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Knodel

(54) **STAPLING DEVICE WITH DISTALLY LOCATED HYDRAULIC DRIVE- ROTARY OPERATED SYSTEM AND METHOD**

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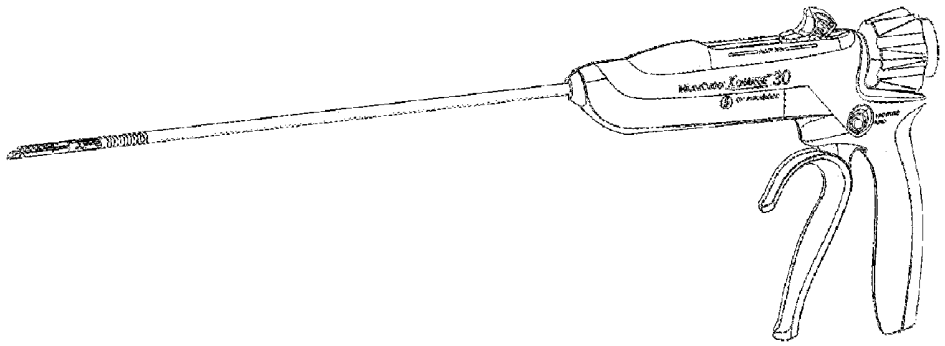
(57) **ABSTRACT**

A surgical stapling device is configured for use in open and/or laparoscopic surgical procedures. The device includes a handle assembly, a shaft assembly coupled to the handle assembly, and an end-effector coupled to the shaft assembly. The end-effector comprises of a jaw assembly configured to clamp, staple, and/or cut a target tissue. The handle assembly comprises of a trigger member that can activate a control member to close the jaw assembly to clamp, staple, and/or cut the target tissue. The end-effector also includes a rotary hydraulic drive system to provide direct drive power next the distal portion of the end-effector to drive the deployment operations, such as deploying staples and cutting tissue.



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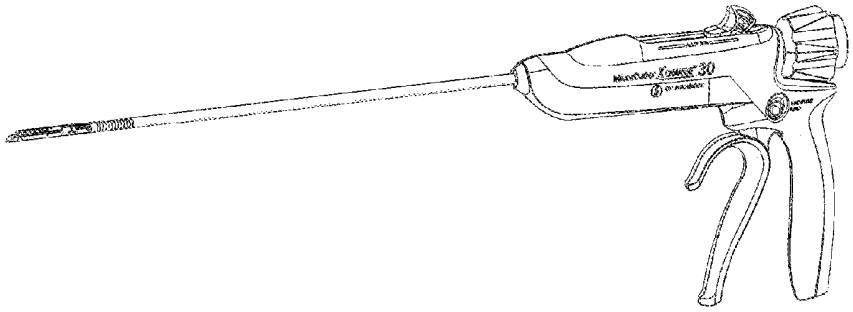

