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(54) **SURGICAL STAPLING INSTRUMENT HAVING ULTRASONIC ENERGY DELIVERY**

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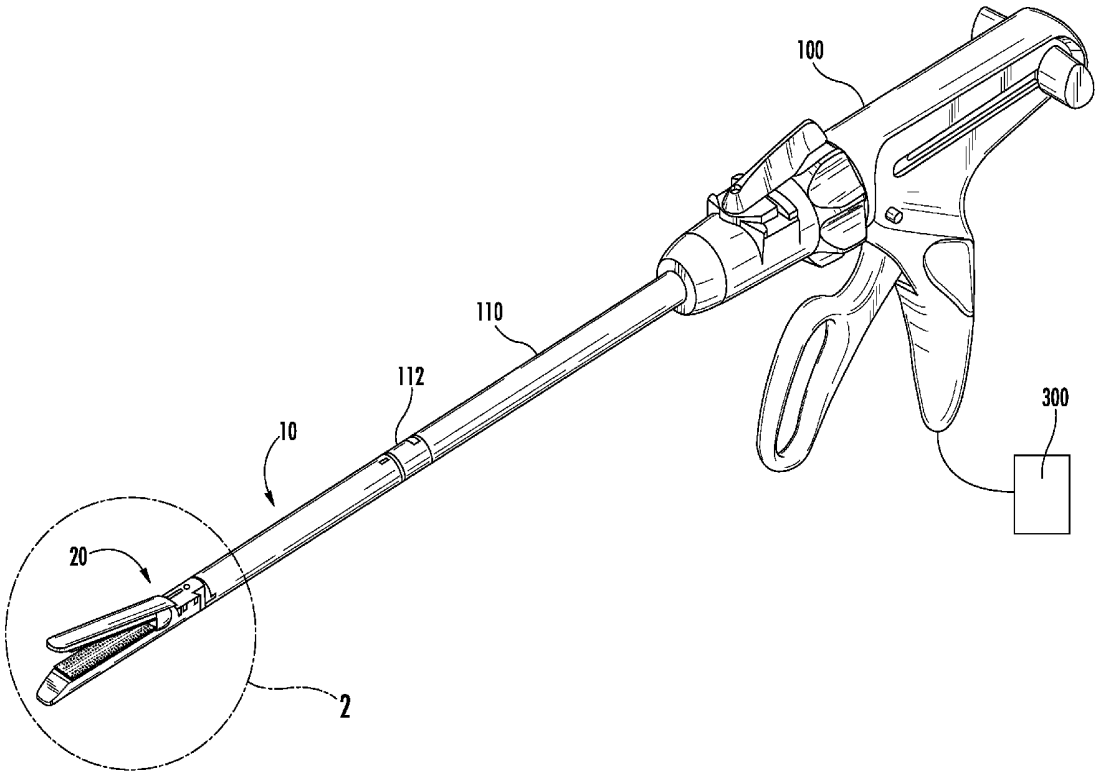
(57) **ABSTRACT**

An end effector includes first and second jaws, first and second buttresses, and an ultrasonic blade. The first jaw includes a fastener cartridge having a first tissue contacting surface and a plurality of fasteners arranged in rows parallel to a longitudinal axis of the first jaw. The first buttress is attached to the first tissue contacting surface and the second buttress is attached to a second tissue contracting surface of the second jaw. The first and second jaws are movable relative to one another and are configured to grasp tissue therebetween. The ultrasonic is activatable to weld the first buttress to the second buttress and to subsequently cut the welded first and second buttresses and tissue grasped between the first and second jaws.



