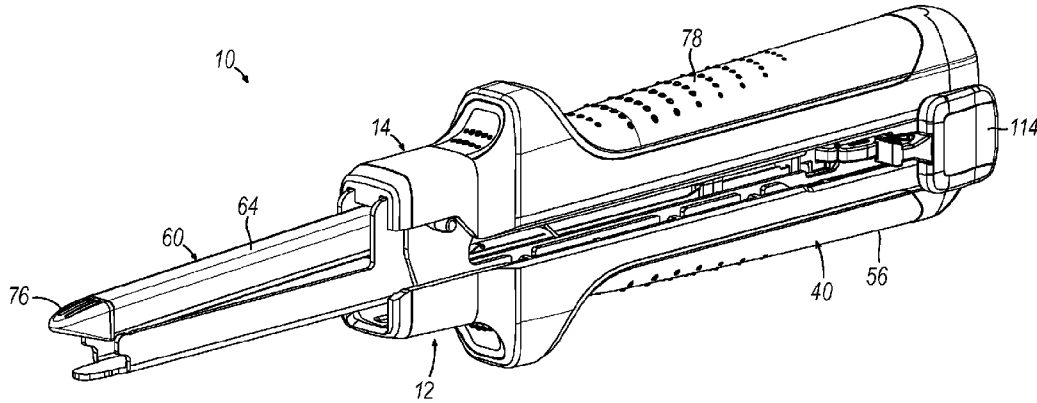


FIG. 1

(57) Abstract: An apparatus includes first and second elongate members having first and second stapling surfaces and being configured to releasably couple together. A clamp member is movable from a first position to a second position to approximate the stapling surfaces for clamping tissue. A latch member is transitionable from an unlatched state to a latched state to releasably retain the clamp member in the second position. A firing assembly is actuatable from a home position to fire staples into the clamped tissue. The latch member is transitionable from the unlatched state to the latched state when the clamp member is in the second position while the firing assembly is in the home position. The latch member is inhibited from transitioning from the unlatched state to the latched state when the clamp member is in the second position while the firing assembly is displaced from the home position.



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LINEAR SURGICAL STAPLER

PRIORITY

5 [0001] This application claims the benefit of U.S. Provisional App. No. 63/352,093, filed June 16, 2022, and U.S. Provisional App. No. 63/423,300, filed November 7, 2022, the disclosures of which are incorporated by reference herein in their entireties.

BACKGROUND

10 [0002] In some surgical operations, such as a gastrointestinal anastomosis, it may be desirable to clamp down on one or more layers of tissue, cut through the clamped layers, and simultaneously drive staples through the layers to substantially seal the severed layers together near their severed ends. One such instrument that may be used in such operations is a linear surgical stapler, also referred to as a "linear cutter." A linear surgical stapler generally includes a first half (referred to as a "cartridge half" or "reload half") having a distal jaw configured to support a staple cartridge (or "reload"), and a second half (referred to as an "anvil half") having a distal jaw that supports an anvil surface having staple forming features. The stapler further includes a moveable clamp lever configured to releasably clamp the stapler halves together. The stapler halves are configured to releasably couple together and pivot relative to one another to clamp tissue positioned between the two distal jaws when the clamp lever is closed. A firing assembly of the stapler is configured to be actuated to cut the clamped layers and simultaneously drive staples through the tissue on either side of the cut line. After the stapler is fired, the clamp lever may be opened, and the stapler halves separated to release the severed and stapled tissue.

20 [0003] While various kinds of surgical stapling instruments and associated components have been made and used, it is believed that no one prior to the inventor(s) has made or used the invention described in the appended claims.

25

BRIEF DESCRIPTION OF THE DRAWINGS

- [0004] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention, and, together with the general description of the invention given above, and the detailed description of the embodiments given below, serve to explain the principles of the present invention.
- [0005] FIG. 1 depicts a perspective view of an illustrative linear surgical stapler, showing a cartridge half and an anvil half of the stapler coupled together with a clamp lever of the cartridge half in a fully closed position;
- [0006] FIG. 2 depicts an exploded perspective view of the linear surgical stapler of FIG. 1, additionally showing a staple cartridge;
- [0007] FIG. 3 depicts a perspective view of a distal end portion of the anvil half of the linear surgical stapler of FIG. 1;
- [0008] FIG. 4 depicts a perspective view of a distal end portion of the staple cartridge of FIG. 2;
- [0009] FIG. 5 depicts a cross-sectional perspective view of a proximal portion of the cartridge half of the linear surgical stapler of FIG. 1 with the clamp lever in an open position to reveal details of a firing assembly and a retaining assembly of the cartridge half;
- [00010] FIG. 6 depicts an exploded perspective view of the retaining assembly of FIG. 5;
- [00011] FIG. 7 depicts another exploded perspective view of the retaining assembly of FIG. 5;
- [00012] FIG. 8 depicts a perspective view of the firing assembly of FIG. 5;
- [00013] FIG. 9 depicts a perspective view of a staple cartridge assembly that includes the staple cartridge of FIG. 2;

- [00014] FIG. 10 depicts an exploded perspective view of the staple cartridge assembly of FIG. 9;
- [00015] FIG. 11 depicts a top plan view of the staple cartridge of FIG. 9;
- [00016] FIG. 12 depicts a rear elevational view of the staple cartridge of FIG. 9;
- 5 [00017] FIG. 13 depicts an enlarged perspective view of a distal portion of the staple cartridge of FIG. 9, showing tissue gripping members formed on a deck of the staple cartridge;
- [00018] FIG. 14 depicts an enlarged perspective view of a deck portion of the staple cartridge of FIG. 9, showing bridge elements of the tissue gripping members and showing
10 staple drivers and staples of the staple cartridge in an actuated state;
- [00019] FIG. 15 depicts a perspective view of a staple driver unit and a corresponding pair of staples of the staple cartridge of FIG. 9;
- [00020] FIG. 16 depicts a side elevational view of the staple cartridge of FIG. 9;
- [00021] FIG. 17 depicts a side elevational view of another illustrative staple cartridge
15 configured for use with a linear surgical stapler;
- [00022] FIG. 18 depicts a side elevational view of another illustrative staple cartridge configured for use with a linear surgical stapler.
- [00023] FIG. 19A depicts a side elevational view of the linear surgical stapler of FIG. 1, showing the stapler halves separated from one another with the clamp lever in the open
20 position;
- [00024] FIG. 19B depicts a side elevational view of the linear surgical stapler of FIG. 1, showing proximal ends of the stapler halves coupled together while the clamp lever is in the open position to provide the stapler in a “hang-open” state;

- [00025] FIG. 19C depicts a side elevational view of the linear surgical stapler of FIG. 1, showing distal portions of the stapler halves having been approximated so that a distal pin of the anvil half is received by clamp lever jaws of the cartridge half;
- [00026] FIG. 19D depicts a side elevational view of the linear surgical stapler of FIG. 1, showing closure of the clamp lever to fully clamp the stapler halves together;
- [00027] FIG. 19E depicts a side elevational view of the linear surgical stapler of FIG. 1, showing distal actuation of the firing assembly while the stapler halves are in the fully clamped state;
- [00028] FIG. 20 depicts a perspective view of a proximal portion of another illustrative linear surgical stapler, showing a cartridge half and an anvil half of the stapler coupled together with a clamp lever of the cartridge half in a fully closed position with a latch member of the clamp lever in a latched state;
- [00029] FIG. 21 depicts a perspective view of a clamp lever latch member of the linear surgical stapler of FIG. 20;
- [00030] FIG. 22 depicts a side cross-sectional view of the proximal portion of the linear surgical stapler of FIG. 20, showing details of a firing assembly, a retaining assembly, and the clamp lever latch member of the cartridge half, showing the clamp lever in the fully closed position with the latch member in an unlatched state while the firing assembly is displaced from a proximal home position;
- [00031] FIG. 23 depicts a side cross-sectional view of the proximal portion of the linear surgical stapler of FIG. 20, showing the latch member in the latched state while the firing assembly is in the proximal home position;
- [00032] FIG. 24 depicts a side elevational view of the proximal portion of the linear surgical stapler of FIG. 20, showing a protrusion located at a proximal end of a shroud of the anvil half and contacting a retaining member of the cartridge half to resist decoupling of the proximal ends of the stapler halves when the stapler is in the hang-open state;

[00033] FIG. 25A depicts a side elevational view of another illustrative linear surgical stapler, showing a clamp lever of the stapler in an open position;

[00034] FIG. 25B depicts a side elevational view of the linear surgical stapler of FIG. 25A, showing the clamp lever in a partially closed, non-latched position; and

5 [00035] FIG. 25C depicts a side elevational view of the linear surgical stapler of FIG. 25A, showing the clamp lever in a fully closed, non-latched position.

[00036] The drawings are not intended to be limiting in any way, and it is contemplated that various embodiments of the invention may be carried out in a variety of other ways, including those not necessarily depicted in the drawings. The accompanying drawings
10 incorporated in and forming a part of the specification illustrate several aspects of the present invention, and together with the description serve to explain the principles of the invention; it being understood, however, that this invention is not limited to the precise arrangements shown.

DETAILED DESCRIPTION

15 [00037] The following description of certain examples of the invention should not be used to limit the scope of the present invention. Other examples, features, aspects, embodiments, and advantages of the invention will become apparent to those skilled in the art from the following description, which is by way of illustration, one of the best modes contemplated for carrying out the invention. As will be realized, the invention is capable
20 of other different and obvious aspects, all without departing from the invention. Accordingly, the drawings and descriptions should be regarded as illustrative in nature and not restrictive.

[00038] F
or clarity of disclosure, the terms “proximal” and “distal” are defined herein relative to a
25 surgeon, or other operator, grasping a surgical instrument having a distal surgical end effector. The term “proximal” refers to the position of an element arranged closer to the surgeon, and the term “distal” refers to the position of an element arranged closer to the

surgical end effector of the surgical instrument and further away from the surgeon. Moreover, to the extent that spatial terms such as "upper," "lower," "vertical," "horizontal," or the like are used herein with reference to the drawings, it will be appreciated that such terms are used for illustrative description purposes only and are not intended to be limiting or absolute. In that regard, it will be understood that surgical instruments such as those disclosed herein may be used in a variety of orientations and positions not limited to those shown and described herein.

[00039] F

urthermore, the terms "about" and "approximately" as used herein in connection with any numerical values or ranges indicate a suitable dimensional tolerance that allows the referenced feature(s) to function for its intended purpose as described herein.

[00040] I

15 Illustrative Linear Surgical Staplers

[00041] A.

Overview of Linear Surgical Stapler

[00042] F

IGS. 1-2 show an illustrative linear surgical stapler (10) (also referred to as a "linear cutter") suitable for use in a variety of cutting and stapling procedures, such as a gastrointestinal anastomosis procedure. Linear surgical stapler (10) includes a cartridge half (12) (also referred to as a "reload half") and an anvil half (14) configured to releasably couple together to clamp tissue therebetween for simultaneous cutting and stapling of the clamped tissue.

[00043] C

artridge half (12) includes a first elongate member in the form of an elongate cartridge channel (16) having a proximal frame portion (18) and a distal jaw portion (20). Proximal frame portion (18) slidably retains a firing assembly (110) and includes a laterally opposed pair of upright side flanges (22). Each side flange (22) includes a vertical slot (24) arranged

at a distal end thereof, and a tapered notch (26) arranged at a proximal end thereof. An outwardly projecting stiffening rib (28) extends longitudinally between the distal slot (24) and proximal notch (26) of each side flange (22) and is configured to provide the side flange (22) with enhanced stiffness. An outwardly flared upper segment (30) defines an upper edge of a proximal portion of each side flange (22) and is configured to facilitate receipt of anvil half (14) by cartridge half (12). Each side flange (22) further includes an elongate firing slot (32) extending longitudinally between proximal notch (26) and distal slot (24) along a lower side of side flange (22). Elongate firing slots (32) are configured to guide firing assembly (110) between proximal and distal positions. Firing assembly (110) is described in greater detail below in connection with FIG. 8.

[00044]

D

istal jaw portion (20) of cartridge channel (16) is configured to releasably receive a staple cartridge (140) (or "reload"). As shown in FIGS. 4 and 9-16, staple cartridge (140) includes a cartridge body (142) having an upper side that defines a first stapling surface in the form of a deck (156) having a plurality of staple openings (166) that house a plurality of staples (168) and corresponding staple drivers (172) (see FIG. 16). Illustrative features of staple cartridge (140) are described in greater detail below in connection with FIGS. 9-16.

[00045]

C

artridge half (12) further includes a clamp member in the form of a clamp lever (40) (also referred to as a "clamp arm" or "latch lever") pivotably coupled to cartridge channel (16) with a clamp lever pivot pin (42), which is arranged in approximate alignment with distal slots (24) of cartridge channel side flanges (22). Clamp lever (40) includes an elongate lever arm (44) having a free proximal end (46) and a distal end that is pivotably coupled to a lower portion of cartridge channel (16) with pivot pin (42). A pair of opposed jaws (48) extend distally from the distal end of lever arm (44) alongside cartridge channel side flanges (22). Each jaw (48) includes a curved slot (50) having a closed proximal end and an open distal end configured to receive a latch pin (68) of anvil half (14), as described below.

[00046]

C

lamp lever (40) is operable to pivot relative to cartridge channel (16) between an open position in which proximal end (46) of lever arm (44) is spaced from cartridge channel frame portion (18) as shown in FIGS. 19A-19C described below, and a closed position in which proximal end (46) confronts cartridge channel frame portion (18) as shown in FIG. 9D described below. Actuation of clamp lever (40) from the open position to the closed position operates to capture the opposed lateral ends of latch pin (68) within clamp lever jaw slots (50), and thereby clamp anvil half (14) against cartridge half (12), as shown and described below in connection with FIGS. 19C-19D. In that regard, the curvature of each jaw slot (50) defines respective upper and lower camming surfaces configured to engage and draw the respective lateral end of latch pin (68) toward cartridge channel (16) as clamp lever (40) is pivotably closed. A resilient member shown in the form of a leaf spring (52) biases lever arm (44) toward the open position. Accordingly, leaf spring (52) promotes disengagement of clamp lever jaws (48) from anvil half latch pin (68) upon initial advancement of clamp lever (40) from the closed position toward the open position.

[00047]

A

s best shown in FIG. 2, clamp lever (40) further includes a latch member (54) arranged at proximal end (46) of lever arm (44). Clamp lever latch member (54) is configured to resiliently and releasably engage a proximal end of cartridge channel frame portion (18) and thereby releasably retain clamp lever (40) in the closed position, for instance while stapler (10) is being fired. Clamp lever latch member (54) may be further configured in accordance with the teachings of U.S. Pat. No. 11,278,285, entitled "Clamping Assembly for Linear Surgical Stapler," issued March 22, 2022, the disclosure of which is incorporated by reference herein. An illustrative variation of clamp lever latch member (54) is described in greater detail below in connection with FIGS. 20-23.

[00048]

A

nvil half (14) of linear surgical stapler (10) includes a second elongate member in the form of an elongate anvil channel (60) having a proximal frame portion (62) and a distal jaw portion (64). Proximal frame portion (62) includes a laterally opposed pair of upright side

flanges (66) that are configured to be received between cartridge channel side flanges (22) when anvil half (14) is coupled with cartridge half (12). A distal latch projection in the form of latch pin (68) extends laterally through the distal ends of anvil channel side flanges (66), and a proximal pivot projection in the form of a proximal pin (70) extends laterally through the proximal ends of anvil channel side flanges (66). Anvil half pins (68, 70) are configured to facilitate coupling of anvil half (14) with cartridge half (12), as described below.

[00049]

A

s shown in FIGS. 2 and 3, distal jaw portion (64) of anvil half (14) supports an anvil plate (72) that defines a second stapling surface in the form of an anvil surface having a plurality of staple forming pockets (74) configured to deform legs of staples ejected by staple cartridge (140) when stapler (10) is fired. Staple forming pockets (74) of the present example may be formed via a coining process and are configured to form each staple of staple cartridge (140) with a three-dimensional shape in which the legs of each formed staple are laterally offset from one another so as to provide the formed staple with a non-planar shape, for example as disclosed in U.S. Pat. No. 11,229,433, entitled "Linear Surgical Stapler," issued January 25, 2022, the disclosure of which is incorporated by reference herein. Anvil channel (60), anvil plate (72), and staple forming pockets (74) may be formed in one or more of the manners disclosed in U.S. Pat. No. 11,229,433; U.S. Pat. No. 11,045,193, entitled "Anvil Assembly for Linear Surgical Stapler," issued June 29, 2021; and/or U.S. Pub. No. 2022/0142641, entitled "System and Method for Forming Pockets in Anvil of Surgical Stapler," published May 12, 2022, the disclosures of which are incorporated by reference herein. For instance, distal jaw portion (64) of anvil half (14) may be pre-formed with a curvature along its length that accommodates deflection of distal jaw portion (64) and anvil plate (72) when stapler halves (12, 14) are clamped together by clamp lever (40). Distal jaw portion (64) of anvil half (14) additionally supports a tapered distal tip member (76). In some versions, distal tip member (76) may be selectively extendable relative to distal jaw portion (64) in accordance with the teachings of U.S. Pat. No. 11,033,266, entitled "Decoupling Mechanism for Linear Surgical Stapler," issued June 15, 2021, the disclosure of which is incorporated by reference herein.

[00050]

A

s shown in FIG. 2, linear surgical stapler (10) further includes a pair of shrouds (56, 78) that cover select portions of stapler (10) and promote effective grip and manipulation of stapler (10) by an operator during use. In the present example, a clamp lever shroud (56) is affixed to and covers an outwardly facing side of clamp lever (40) such that clamp lever shroud (56) is configured to pivot with clamp lever (40) relative to cartridge channel (16). Additionally, an anvil shroud (78) is affixed to and covers an outwardly facing side of anvil channel (60). In some versions, anvil shroud (78) may be coupled with anvil channel (60) via interaction between pins (68, 70) and one or more tabs, ribs, or other structures that are disposed within an interior of anvil shroud (78) and include an opening, slot, keyhole, or other feature configured to receive a respective one of pins (68, 70). By way of example only, shrouds (56, 78) may be affixed using one or more of the teachings of U.S. Pat. No. 11,278,285, incorporated by reference above. In other versions, shrouds (56, 78) may be coupled with clamp lever (40) and anvil channel (60) in a variety of other suitable manners readily apparent to those of ordinary skill in the art in view of the teachings herein.

[00051]

A

s shown best in FIGS. 2 and 5-7, a proximal end of cartridge half (12) includes a retaining assembly (80) configured to releasably retain portions of anvil half (14) and firing assembly (110). Retaining assembly (80) of the present example includes a first movable retaining member in the form of an anvil latch member (82) and a second movable retaining member in the form of a detent member (84). Anvil latch member (82) and detent member (84) are rotatably coupled with a proximal end of cartridge channel (16) via a laterally extending pin (85) arranged proximally of firing slots (32), and members (82, 84) are resiliently biased in opposite rotational directions by a resilient member in the form of a torsion spring (86) positioned between members (82, 84).

[00052]

A

nvil latch member (82) includes a central body (88), a latch finger (90) extending upwardly from central body (88), and a release button (92) extending downwardly from central body (88) through a base wall of proximal frame portion (18) of cartridge channel (16). An upper

end of latch finger (90) tapers distally and is configured to releasably capture proximal anvil pin (70) of anvil half (14) with an angled latching surface (94) that overlies proximal anvil pin (70) once captured. Anvil latch member (82) further includes a pin ejection feature in the form of an angled projection (96) extending distally from a base portion of latch finger (90) and which defines an ejection cam ramp (98) that faces proximally toward latch finger (90).

[00053]

D

retent member (84) of proximal retaining assembly (80) includes a generally cylindrical central body (100), a distal finger (102) extending distally from central body (100), and a proximal hook (104) extending proximally from central body (100). Distal finger (102) is configured to releasably engage a proximal end of firing assembly (110) and thereby retain firing assembly (110) in a proximal home position. Proximal hook (104) is configured to overlie and capture an upper tip of clamp lever latch member (54) when clamp lever (40) is fully closed and firing assembly (110) is translated distally from its proximal home position, thereby preventing clamp lever (40) from opening during a firing stroke, for example as described in greater detail in U.S. Pat. No. 11,278,285, incorporated by reference above.