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Figure 1A

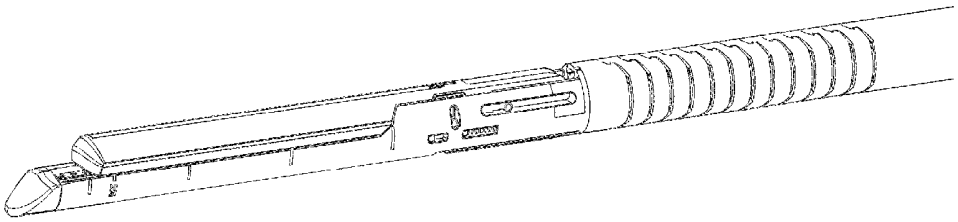

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Figure 1B

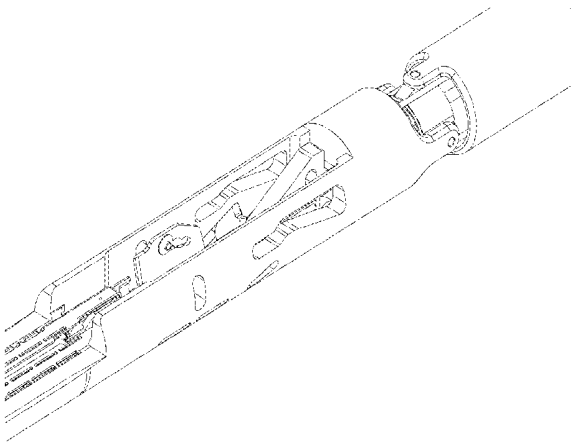

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Figure 1C

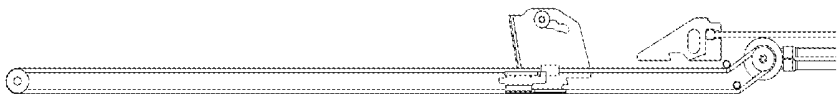

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Figure 1D

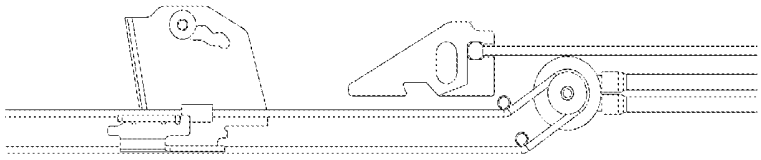

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Figure 2A

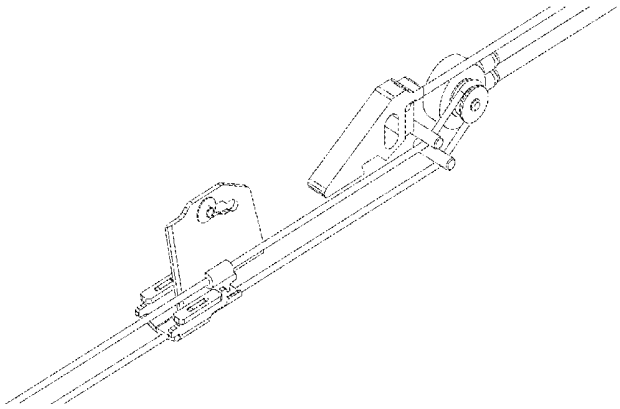

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Figure 2B

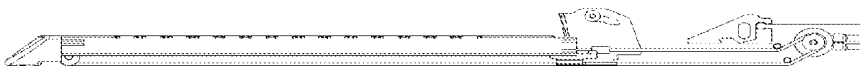

Figure 3A

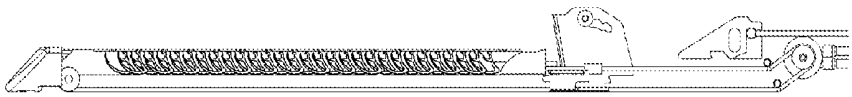

Figure 3B

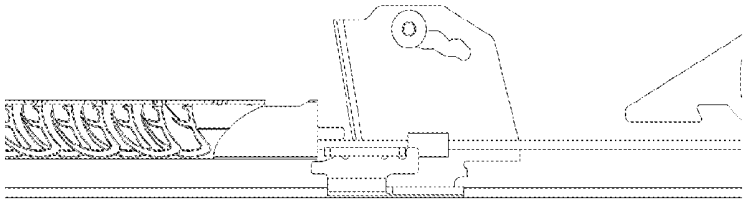

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Figure 4A

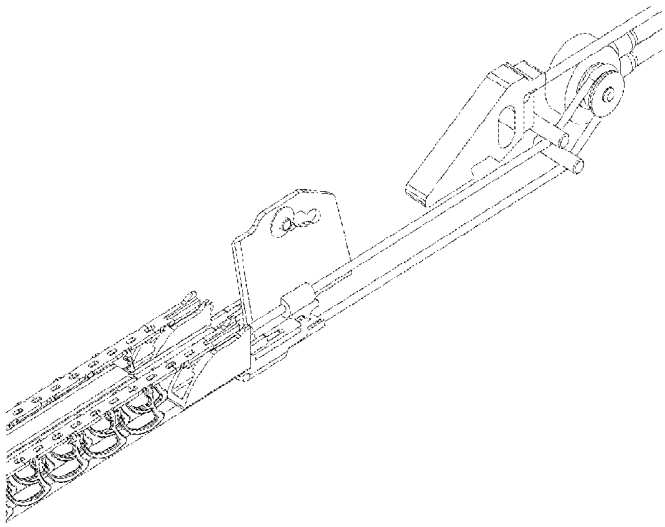

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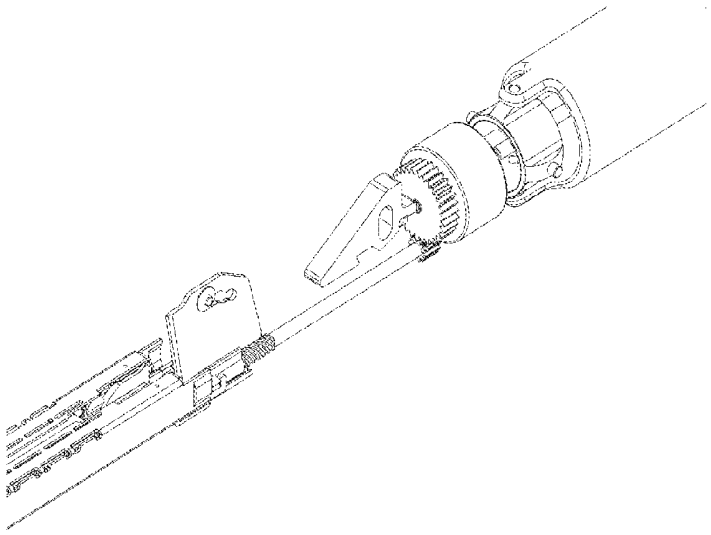
Figure 4B