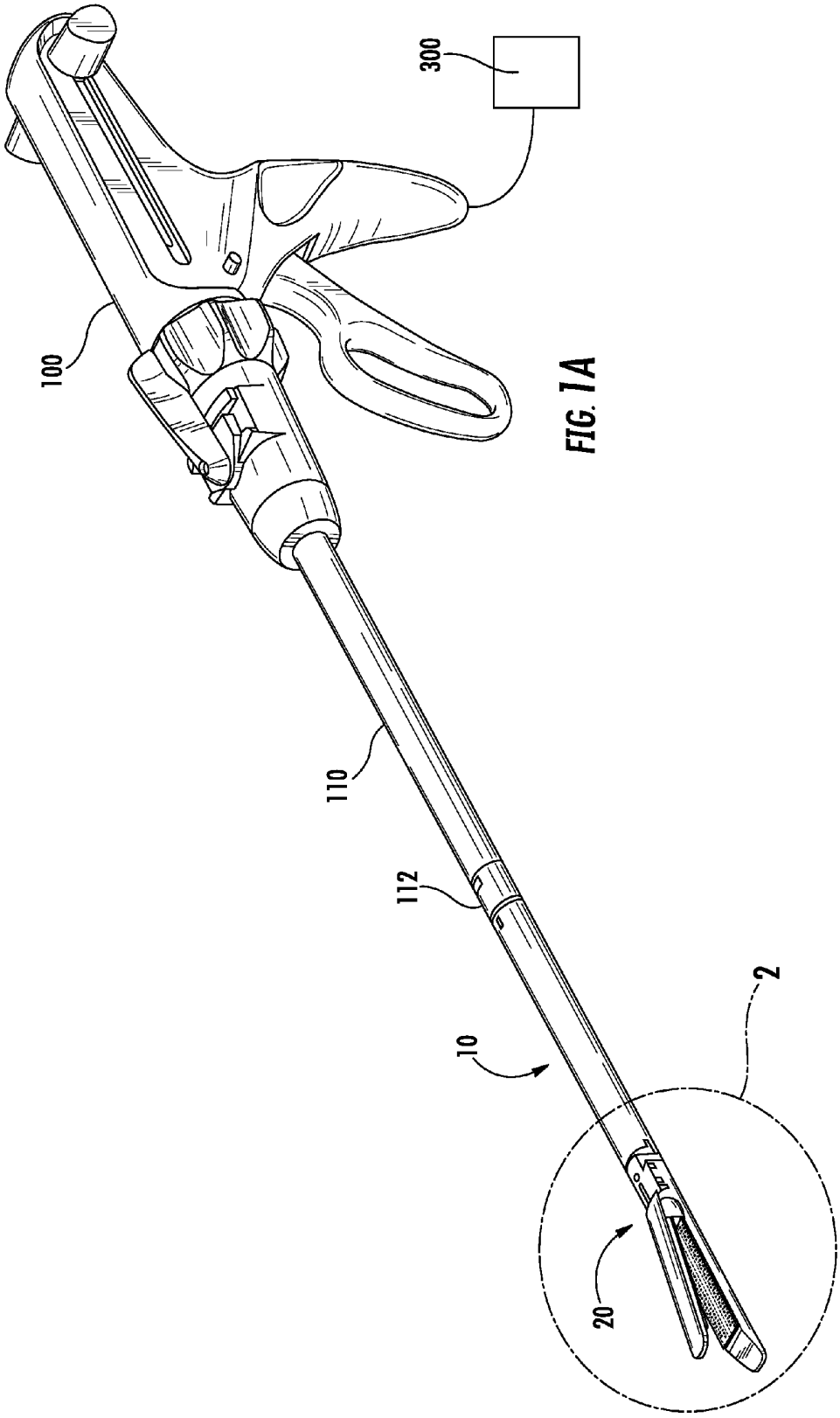


FIG. 1A

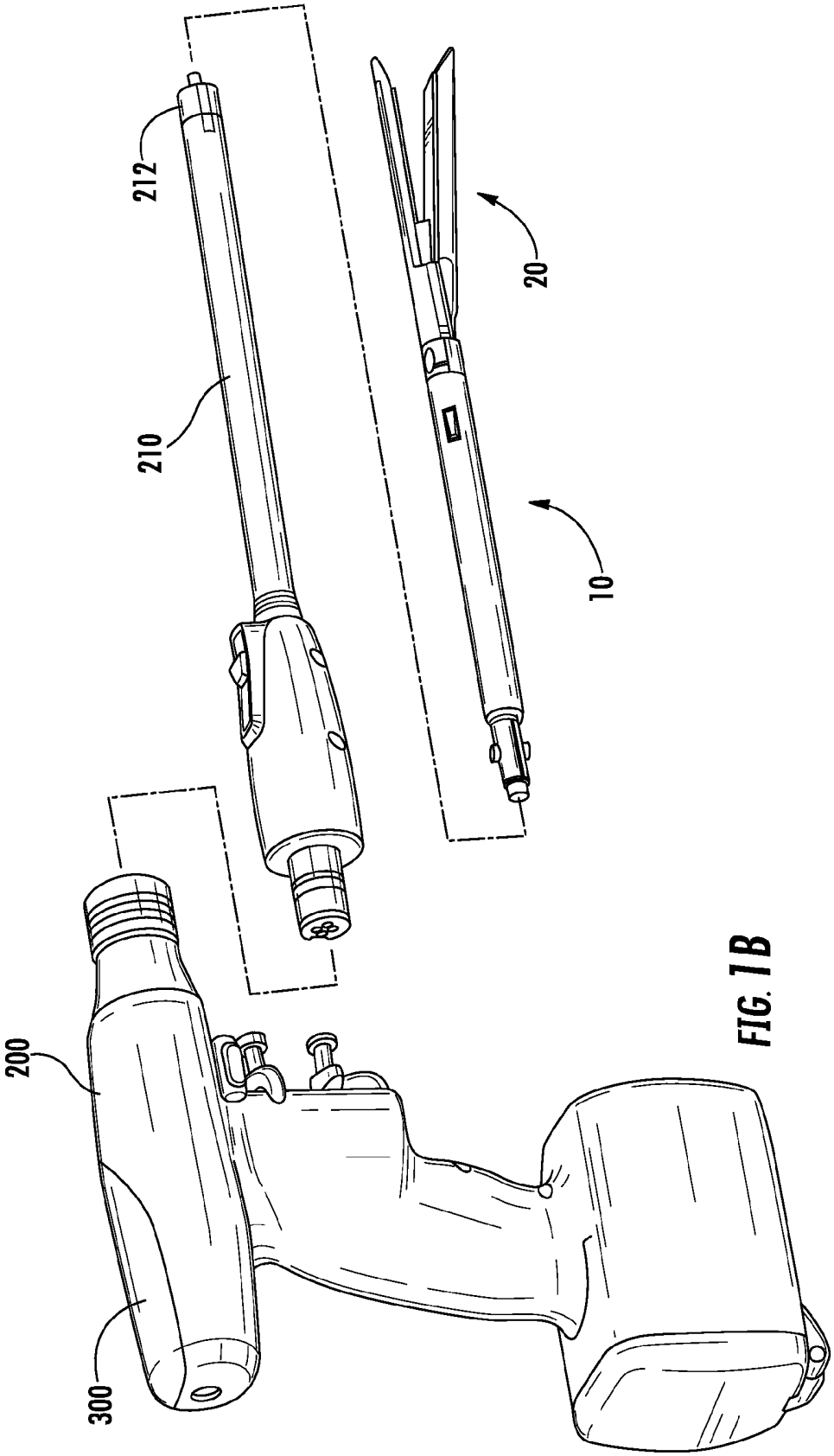


FIG. 1B

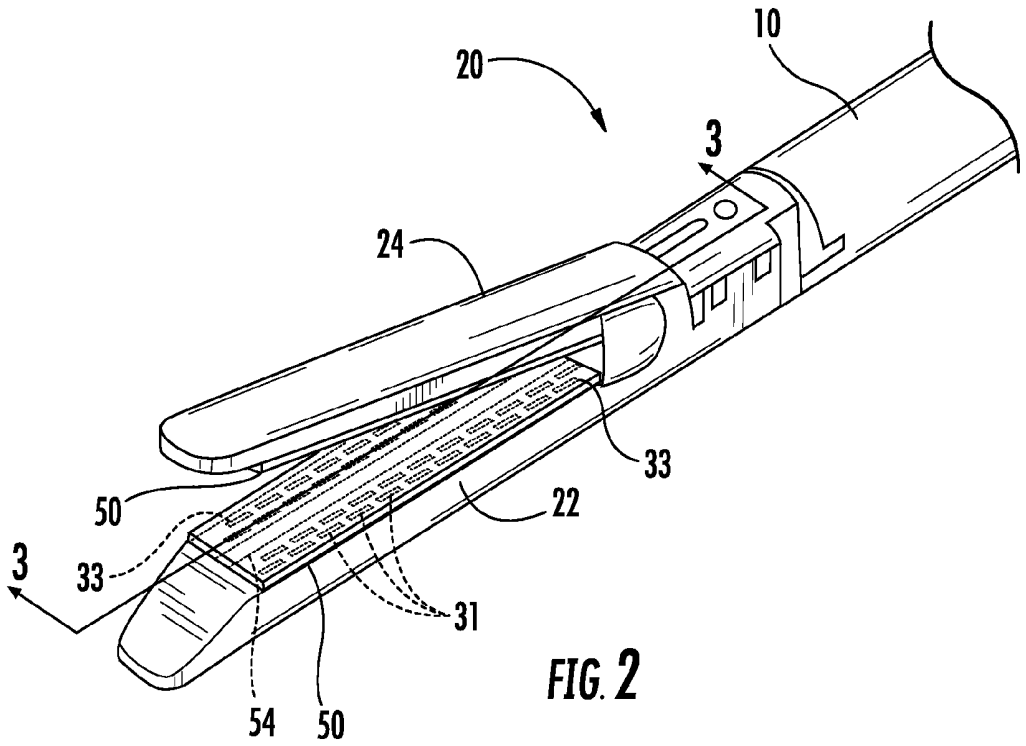


FIG. 2

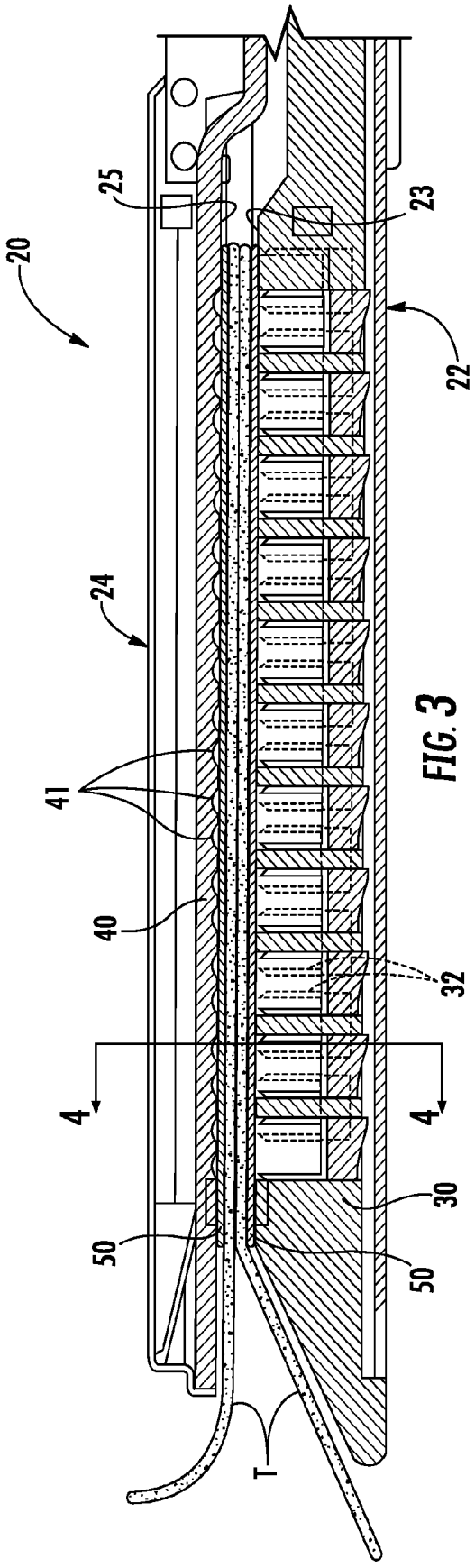


FIG. 3

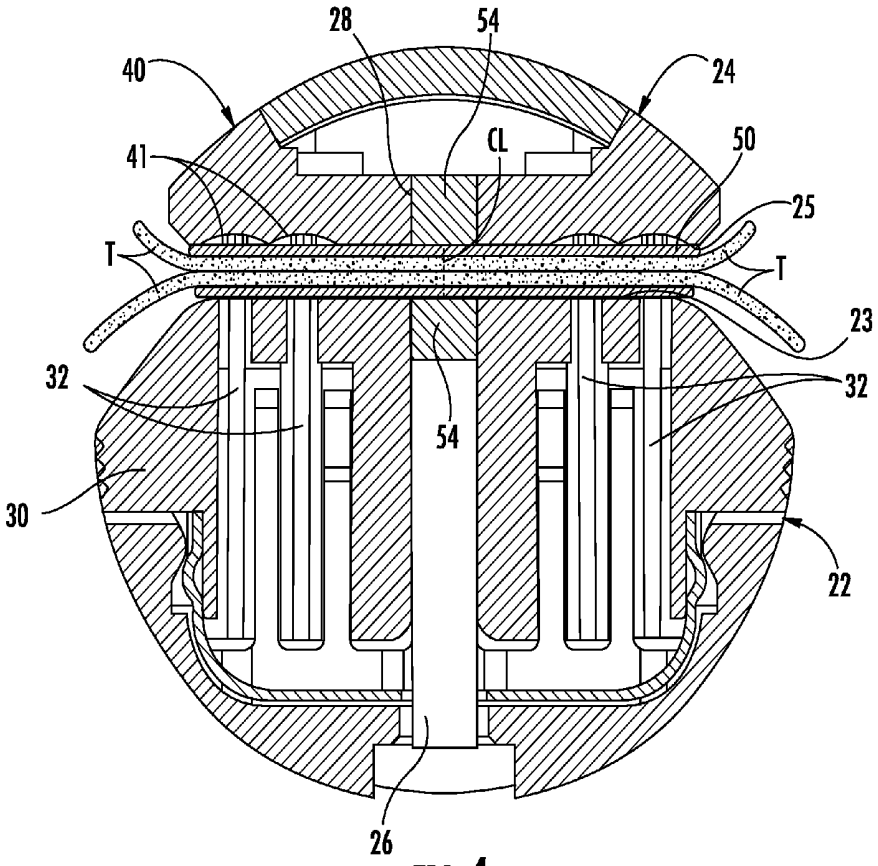


FIG. 4

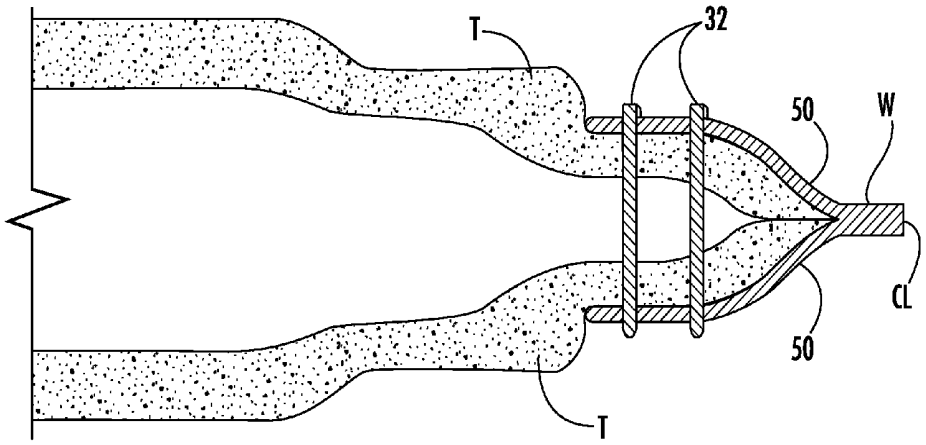


FIG. 5

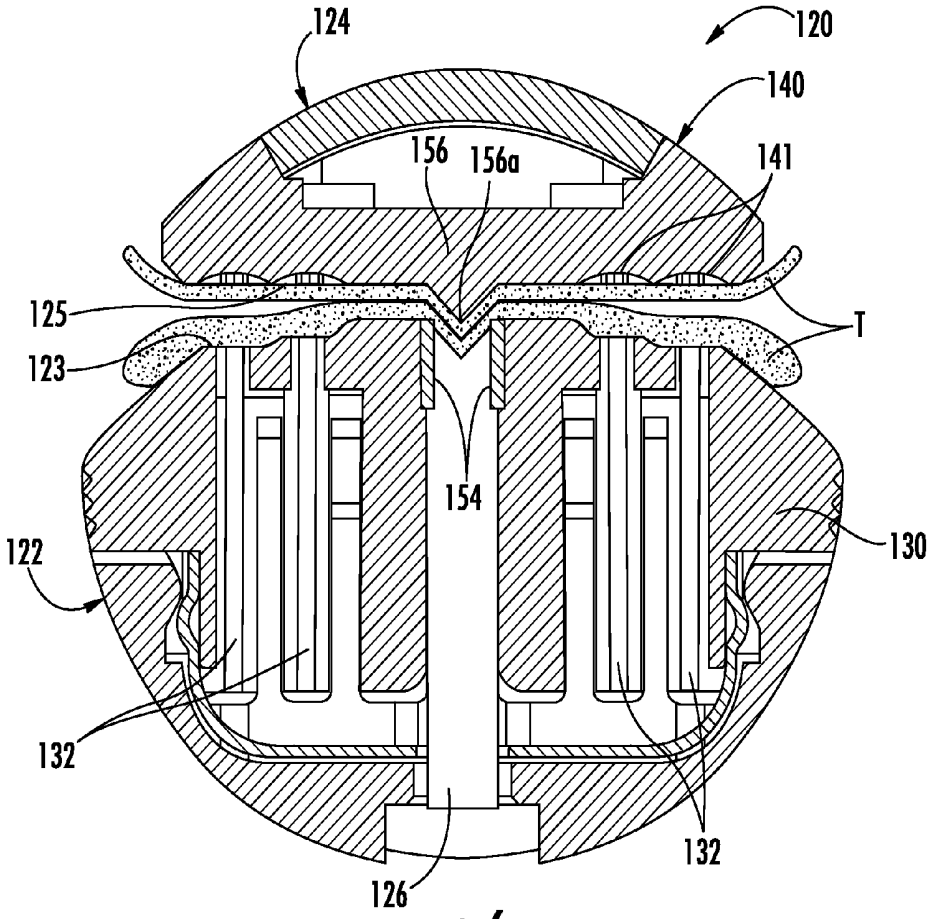


FIG. 6

SURGICAL STAPLING INSTRUMENT HAVING ULTRASONIC ENERGY DELIVERY

BACKGROUND

[0001] 1. Technical Field

[0002] The present disclosure relates generally to surgical stapling instruments. More specifically, the present disclosure relates to stapling instruments including ultrasonic energy delivery.

[0003] 2. Background of Related Art

[0004] Surgical stapling instruments configured to join tissue portions during a surgical procedure are well known. These stapling instruments include linear end effectors which are oriented parallel or transverse to a longitudinal axis of the instrument. These stapling instruments also include circular end effectors.

[0005] Stapling instruments can include a knife that cuts tissue between staple lines. Alternatively, some stapling instruments include ultrasonic blades that cut tissue between the staple lines.

[0006] Surgical buttress material may be used in combination with stapling instruments to reinforce the staple lines to promote proper staple formation, reduce bleeding, and promote anastomosis of tissue.