[00054]

I

in use, with stapler halves (12, 14) coupled together at their proximal ends such that proximal anvil pin (70) is retained by anvil latch member (82), and with clamp lever (40) in the open position, distal actuation of lower release button (92) causes anvil latch member (82) to rotate about pin (85) such that ejection cam ramp (98) advances proximally to drive proximal anvil pin (70) upwardly out of proximal tapered notches (26) of cartridge channel (16). Cartridge half (12) of the present version further includes a stationary finger grip projection (106) that extends downwardly from a base wall of proximal frame portion (18) of cartridge channel (16) at a location distal to lower release button (92), and is configured to facilitate actuation of release button (92). In particular, a user may apply his or her thumb to a proximal side of release button (92) and one or more fingers to a distal side of finger grip projection (106), and then squeeze release button (92) distally toward stationary finger

grip projection (106) to rotate latch finger (90) out of engagement with proximal anvil pin (70) and eject pin (70) upwardly from cartridge channel (16) with ejection cam ramp (98).

[00055]

R

5 retaining assembly (80) and related components of cartridge half (12) may be further configured and operable in accordance with one or more teachings of U.S. Pat. No. 10,898,187, entitled "Firing System for Linear Surgical Stapler," issued January 26, 2021, the disclosure of which is incorporated by reference herein; and/or U.S. Pat. No. 11,033,266, incorporated by reference above.

[00056]

A

10 s shown in FIG. 8, firing assembly (110) of cartridge half (12) includes a slide block (112), a pair of actuators (114, 116) (or "firing knobs") pivotably coupled to slide block (112), and a set of elongate beams (118, 122) extending distally from slide block (112). A pair of side beams (118) are coupled at their proximal ends to a distal end of slide block (112) and terminate distally in a pair of cam ramps (120). Cam ramps (120) are configured to
15 engage the undersides of staple drivers (172) (see FIGS. 10 and 15) housed within staple cartridge (140) and actuate staple drivers (172) upwardly to thereby drive (or "fire") staples from cartridge (130) into tissue clamped between staple cartridge (140) and anvil plate (72). A center beam (122) is coupled with side beams (118) via a bridge member (124) (or "knife block") spaced distally from slide block (112). Center beam (122) terminates
20 distally in a distally angled knife member (126) having a distal cutting edge (128) configured to cut tissue clamped between the distal portions of stapler halves (12, 14).

[00057]

E

25 Each actuator (114, 116) of firing assembly (110) is configured and rotatable relative to slide block (112) between a deployed position and a retracted position such that only one actuator (114, 116) may be deployed at a time, for example as disclosed in U.S. Pat. No. 10,898,187, incorporated by reference above. In the deployed position, an actuator (114, 116) may be driven distally by an operator to actuate firing assembly (110) distally through stapler (10) and thereby simultaneously cut and staple tissue clamped between stapler halves (12, 14).

[00058] B. Illustrative Staple Cartridges

[00059] FIGS. 9-16 show an illustrative staple cartridge assembly (130) configured for use with linear surgical stapler (10). Staple cartridge assembly (130) includes staple cartridge (140) and a retainer (132) configured to releasably couple with staple cartridge (140) to retain staples (168) in staple cartridge (140) before use.

5

[00060] Staple cartridge (140) includes a cartridge body (142) that extends linearly along a longitudinal axis between a proximal end having a cartridge channel coupling feature in the form of a plurality of downwardly extending coupling legs (144, 146) (also known as “fangs”), and a distal end having a tapered nose (150). Coupling legs (144, 146) are configured to releasably capture clamp lever pivot pin (42) and extend downwardly through corresponding openings formed in a floor of cartridge channel (16) when staple cartridge (140) is seated within distal jaw portion (20) of cartridge channel (16). A pair of wing tabs (152) disposed on the lateral sides of cartridge body (142) near the proximal end are configured to facilitate insertion and removal of staple cartridge (140) relative to distal jaw portion (20). As shown in FIG. 20, an interior side of each wing tab (152) includes a chamfer (154) at its proximal end that serves as a relief feature to provide clearance for the sidewalls of distal jaw portion (20) to facilitate installation and removal of staple cartridge (140) without interference.

10

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[00061] An upper side of cartridge body (142) defines a deck (156). An elongate knife slot (158) extends longitudinally through deck (156) along the longitudinal axis of staple cartridge (140) and is configured to slidably receive knife member (126) of firing assembly (110) therethrough in response to distal actuation thereof, described above. A firing lockout bypass feature in the form of a swing tab (160) is rotatably coupled to cartridge body (142) at a proximal end of knife slot (158). Swing tab (160) is configured to rotate between a deployed position in which swing tab (160) extends perpendicularly across the proximal end of knife slot (158), and a retracted position in which swing tab (160) extends parallel to knife slot (158). Swing tab (160) in the deployed position is configured to urge firing assembly (110) from a lockout state toward a firing state in which firing beams (118, 122)

may translate distally through staple cartridge (140) to enact stapling and cutting of tissue clamped by stapler (10).

5 [00062] A rigid tissue gap post (162) is secured at a distal end of knife slot (158) and protrudes upwardly away from cartridge deck (156). A rounded upper end of tissue gap post (162) is configured to contact a distal end of anvil plate (72) and thereby define a tissue gap of predetermined size between cartridge deck (156) and anvil plate (72) when stapler halves (12, 14) are clamped together in the manner described above.

10 [00063] A pair of elongate ribs (164) extend along opposing sides of knife slot (158) and project away from deck (156) to define raised surfaces. Elongate ribs (164) terminate at proximal and distal ends of knife slot (158) and are configured to promote enhanced gripping of tissue along knife slot (158), thus stabilizing the tissue during cutting by knife member (126).

15 [00064] Cartridge body (142) of staple cartridge (140) further includes a plurality of staple openings (166) that extend transversely through cartridge body (142) and open to deck (156). In the present example, staple openings (166) are arranged in first and second parallel rows along each side of knife slot (158), such that the staple openings (166) of each row are longitudinally staggered relative to staple openings (166) of the adjacent row. It will be understood that various suitable arrangements and quantities of staple openings (166) may be provided in other versions of staple cartridge (140). Each staple opening (166) is configured to house a respective staple (168) and staple driver (172). As described
20 above, cam ramps (120) of firing assembly (110) are configured to engage the undersides of staple drivers (172) and actuate staple drivers (172) upwardly within staple openings (166) to drive (or “fire”) staples (170) from staple openings (166), into tissue, and against anvil plate (72).

25 [00065] As shown best in FIGS. 13-14, staple cartridge (140) further includes a plurality of tissue gripping members (180) arranged on and projecting upwardly from cartridge deck (156). Tissue gripping members (180) are distributed along a length of deck (156) and are laterally offset from knife slot (158) and elongate ribs (164) to align with and open to a

respective one or more staple openings (166). Tissue gripping members (180) are configured to grip and thereby stabilize tissue when deck (156) and anvil plate (72) are clamped together; and, further, optimize tissue compression at the staple locations to facilitate effective stapling and cutting of the tissue. Tissue gripping members (180) of the present version are integrally connected with cartridge body (142).

[00066] Each tissue gripping member (180) includes a first end feature (182) that wraps partially around a first end portion of a staple opening (166), and an opposed second end feature (182) that wraps partially around an opposed second end portion of the same staple opening (166). A pair of bridge elements (184) extend between the first and second end features (182) along opposed lateral sides of the staple opening (166) and are recessed relative to the first and second end features (182). Accordingly, each bridge element (184) has a maximum height relative to deck (156) that is less than a maximum height of each of the first and second end features (182). Each pair of bridge elements (184) is configured to cooperate with the respective end features (182) to compress and grip tissue around the respective staple opening (166), and to guide a respective staple driver (172) toward anvil plate (72) without contacting the legs of the respective staple (168) during staple leg formation. Such compression of tissue by end features (182) and bridge elements (184) assists in gripping and stabilizing the tissue, while also minimizing the compression of tissue by staple drivers (172) themselves, which in turn minimizes the user input force required to fire stapler (10). Additionally, at least one end feature (182) associated with each staple opening (166) is integrally connected with an adjacent end feature (182) associated with a longitudinally adjacent staple opening (166), with a recessed region (186) located between each integrally connected pair of end features (182).

[00067] As shown in FIG. 15, each pair of staple drivers (172) of staple cartridge (140) is integrally formed as a staple driver unit (170) having a bridge feature (174) that interconnects staple drivers (172) at their lower ends. Staple drivers (172) of driver unit (170) are arranged in a staggered formation in which staple drivers (172) are laterally and longitudinally offset from one another, relative to the longitudinal axis of staple cartridge (140), such that staple drivers (172) are configured to align with respective staple openings

(166) of cartridge body (142). Each staple driver (172) includes a groove (176) at its upper end configured to receive and support the crown of a respective staple (168). Additionally, each staple driver (172) includes at its upper end staple leg receiving features in the form of pockets (178) that are defined by respective chamfered surfaces and are configured to receive staple leg tips of a respective staple (168) during formation of staple (168) by anvil plate (72) when stapler (10) is fired. Such features are described in greater detail in U.S. Pat. No. 11,229,433, incorporated by reference above.

[00068] As described above, coupling legs (144, 146) formed at the proximal end of staple cartridge (140) facilitate coupling of staple cartridge (140) with distal jaw portion (20) of cartridge channel (16). More specifically, each lateral side of staple cartridge (140) includes a longer distal coupling leg (144) and a shorter proximal coupling leg (146), separated by a gap (148). Gap (148) is suitably positioned and shaped, for example with an oval-like shape, to provide proximal coupling leg (146) with a smaller minimum thickness in a longitudinal direction than distal coupling leg (144), thus rendering proximal coupling leg (146) suitably flexible relative to cartridge body (142). Accordingly, during installation of staple cartridge (140) into distal jaw portion (20), proximal coupling leg (146) is configured to deflect relative to distal coupling leg (144) to enable clamp lever pivot pin (42) to be received into gap (148) with a snap-fit engagement and with a suitable degree of installation force by the user.

[00069] Distal coupling leg (144) of staple cartridge (140) may also serve as a poka-yoke feature that is sized and shaped to render staple cartridge (140) usable with only a predetermined type of linear surgical stapler, such as a stapler configured to apply to tissue a staple pattern and cut line of a predetermined length (e.g., 60mm). FIG. 17 shows another illustrative staple cartridge (190) that is generally similar to staple cartridge (140), except that staple cartridge (190) is longer and has a uniquely shaped distal coupling leg (192) that renders staple cartridge (190) usable with only another predetermined type of linear surgical stapler, such as a stapler configured to apply a longer (e.g., 80mm) staple pattern and cut line to tissue. FIG. 18 shows yet another illustrative staple cartridge (200) that is generally similar to staple cartridges (140, 190), except that staple cartridge (200) is even

longer and has a uniquely shaped distal coupling leg (202) that renders staple cartridge (200) usable with only another predetermined type of linear surgical stapler, such as a stapler configured to apply an even longer (e.g., 100mm) staple pattern and cut line to tissue.

5 [00070] S

taple cartridges (140, 190, 200) may be further configured in accordance with the teachings of U.S. Pat. App. No. [Atty. Ref. END9456USDP1], entitled “Staple Cartridge for Linear Surgical Stapler,” filed concurrently herewith, the disclosure of which is incorporated by reference herein.

10 [00071] C.

Illustrative Use of Linear Surgical Stapler

[00072] F

15 IGS. 19A-19E show illustrative coupling of stapler halves (12, 14) and subsequent firing of assembled stapler (10) during a surgical procedure. As shown in FIG. 9A, clamp lever (40) of cartridge half (12) is provided in the open position so that jaw slots (50) align with vertical slots (24) of cartridge channel side flanges (22). Additionally, firing assembly (110) is maintained in its proximal home position by detent member (84) of retaining assembly (80), as shown in FIG. 5 described above. At this stage, a section of tissue (not shown) to be stapled and cut may be positioned over the top of staple cartridge (140)
20 disposed in distal jaw portion (20) of cartridge half (12). Alternatively, the tissue may be positioned over staple cartridge (140) following coupling of the proximal ends of stapler halves (12, 14), described below.

[00073] A

25 s shown in FIGS. 19A-19B, the proximal ends of stapler halves (12, 14) are aligned with one another, and proximal anvil pin (70) is directed downwardly into proximal tapered notches (26) of cartridge channel (16) to engage latch finger (90) of anvil latch member (82). This engagement forces anvil latch member (82) to resiliently rotate clockwise, thus enabling latch finger (90) to capture anvil pin (70) and thereby releasably couple together

the proximal ends of stapler halves (12, 14), as seen in FIG. 19B. With clamp lever (40) still in the open position as shown in FIG. 19B, stapler (10) is provided in a “hang-open” state such that stapler (10) may be held single-handedly by anvil half (14) while cartridge half (12) remains coupled to anvil half (14). As shown in FIG. 9C, and with clamp lever (40) remaining in the open position, anvil half (14) is rotated toward anvil half (14) about proximal anvil pin (70) so that distal latch pin (68) of anvil half (14) is received into vertical slots (24) of cartridge channel side flanges (22) and jaw slots (50) of clamp lever (40). Distal jaw portions (20, 64) of stapler halves (12, 14) are now in a partially approximated state such that tissue received therebetween may be finally adjusted before clamping.

10 [00074]

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As shown in FIG. 19D, clamp lever (40) is closed to draw anvil latch pin (68) against the closed proximal ends of jaw slots (50) and thereby fully clamp anvil half (14) against cartridge half (12), with tissue (not shown) clamped between the stapling surfaces defined by staple cartridge (140) and anvil plate (72). A slight transverse gap is defined between staple cartridge (140) and anvil plate (72) by a tissue gap post (162) of staple cartridge (140), thus accommodating the tissue therebetween with a predetermined degree of tissue compression. As shown in FIGS. 19A and 19B, tissue gap post (162) is disposed at a distal end of staple cartridge (140) and is configured to contact a distal end of anvil plate (72) when stapler (10) is in the fully clamped state shown in FIG. 19D. In response to clamp lever (40) reaching the fully closed position, clamp lever latch member (54) may rotate to capture a proximal end of a base wall of cartridge channel (16) and thereby assume a latched state in which clamp lever latch member (54) maintains clamp lever (40) in the closed position.

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[00075]

A

As shown in FIG. 19E, upon reaching the fully clamped state, stapler (10) may be fired by driving a deployed actuator (114, 116) of firing assembly (110) distally along proximal frame portion (18) of cartridge half (12). This action causes elongate beams (118, 122) of firing assembly (110) to translate distally through corresponding channels formed in staple cartridge (140) and thereby fire staples into the clamped tissue via cam ramps (120) and

25

staple drivers (172), and simultaneously cut the clamped tissue with knife member (126). Following completion of the firing stroke, firing assembly (110) is returned to its proximal home position via the actuator (114, 116). Clamp lever latch member (54) may then be depressed to release the proximal end of clamp lever (40) from cartridge channel (16), thus permitting clamp lever (40) to be re-opened. Then, release button (92) of retaining assembly (80) may be depressed to release anvil half (14) from cartridge half (12) so that stapler halves (12, 14) may be separated from one another, thereby releasing the newly stapled and severed tissue. It will be understood that in some versions, stapler (10) may include additional features to promote decoupling of stapler halves (12, 14), for example as disclosed in U.S. Pat. No. 11,033,266, incorporated by reference above.

[00076] D. Linear Surgical Stapler Having Hang-Open Feature and Clamp Lever Latch Inhibiting Feature

[00077] As described above in connection with linear surgical stapler (10), a pivotable coupling is established between the proximal ends of stapler halves (12, 14) when anvil pin (70) is captured by anvil latch member (82). Additionally, clamp lever latch member (54) is configured to releasably capture a proximal end of a base wall of cartridge channel (16) to retain clamp lever (40) in its closed position during firing.

[00078] I
In some instances, it may be desirable to provide a linear surgical stapler with the ability to assume an open state in which the respective elongate members of the stapler halves assume a predetermined maximum angular orientation relative to one another and remain releasably coupled together at their proximal ends (referred to as a “hang-open” or “open aperture” state), such that the stapler in the assembled yet open state can be easily manipulated by an operator with a single hand. It may also be desirable to inhibit latching of the clamp lever latch member when the firing assembly is displaced from its proximal home position, to serve as an indicator to a user that the staple cartridge may have already been at least partially fired and thus not suitable for use in a surgical procedure. The

following description provides an illustrative example of a variation of linear surgical stapler (210) that provides such functionality.

[00079]

F

5 IG. 20 shows a proximal portion of another illustrative linear surgical stapler (210) that includes a cartridge half (212) and an anvil half (214), which are similar to cartridge half (12) and anvil half (14) of linear surgical stapler (10) described above except as otherwise described below. In particular, cartridge half (212) includes a clamp lever (240) having a clamp lever latch member (254) that is configured to inhibit latching of the proximal end of clamp lever (240) to the proximal end of cartridge channel (216) when clamp lever (240) is closed unless firing assembly (310) is in its proximal home position. As shown in FIG. 10 21, clamp lever latch member (254) includes a latch member body (256) that pivotably couples with clamp lever (240), and a tapered projection (258) that extends upwardly from latch member body (256). Tapered projection (258) includes a lower edge (260) configured to hook onto the proximal end of a base wall of cartridge channel (216) of cartridge half (212) and thereby retain clamp lever (240) in a closed state. Tapered projection (258) further includes a convexly curved cam surface (262) that faces distally.

[00080]

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15 s shown in FIG. 22, when firing assembly (310) is displaced distally from its proximal home position, the proximal end of the firing assembly slide block (312) is disengaged from distal finger (302) of detent member (284). Via the resilient bias of torsion spring (286), detent member (284) rotates clockwise to a rotational position in which its proximal hook (304) is lowered. When clamp lever (240) is then moved from the open position to the closed position while firing assembly (310) is in this distally displaced state, the proximal end of proximal hook (304) contacts cam surface (262) of clamp lever latch member (254). This camming interaction drives tapered projection (258) of clamp lever latch member (254) away from cartridge channel (216) and thus prevents clamp lever latch member (254) from latching onto the proximal end of cartridge channel (216). This result may alert the user that firing assembly (310) is displaced from its proximal home position such that staple cartridge (140) may already be partially fired and thus not suitable for use

on a patient. In response, the user may then return the firing assembly (310) to its proximal home position, substitute in a fresh staple cartridge (140), and proceed with the surgical procedure. With firing assembly (310) in its proximal home position as shown in FIG. 23, detent member (284) is maintained by slide block (312) in a counter-clockwise rotational position in which proximal hook (104) is raised. Accordingly, clamp lever latch member (254) may avoid contact with proximal hook (304) and latch onto the proximal end of cartridge channel (216) when clamp lever (240) is closed.

[00081]

A

s shown in FIG. 24, anvil half (214) of stapler (210) further includes an anvil shroud (278) having a protrusion in the form of a rib (279) that extends downwardly from a proximal end of anvil shroud (278). Rib (279) includes a rounded tip that is configured to contact a proximal surface of proximal hook (304) of retaining assembly (280) of cartridge half (212) when stapler (210) is held by anvil half (214) in a hang-open state similar to the hang-open state shown in FIG. 19B. The engagement between rib (279) and proximal hook (304) of detent member (284) in the hang-open state provides a resistance to decoupling of the stapler halves (212, 214). More specifically, in the hang-open state, proximal anvil pin (270) exerts an upward prying force against the underside latching surface (294) of latch finger (290) of anvil latch member (282), which causes anvil latch member (282) to rotate clockwise release anvil pin (270) and decouple stapler halves (212, 214). The interaction between rib (279) and proximal hook (304) of detent member (284) effectively counteracts and lessens this upward prying force, thereby providing resistance to decoupling of stapler halves (212, 214) and enabling stapler (210) to remain in the hang-open state more securely without unintentional decoupling. Such a configuration may be particularly beneficial for versions of stapler (210) in which cartridge half (212) has an increased weight, due to size

and/or material selection, that results in an increase prying force being exerted between proximal anvil pin (270) and anvil latch member (282) in the hang-open state.

[00082] E. Linear Surgical Stapler Having Clamp Lever with Missed-Latch Indication Features

5 **[00083]** As described above in connection with linear surgical stapler (10), when latch pin (68) is properly aligned with jaw slots (50), actuation of clamp lever (40) from the open position to the closed position (see FIG. 19C-19D) operates to cammingly drive the opposed lateral ends of latch pin (68) proximally within jaw slots (50) and thereby clamp stapler halves (12, 14) together to approximate stapling surfaces (72, 140). In some instances, it may be difficult for the surgeon to sufficiently approximate stapler halves (12, 14) to properly align latch pin (68) with jaw slots (50), such as when clamping on thick tissue, and the surgeon may unknowingly close clamp lever (40) without properly capturing latch pin (68), such that stapler halves (12, 14) are not properly latched together. Accordingly, it may be desirable to provide stapler (10) with one or more features that are configured provide to the surgeon a clear indication when latch pin (68) has not been properly captured within jaw slots (50), and that readjustment of clamp lever (40) is required to achieve proper clamping on tissue.