Distal *Proximal*

Figure 5A

Distal *Proximal*

Figure 5B

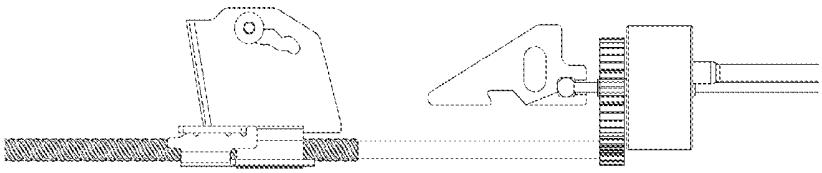


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Figure 6A

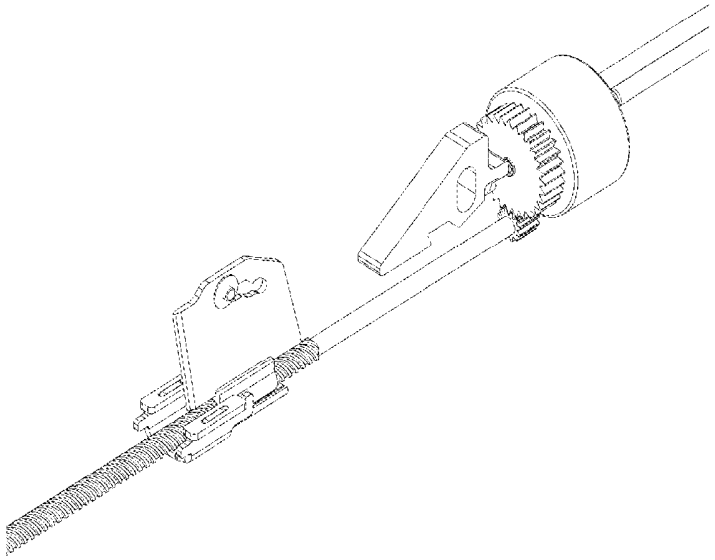

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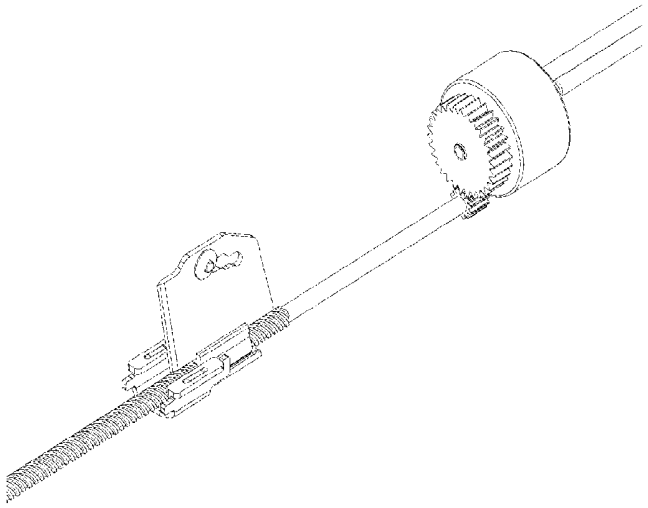
Figure 6B