SUMMARY

[0007] In an aspect of the present disclosure, an end effector includes first and second jaws, first and second buttresses, and an ultrasonic blade. The first jaw includes a fastener cartridge that has a first tissue contacting surface and a plurality of fasteners arranged in rows parallel to a longitudinal axis of the first jaw. The second jaw includes a section tissue contacting surface. The first and second jaws are moveable relative to one another and are configured to grasp tissue therebetween. The first buttress is attached to the first tissue contacting surface. The second buttress is attached to the second tissue contacting surface. The ultrasonic blade is activatable to weld the first buttress to the second buttress and to subsequently cut the welded first and second buttresses and tissue grasped between the first and second jaws.

[0008] In aspects, the ultrasonic blade has a first portion that is disposed on the first tissue contacting surface between two rows of the plurality of fasteners. The ultrasonic blade may have a second portion that is disposed on the second tissue contacting surface opposing the first portion of the ultrasonic blade. The second portion may be parallel to a longitudinal axis of the second jaw.

[0009] In some aspects, the plurality of fasteners are ejectable from the fastener cartridge and are configured to secure the first and second buttresses about tissue grasped between the first and second jaws. The plurality of fasteners may be staples and the second jaw may include an anvil for deforming the staples as the staples are ejected from the fastener cartridge.

[0010] In another aspect of the present disclosure, an end effector includes a first jaw, a second jaw, and an ultrasonic blade. The first jaw includes a fastener cartridge that has a first tissue contacting surface and a plurality of fasteners that are arranged in rows parallel to a longitudinal axis of the first jaw. The fastener cartridge defines a blade channel along its longitudinal axis. The second jaw includes a second tissue contacting surface and a protrusion that opposes the blade channel. The first and second jaws are moveable relative to one another and are configured to grasp tissue therebetween. The ultrasonic blade has first and second portions that are disposed within the blade channel. The first and second portions are each adjacent one of the opposing walls defining the blade channel. The first and second portions define a gap therebetween along the longitudinal axis of the first jaw. The protrusion is disposed within the gap when the first and second jaws are in an approximated configuration.

[0011] In aspects, the end effector includes a first buttress attached to the first tissue contacting surface and a second buttress attached to the second tissue contacting surface. The plurality of fasteners may be staples and the second jaw may include an anvil for deforming the staples as the staples are ejected from the fasteners cartridge.

[0012] In yet another aspect of the present disclosure, a method of dissecting tissue includes clamping tissue between opposing jaws of an end effector, ejecting fasteners from one of the opposing jaws, and activating an ultrasonic blade. Each of the opposing jaws may include a buttress attached to a tissue contacting surface. Ejecting the fasteners from one of the opposing jaws includes ejecting the fasteners through each of the buttresses to fasten the clamped tissue together. The fasteners are disposed in rows parallel to a longitudinal axis of the end effector. The ultrasonic blade is disposed in a blade channel disposed along the longitudinal axis of the end effector. Activating the ultrasonic blade cuts the tissue and welds the buttresses together. Clamping tissue between the opposing jaws of the end effector may include a protrusion on one jaw urging a portion of the tissue into the blade channel of the opposing jaw.