[00084] FIGS. 25A-25C show another illustrative linear surgical stapler (410) that includes a cartridge half (412) and an anvil half (414) that are similar to cartridge half (12) and anvil half (14) of linear surgical stapler (10) described above except as otherwise described below. In particular, clamp lever (440) of cartridge half (412) includes a laterally opposed pair of jaws (448) that are uniquely shaped to provide to a surgeon a clear indication when latch pin (68) has not been properly aligned with and captured by jaw slots (450) during closure of clamp lever (440).

25 **[00085]** Referring briefly to FIG. 25C, each jaw (448) includes a first pin engagement feature in the form of a curved slot (450) having a closed proximal end and an open distal end configured to receive a respective lateral end of latch pin (68). Each jaw slot (450) divides its respective jaw (448) into an upper jaw portion (452) and a lower jaw portion (454) that are interconnected along a proximal side of jaw (448). Each upper jaw portion

(452) at its distal end includes a second pin engagement feature in the form of a recess (456) that is generally semi-circular in shape and is sized to releasably capture a respective lateral end of latch pin (68) when latch pin (68) is mis-aligned with jaw slots (450), as described further below. Additionally, upper jaw portion (452) has an angled outer profile such that a width of upper jaw portion (452) measured transversely between jaw slot (450) and an outer surface (458) increases proximally from a distal end of jaw (448) toward an apex (460) of upper jaw portion (452) that is approximately aligned with a mid-length point of slot (450), before then decreasing. Accordingly, a maximum such width of upper jaw portion (452) is defined at apex (460). As described in greater detail below, each of recess (456) and outer surface (458) is configured to engage latch pin (68) when latch pin (68) is misaligned with jaw slots (450) so as to indicate to the surgeon that latch pin (68) has not been properly captured by jaw slots (450) and that readjustment of stapler halves (412, 414) is required.

[00086] FIG. 25A shows an illustrative scenario in which stapler halves (412, 414) have been sufficiently approximated such that latch pin (68) is properly aligned with and capturable by jaw slots (450). Stapling surfaces (472, 474) are situated in a partially approximated state that defines a gap (G1) at a mid-length point of the staple cartridge. In this scenario, clamp lever (440) may then be closed to properly clamp stapler halves (412, 414) together and fully approximate stapling surfaces (472, 474), such as shown in FIGS. 19C-19D in connection with linear surgical stapler (10).

[00087] FIG. 25B shows an alternative scenario in which a surgeon has failed sufficiently approximate stapler halves (412, 414) during clamping such that latch pin (68) is just slightly misaligned with and not capturable by jaw slots (450). When the surgeon then attempts to close clamp lever (440), latch pin (68) is captured by jaw recesses (456) such that clamp lever (440) is inhibited from closing and is constrained in an intermediate position between its open position and its closed position. This situates stapling surfaces (472, 474) in a spaced-apart state in which they define a second gap (G2) at the mid-length point of the staple cartridge, where the second gap (G2) is noticeably larger than the first gap (G1) of FIG. 25A. This provides the surgeon with a visible and tactile indication that

clamp lever (440) is not properly aligned with latch pin (68) and must be reopened and adjusted to achieve proper clamping together of stapler halves (412, 414).

[00088] FIG. 25C shows yet another alternative scenario in which a surgeon has failed to sufficiently approximate stapler halves (412, 414) during clamping such that latch pin (68) is more substantially misaligned with and not capturable by jaw slots (450). In this scenario, clamp lever (440) has been permitted to pivot to its closed position while latch pin (68) has simultaneously tracked proximally along the outer surface (458) of each upper jaw portion (452), via rotation of jaw (448) relative to latch pin (468), and ultimately rest at apex (460) when clamp lever (440) is fully closed. The angled outer profile of upper jaw portions (452) acts as a camming feature that urges the distal end of anvil half (412) away from the distal end of cartridge half (412) as clamp lever (440) is closed latch pin (68) approaches apex (460) along outer surface (458). This situates stapling surfaces (472, 474) in an even further spaced-apart state in which they define a third gap (G3) at the mid-length point of the staple cartridge, where the third gap (G3) is noticeably larger than the second gap (G2) of FIG. 25B. Thus, the surgeon is provided with a visible indication that stapler (410) is not properly latched and that clamp lever (440) must be reopened to properly approximate stapler halves (412, 414) so that latch pin (68) may be properly aligned with and received by jaw slots (450) before clamp lever (440) is reclosed.

[00089] II.

Illustrative Combinations

[00090] The following examples relate to various non-exhaustive ways in which the teachings herein may be combined or applied. It should be understood that the following examples are not intended to restrict the coverage of any claims that may be presented at any time in this application or in subsequent filings of this application. No disclaimer is intended. The following examples are being provided for nothing more than merely illustrative purposes. It is contemplated that the various teachings herein may be arranged and applied in numerous other ways. It is also contemplated that some variations may omit certain features referred to in the below examples. Therefore, none of the aspects or features referred to below should be deemed critical unless otherwise explicitly indicated

as such at a later date by the inventors or by a successor in interest to the inventors. If any claims are presented in this application or in subsequent filings related to this application that include additional features beyond those referred to below, those additional features shall not be presumed to have been added for any reason relating to patentability.

5 [00091] Example 1

[00092] An apparatus comprises: (a) a first elongate member having a distal portion configured to present a first stapling surface; (b) a second elongate member having a distal portion configured to present a second stapling surface, wherein the first and second elongate members are configured to releasably couple together to enable the first and second stapling surfaces to cooperate to clamp and staple tissue with a plurality of staples; 10 (c) a clamp member, wherein the clamp member is movable relative to the first and second elongate members from a first position to a second position to approximate the first and second stapling surfaces for clamping tissue; (d) a latch member configured to transition from an unlatched state to a latched state to releasably retain the clamp member in the 15 second position; and (e) a firing assembly, wherein the firing assembly is actuatable from a home position to fire the staples into the clamped tissue, wherein the latch member is configured to transition from the unlatched state to the latched state when the clamp member is in the second position while the firing assembly is in the home position, wherein the latch member is inhibited from transitioning from the unlatched state to the latched 20 state when the clamp member is in the second position while the firing assembly is displaced from the home position.

[00093] Example 2

[00094] The apparatus of Example 1, wherein the latch member is coupled with the clamp member such that the latch member is movable with the clamp member between the first 25 and second positions.

[00095] Example 3

[00096] The apparatus of any of the preceding Examples, wherein the latch member is selectively actuatable from the latched state to the unlatched state to release the clamp member from the second position and permit the clamp member to move toward the first position.

5 **[00097]** Example 4

[00098] The apparatus of any of the preceding Examples, wherein the clamp member comprises a clamp lever pivotably coupled with the second elongate member, wherein the clamp lever is pivotable toward the second elongate member from the first position to the second position.

10 **[00099]** Example 5

[000100] The apparatus of Example 4, wherein a distal portion of the clamp lever is pivotably coupled with the second elongate member, wherein the latch member is pivotably coupled to a proximal end of the clamp lever.

[000101] Example 6

15 **[000102]** The apparatus of any of Examples 4 through 5, wherein the latch member is configured to releasably capture a proximal end feature of the second elongate member when the clamp lever is in the second position and thereby assume the latched state, wherein the latch member is selectively actuatable from the latched state to the unlatched state to release the proximal end feature and permit movement of the clamp lever from the
20 second position toward the first position.

[000103] Example 7

[000104] The apparatus of any of the preceding Examples, wherein the latch member is configured to transition from the latched state to the unlatched state only when the firing assembly is in the home position.

25 **[000105]** Example 8

5 [000106] The apparatus of any of the preceding Examples, wherein the latch member is pivotable between the unlatched state and the latched state, wherein the latch member includes a cam surface configured to contact a portion of the apparatus such that the latch member is configured to pivot in a direction away from the latched state when the clamp member is moved to the second position while the firing assembly is displaced from the home position.

[000107] Example 9

10 [000108] The apparatus of Example 8, further comprising a retaining feature operable to releasably retain the firing assembly in the home position, wherein the retaining feature is configured to contact the cam surface of the latch member and thereby inhibit the latch member from transitioning to the latched state from the unlatched state when the clamp member is in the second position while the firing assembly is displaced from the home position.

[000109] Example 10

15 [000110] The apparatus of Example 9, wherein the cam surface is defined on a distal side of the latch member, wherein a proximal end of the retaining feature is configured to contact the cam surface.

[000111] Example 11

20 [000112] The apparatus of any of Examples 9 through 10, wherein the retaining feature is configured to inhibit the latch member from transitioning to the unlatched state from the latched state when the clamp member is in the second position while the firing assembly is displaced from the home position.

[000113] Example 12

25 [000114] The apparatus of any of Examples 9 through 11, wherein the latch member is arranged at a proximal end of the clamp member, wherein the retaining feature is arranged

at a proximal end of one of the first elongate member or the second elongate member, wherein the home position of the firing assembly comprises a proximal position.

[000115] Example 13

5 [000116] The apparatus of any of claims 9 through 12, wherein the retaining feature comprises: (i) a first movable member configured to releasably couple a proximal end of the first elongate member with a proximal end of the second elongate member, and (ii) a second movable member configured to releasably retain the firing assembly in the home position, wherein the first and second movable members are movable relative to one another.

10 [000117] Example 14

[000118] The apparatus of any of the preceding Examples, wherein the apparatus comprises a surgical stapler that includes an anvil having a plurality of staple forming pockets and a removable staple cartridge having a plurality of staples, wherein the anvil defines the first stapling surface and the staple cartridge defines the second stapling surface.

15 [000119] Example 15

[000120] The apparatus of Example 14, wherein the staple cartridge includes a deck having a plurality of interconnected protrusions configured to grip tissue clamped between the first and second stapling surfaces.

[000121] Example 16

20 [000122] An apparatus comprising: (a) a cartridge body; (b) a deck defined by the cartridge body, wherein the deck is configured to compress tissue against an anvil of a surgical stapler; (c) a plurality of staple openings formed in the deck, wherein the staple openings are configured to house a plurality of staples; (d) an elongate slot formed in the deck, wherein the elongate slot is configured to slidably receive a cutting member therethrough;
25 and (e) a plurality of tissue gripping members protruding from the deck along each side of the elongate slot, wherein each tissue gripping member is associated with a respective one

of the staple openings and is configured to grip tissue, wherein each tissue gripping member includes: (i) a first end feature that wraps around a first end of the staple opening, (ii) a second end feature that wraps around a second end of the staple opening, and (iii) a pair of bridge elements that extend between the first end feature and the second end feature along opposed lateral sides of the staple opening, wherein each of the bridge elements has a maximum height relative to the deck that is less than a maximum height of each of the first end feature and the second end feature.

[000123] Example 17

[000124] The apparatus of Example 16, further comprising a plurality of staple drivers disposed within the staple openings, wherein the staple drivers are actuatable to drive the staples through tissue and against the anvil, wherein the bridge elements of each tissue gripping member are configured to guide a respective one of the staple drivers toward the anvil without contacting the respective staple during formation of the staple by the anvil.

[000125] Example 18

[000126] The apparatus of any of Examples 16 through 17, wherein each first end feature is integrally connected with the second end feature of a longitudinally adjacent tissue gripping member.

[000127] Example 19

[000128] An apparatus comprising: (a) a first elongate member having a distal portion configured to present a first stapling surface; (b) a second elongate member having a distal portion configured to present a second stapling surface, wherein the first and second elongate members are configured to releasably couple together at their proximal ends to enable the first and second stapling surfaces to cooperate to clamp and staple tissue with a plurality of staples; (c) a clamp member, wherein the clamp member is movable relative to the first and second elongate members from an open position to a closed position to approximate the first and second stapling surfaces for clamping tissue; (d) a first shroud covering a proximal portion of the first elongate member; (e) a second shroud covering a

proximal portion of the second elongate member; and (f) a protrusion extending from a proximal end of one of the first shroud or the second shroud, wherein the protrusion is configured to contact a feature supported by the proximal end of the opposing first elongate member or second elongate member and thereby resist decoupling of the proximal ends when the apparatus is held by a user while the clamp member is in the open position.

[000129] Example 20

[000130] The apparatus of Example 19, further comprising: (a) a firing assembly, wherein the firing assembly is actuatable from a home position to fire the staples into the clamped tissue; (b) a first movable member operable to releasably retain the proximal ends of the first and second elongate members in coupling engagement; and (c) a second movable member operable to releasably retain the firing assembly in the home position, wherein the feature comprises a proximal end of the second movable member.

[000131] Example 21

[000132] An apparatus, comprising: (a) a first elongate member having a distal portion configured to present a first stapling surface; (b) a second elongate member having a distal portion configured to present a second stapling surface, wherein the first and second elongate members are configured to releasably couple together to enable the first and second stapling surfaces to cooperate to clamp and staple tissue with a plurality of staples; (c) a latch projection extending from one of the first elongate member or the second elongate member; and (d) a clamp member movably coupled with the other of the first elongate member or the second elongate member, wherein the clamp member includes: (i) a first engagement feature configured to releasably capture the latch projection while the clamp member advances from a first position to a second position to thereby approximate the first and second stapling surfaces for clamping tissue, and (ii) a second engagement feature offset from the first engagement feature and comprising a recess, wherein the second engagement feature is configured to engage the latch projection when the latch projection is misaligned with the first engagement feature to thereby provide an indication to the user that the latch projection is misaligned with the first engagement feature.

[000133] Example 22

[000134] The apparatus of Example 21, wherein the first engagement feature comprises a slot having an open distal end and a closed proximal end, wherein the second engagement feature is configured to releasably capture the latch projection when the latch projection is misaligned with the slot and thereby inhibit the clamp member from assuming the second position.

[000135] Example 23

[000136] The apparatus of any of Examples 21 through 22, wherein the clamp member is configured to assume an intermediate position between the first and second positions when the second engagement feature engages the latch projection.

[000137] Example 24

[000138] The apparatus of any of Examples 21 through 23, wherein the latch projection comprises a pin that extends transversely to a longitudinal axis of the apparatus.

[000139] Example 25

[000140] The apparatus of any of Examples 21 through 24, wherein the clamp member comprises a lever pivotably coupled with one of the first elongate member or the second elongate member.

[000141] Example 26

[000142] The apparatus of any of Examples 21 through 25, wherein the clamp member comprises a jaw, wherein the first and second engagement features are offset from one another on the jaw.

[000143] Example 27

[000144] The apparatus of Example 26, wherein the jaw comprises a first jaw, wherein the clamp member further comprises a second jaw laterally opposed from the first jaw, wherein

each of the first and second jaws includes the first engagement feature and the second engagement feature.

[000145] Example 28

5 [000146] The apparatus of any of Examples 21 through 27, wherein the recess is configured to releasably capture the latch projection.

[000147] Example 29

[000148] The apparatus of Example 22, wherein the slot extends along a curved path.

[000149] Example 30

10 [000150] The apparatus of any of Examples 21 through 29, wherein when the latch projection is misaligned with each of the first engagement feature and the second engagement feature the latch projection is configured to track along an outer edge of the jaw as the clamp member is advanced from the first position toward the second position such that a gap between the first and second stapling surfaces increases.

15 [000151] III.
Miscellaneous

20 [000152] It should be understood that any one or more of the teachings, expressions, embodiments, examples, etc. described herein may be combined with any one or more of the other teachings, expressions, embodiments, examples, etc. that are described herein. The above-described teachings, expressions, embodiments, examples, etc. should therefore not be viewed in isolation relative to each other. Various suitable ways in which the teachings herein may be combined will be readily apparent to those of ordinary skill in the art in view of the teachings herein. Such modifications and variations are intended to be included within the scope of the claims.

25 [000153] Further, any one or more teachings disclosed herein may be combined with any one or more teachings disclosed in U.S. Pat. No. 10,631,866, entitled "Release Mechanism for

Linear Surgical Stapler," issued April 28, 2020; U.S. Pat. No. 10,667,818, entitled "Lockout Assembly for Linear Surgical Stapler," issued June 2, 2020; U.S. Pat. No. 10,932,781, entitled "Features to Align and Close Linear Surgical Stapler," issued March 2, 2021; U.S. Pat. No. 10,898,197, entitled "Releasable Coupling Features for Proximal Portions of Linear Surgical Stapler," issued January 26, 2021; U.S. Pat. No. 10,874,398, 5 entitled "Firing Lever Assembly for Linear Surgical Stapler," issued December 29, 2020; U.S. Pat. No. 10,687,819, entitled "Clamping Mechanism for Linear Surgical Stapler," issued June 23, 2020; U.S. Pat. No. 10,898,187, entitled "Firing System for Linear Surgical Stapler," issued January 26, 2021; U.S. Pat. No. 11,033,266, entitled "Decoupling Mechanism for Linear Surgical Stapler, issued June 15, 2021; U.S. Pat. No. 11,045,193, 10 entitled "Anvil Assembly for Linear Surgical Stapler," issued June 29, 2021; U.S. Pat. No. 10,905,419, entitled "Closure Assembly for Linear Surgical Stapler," issued February 2, 2021; U.S. Pat. No. 11,278,285, entitled "Clamping Assembly for Linear Surgical Stapler," issued March 22, 2022; U.S. Pat. No. 11,229,433, entitled "Linear Surgical Stapler," issued January 25, 2022; U.S. Pub. No. 2022/0142641, entitled "System and Method for Forming Pockets in Anvil of Surgical Stapler," published May 12, 2022; U.S. Pat. No. 11,224,425, 15 entitled "Surgical Linear Cutter Wishbone Separation Mechanism with Detent," issued January 18, 2022; U.S. Pat. No. 11,219,454, entitled "Pin Trap Mechanism for Surgical Linear Cutter," issued January 11, 2022; U.S. Pub. No. 2021/0369272, entitled "Separation Mechanism for Surgical Linear Cutter," published December 2, 2021; U.S. Pat. App. No. 20 17/489,879, entitled "Lockout Feature for Linear Surgical Stapler Cartridge," filed September 30, 2021; U.S. Pat. App. No. 29/842,580, entitled "Staple Cartridge for Linear Surgical Stapler," filed June 16, 2022; and/or U.S. Pat. App. No. 29/842,581, entitled "Linear Surgical Stapler," filed June 16, 2022. The disclosure of each of these references 25 is incorporated by reference herein, in its entirety.

[000154] It should be appreciated that any patent, publication, or other disclosure material, in whole or in part, that is said to be incorporated by reference herein is incorporated herein only to the extent that the incorporated material does not conflict with existing definitions, statements, or other disclosure material set forth in this disclosure. As such, and to the 30 extent necessary, the disclosure as explicitly set forth herein supersedes any conflicting

material incorporated herein by reference. Any material, or portion thereof, that is said to be incorporated by reference herein, but which conflicts with existing definitions, statements, or other disclosure material set forth herein will only be incorporated to the extent that no conflict arises between that incorporated material and the existing disclosure material.

5
[000155] Versions of the devices described above may have application in conventional medical treatments and procedures conducted by a medical professional, as well as application in robotic-assisted medical treatments and procedures. By way of example only, various teachings herein may be readily incorporated into a robotic surgical system such as the DAVINCI™ system by Intuitive Surgical, Inc., of Sunnyvale, California.

10
[000156] Versions of the devices described above may be designed to be disposed of after a single use, or they can be designed to be used multiple times. Versions may, in either or both cases, be reconditioned for reuse after at least one use. Reconditioning may include any combination of the steps of disassembly of the device, followed by cleaning or replacement of particular pieces, and subsequent reassembly. In particular, some versions of the device may be disassembled, and any number of the particular pieces or parts of the device may be selectively replaced or removed in any combination. Upon cleaning and/or replacement of particular parts, some versions of the device may be reassembled for subsequent use either at a reconditioning facility, or by a user immediately prior to a procedure. Those skilled in the art will appreciate that reconditioning of a device may utilize a variety of techniques for disassembly, cleaning/replacement, and reassembly. Use of such techniques, and the resulting reconditioned device, are all within the scope of the present application.

20
[000157] By way of example only, versions described herein may be sterilized before and/or after a procedure. In one sterilization technique, the device is placed in a closed and sealed container, such as a plastic or TYVEK bag. The container and device may then be placed in a field of radiation that can penetrate the container, such as gamma radiation, x-rays, or high-energy electrons. The radiation may kill bacteria on the device and in the container. The sterilized device may then be stored in the sterile container for later use. A device

may also be sterilized using any other technique known in the art, including but not limited to beta or gamma radiation, ethylene oxide, or steam.