Distal *Proximal*

Figure 6C

Distal *Proximal*

Figure 6D

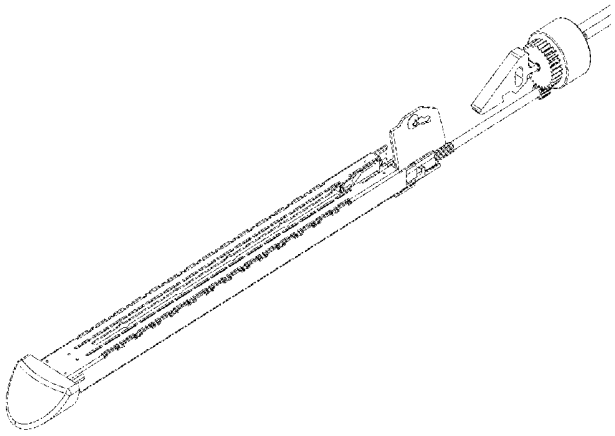


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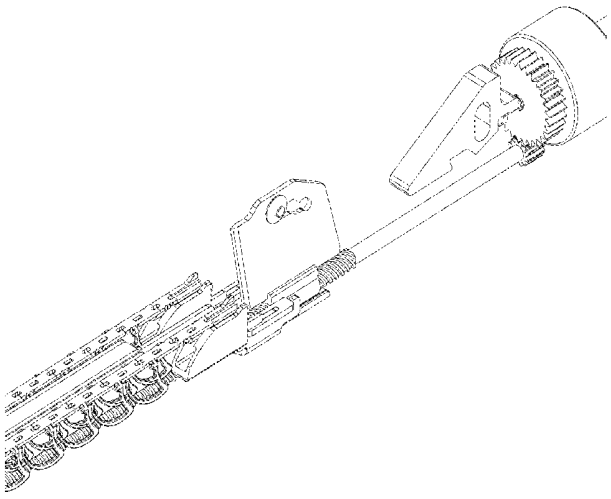
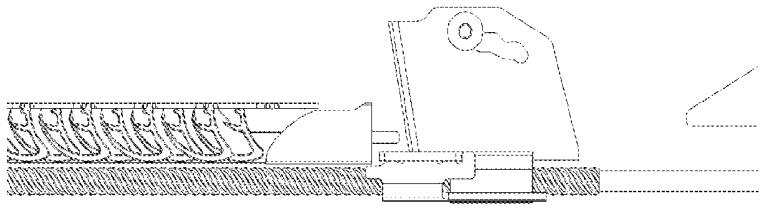
Figure 6E



