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(54) Title: SURGICAL STAPLING DEVICE

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(57) Abstract: A surgical stapling device for sequentially applying a plurality of fasteners to body tissue and simultaneously incising tissue is provided. The surgical stapling device is adapted to receive disposable loading units having staples in linear rows whose length can be between about 30mm and 60mm. The disposable loading unit includes a proximal body portion, a mounting assembly and a tool assembly. The mounting assembly is secured to the proximal end of the tool assembly and pivotally mounted about a pivot axis to the distal end of the proximal body portion. A support member or blow-out plate assembly is positioned on opposite sides of the pivot axis and extends between the proximal body portion and the mounting assembly. An axial drive assembly is slidably positioned between the support members and is translatable through the cartridge assembly to eject staples from the cartridge assembly. The support members prevent outward buckling of the axial drive assembly during actuation of the device especially when the tool assembly is articulated. Preferably, a protrusion is provided in the proximal body portion of the disposable loading unit at a position to frictionally engage an articulation link. Engagement between the protrusion and the articulation link retains the articulation link at a fixed position within the proximal body portion to maintain the tool assembly in a desired orientation until a predetermined axial force is applied to the articulation link. The disposable loading unit also preferably includes a locking member which is operably connected to the axial drive assembly. The locking member provides an audible and/or tactile indication that the device has been actuated.

SURGICAL STAPLING DEVICE

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This application claims priority to U.S. Provisional application Serial Nos. 60/327,527 filed October 5, 2001, 60/363,487 filed March 11, 2002 and 60/363,502 filed March 11, 2002. These applications are incorporated herein by reference in their entireties.

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BACKGROUND

1. Technical Field

This application relates to a surgical stapling device for applying staples to tissue. More particularly, this application relates to a surgical stapling device having an articulatable tool member for applying linear rows of staples to tissue and concurrently incising the tissue between the linear rows of staples.

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2. Background of Related Art

Surgical devices for grasping or clamping tissue between opposed jaw structure of a tool assembly and thereafter fastening the clamped tissue are well known in the art. These devices may include a knife for incising the fastened tissue. The fasteners are typically in the form of surgical staples but two part fasteners formed of a material suitable for surgical use are also well known.

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Typically, the tool member includes a staple cartridge which houses a plurality of staples arranged in at least two laterally spaced rows and an anvil which includes a plurality of staple forming pockets for receiving and forming staple legs of the staples as the staples are driven from the cartridge. Generally, the stapling operation is effected by cam bars that travel longitudinally through the staple cartridge, with the cam bars acting upon staple pushers to sequentially eject the staples from the staple cartridge. A knife can travel between the staple rows to longitudinally cut and/or open the stapled tissue between the rows of staples.

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In laparoscopic and/or endoscopic surgical procedures, the surgical procedure is performed through a small incision or through a narrow cannula inserted through a

small entrance wound in a patient. In conventional or open procedures, surgeons directly access an operative site. Because of reduced patient trauma, shortened patient recovery periods and substantial reduction in overall cost, laparoscopic procedures are preferred over open procedures. In order to address the specific needs of endoscopic and/or laparoscopic surgical procedures, endoscopic surgical stapling devices have
5 been developed which provide a surgeon with easier access to the operative site. Typically, these stapling devices include an articulatable tool member which is supported adjacent to the distal end of the stapling device. The tool member can be selectively manipulated to allow a surgeon to manipulate a tool assembly in a confined
10 space. Tyco Healthcare Group, LP has manufactured and marketed articulatable endoscopic stapling instruments such as the MULTIFIRE ENDO GIA *30, MULTIFIRE ENDO GIA 60 and ENDO GIA *Universal for several years. These instruments have provided significant clinical benefits to the field of endoscopic surgery. Nonetheless, improvements in the area of reducing cost and complexity of
15 manufacture are desirable.

In making improvements or modifications to the current instruments, it would be highly desirable not to sacrifice any of the important benefits of the [MULTIFIRE ENDO GIA * 30 and 60] instruments as compared to other commercially available products. For example, any improvement should advantageously provide a fresh knife
20 blade for each firing of the instrument and permit operation of the instrument with multiple size disposable loading units (DLU's).