[0013] Further, to the extent consistent, any of the aspects described herein may be used in conjunction with any or all of the other aspects described herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Various aspects of the present disclosure are described hereinbelow with reference to the drawings, which are incorporated in and constitute a part of this specification, wherein:

[0015] FIG. **1**A is a perspective view of a manually actuated handle assembly and a loading unit in accordance with the present disclosure;

[0016] FIG. **1**B is a perspective view of an electromechanical instrument, an adaptor, and the loading unit of FIG. **1**A;

[0017] FIG. **2** is an enlarged view of the indicated area of detail of FIG. **1**A;

[0018] FIG. **3** is a cross-sectional view taken along the section line **3-3** with jaws approximated of FIG. **2**;

[0019] FIG. **4** is a cross-sectional view taken along the section line **4-4** of FIG. **3**;

[0020] FIG. **5** is a side cross-sectional view of tissue joined with the end effector of FIG. **2**; and

[0021] FIG. **6** is a cross-sectional view similar to FIG. **4** of another end effector provided in accordance with the present disclosure.

DETAILED DESCRIPTION OF EMBODIMENTS

[0022] Embodiments of the present disclosure are now described in detail with reference to the drawings in which like reference numerals designate identical or corresponding elements in each of the several views. As used herein, the term "clinician" refers to a doctor, a nurse, or any other care provider and may include support personnel. Throughout this

description, the term "proximal" refers to the portion of the device or component thereof that is closest to the clinician and the term "distal" refers to the portion of the device or component thereof that is farthest from the clinician.

[0023] FIGS. **1**A and **1**B illustrate a loading unit **10** having an end effector **20** in accordance with an embodiment of the present disclosure. The loading unit **10** is configured for connection to a manually actuated handle assembly or stapling instrument **100** such as described in U.S. Pat. No. 8,789,737 ("the '737 patent"), which is incorporated herein by reference. Alternatively, the loading unit **10** can be configured for selective connection to a powered hand held electromechanical instrument **200** via the adaptor **210**. In such an embodiment, the adaptor **210** of the electromechanical instrument **200** may have a configuration similar to that of the elongated body portion **110** of the stapling instrument **100** as shown in FIG. **1**A. The loading unit **10** is releasably coupled to a distal end **112** of the elongated body portion **110** of the manually actuated handle assembly **100** or to a distal end **212** of the adaptor **210** of the electromechanical instrument **200**. The end effector **20** is operatively associated with an ultrasonic generator **300**. As shown in FIG. **1**A, the ultrasonic generator **300** may be external to the stapling instrument (e.g., stapling instrument **100** or electromechanical instrument **200**). Alternatively, as shown in FIG. **1**B, the ultrasonic generator **300** may be incorporated into the stapling instrument (e.g., stapling instrument **100** or electromechanical instrument **200**).

[0024] For a detailed description of the structure and function of an exemplary adaptor and loading unit, please refer to commonly owned U.S. Patent Publication No. 2012/0089131. For a detailed description of the structure and function of an exemplary electromechanical instrument, please refer to commonly owned U.S. Patent Publication Nos. 2012/0253329 and 2012/0323226. For a detailed description of the structure and function of an exemplary ultrasonic generator, please refer to commonly owned U.S. Pat. No. 8,419,758. Each of these disclosures is incorporated herein by reference in its entirety.

[0025] Referring to FIGS. **2** and **3**, the loading unit **10** includes a first or lower jaw **22** and a second or upper jaw **24**. The upper and lower jaws **22**, **24** are moveable relative to one another between a spaced-apart configuration (FIG. **2**) and an approximated configuration (FIG. **3**). The lower jaw **22** includes a fastener cartridge **30** having a plurality of staples **32** arranged in rows **33** on either side of a knife or lower blade channel **26** (FIG. **4**). The fastener cartridge **30** may be releasably coupled to the lower jaw **22**. The upper jaw **24** includes an anvil **40** that is configured to deform the staples **32** into formed staples as the staples **32** are ejected through openings **31** of the fastener cartridge **30** when the jaws **22**, **24** are in the approximated configuration as detailed below.

[0026] Alternatively, the fastener cartridge **30** of the lower jaw **22** may include a plurality of fasteners (not explicitly shown) and the upper jaw **24** may include a retainer cartridge (not shown) that includes a plurality of retainers (not shown). As the fasteners are ejected from the fastener cartridge **30** of the first jaw **22**, each of the fasteners forms a two-part fastener with one of the retainers of the retainer cartridge.

[0027] With additional reference to FIG. **4**, the fastener cartridge **30** and the anvil **40** each include a tissue contacting surface **23**, **25**, respectively. The end effector **20** may include a buttress **50** releasably disposed on each of the tissue contacting surfaces **23**, **25**. The buttress **50** may be fabricated from a suitable biocompatible and bioabsorbable material. The buttress **50** may be fabricated from a non-absorbent material which does not retain fluid, or the buttress can be made from an absorbent material. For a detailed description of suitable materials for surgical buttresses, please refer to commonly owned U.S. Pat. Nos. 5,542,594; 5,908,427; 5,964,774; 6,045,560; 7,823,592; and 7,938,307, and commonly assigned U.S. Patent Publication No. 2010/0092710, the entire contents of each of which is incorporated herein by reference. As detailed below, the buttress **50** detaches from the tissue contacting surfaces **23**, **25** of the fastener cartridge **30** and the anvil **40** when the staples **32** are ejected from the fastener cartridge **30**. As discussed in greater detail below, the buttresses **50** may promote anastomosis, reduce bleeding, provide support for the tissue to facilitate a higher burst pressure, and distribute pressure from the fasteners to a larger area of tissue.