[000158] Having shown and described various embodiments of the present invention, further adaptations of the methods and systems described herein may be accomplished by appropriate modifications by one of ordinary skill in the art without departing from the scope of the present invention. Several of such potential modifications have been mentioned, and others will be apparent to those skilled in the art. For instance, the examples, embodiments, geometrics, materials, dimensions, ratios, steps, and the like discussed above are illustrative and are not required. Accordingly, the scope of the present invention should be considered in terms of the following claims and is understood not to be limited to the details of structure and operation shown and described in the specification and drawings.

I/We claim:

1. An apparatus comprising:

- 5 (a) a first elongate member having a distal portion configured to present a first stapling surface;
- (b) a second elongate member having a distal portion configured to present a second stapling surface, wherein the first and second elongate members are configured to releasably couple together to enable the first and second stapling surfaces to cooperate to clamp and staple tissue with a plurality of
- 10 (c) a clamp member, wherein the clamp member is movable relative to the first and second elongate members from a first position to a second position to approximate the first and second stapling surfaces for clamping tissue;
- (d) a latch member configured to transition from an unlatched state to a latched state to releasably retain the clamp member in the second position; and
- 15 (e) a firing assembly, wherein the firing assembly is actuatable from a home position to fire the staples into the clamped tissue,

wherein the latch member is configured to transition from the unlatched state to the latched state when the clamp member is in the second position while the

20 firing assembly is in the home position,

wherein the latch member is inhibited from transitioning from the unlatched state to the latched state when the clamp member is in the second position while the firing assembly is displaced from the home position.

25 2. The apparatus of claim 1, wherein the latch member is coupled with the clamp member such that the latch member is movable with the clamp member between the first and second positions.

3. The apparatus of claim 1 or claim 2, wherein the latch member is selectively actuatable from the latched state to the unlatched state to release the clamp member from the second position and permit the clamp member to move toward the first position.

5 4. The apparatus of any one of claims 1 – 3, wherein the clamp member comprises a clamp lever pivotably coupled with the second elongate member, wherein the clamp lever is pivotable toward the second elongate member from the first position to the second position.

10 5. The apparatus of claim 4, wherein a distal portion of the clamp lever is pivotably coupled with the second elongate member, wherein the latch member is pivotably coupled to a proximal end of the clamp lever.

15 6. The apparatus of claim 4 or claim 5, wherein the latch member is configured to releasably capture a proximal end feature of the second elongate member when the clamp lever is in the second position and thereby assume the latched state, wherein the latch member is selectively actuatable from the latched state to the unlatched state to release the proximal end feature and permit movement of the clamp lever from the second position toward the first position.

20 7. The apparatus of any preceding claim, wherein the latch member is configured to transition from the latched state to the unlatched state only when the firing assembly is in the home position.

25 8. The apparatus of any preceding claim, wherein the latch member is pivotable between the unlatched state and the latched state, wherein the latch member includes a cam surface configured to contact a portion of the apparatus such that the latch member is configured to pivot in a direction away from the latched state when the clamp member is moved to the second position while the firing assembly is displaced from the home position.

30 9. The apparatus of claim 8, further comprising a retaining feature operable to releasably retain the firing assembly in the home position, wherein the retaining feature is

configured to contact the cam surface of the latch member and thereby inhibit the latch member from transitioning to the latched state from the unlatched state when the clamp member is in the second position while the firing assembly is displaced from the home position.

5 10. The apparatus of claim 9, wherein the cam surface is defined on a distal side of the latch member, wherein a proximal end of the retaining feature is configured to contact the cam surface.

10 11. The apparatus of claim 9 or claim 10, wherein the retaining feature is configured to inhibit the latch member from transitioning to the unlatched state from the latched state when the clamp member is in the second position while the firing assembly is displaced from the home position.

15 12. The apparatus of any one of claims 9 – 11, wherein the latch member is arranged at a proximal end of the clamp member, wherein the retaining feature is arranged at a proximal end of one of the first elongate member or the second elongate member, wherein the home position of the firing assembly comprises a proximal position.

20 13. The apparatus of any one of claims 9 – 12, wherein the retaining feature comprises:
 (i) a first movable member configured to releasably couple a proximal end of the first elongate member with a proximal end of the second elongate member, and
 (ii) a second movable member configured to releasably retain the firing assembly in the home position, wherein the first and second movable
25 members are movable relative to one another.

30 14. The apparatus of any preceding claim, wherein the apparatus comprises a surgical stapler that includes an anvil having a plurality of staple forming pockets and a removable staple cartridge having a plurality of staples, wherein the anvil defines the first stapling surface and the staple cartridge defines the second stapling surface.

15. The apparatus of claim 14, wherein the staple cartridge includes a deck having a plurality of interconnected protrusions configured to grip tissue clamped between the first and second stapling surfaces.

5

16. The apparatus of any preceding claim, further comprising a latch projection extending laterally from one of the first elongate member or the second elongate member, wherein the clamp member is movably coupled with the other of the first elongate member or the second elongate member, wherein the clamp member includes:

- 10 (i) a first engagement feature configured to engage the latch projection while the clamp member advances from the first position to the second position to thereby approximate the first and second stapling surfaces for clamping tissue, and
- 15 (ii) a second engagement feature configured to engage the latch projection when the latch projection is misaligned with the first engagement feature to thereby inhibit the clamp member from assuming the second position and inhibit approximation of the first and second stapling surfaces.

17. An apparatus comprising:

- 20 (a) a cartridge body;
- (b) a deck defined by the cartridge body, wherein the deck is configured to compress tissue against an anvil of a surgical stapler;
- (c) a plurality of staple openings formed in the deck, wherein the staple openings are configured to house a plurality of staples;
- 25 (d) an elongate slot formed in the deck, wherein the elongate slot is configured to slidably receive a cutting member therethrough; and
- (e) a plurality of tissue gripping members protruding from the deck along each side of the elongate slot, wherein each tissue gripping member is associated with a respective one of the staple openings and is configured to grip tissue,
- 30 wherein each tissue gripping member includes:

- (i) a first end feature that wraps around a first end of the staple opening,
(ii) a second end feature that wraps around a second end of the staple opening, and
(iii) a pair of bridge elements that extend between the first end feature and the second end feature along opposed lateral sides of the staple opening,

wherein each of the bridge elements has a maximum height relative to the deck that is less than a maximum height of each of the first end feature and the second end feature.

5

10

18. The apparatus of claim 17, further comprising a plurality of staple drivers disposed within the staple openings, wherein the staple drivers are actuatable to drive the staples through tissue and against the anvil, wherein the bridge elements of each tissue gripping member are configured to guide a respective one of the staple drivers toward the anvil without contacting the respective staple during formation of the staple by the anvil.

15

19. The apparatus of claim 17 or claim 18, wherein each first end feature is integrally connected with the second end feature of a longitudinally adjacent tissue gripping member.

20

20. An apparatus comprising:

- (a) a first elongate member having a distal portion configured to present a first stapling surface;
(b) a second elongate member having a distal portion configured to present a second stapling surface, wherein the first and second elongate members are configured to releasably couple together at their proximal ends to enable the first and second stapling surfaces to cooperate to clamp and staple tissue with a plurality of staples;
(c) a clamp member, wherein the clamp member is movable relative to the first and second elongate members from an open position to a closed position to approximate the first and second stapling surfaces for clamping tissue;

25

30

- (d) a first shroud covering a proximal portion of the first elongate member;
- (e) a second shroud covering a proximal portion of the second elongate member; and
- (f) a protrusion extending from a proximal end of one of the first shroud or the second shroud, wherein the protrusion is configured to contact a feature supported by the proximal end of the opposing first elongate member or second elongate member and thereby resist decoupling of the proximal ends when the apparatus is held by a user while the clamp member is in the open position.

5

10

21. The apparatus of claim 20, further comprising:

- (a) a firing assembly, wherein the firing assembly is actuatable from a home position to fire the staples into the clamped tissue;
- (b) a first movable member operable to releasably retain the proximal ends of the first and second elongate members in coupling engagement; and
- (c) a second movable member operable to releasably retain the firing assembly in the home position,

15

wherein the feature comprises a proximal end of the second movable member.

20

22. An apparatus, comprising:

- (a) a first elongate member having a distal portion configured to present a first stapling surface;
- (b) a second elongate member having a distal portion configured to present a second stapling surface, wherein the first and second elongate members are configured to releasably couple together to enable the first and second stapling surfaces to cooperate to clamp and staple tissue with a plurality of staples;
- (c) a latch projection extending from one of the first elongate member or the second elongate member; and

25

(d) a clamp member movably coupled with the other of the first elongate member or the second elongate member, wherein the clamp member includes:

5 (i) a first engagement feature configured to releasably capture the latch projection while the clamp member advances from a first position to a second position to thereby approximate the first and second stapling surfaces for clamping tissue, and

10 (ii) a second engagement feature offset from the first engagement feature and comprising a recess, wherein the second engagement feature is configured to engage the latch projection when the latch projection is misaligned with the first engagement feature to thereby provide an indication to the user that the latch projection is misaligned with the first engagement feature.

15 23. The apparatus of claim 22, wherein the first engagement feature comprises a slot having an open distal end and a closed proximal end, wherein the second engagement feature is configured to releasably capture the latch projection when the latch projection is misaligned with the slot and thereby inhibit the clamp member from assuming the second position.

20 24. The apparatus of claim 22 or claim 23, wherein the clamp member is configured to assume an intermediate position between the first and second positions when the second engagement feature engages the latch projection.

25 25. The apparatus of any one of claims 22 – 24, wherein the latch projection comprises a pin that extends transversely to a longitudinal axis of the apparatus.

26. The apparatus of any one of claim 22 – 25, wherein the clamp member comprises a lever pivotably coupled with one of the first elongate member or the second elongate member.

27. The apparatus of any one of claim 22 – 26, wherein the clamp member comprises a jaw, wherein the first and second engagement features are offset from one another on the jaw.

5 28. The apparatus of claim 27, wherein the jaw comprises a first jaw, wherein the clamp member further comprises a second jaw laterally opposed from the first jaw, wherein each of the first and second jaws includes the first engagement feature and the second engagement feature.

10 29. The apparatus of any one of claims 22 – 28, wherein the recess is configured to releasably capture the latch projection.

30. The apparatus of any one of claims 22 – 29, wherein the slot extends along a curved path.

15 31. The apparatus of any one of claims 22 – 30, wherein when the latch projection is misaligned with each of the first engagement feature and the second engagement feature the latch projection is configured to track along an outer edge of the jaw as the clamp member is advanced from the first position toward the second position such that a gap between the first and second stapling surfaces increases.