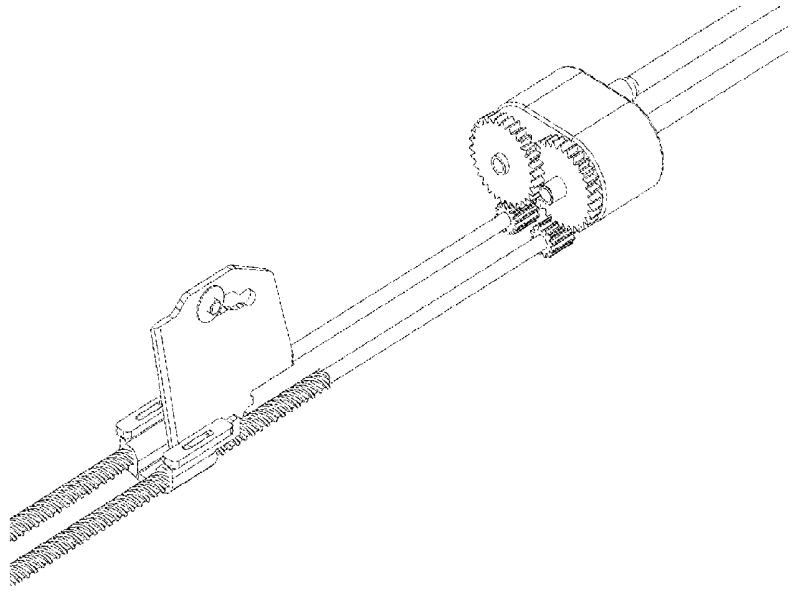
Distal *Proximal*

Figure 6F



Distal *Proximal*

Figure 6G



Distal *Proximal*

Figure 7

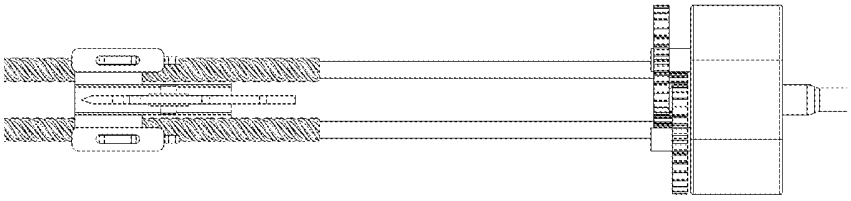


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Figure 8A

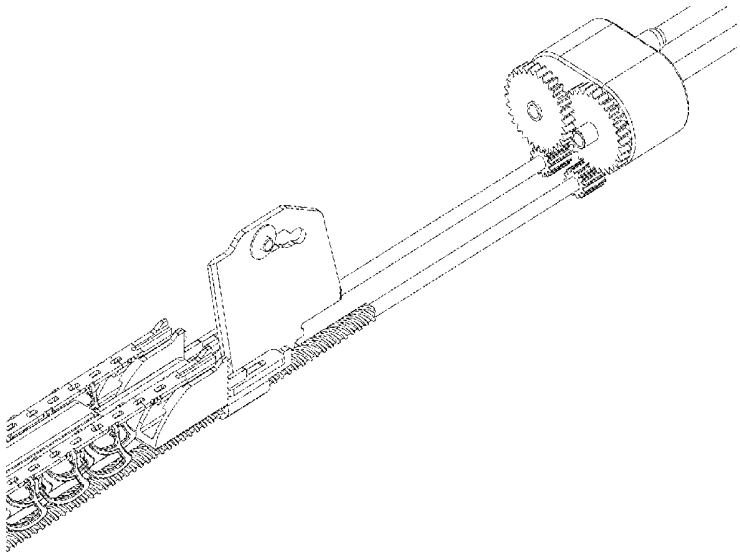

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Figure 8B

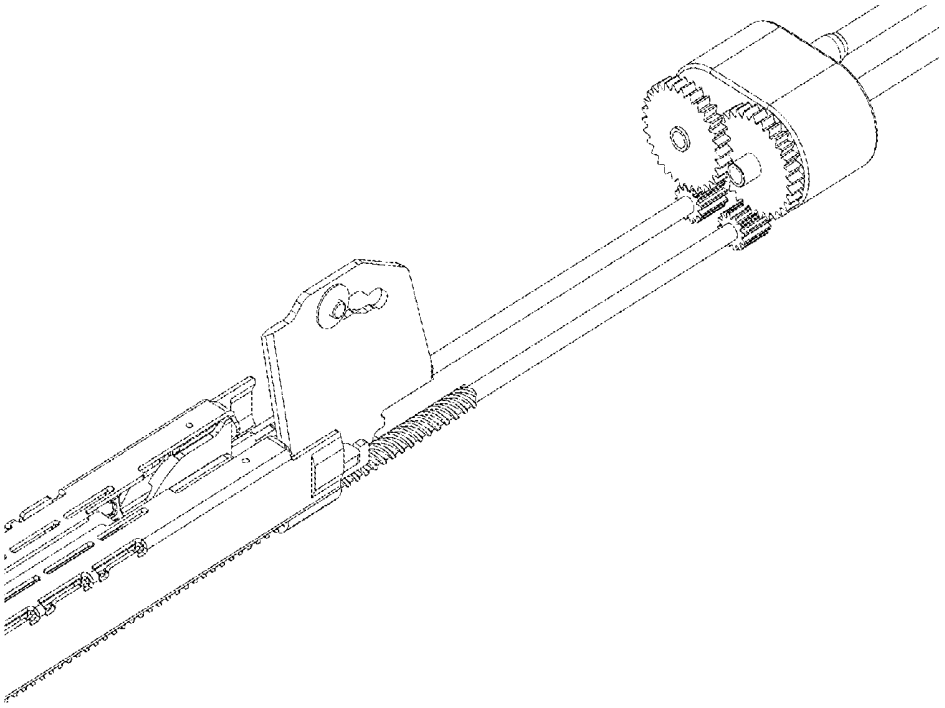

Figure 8C

STAPLING DEVICE WITH DISTALLY LOCATED HYDRAULIC DRIVE- ROTARY OPERATED SYSTEM AND METHOD

FIELD OF THE INVENTION

[0001] This Nonprovisional Application claims priority to Provisional Application No. 62/091,251 filed Dec. 12, 2014.

[0002] The present invention relates generally to surgical devices, and more particularly to surgical stapling or clip applying systems.

BACKGROUND

[0003] Surgical stapling devices, such as endocutters, typically staple and cut tissue to transect that tissue while leaving the cut ends of that tissue hemostatic. More advanced surgical stapling devices typically have end-effectors that are small enough in diameter so that they can be used in minimally invasive surgical procedures where access to a surgical site is obtained through a trocar, port, or small incision in the body of a patient. A typical stapling device holds a disposable single-use cartridge with typically two or more rows of staples, and includes an anvil to oppose the staples as the staples are deployed from the cartridge. During operations, the surgeon inserts the stapling device through an opening in the body (usually using a trocar), orients the end of the stapling device around the tissue to be transected, and compresses the anvil and cartridge together to clamp that tissue. Then, a row or rows of staples are deployed on either side of the transection line, and a blade is advanced along the transection line to cut and/or divide the tissue.

[0004] During actuation of the endocutter, the stapling device fires all of the staples in the single-use disposable cartridge. In order to deploy more staples, the endocutter must be moved away from the surgical site and removed from within the patient. The spent cartridge is removed from the endocutter and replaced by a new cartridge. The endocutter is then reinserted into the patient for further staple deployment.

[0005] Accordingly, it would be desirable to miniaturize the components within the end-effector of the stapling device to allow for greater operability within a small space and ease of operation.

SUMMARY OF THE INVENTION

[0006] A surgical stapling device is configured for use in open and/or laparoscopic surgical procedures. The device includes a handle assembly, a shaft assembly coupled to the handle assembly, and an end-effector coupled to the shaft assembly. The end-effector comprises of a jaw assembly configured to clamp, staple, and/or cut a target tissue. The handle assembly comprises of a trigger member that can activate a clamp control member to close the jaw assembly on the target tissue. The stapling device includes a rotary hydraulic drive system within the end-effector to provide direct driving of a deployment assembly member to deploy staples.