[0028] The anvil **40** defines an upper blade channel **28** that opposes the lower blade channel **26** of the fastener cartridge **30**. An ultrasonic blade **54** is disposed in each of the blade channels **26**, **28**. The ultrasonic blades **54** are operatively associated with an ultrasonic generator **300** (FIG. **1**A). The ultrasonic generator **300** provides ultrasonic energy to the ultrasonic blades **54** to ultrasonically translate the ultrasonic blades **54** within the blade channels **26**, **28**. As detailed below, the ultrasonic blades **54** are configured to cut tissue between the jaws **22**, **24** along a cut line CL (FIG. **4**) in the approximated configuration and to weld the buttress **50** attached to the tissue contacting surface **23** of the lower jaw **22** to buttress **50** attached to the tissue contacting surface **25** of the upper jaw **24**.

[0029] Referring to FIGS. **4** and **5**, the end effector **20** is used to fasten and divide tissue T in accordance with the present disclosure. The jaws **22**, **24** of the end effector **20** are approximated over tissue T to be fastened and divided. With layers of the tissue T positioned between the jaws **22**, **24**, the staples **32** are ejected from the fastener cartridge **30** of the lower jaw **22** towards the anvil **40** of the upper jaw **24**. The staples **32** pass through the buttresses **50** and are formed in staple pockets **41** defined by the anvil **40** such that the staples **32** are disposed on either side of the tissue to urge the buttresses **50** towards one another. The staple pockets **41** deform legs of the staples **32** towards one another such that the staples **32** fasten the layers of tissue T to one another. The buttresses **50** compress the layers of tissue T therebetween to promote anastomosis of the tissue T. The ultrasonic blades **54** are then supplied with ultrasonic energy to cut the layers of tissue T between the ultrasonic blades **54** along the cut line CL. As the ultrasonic blades **54** cut the tissue T between the ultrasonic blades **54**, the ultrasonic blades **54** weld the buttresses **50** together adjacent the central cut line CL. The weld W (FIG. **5**) of the buttresses **50** helps seal the cut portion of the tissue T.

[0030] By welding the buttresses **50** together adjacent the cut line CL of the tissue T, bleeding of the tissue T may be reduced when compared to anastomosis from stapling alone. Further, by stapling through the buttresses **50** adjacent the cut line CL, the ultrasonic blades **54** may be used to cut and seal tissue T having a greater thickness when compared to an ultrasonic dissector alone.

[0031] Referring now to FIG. **6**, another end effector **120** is provided in accordance with the present disclosure. The end effector **120** is similar to the end effector **20** detailed above with like structures represented with similar labels, as such only the differences will be discussed in detail below. A lower jaw **122** includes a fastener cartridge **130** and has a stepped

tissue contacting surface **123**. It is within the scope of this disclosure, that the tissue contacting surface **125** of the anvil **140** may also have a stepped configuration similar to the stepped configuration of the tissue contacting surface **123** of the fastener cartridge **130**. The stepped configuration of the tissue contacting surfaces **123**, **125** compress tissue T between the jaws **122**, **124** in a step like manner which may allow tissue having a greater thickness to be stapled and cut. The fastener cartridge **130** defines a blade channel **126** between rows of fasteners **132**. Two ultrasonic blades **154** are disposed within the blade channel **126** adjacent walls defining the blade channel **126**.

[0032] The tissue contacting surface **125** of the upper jaw **124** includes a protrusion **156** opposing the blade channel **126** of the fastener cartridge **130**. The protrusion **156** extends into the blade channel **126** when the jaws **122**, **124** are in the approximated configuration as shown in FIG. **6**. The protrusion **156** urges the tissue T into the blade channel **126** and may compress the tissue T into the blade channel **126**. As shown, the protrusion **156** has a triangular cross-sectional shape; however, the protrusion **156** may have a variety of shapes that fit within the blade channel **126** of the lower jaw **122** (e.g., semi-circular, rectangular, pentagonal, etc.). When the tissue T is within the blade channel **126**, the fasteners **132** are ejected from the fastener cartridge **130** and the ultrasonic blades **154** are activated to cut and seal the tissue T. The protrusion **156** being received within the blade channel **126** may also align the fastener cartridge **130** and the anvil **140**.

[0033] It is contemplated that the tissue contacting surfaces **123**, **125** of the fastener cartridge **130** and the anvil **140** may include buttresses (not explicitly shown) as detailed above to provide additional support to the tissue T as the tissue is stapled and cut. The buttresses may also be welded together adjacent the cutlines of the ultrasonic blades **154** as detailed above.

[0034] It is also contemplated that the protrusion **156** may include an ultrasonic blade such that after the tissue T is stapled and sealed, the ultrasonic blade of the protrusion **156** is activated to cut the tissue along a tip **156***a* of the protrusion **156**.