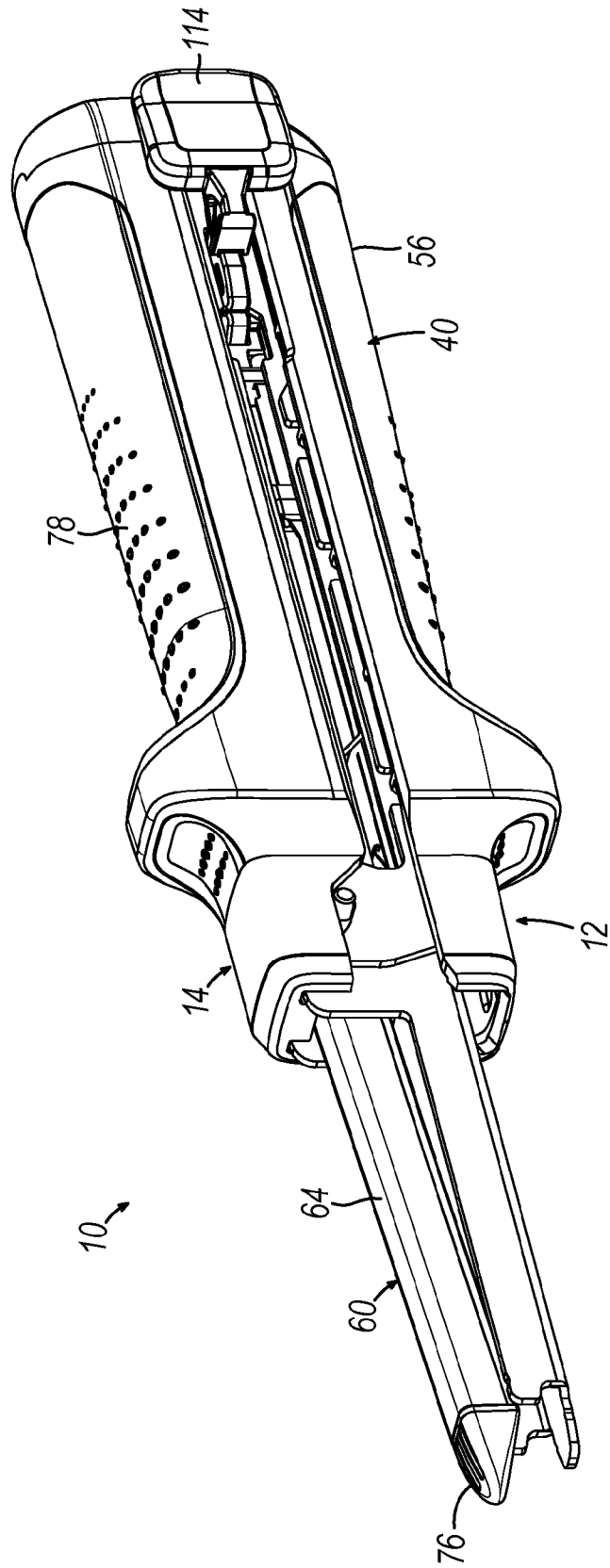


FIG. 1

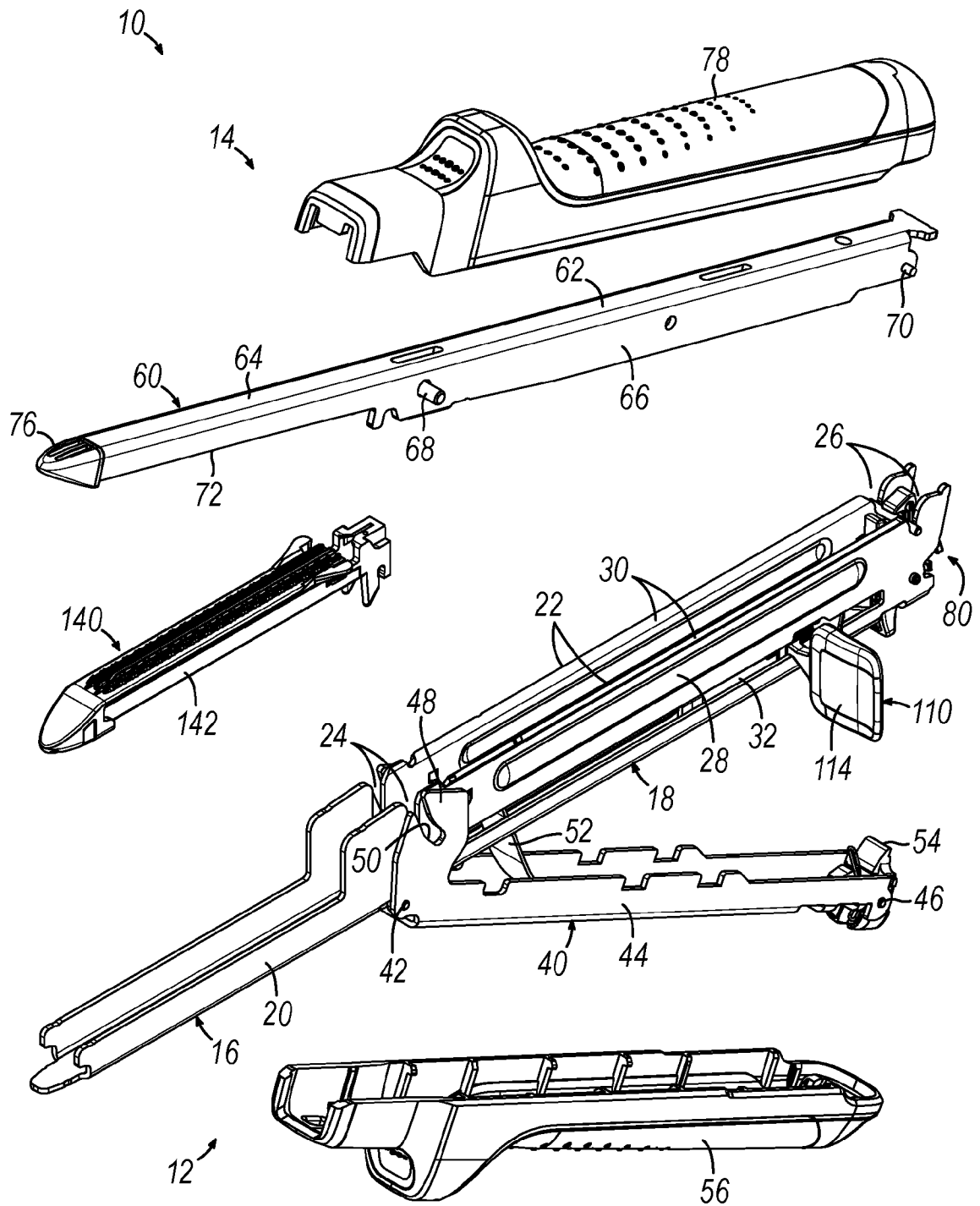


FIG. 2

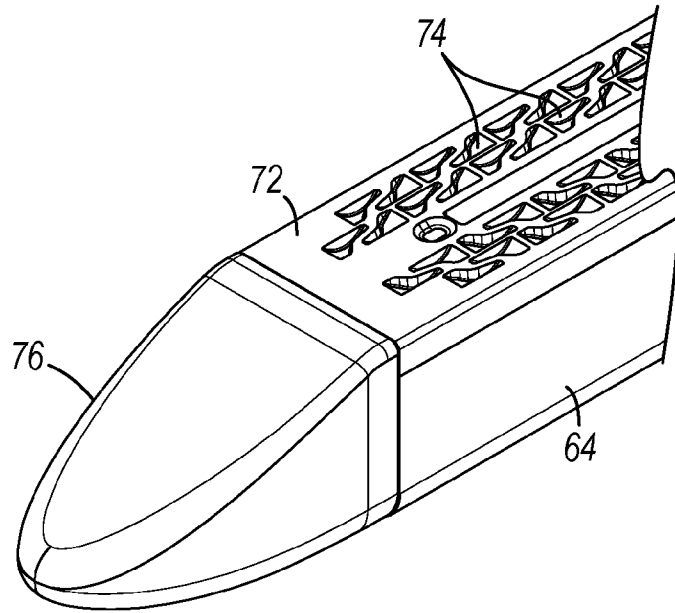


FIG. 3

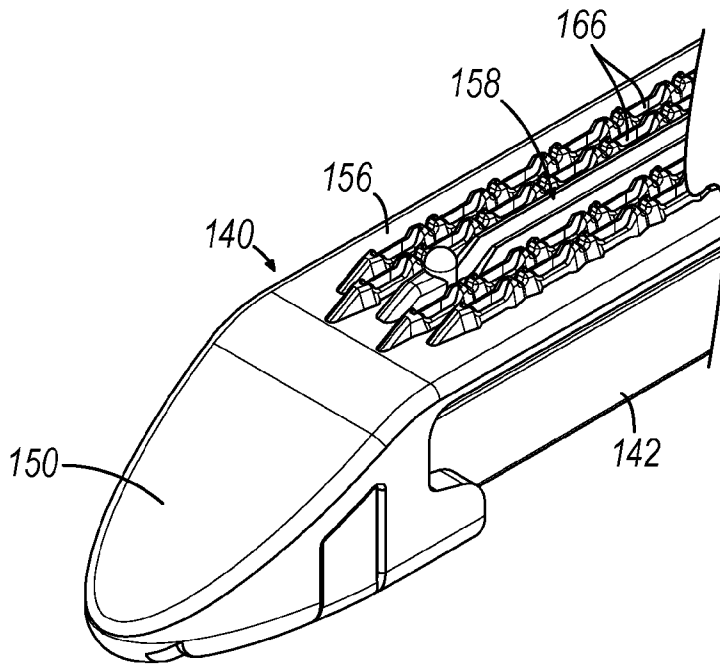


FIG. 4

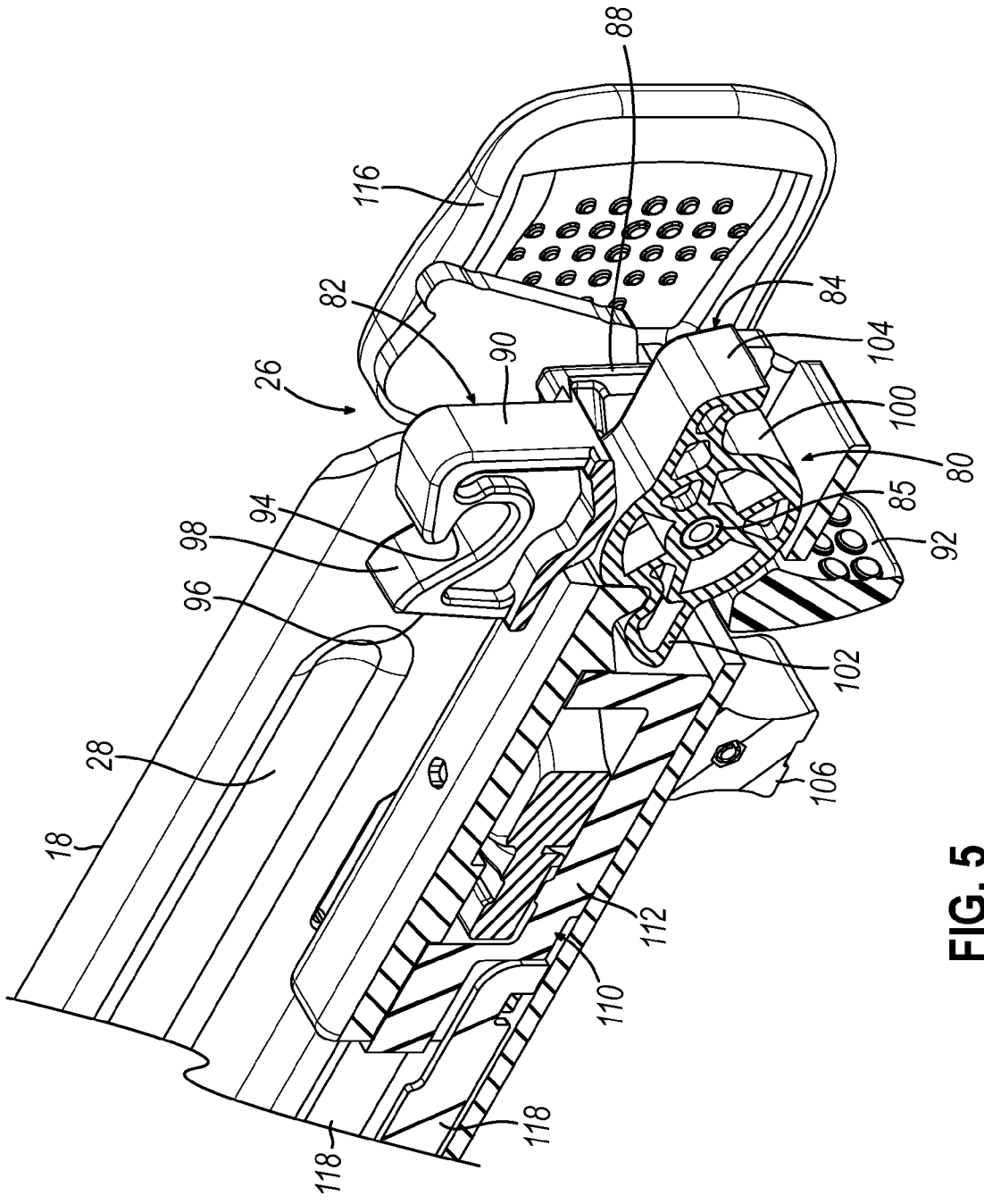
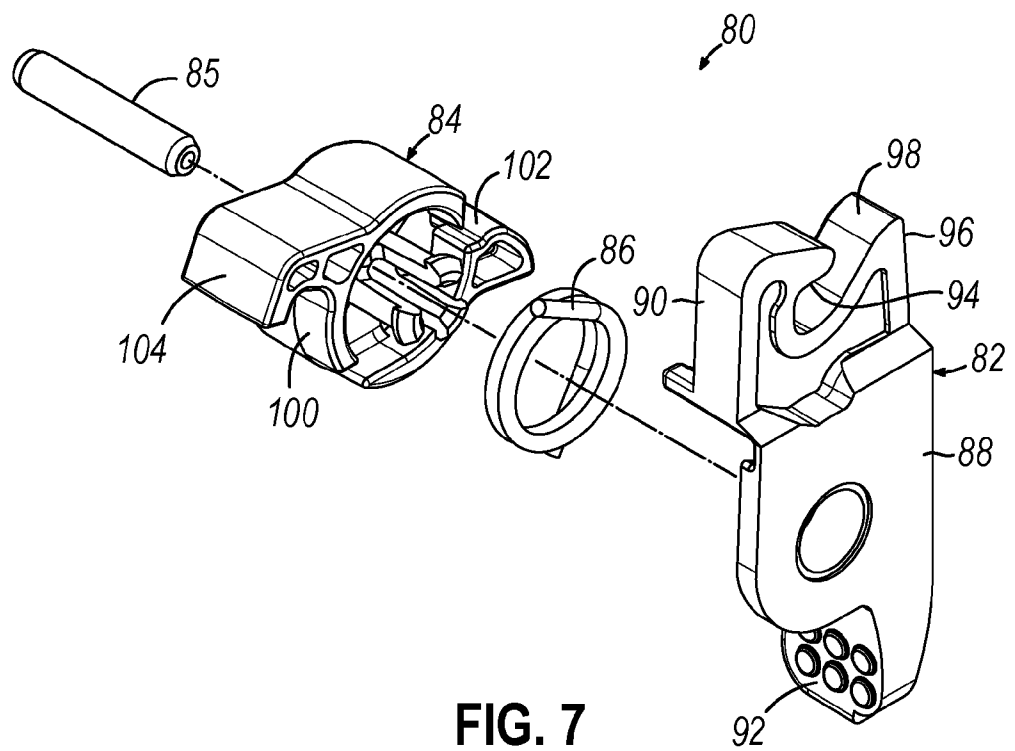
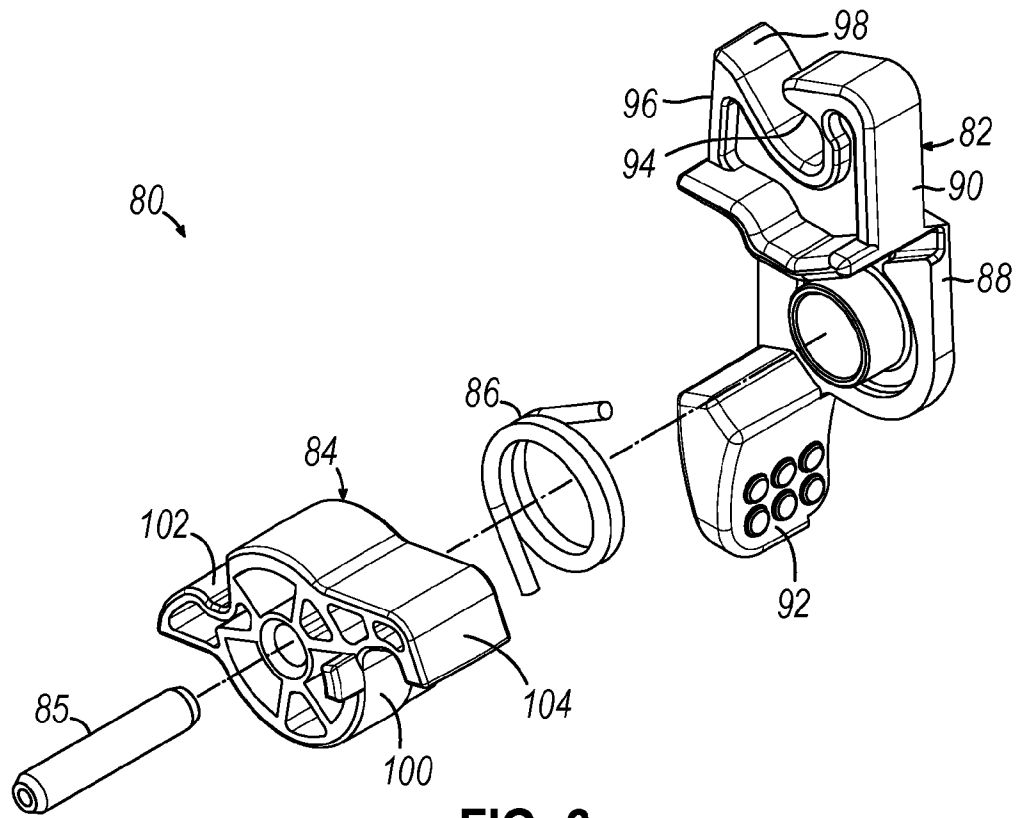