[0007] A surgical stapling device is configured for use in open and/or laparoscopic surgical procedures. The device includes a handle assembly, a shaft assembly coupled to the handle assembly, and an end-effector coupled to the shaft assembly. The end-effector comprises of a jaw assembly configured to clamp, staple, and/or cut a target tissue. The handle assembly comprises of a trigger member that can activate a control member to close the jaw assembly to clamp, staple, and/or cut the target tissue. The end-effector also includes a rotary hydraulic drive system to provide direct drive power next the distal portion of the end-effector to drive the deployment operations, such as deploying staples and cutting tissue.

[0008] The stapling device as described in this disclosure comprises of a shaft member coupled to the end-effector, wherein the shaft member includes a flexible segment to allow articulation of the end-effector. In addition, hydraulic supply lines are routed from within the shaft member to the end-effector to operate the rotary hydraulic drive system within the end-effector.

[0009] The stapling device as described in this disclosure, wherein in some embodiments the rotary hydraulic drive system is disposed within the lower jaw member of the end-effector.

[0010] The stapling device as described in this disclosure, wherein in some embodiments the rotary hydraulic drive system includes a drive power member to operate a drive control member that advances or retracts the deployment assembly member to execute deployment operations or to execute reset operations.

[0011] The stapling device as described in this disclosure, wherein in some embodiments the drive power member is a drive gear or a drive pulley and the drive control member is cable.

[0012] The stapling device as described in this disclosure, wherein in some embodiments the drive power member is a drive gear and the drive control member is screw drive rod.

[0013] The stapling device as described in this disclosure, wherein in some embodiments the hydraulic drive system includes a pair of drive power members, wherein each of the pair of drive power members operates a respective drive control member that advances or retracts a corresponding sub-assembly member of the deployment assembly member to execute deployment operations or to execute reset operations.

[0014] The stapling device as described in this disclosure, in some embodiments the corresponding sub-assembly member comprises of a wedge member configured to deploy staples.

[0015] The stapling device as described in this disclosure, in some embodiments, the hydraulic drive system can selectively drive one or both of the pair of drive power members, such that each of the pair of drive power members can be operated separately or independently.

[0016] The stapling device as described in this disclosure, in some embodiments, each of the pair of the drive power members is a drive gear and the respective drive control member is screw drive rod.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The present invention will be readily understood by the following detailed description, taken in conjunction with accompanying drawings, illustrating by way of examples of the embodiments of the invention. The figures are merely exemplary and not limiting. The objects and elements in the drawings are not necessarily drawn to scale, proportion, precise orientation or positional relationships; instead, emphasis is focused on illustrating the principles of the invention. Descriptive terms such as "upper," "lower," "upward," "downward", "forward", "backward", and the like are intended for the convenience of the reader and refer to the orientation and/or motion of parts as illustrated and described; they do not necessarily limit the orientation or operation of the features, aspects, or embodiments of the invention. The drawings illustrate the design and utility of

various features, aspects, or embodiments of the present invention, in which like element are typically referred to by like reference symbols or numerals. The drawings, however, depict the features, aspects, or embodiments of the invention, and should not be taken as limiting in their scope. With this understanding, the features, aspects, or embodiments of the invention will be described and explained with specificity and details through the use of the accompanying drawings in which:

[0018] FIG. **1**A illustrates an example of a surgical stapling device, in accordance with features, aspects or embodiments of the present invention.

[0019] FIG. **1**B illustrates the distal portion of the surgical stapling device which includes an articulation segment that allows an end-effector of the surgical stapling device to articulate, in accordance with features, aspects or embodiments of the present invention.

[0020] FIG. **1**C illustrates a joint portion or section of the end-effector of the surgical stapling device, wherein the joint portion, as illustrated, is located distally to the articulation segment and proximally to the effector, in accordance with features, aspects or embodiments of the present invention.

[0021] FIG. **1**D illustrates one example of a hydraulic drive system positioned distally to the joint portion or articulation portion and within the end-effector which allows for direct operation of the control elements of the end-effector, in accordance with features, aspects or embodiments of the present invention.

[0022] FIG. **2**A illustrates a close-up (side) view of the hydraulic drive system positioned distally to the joint portion or articulation portion and within the end-effector which allows for direct operation of the control elements of the end-effector, in accordance with features, aspects or embodiments of the present invention.

[0023] FIG. **2**B illustrates a close-up (isometric) view of the hydraulic drive system positioned distally to the joint portion or articulation portion and within the end-effector which allows for direct operation of the control elements of the end-effector, in accordance with features, aspects or embodiments of the present invention.