[0035] While several embodiments of the disclosure have been shown in the drawings, it is not intended that the disclosure be limited thereto, as it is intended that the disclosure be as broad in scope as the art will allow and that the specification be read likewise. For example, in any of the embodiments disclosed herein, the surgical instrument can include one or more electrosurgical components, such as monopolar or bipolar components for cutting, cauterizing, and/or sealing tissue or buttress material. Any combination of the above embodiments is also envisioned and is within the scope of the appended claims. Therefore, the above description should not be construed as limiting, but merely as exemplifications of particular embodiments. Those skilled in the art will envision other modifications within the scope of the claims appended hereto.

What is claimed:

1. An end effector comprising:

a first jaw including a fastener cartridge having a first tissue contacting surface and a plurality of fasteners arranged in rows parallel to a longitudinal axis of the first jaw;

a first buttress attached to the first tissue contacting surface;

a second jaw including a second tissue contacting surface, the first and second jaws movable relative to one another and configured to grasp tissue therebetween;

a second buttress attached to the second tissue contacting surface; and

an ultrasonic blade activatable to weld the first buttress to the second buttress and to subsequently cut the welded first and second buttresses and tissue grasped between the first and second jaws.

2. The end effector according to claim **1**, wherein the ultrasonic blade has a first portion disposed on the first tissue contacting surface between two rows of the plurality of fasteners.

3. The end effector according to claim **2**, wherein the ultrasonic blade has a second portion disposed on the second tissue contacting surface opposing the first portion of the ultrasonic blade.

4. The end effector according to claim **1**, wherein the ultrasonic blade has a second portion disposed on the second tissue contacting surface parallel to a longitudinal axis of the second jaw.

5. The end effector according to claim **1**, wherein the plurality of fasteners are ejectable from the fastener cartridge and are configured to secure the first and second buttresses about tissue grasped between the first and second jaws.

6. The end effector according to claim **1**, wherein the plurality of fasteners are staples and the second jaw includes an anvil for deforming the staples as the staples are ejected from the fastener cartridge.

7. An end effector comprising:

a first jaw including a fastener cartridge having a first tissue contacting surface and a plurality of fasteners arranged in rows parallel to a longitudinal axis of the first jaw, the fastener cartridge defining a blade channel along its longitudinal axis;

a second jaw including a second tissue contacting surface and a protrusion opposing the blade channel, the first and second jaws movable relative to one another and configured to grasp tissue therebetween; and

an ultrasonic blade having first and second portions disposed within the blade channel, the first and second portions each adjacent one of opposing walls defining the blade channel, the first and second portions defining a gap therebetween along the longitudinal axis of the first jaw, the protrusion disposed within the gap when the first and second jaws are in an approximated configuration.

8. The end effector according to claim **7**, further comprising a first buttress attached to the first tissue contacting surface and a second buttress attached to the second tissue contacting surface.

9. The end effector according to claim **7**, wherein the plurality of fasteners are staples and the second jaw includes an anvil for deforming the staples as the staples are ejected from the fastener cartridge.

10. A method of dissecting tissue, the method comprising:

clamping tissue between opposing jaws of an end effector, each of the opposing jaws having a buttress attached to a tissue contacting surface;

ejecting fasteners from one of the opposing jaws through each of the buttresses to fasten the clamped tissue together, the fasteners disposed in rows parallel to a longitudinal axis of the end effector; and

activating an ultrasonic blade disposed in a blade channel disposed along the longitudinal axis of the end effector to cut the tissue and to weld the buttresses together.

11. The method according to claim **10**, wherein clamping tissue between opposing jaws of the end effector includes a protrusion on one jaw urging a portion of the tissue into the blade channel of the opposing jaw.

* * * * *

专利名称(译)	具有超声能量输送的外科缝合器械		
公开(公告)号	US20160228145A1	公开(公告)日	2016-08-11
申请号	US14/618255	申请日	2015-02-10
[标]申请(专利权)人(译)	柯惠有限合伙公司		
申请(专利权)人(译)	COVIDIEN LP		
当前申请(专利权)人(译)	COVIDIEN LP		
[标]发明人	GLEIMAN SETH CENICCOLA ANTHONY NELSON ANNE CHOWANIEC MATTHEW RACENET DAVID SCHMITT JEFFREY HODGKINSON GERALD SNOW JOSHUA		
发明人	GLEIMAN, SETH CENICCOLA, ANTHONY NELSON, ANNE CHOWANIEC, MATTHEW RACENET, DAVID SCHMITT, JEFFREY HODGKINSON, GERALD SNOW, JOSHUA		
IPC分类号	A61B17/32 A61B17/072		
CPC分类号	A61B17/320092 A61B17/072 A61B2017/07271 A61B2017/07285 A61B2017/07242 A61B17/07207 A61B17/07292 A61B17/320068 A61B17/0643 A61B17/320016 A61B17/3209 A61B2017/07257 A61B2017/320094 A61B2017/320095 A61B2017/320097		
其他公开文献	US10470767		
外部链接	Espacenet USPTO		

摘要(译)

末端执行器包括第一和第二钳口，第一和第二支柱，以及超声刀。第一钳口包括紧固件盒，紧固件盒具有第一组织接触表面和多个紧固件，所述紧固件成行布置成平行于第一钳口的纵向轴线。第一支撑件附接到第一组织接触表面，第二支撑件附接到第二钳口的第二组织收缩表面。第一钳口和第二钳口可相对于彼此移动，并构造成抓住其间的组织。超声波可被激活以将第一支撑件焊接到第二支撑件，并随后切割焊接的第一和第二支撑件以及夹在第一和第二钳口之间的组织。