FIG. 5



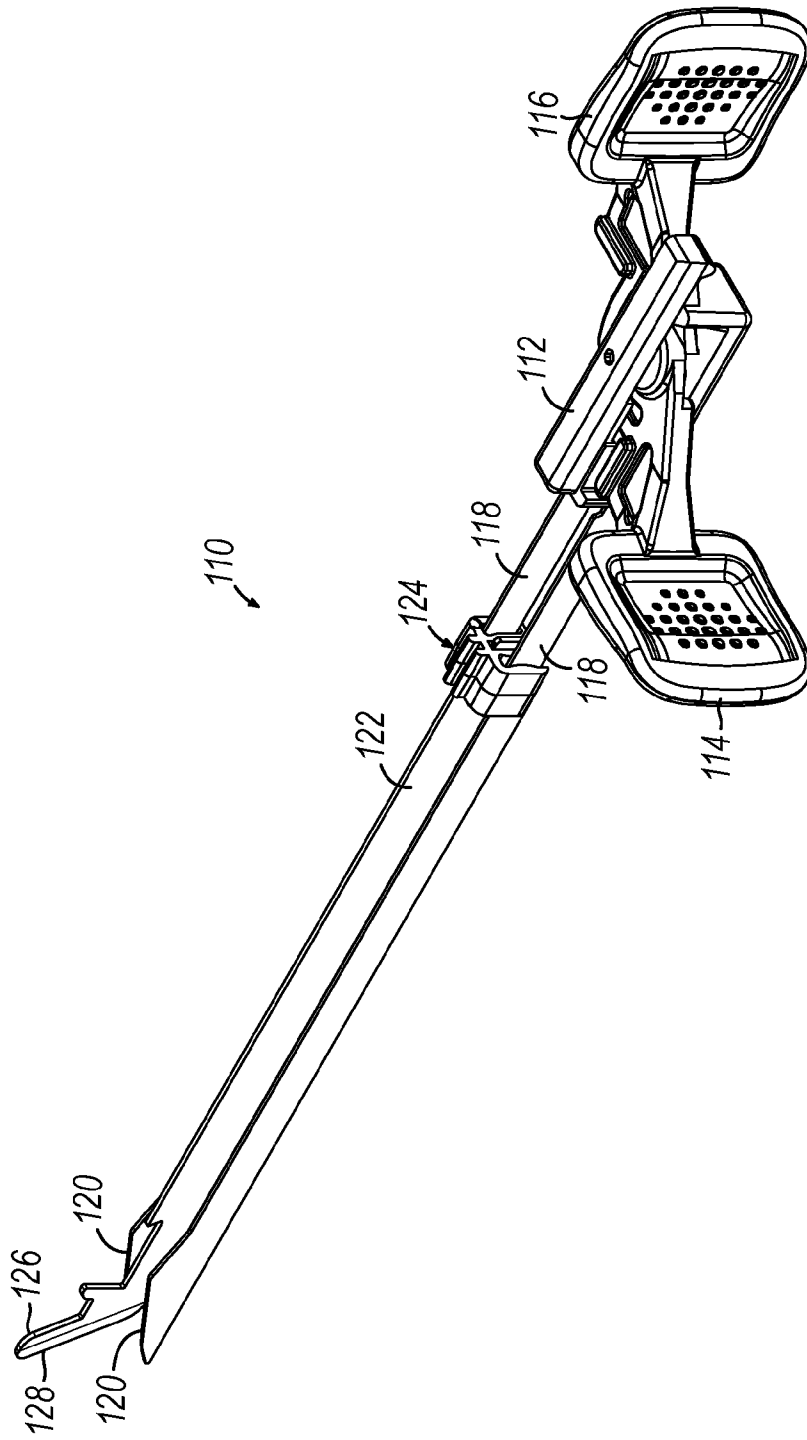


FIG. 8

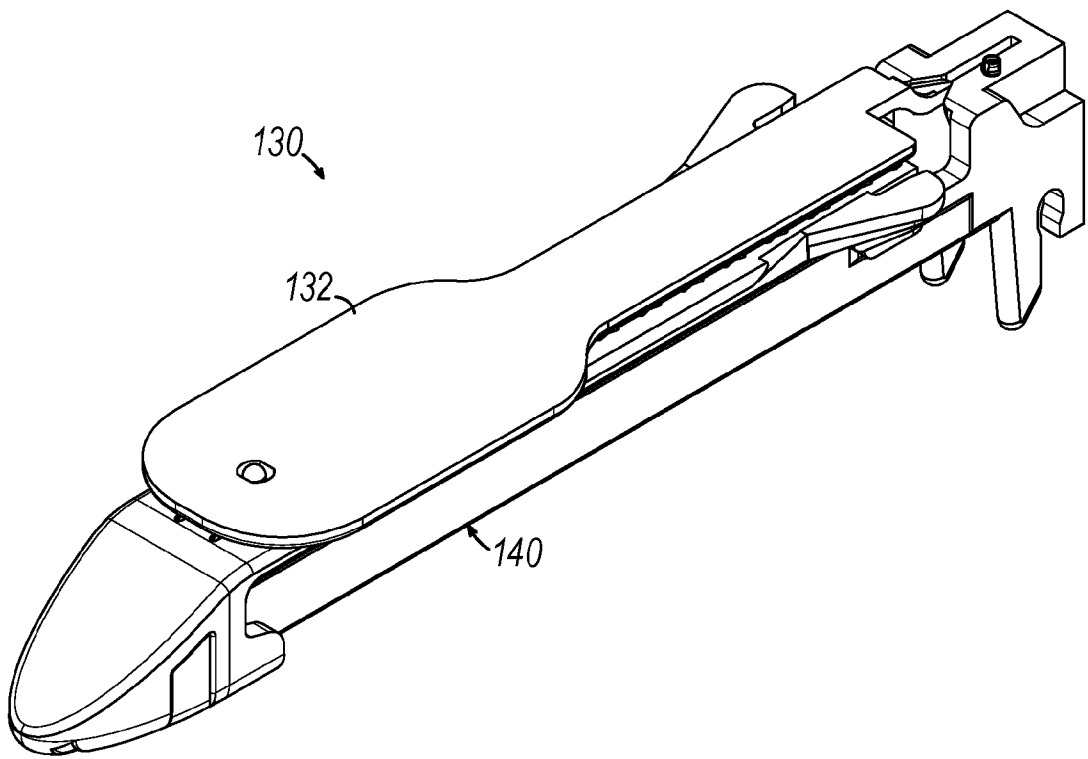


FIG. 9

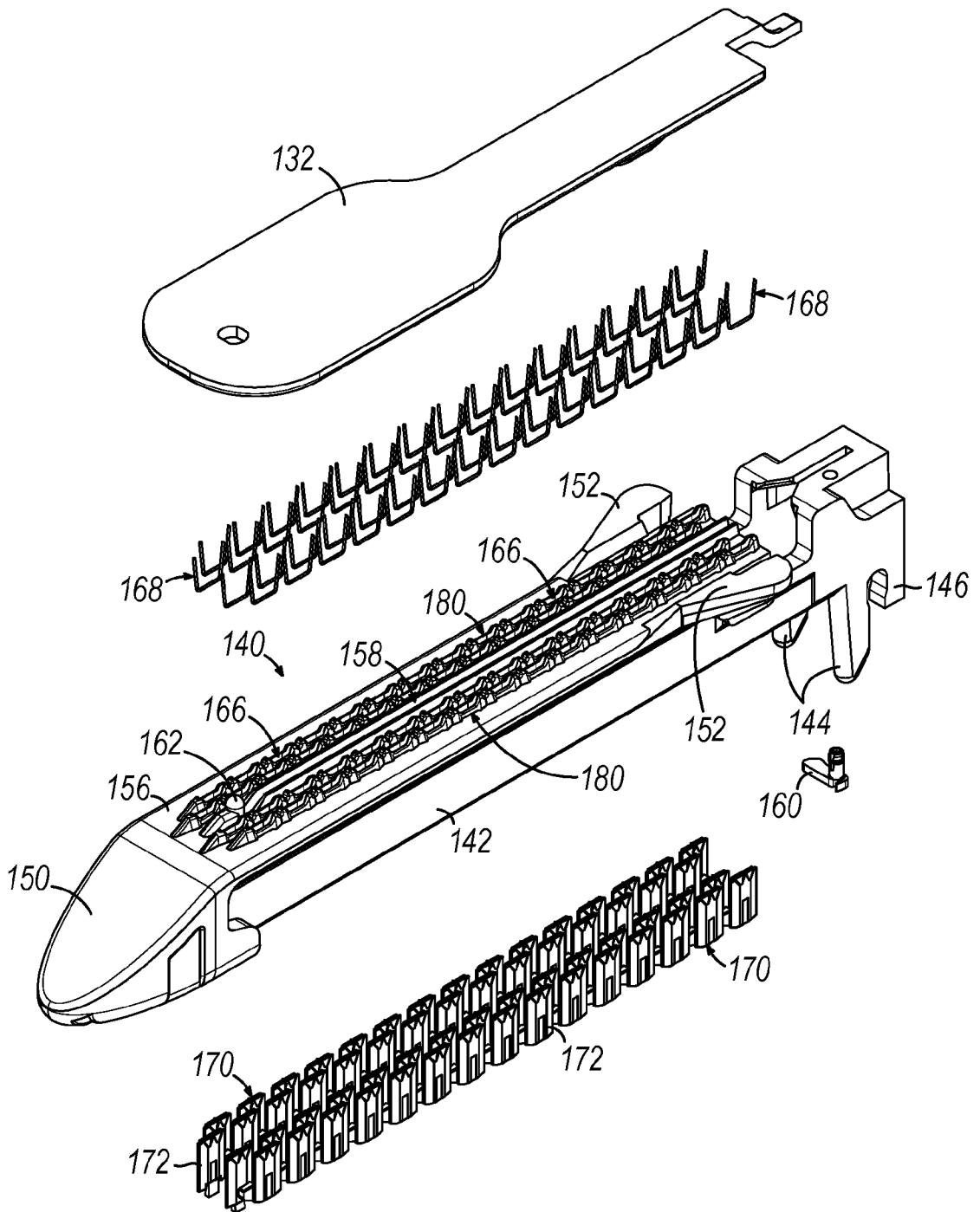


FIG. 10

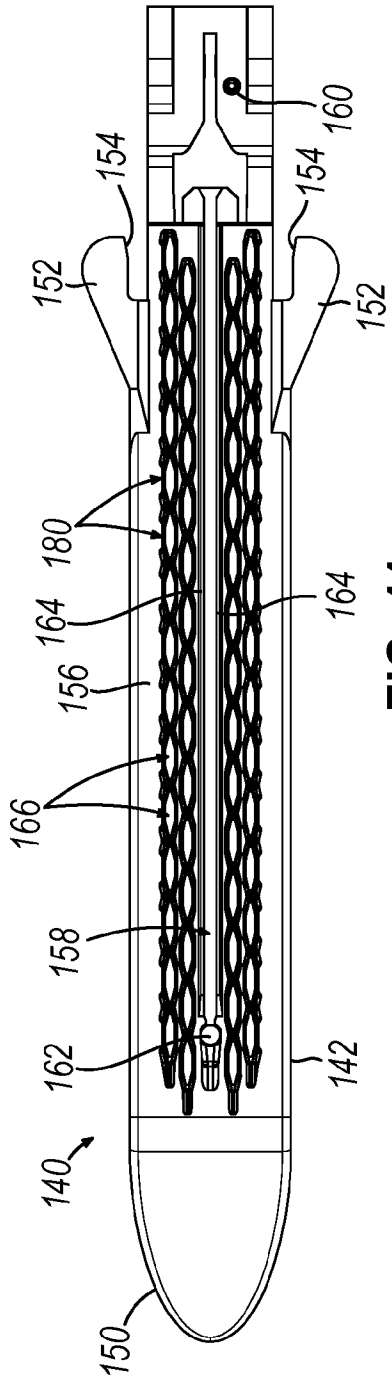


FIG. 11

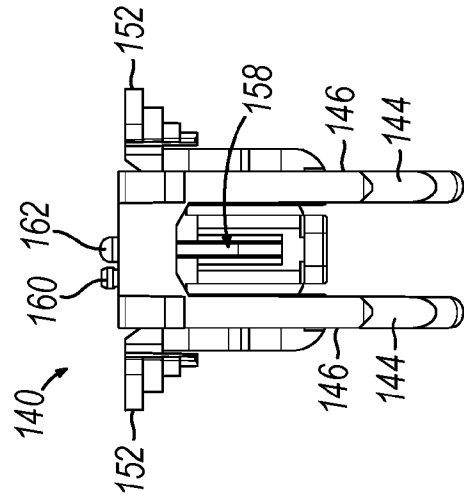


FIG. 12

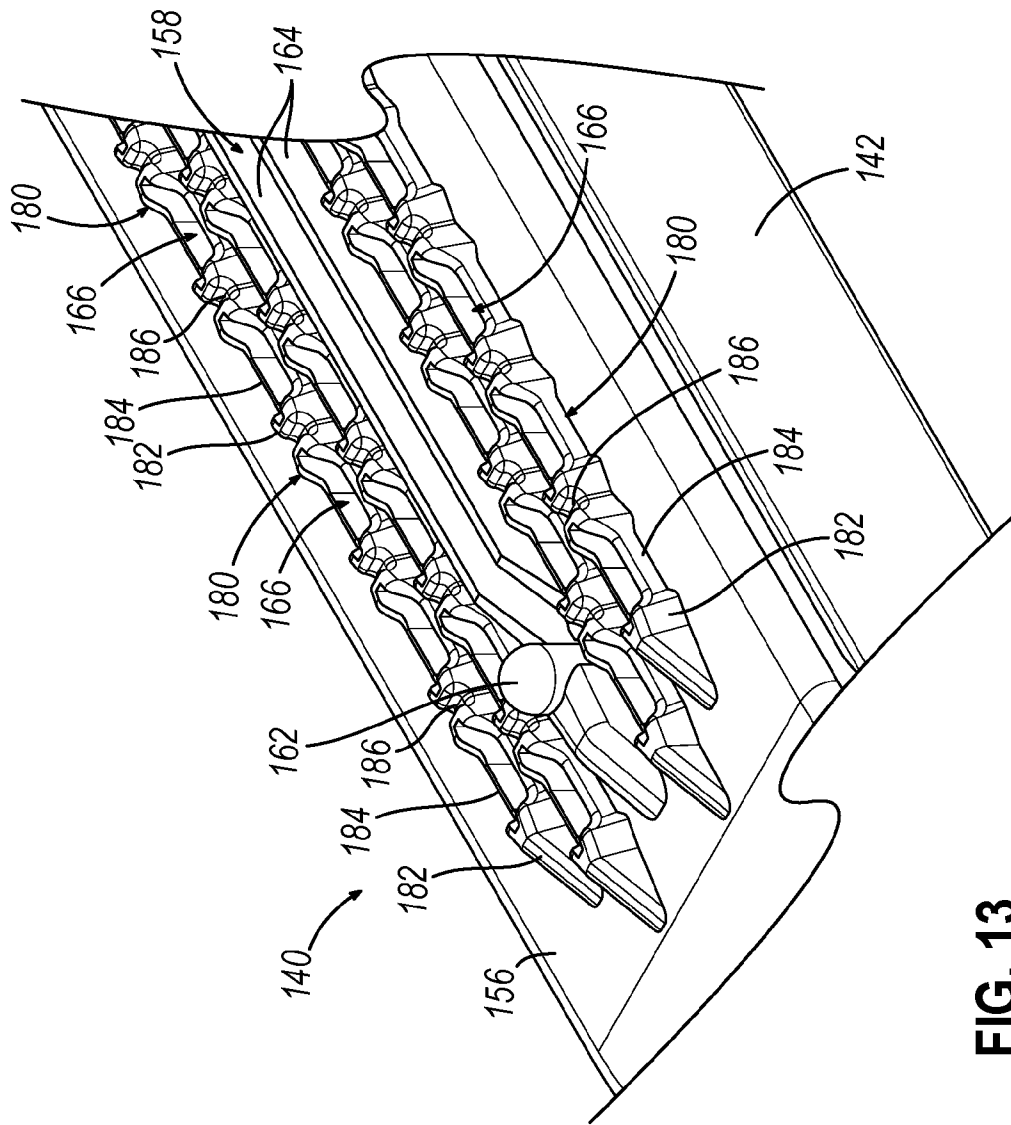


FIG. 13

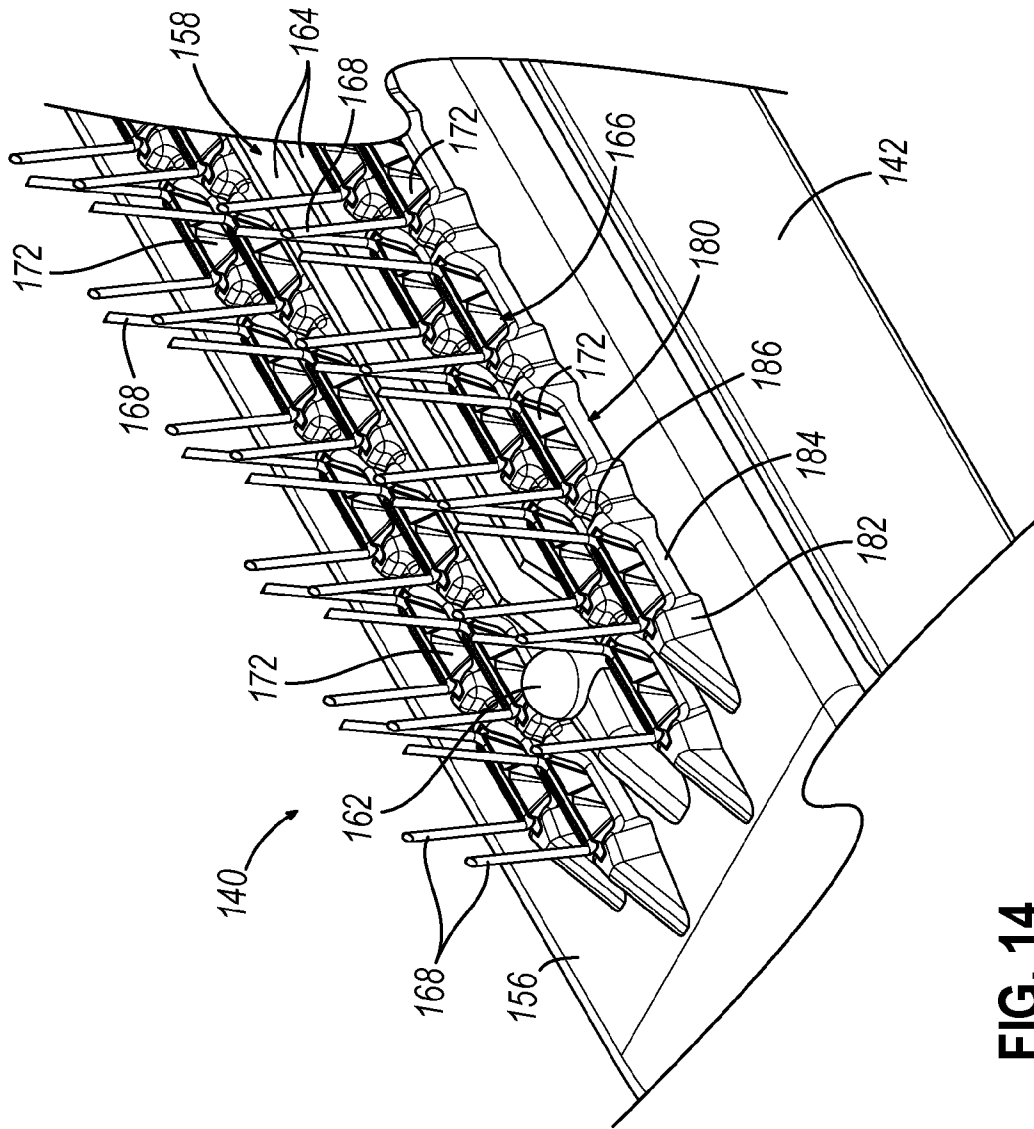


FIG. 14

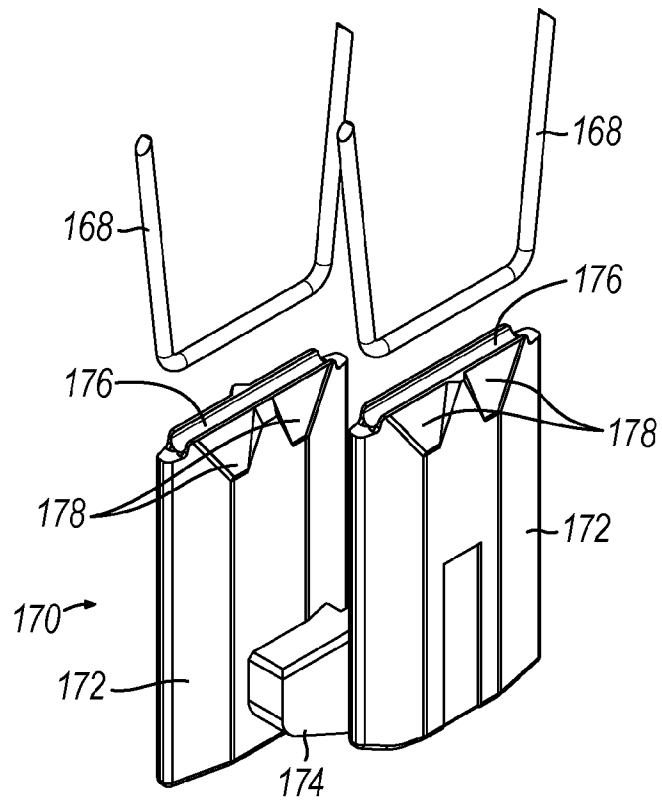


FIG. 15

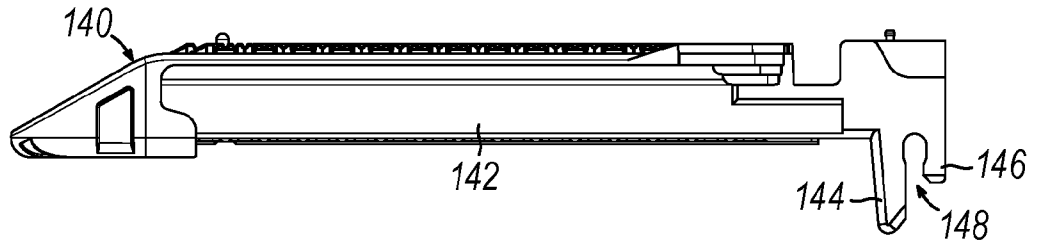


FIG. 16

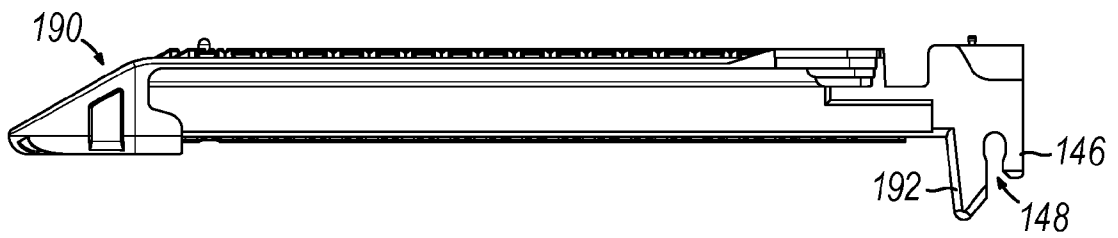


FIG. 17



FIG. 18

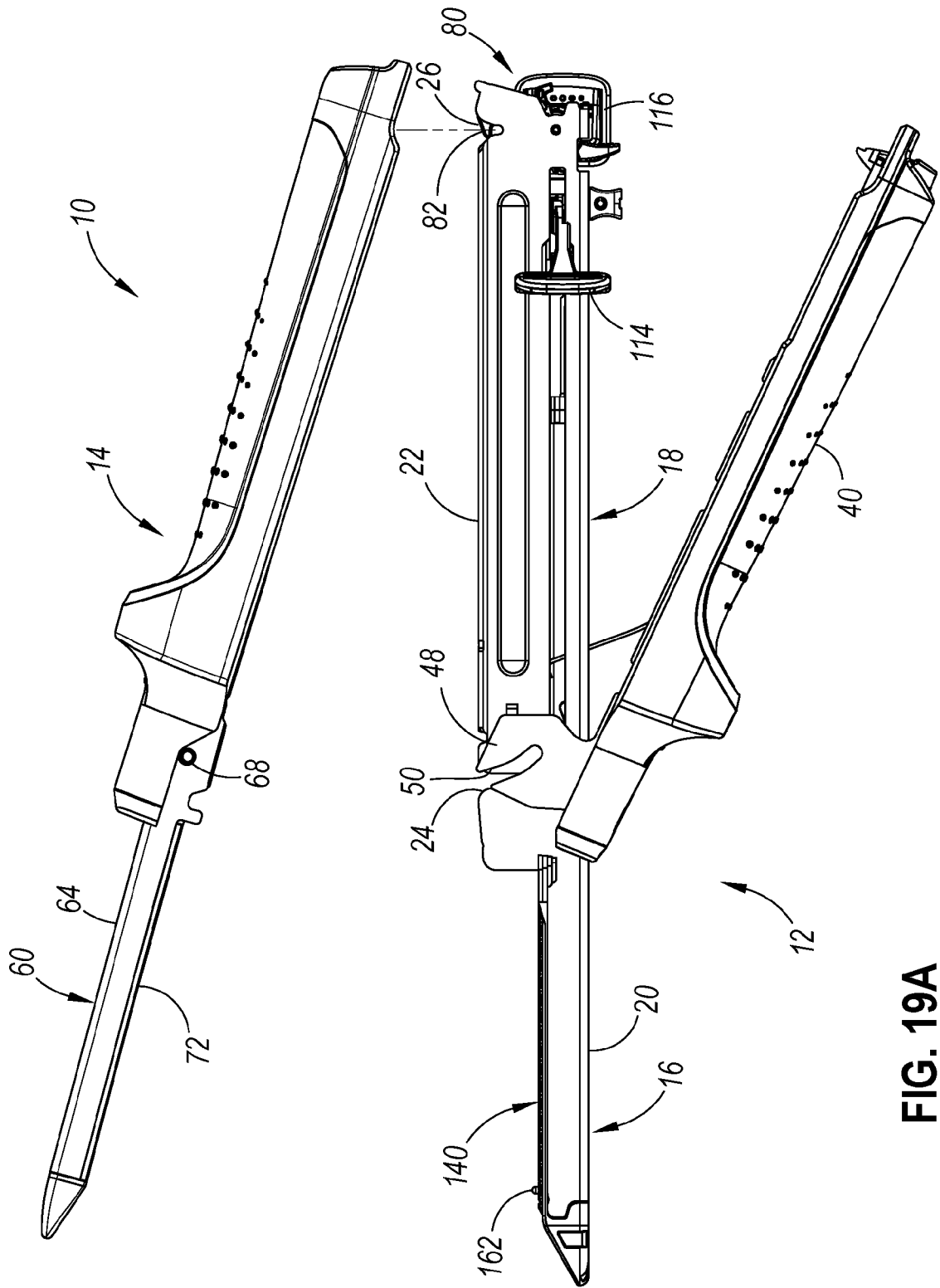


FIG. 19A

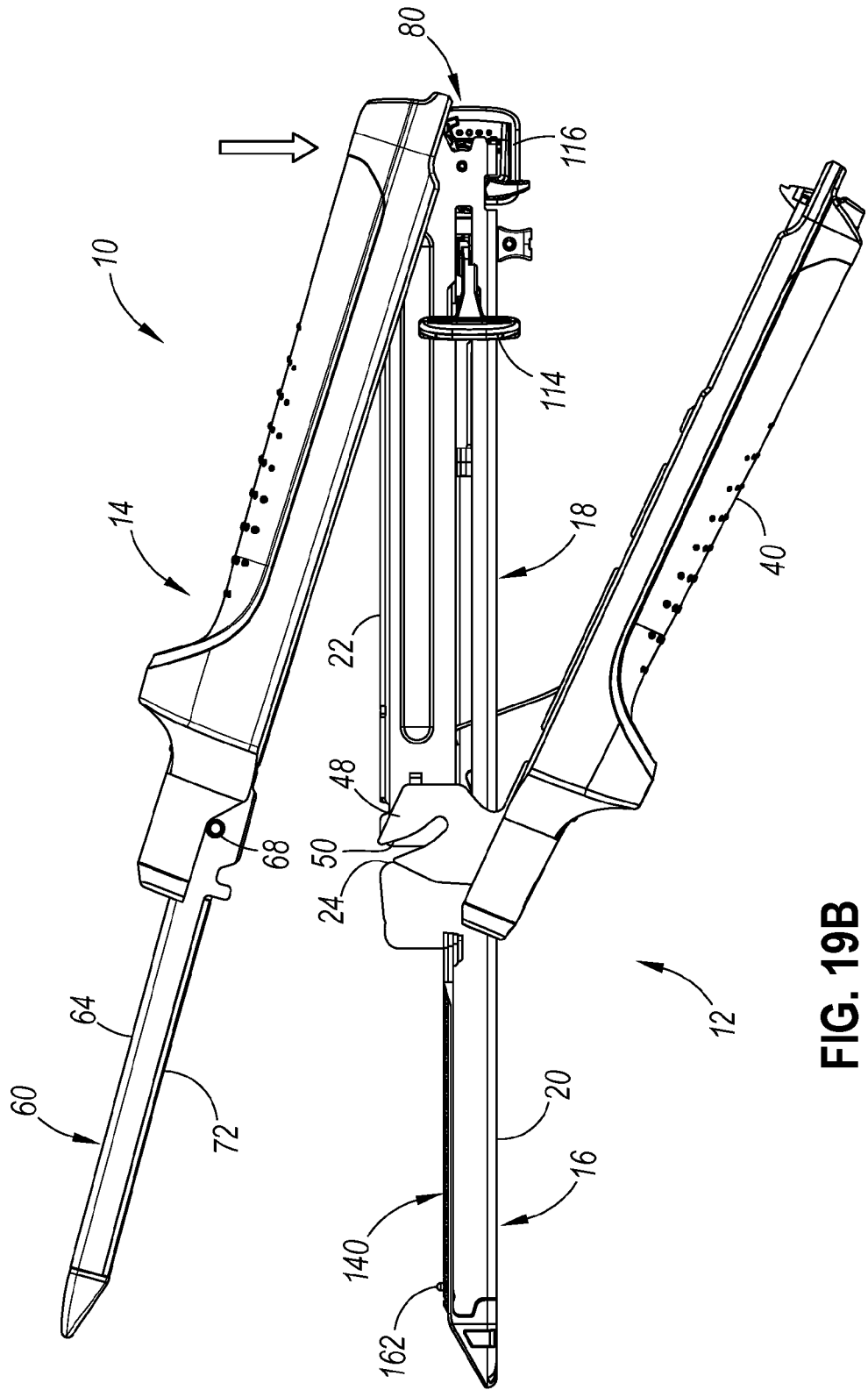


FIG. 19B

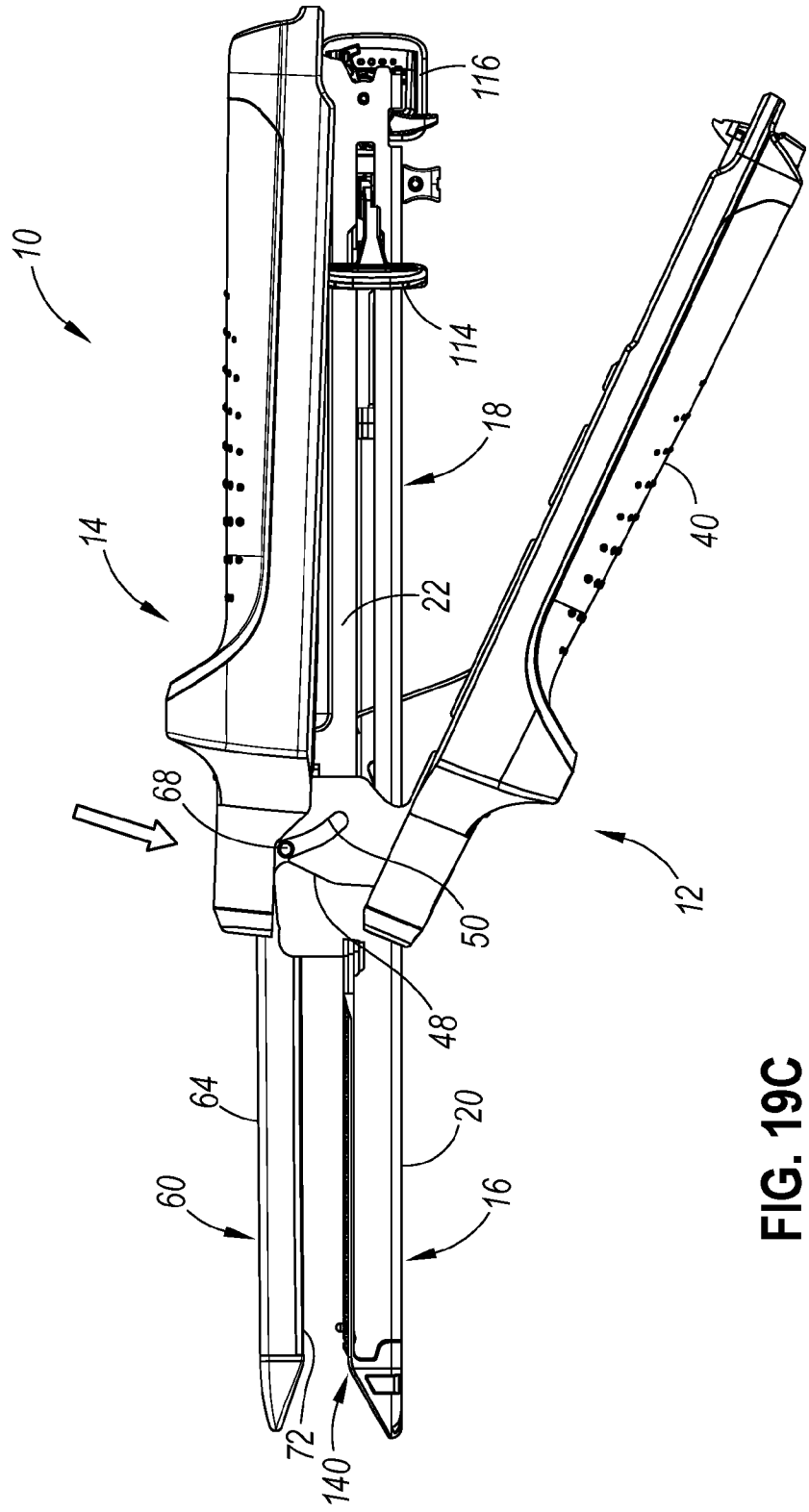


FIG. 19C

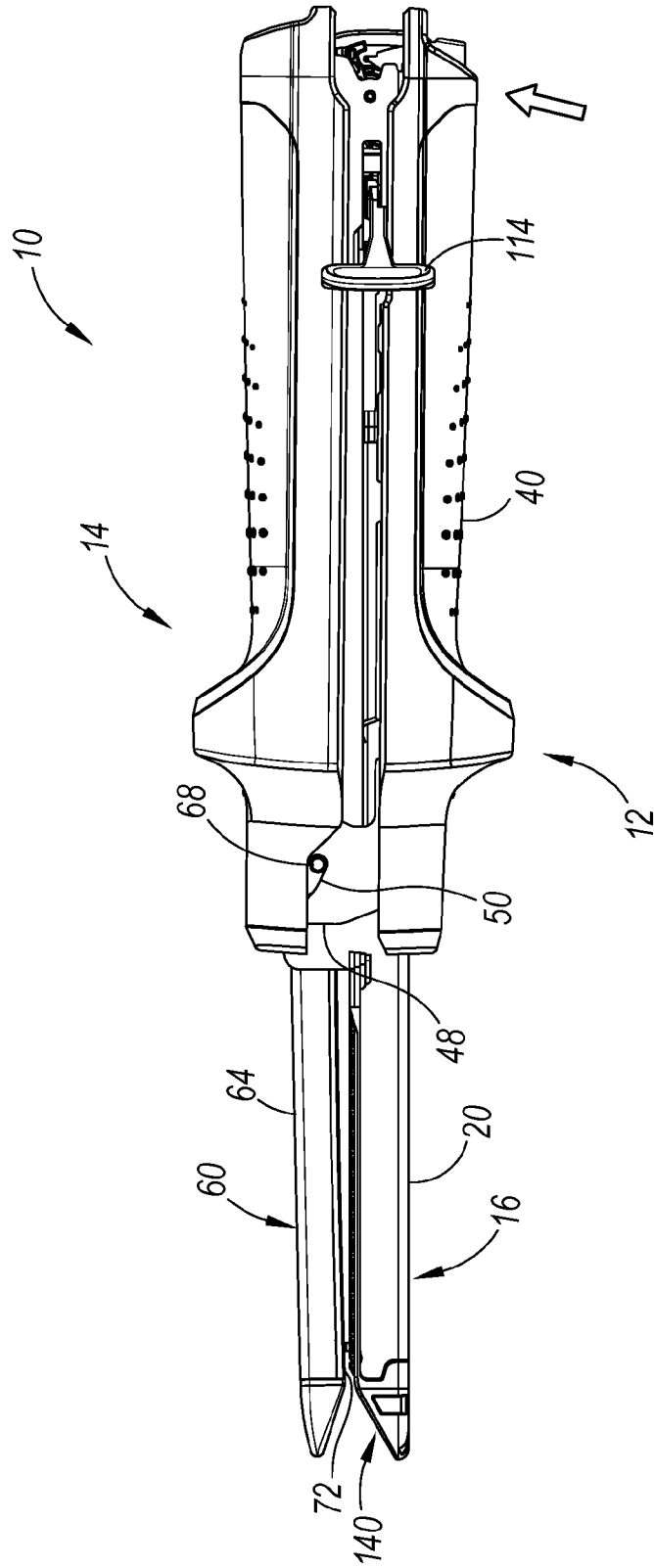


FIG. 19D

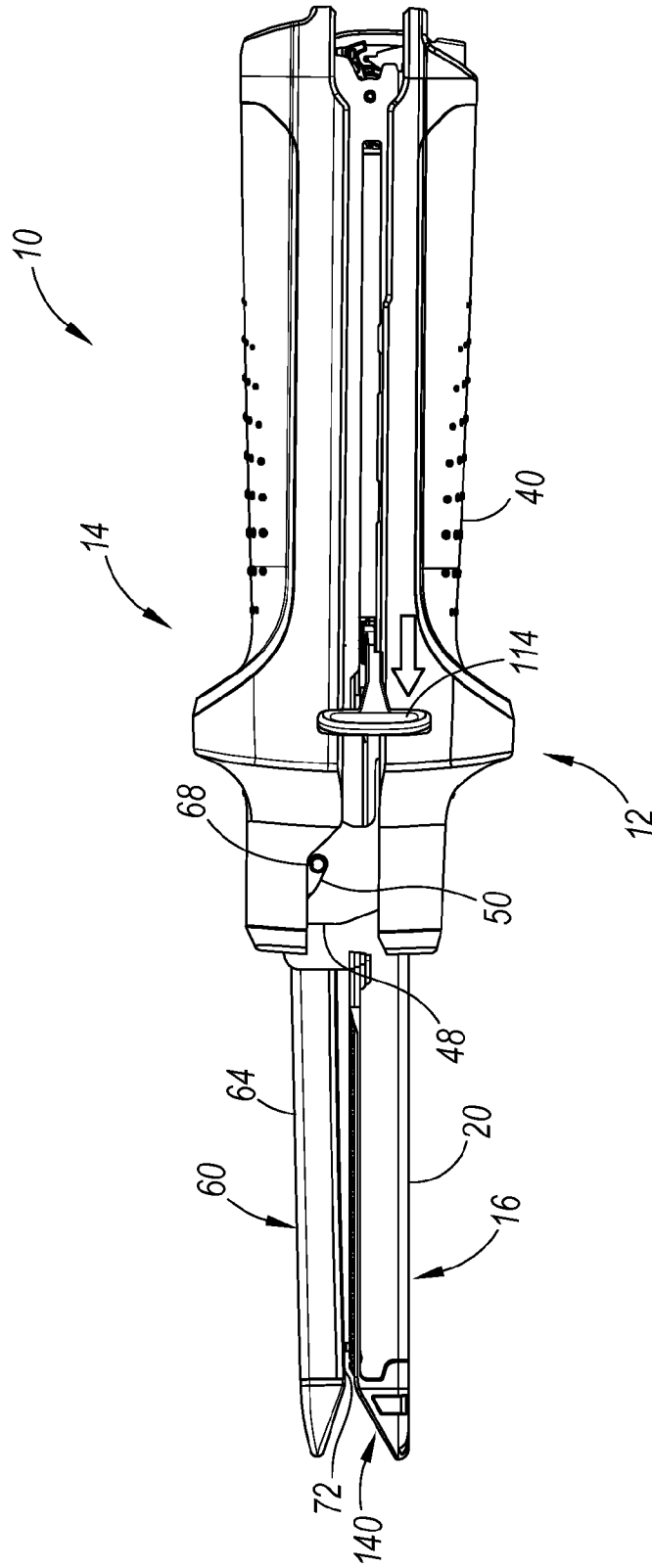


FIG. 19E

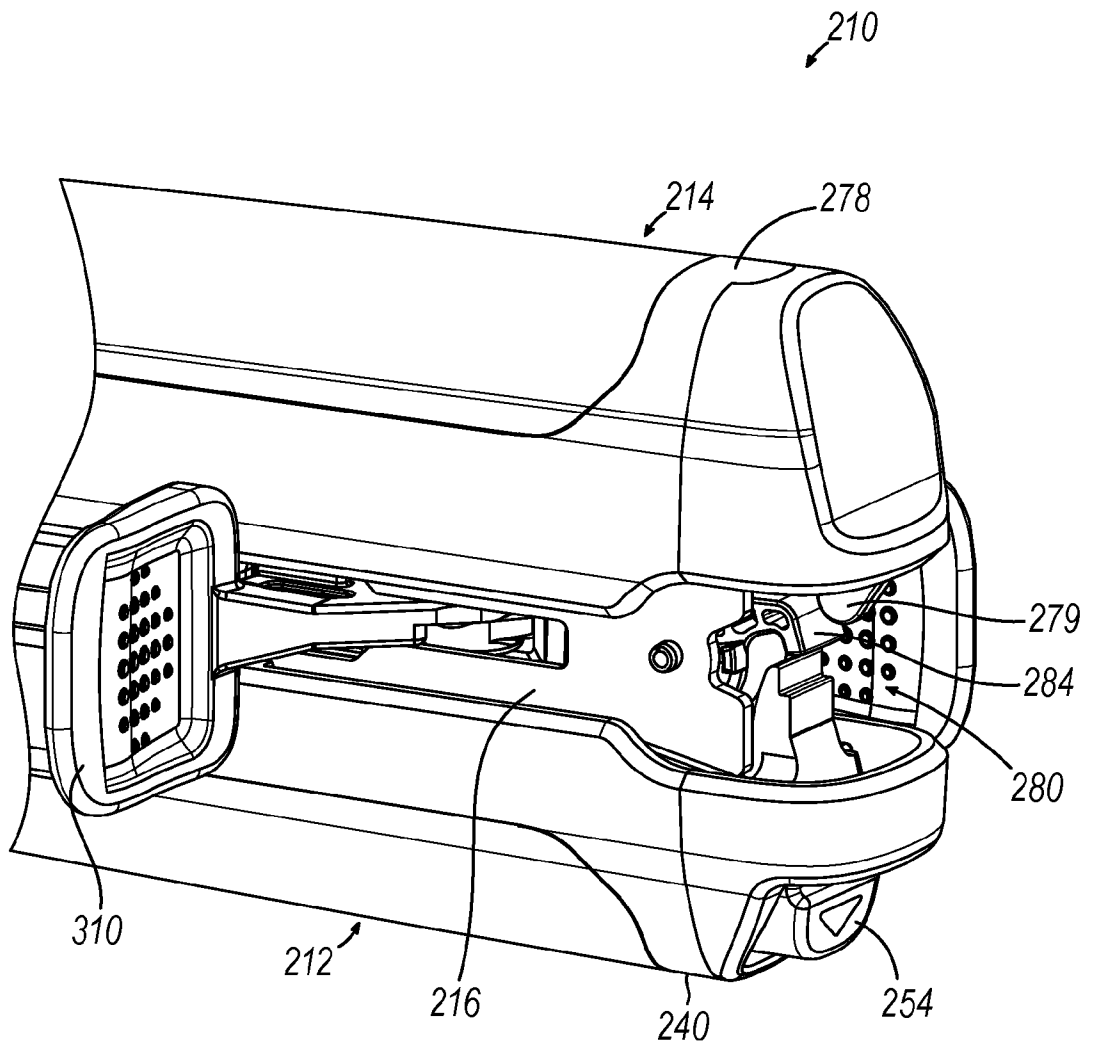


FIG. 20

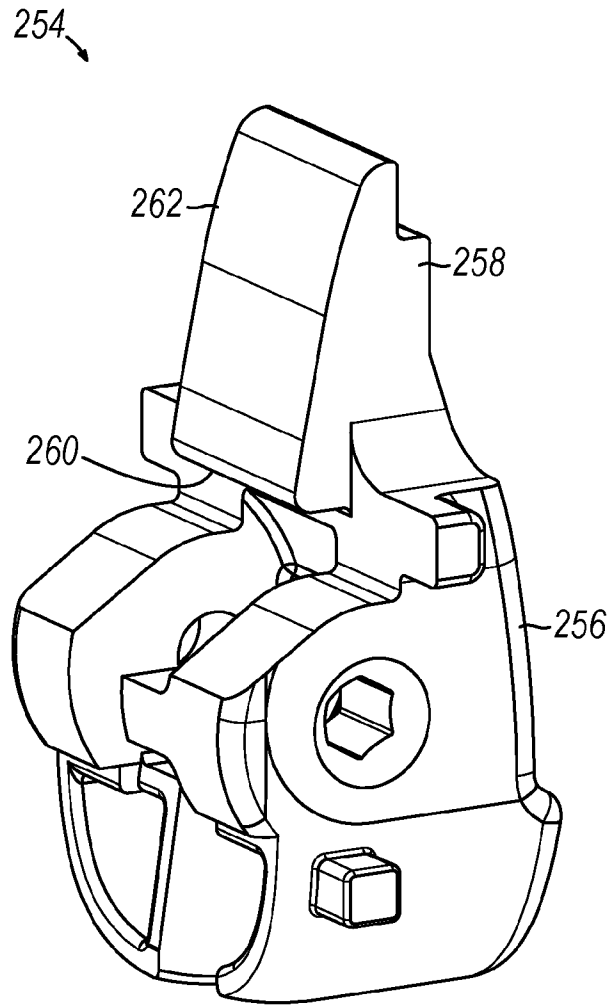


FIG. 21

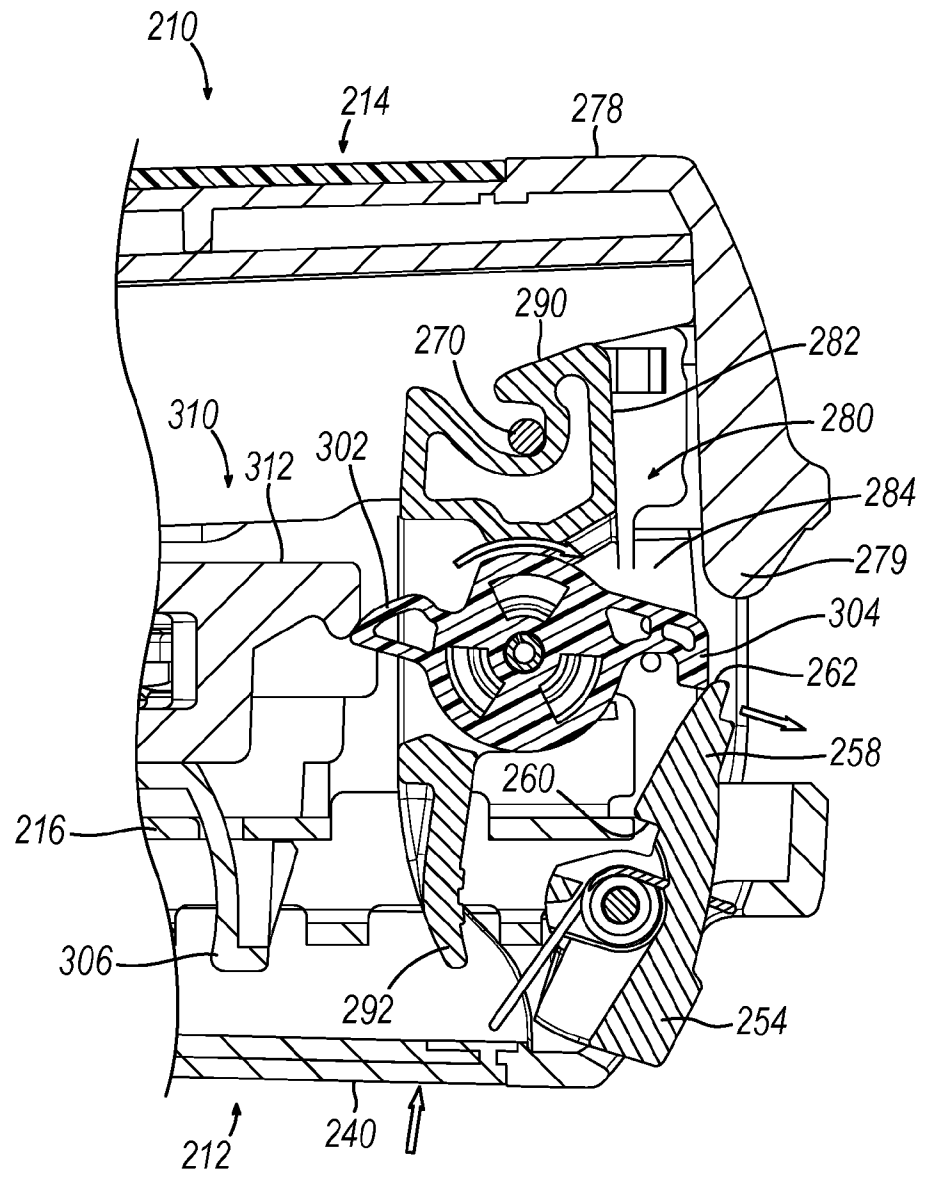


FIG. 22

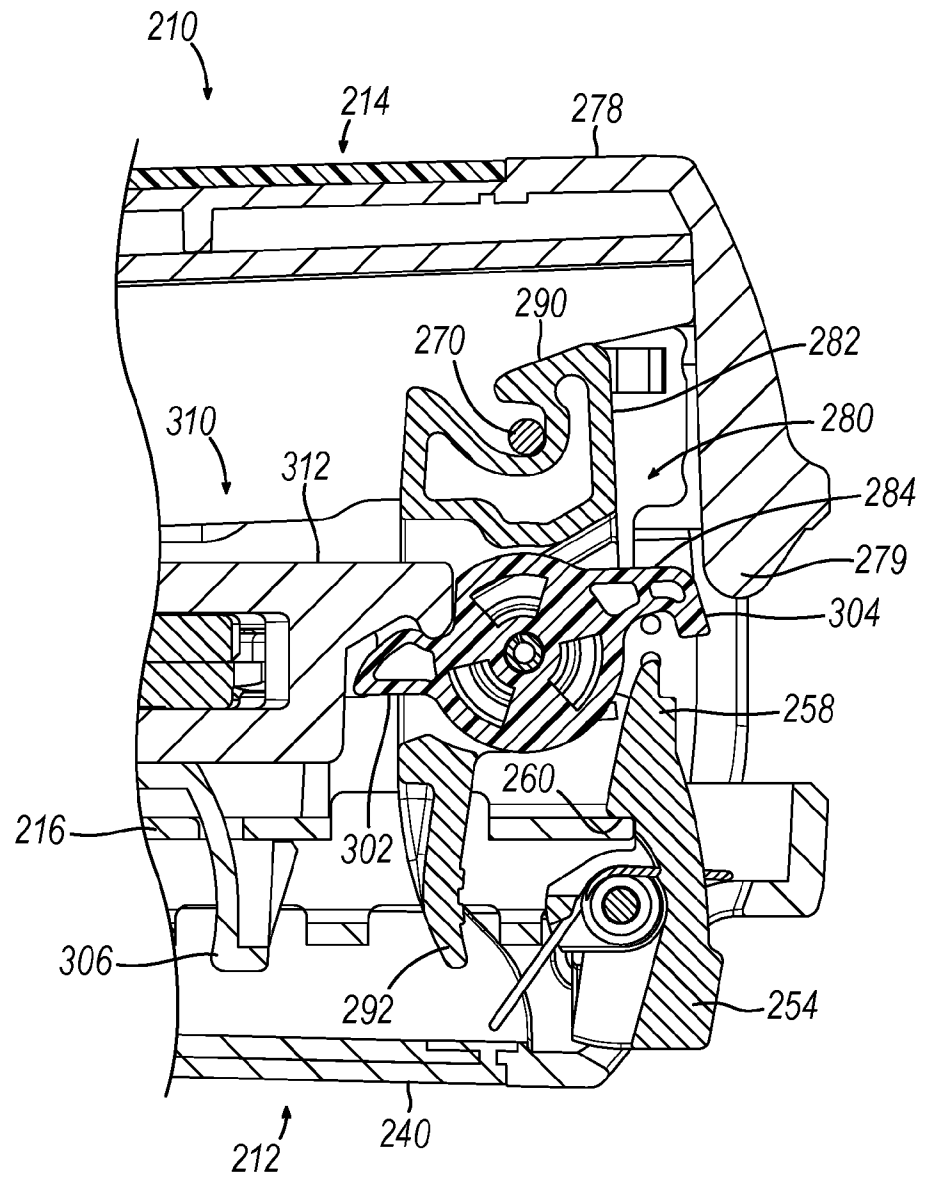


FIG. 23

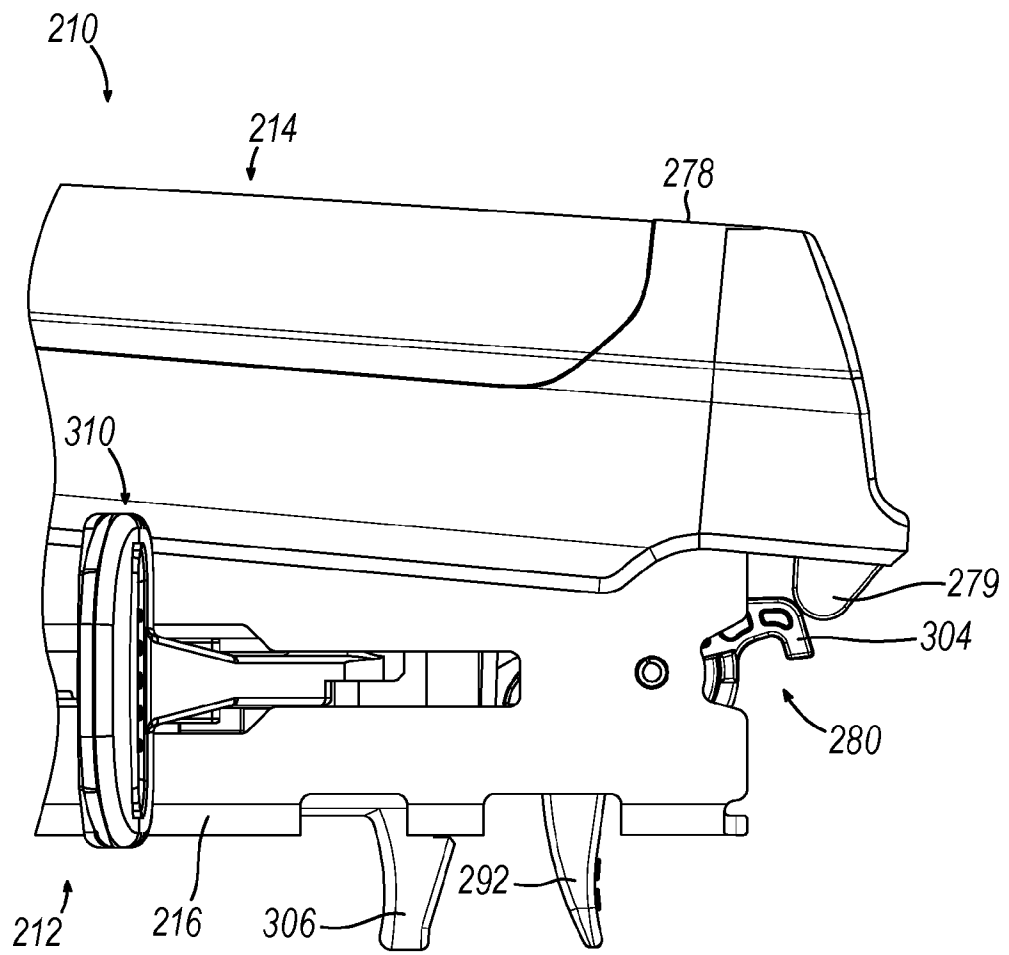


FIG. 24

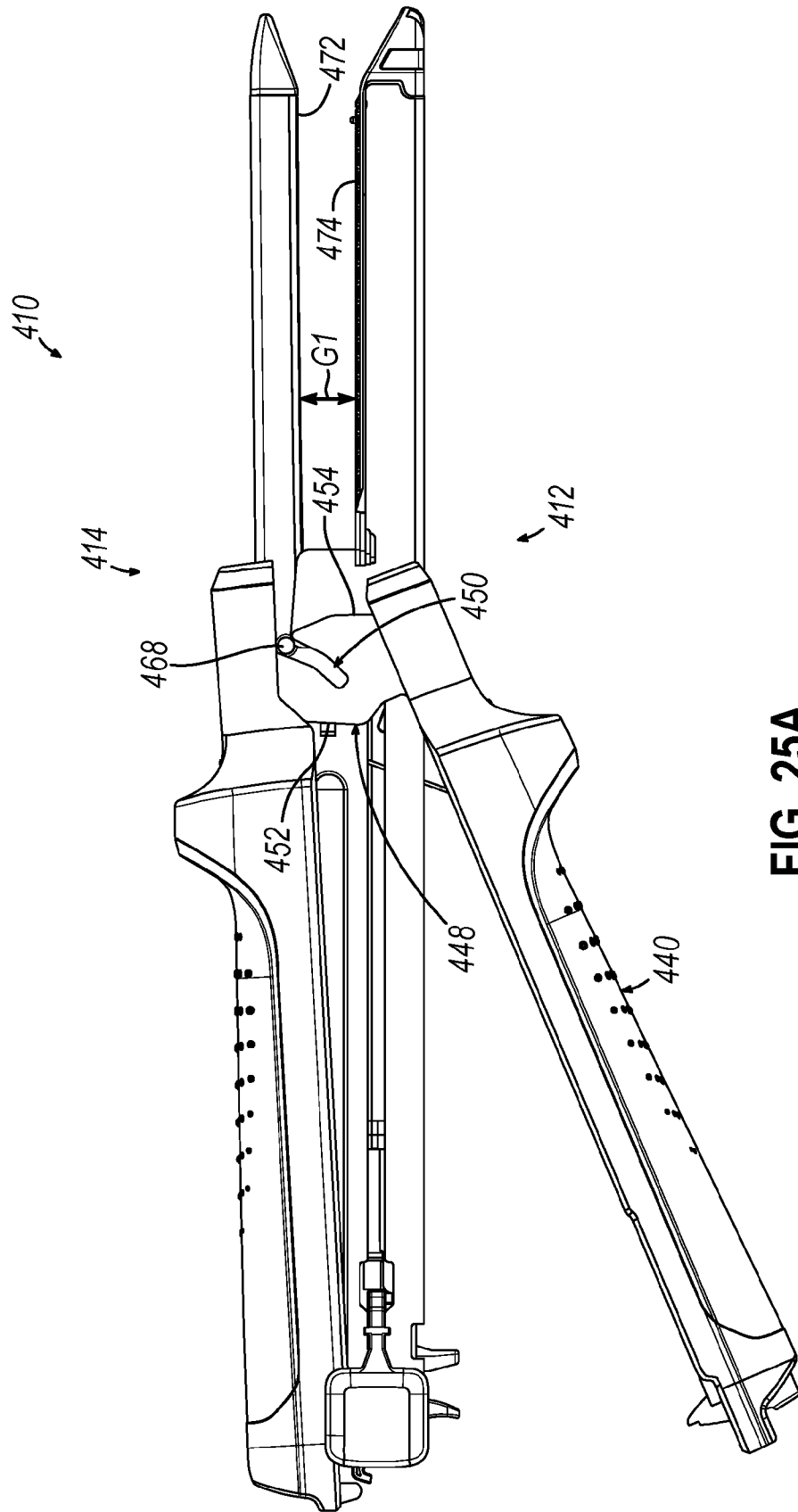


FIG. 25A

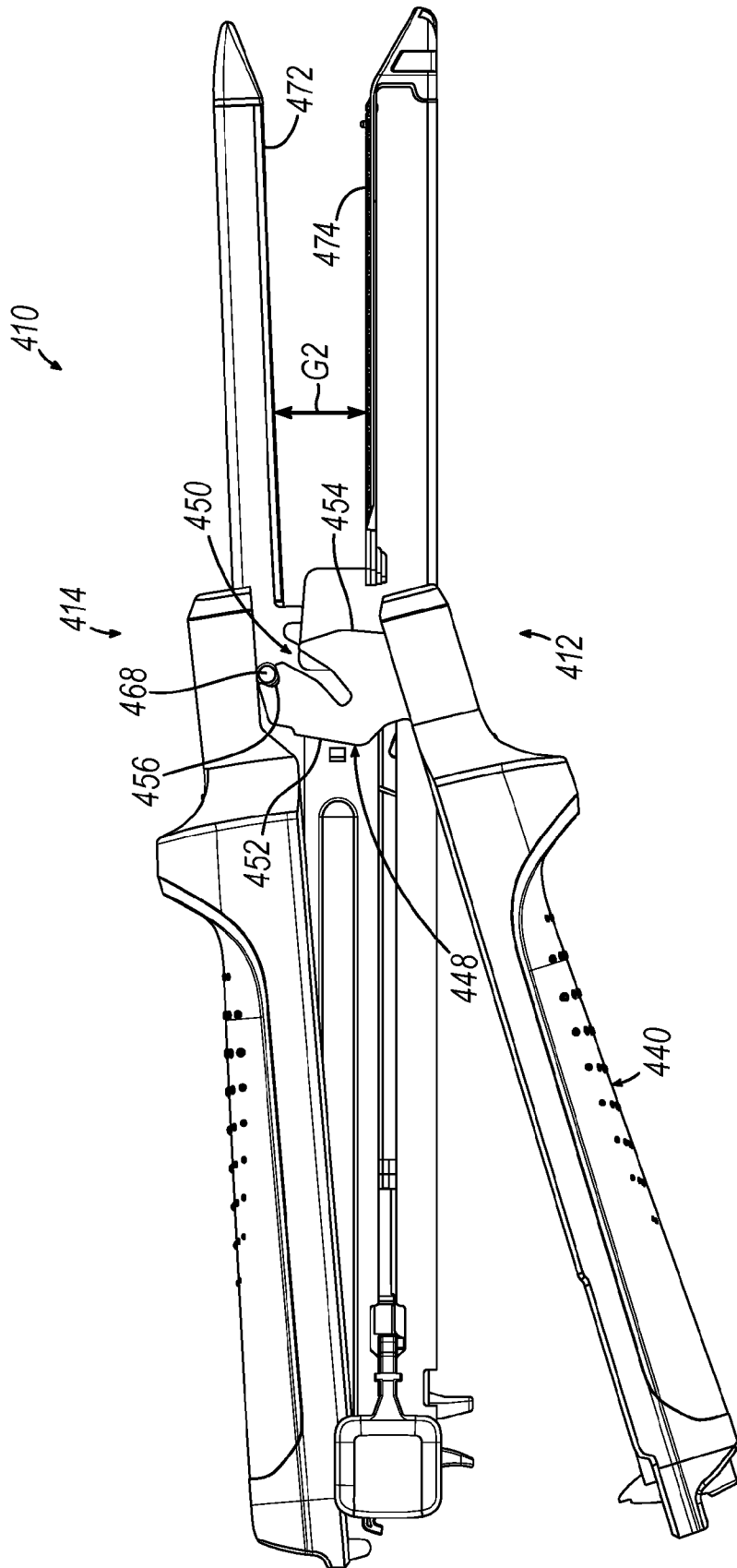


FIG. 25B

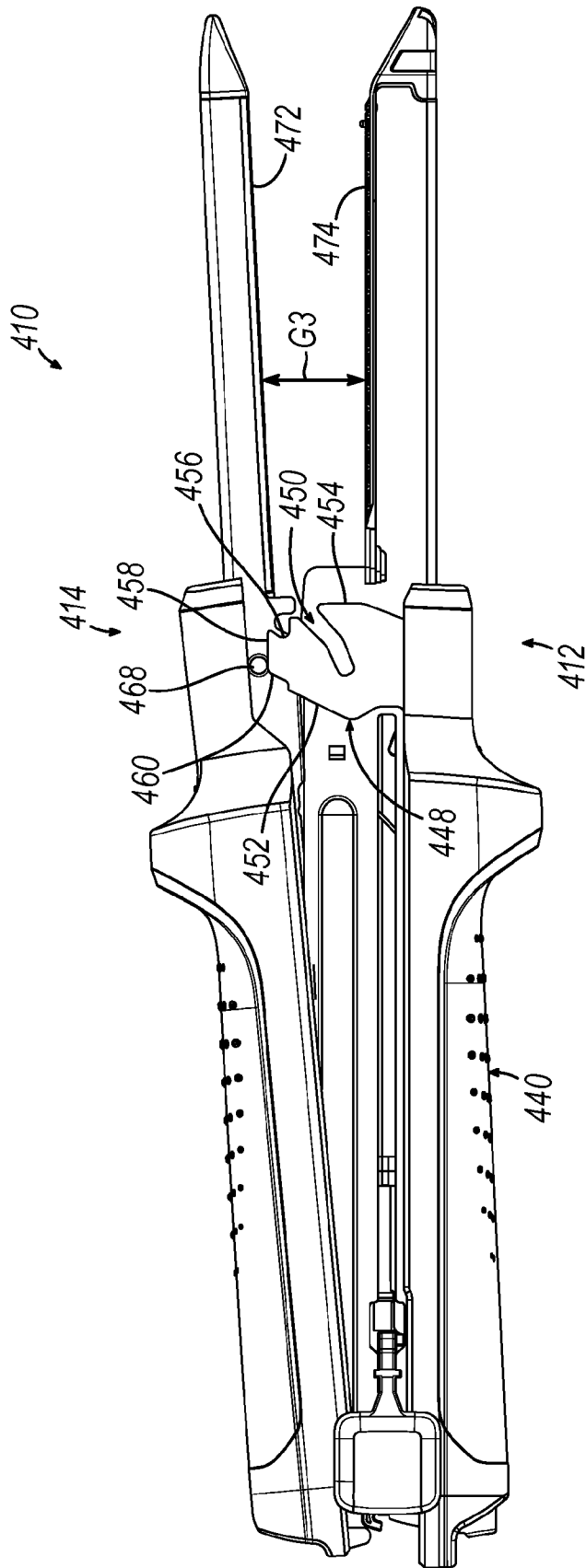


FIG. 25C

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2023/056026

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B17/072 A61B90/00
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61B

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 3 610 801 A2 (ETHICON LLC [PR]) 19 February 2020 (2020-02-19)	1-14, 16
Y	paragraphs [0041], [0042]; figures 16A-16D	15
Y	US 11 229 433 B2 (ETHICON LLC [US]; CILAG GMBH INT [CH]) 25 January 2022 (2022-01-25) cited in the application	15
A	figure 11 figure 8	17
X	US 2019/357909 A1 (HUITEMA THOMAS W [US] ET AL) 28 November 2019 (2019-11-28) paragraph [0310]; figures 55, 55A figure 16A	17-19
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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

25 October 2023

Date of mailing of the international search report

03/11/2023

Name and mailing address of the ISA/
 European Patent Office, P.B. 5818 Patentlaan 2
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Christen, Jérôme

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2023/056026

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:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional 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.:

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/IB2023/056026

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 3 520 710 A1 (ETHICON LLC [PR]) 7 August 2019 (2019-08-07) paragraph [0059]; figures 16A,16B paragraphs [0030] - [0032]; figures 10A-D,13A-14B -----	20-31
A	EP 3 639 757 A2 (ETHICON LLC [PR]) 22 April 2020 (2020-04-22) paragraph [0070]; figures 28A,28B -----	20,21