[0024] FIGS. **3**A and **3**B illustrate the hydraulic drive system that drives the control elements to operate various components in the end-effector of the surgical stapling device, wherein the components include a wedge assembly to deploy staples and a knife member to cut tissue, in accordance with features, aspects or embodiments of the present invention.

[0025] FIG. **4**A illustrates a close-up (side) view of the hydraulic drive system that drives the control elements to operate various components in the end-effector of the surgical stapling device, wherein the components include a wedge assembly to deploy staples and a knife member to cut tissue, in accordance with features, aspects or embodiments of the present invention.

[0026] FIG. **4**B illustrates a close-up (isometric) view of the hydraulic drive system that drives the control elements to operate various components in the end-effector of the surgical stapling device, wherein the components include a wedge assembly to deploy staples and a knife member to cut tissue, in accordance with features, aspects or embodiments of the present invention.

[0027] FIGS. **5**A and **5**B illustrate another example of a hydraulic drive system positioned distally to the joint portion or articulation portion (and within the end-effector of the stapling device) which allows for direct operation of the control elements of the end-effector, in accordance with features, aspects or embodiments of the present invention.

[0028] FIG. **6**A through FIG. **6**G illustrate the close-up views of the hydraulic drive system which drives various control elements to operate various components in the end-effector of the surgical stapling device, wherein the components include a wedge assembly to deploy staples and a knife member to cut tissue, in accordance with features, aspects or embodiments of the present invention.

[0029] FIGS. **7** illustrates yet another example of a hydraulic drive system positioned distally to the joint portion or articulation portion (and within the end-effector of the stapling device) which allows for direct operation of the control elements of the end-effector, in accordance with features, aspects or embodiments of the present invention.

[0030] FIG. **8**A through FIG. **8**C illustrate the close-up views of the hydraulic drive system which drives various control elements to operate various components in the end-effector of the surgical stapling device, wherein the components include a wedge assembly to deploy staples and a knife member to cut tissue, in accordance with features, aspects or embodiments of the present invention.

DETAILED DESCRIPTION

[0031] In the following detailed description, specific details are set forth in order to provide a thorough understanding of the present invention. However, it will be readily understood by those skilled in the art that the present invention may be practiced without these specific details. Alternatively, some of the well-known parts, components, hardware, methods of operations, and procedures may not be described in detail or elaborated so as to avoid obscuring the present invention; but, nevertheless, they are within the spirit and scope of the present invention.

[0032] As mentioned, surgical stapling devices, such as endocutters, typically staple and cut tissue to transect that tissue while leaving the cut ends of that tissue hemostatic. More advanced surgical stapling devices typically have end-effectors that are small enough in diameter so that they can be used in minimally invasive surgical procedures where access to a surgical site is obtained through a trocar, port, or small incision in the body of a patient. A typical stapling device holds a disposable single-use cartridge with several rows of staples, and includes an anvil to oppose the staples as the staples are deployed from the cartridge. During operations, the surgeon inserts the stapling device through an opening in the body (typically using a trocar), orients the end of the stapling device around the tissue to be transected, and compresses the anvil and cartridge together to clamp that tissue. Then, a row or rows of staples are deployed on either side of the transection line, and a blade is advanced along the transection line to divide the tissue.

[0033] As can be appreciated, it would be highly desirable to develop and implement miniaturized mechanisms and features that can drive or operate various functions of a surgical stapling device. Towards that end, this disclosure describes a stapling device with a distally located hydraulic drive system in accordance with features, aspects or embodiments of the present invention.

[0034] By way of example, FIG. **1**A illustrates a surgical stapling device **100** in accordance with features, aspects and embodiments of the present invention. As illustrated, the surgical stapling device **100** includes a body portion **102**, a handle portion **104**, a trigger member **106**, a shaft member