SUMMARY

In accordance with the present disclosure, a surgical stapling device for
25 sequentially applying a plurality of fasteners to body tissue and simultaneously incising tissue is provided. The surgical stapling device is adapted to receive disposable loading units having linear rows of staples having a length of between about 30mm and 60mm. The disposable loading units include an articulatable tool assembly which can be operated by manipulating an articulation lever located adjacent a handle assembly of
30 the surgical stapling device.

In addition to the handle assembly, the surgical stapling device includes an elongated body defining the longitudinal axis of the device. The elongated body is

operably connected to the handle assembly, for example, by a rotatable collar or knob which is rotatable to effect rotation of the elongated body about the longitudinal axis of the device. The handle assembly includes a movable handle and a stationary handle. The movable handle is movable through an actuation stroke to approximate a cartridge
5 assembly and an anvil assembly, clamp tissue and eject staples from the cartridge assembly of the disposable loading unit.

The disposable loading unit includes a proximal body portion, a mounting assembly and a tool assembly. The mounting assembly is secured to the proximal end of the tool assembly and pivotally mounted about a pivot axis to the distal end of the
10 proximal body portion. A support member or blow-out plate assembly is positioned on opposite sides of the pivot axis and extends between the proximal body portion and the mounting assembly. An axial drive assembly is slidably positioned between the support members and is translatable through the cartridge assembly to eject staples from the cartridge assembly. The support members prevent outward buckling of the
15 axial drive assembly during actuation especially when the tool assembly is articulated.

An articulation link is provided in the proximal body portion of the disposable loading unit. A first end of the articulation link is operably connected to an articulation assembly of the surgical stapling device. A second end of the articulation link is connected to the mounting assembly at a point offset from the pivot axis. The
20 articulation link is movable to pivot the mounting assembly about the pivot axis to articulate the tool assembly. Preferably, a protrusion is provided in the proximal body portion of the disposable loading unit at a position to frictionally engage the articulation link. Engagement between the protrusion and articulation link retains the articulation link at an axially fixed position within the proximal body portion to maintain the tool
25 assembly in a desired orientation until a predetermined axial force is applied to the articulation link. A recess or recesses may be provided on the articulation link at a position to receive the protrusion to selectively retain the tool assembly at a multiplicity of articulated positions. Alternately, recesses may be provided in the proximal body portion of the disposable loading unit and the protrusion may be provided on the
30 articulation link.

The disposable loading unit preferably includes a locking member which is operably connected to the axial drive assembly. The locking member includes one or

more extensions or protrusions which are configured to be received within recesses formed in the proximal body portion of the disposable loading unit. When the drive assembly is actuated to approximate the tool assembly, the protrusions are forced from the recesses to provide an audible and/or tactile indication that the device has been
5 actuated. The locking member also prevents actuation or movement of the drive assembly during shipping.

BRIEF DESCRIPTION OF THE DRAWINGS

Various preferred embodiments of the presently disclosed surgical stapling
10 device are described herein with reference to the drawings:

FIG. 1 is a perspective view of one preferred embodiment of the presently disclosed surgical stapling device;

FIG. 2 is a perspective view of another preferred embodiment of the presently disclosed surgical stapling device;

15 FIG. 3 is a side view of the surgical stapling device shown in FIG. 2;

FIG. 4 is a top view of the surgical stapling device shown in FIG. 2;

FIG. 5 is a perspective view with parts separated of the handle assembly of the surgical stapling device shown in FIG. 2;

FIG. 6 is a front side perspective view of the surgical stapling device shown in
20 FIG. 2 with a housing half section, the rotatable knob, and the outer tube of the elongated body removed;

FIG. 7 is an enlarged side perspective view with portions broken away of the handle assembly of the surgical stapling device shown in FIG. 2 with the housing half section removed;

25 FIG. 8 is an enlarged side view of the handle assembly with portions broken away of the surgical stapling device shown in FIG. 2 with the housing half section removed;

FIG. 9 is a rear side perspective view of the surgical stapling device shown in FIG. 2 with the housing half section, the rotatable knob, and the outer tube of the
30 elongated body of the instrument removed;

FIG. 10 is a side vertical cross sectional view of the surgical stapling device shown in FIG. 2;

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