A	EP 3 636 166 A2 (ETHICON LLC [PR]) 15 April 2020 (2020-04-15) paragraphs [0054] - [0058]; figures 31,32 -----	22

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-16

1. An apparatus comprising:

- (a) a first elongate member having a distal portion configured to present a first stapling surface;
 - (b) a second elongate member having a distal portion configured to present a second stapling surface, wherein the first and second elongate members are configured to releasably couple together to enable the first and second stapling surfaces to cooperate to clamp and staple tissue with a plurality of staples;
 - (c) a clamp member, wherein the clamp member is movable relative to the first and second elongate members from a first position to a second position to approximate the first and second stapling surfaces for clamping tissue;
 - (d) a latch member configured to transition from an unlatched state to a latched state to releasably retain the clamp member in the second position; and
 - (e) a firing assembly, wherein the firing assembly is actuatable from a home position to fire the staples into the clamped tissue,
- wherein the latch member is configured to transition from the unlatched state to the latched state when the clamp member is in the second position while the firing assembly is in the home position,
- wherein the latch member is inhibited from transitioning from the unlatched state to the latched state when the clamp member is in the second position while the firing assembly is displaced from the home position.

2. claims: 17-19

17. An apparatus comprising:

- (a) a cartridge body;
- (b) a deck defined by the cartridge body, wherein the deck is configured to compress tissue against an anvil of a surgical stapler;
- (c) a plurality of staple openings formed in the deck, wherein the staple openings are configured to house a plurality of staples;
- (d) an elongate slot formed in the deck, wherein the elongate slot is configured to slidably receive a cutting member therethrough; and
- (e) a plurality of tissue gripping members protruding from the deck along each side of the elongate slot, wherein each tissue gripping member is associated with a respective one of the staple openings and is configured to grip tissue, wherein each tissue gripping member includes:
 - (i) a first end feature that wraps around a first end of the staple opening,
 - (ii) a second end feature that wraps around a second end of

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

the staple opening, and
(iii) a pair of bridge elements that extend between the first end feature and the second end feature along opposed lateral sides of the staple opening, wherein each of the bridge elements has a maximum height relative to the deck that is less than a maximum height of each of the first end feature and the second end feature.

3. claims: 20, 21

20. An apparatus comprising:

- (a) a first elongate member having a distal portion configured to present a first stapling surface;
- (b) a second elongate member having a distal portion configured to present a second stapling surface, wherein the first and second elongate members are configured to releasably couple together at their proximal ends to enable the first and second stapling surfaces to cooperate to clamp and staple tissue with a plurality of staples;
- (c) a clamp member, wherein the clamp member is movable relative to the first and second elongate members from an open position to a closed position to approximate the first and second stapling surfaces for clamping tissue;
- (d) a first shroud covering a proximal portion of the first elongate member;
- (e) a second shroud covering a proximal portion of the second elongate member; and
- (f) a protrusion extending from a proximal end of one of the first shroud or the second shroud, wherein the protrusion is configured to contact a feature supported by the proximal end of the opposing first elongate member or second elongate member and thereby resist decoupling of the proximal ends when the apparatus is held by a user while the clamp member is in the open position.

4. claims: 22-31

22. An apparatus, comprising:

- (a) a first elongate member having a distal portion configured to present a first stapling surface;
- (b) a second elongate member having a distal portion configured to present a second stapling surface, wherein the first and second elongate members are configured to releasably couple together to enable the first and second stapling surfaces to cooperate to clamp and staple tissue with a plurality of staples;
- (c) a latch projection extending from one of the first elongate member or the second elongate member; and
- (d) a clamp member movably coupled with the other of the first elongate member or the second elongate member, wherein the clamp member includes:
 - (i) a first engagement feature configured to releasably capture the latch projection while the clamp member advances

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

from a first position to a second position to thereby approximate the first and second stapling surfaces for clamping tissue, and
(ii) a second engagement feature offset from the first engagement feature and comprising a recess, wherein the second engagement feature is configured to engage the latch projection when the latch projection is misaligned with the first engagement feature to thereby provide an indication to the user that the latch projection is misaligned with the first engagement feature.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2023/056026

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