108, and an end-effector **110**. FIG. **1**B illustrates a close up view of the distal portion of the shaft member **108** along with the end-effector **110**. As can be seen, the distal portion of the shaft member **108** may include a flexible segment or flexible region such that the shaft member **108** may be articulated. In some embodiments, the shaft member **108** may include a flexible section (as illustrated), and in some embodiments, the shaft member **108** may be a substantially rigid shaft. Further illustrated in FIG. **1**B, the end-effector **110** may include jaw members such as an anvil member **204** and a staple holder channel member **206**. The staple holder channel member **206** may be configured to hold a staple cartridge **208**. The staple cartridge **208** may include staples and a cutting member for stapling and cutting tissue(s). FIG. **1**C illustrates a joint portion or section **210** of the end-effector of the surgical stapling device, wherein the joint portion **210**, as illustrated, is located distally to the articulation segment and proximally to the effector. The joint **210** may be a separate component joining, coupling or connecting the shaft member **108** and the end-effector **110**. Alternatively, the joint **210** may not be a separate component integral to the shaft member **108** and the end-effector **110**. The joint member **210** may be a substantially flexible joint connecting the shaft member **108** and the end-effector **110**. FIG. **1**D illustrates an example of an embodiment of a rotary hydraulic drive system **140** positioned distally to the joint portion or articulation portion and within the end-effector which allows for direct operation of the control elements of the end-effector, in accordance with features, aspects or embodiments of the present invention. The rotary hydraulic drive system **140** is housed or located distally of the joint portion **210** and near the proximal portion of the end-effector **110**. The hydraulic drive system **140** is configured to provide the necessary driving force to operate the deployment operations of the staple device **100**. The hydraulic drive system **140** as contained within the end-effector is configured to provide "direct drive input" for deployment operations of the stapling device. Such direct drive input provided by the hydraulic drive system enhances mechanical output advantages. In other words, the features, aspects, and embodiments of the present invention implements a "direct drive" system right near the very tip of the end-effector **110**, where deployment operations are executed, to provide increased efficient operating or driving force necessary to performance various deployment operations of the stapling device **100**.

[0035] FIG. **2**A illustrates a close-up (side) view of the rotary hydraulic drive system **140** positioned distally to the joint portion or articulation portion **210** and within the end-effector **110** which allows for direct operation of the control elements of the end-effector **110**. For example, the rotary hydraulic drive system **140** includes input and output hydraulic lines **212** that operate a hydraulic rotary gear or pulley **214** which drives a control element **216**, such as a deployment cable. The deployment cable **216** advances or retracts a deployment slide **218**. As will be illustrated and discussed in more detail, the deployment slide **218** may be coupled to a staple deployment member and a tissue cutting member (e.g., a staple deployment wedge, a tissue cutting knife, or other similar instruments), such that the deployment cable **216** operatively controls the deployment of staples and cutting of tissue for the stapling device **100**. Since the rotary system **140** is located within the end-effector **110**, the mechanical advantage of operation is highly efficient as compared to other conventional power supply systems for operating the deployment components of the stapling device. Also illustrated in FIG. **2**A is a control member **202** which may be configured to operate the jaw members, e.g., anvil member **204** and staple holder channel **206**. FIG. **2**B illustrates a close-up (isometric) view of the hydraulic drive system **140** positioned distally to the joint portion or articulation portion **210** and within the end-effector **110** which allows for direct operation of the control elements of the end-effector **110**, e.g., staple deployment and tissue cutting members of the stapling device.

[0036] FIG. **3**A and FIG. **3**B illustrate the rotary hydraulic drive system **140** that drives the control element **216** to operate various components in the end-effector **110** of the surgical stapling device **100**, wherein the components may include a deployment slide **218**, a wedge assembly **302** to deploy staples **306** in the staple cartridge **208** and a knife member **304** to cut tissue. FIG. **3**A illustrates an enclosed staple cartridge **208**. In contrast, FIG. **3**B illustrates an exposed staple cartridge **208** with the enclosed staples **306** visible. In addition, the wedge assembly **302** is also visible in this exposed view.

[0037] FIG. **4**A illustrates a close-up (side) view of the hydraulic drive system **140** that drives the control elements **216** and **218** to operate various components **302** and **304** in the end-effector **110** of the surgical stapling device, wherein the components include a wedge assembly **302** to deploy staples **306** and a knife member **304** to cut tissue. FIG. **4**B illustrates a close-up (isometric) view of the hydraulic drive system **140** that drives the control elements (e.g., deployment cable **216** and deployment slide **218**) to operate various components (e.g., wedge assembly **302** and cutting member **304**) in the end-effector **110** of the surgical stapling device, wherein the components include a wedge assembly **302** to deploy staples **306** and a knife member **304** to cut tissue.

[0038] FIG. **5**A and FIG. **5**B illustrate another example of a hydraulic drive system **500** positioned distally to the joint portion or articulation portion **210** (and within the end-effector **110** of the stapling device) which allows for direct operation of the control elements of the end-effector. As illustrated in **5**A, the hydraulic drive system **500** may be comprises of a hydraulic-turbo drive member **502** (e.g., gear, pulley and the like) to operate a drive rod (e.g., a rod screw) **504**. The drive rod **504** or rod screw member is coupled to a deployment slide member **506**, which is configured to "ride" on the rod screw member **504**. When the rod screw member **504** is turned in a first direction by the hydraulic-turbo drive member **502**, the deployment slide member **506** may ride forward or advance forward (e.g., distally). When the rod screw member **504** is turned in a second direction by the hydraulic-turbo drive member **502**, the deployment slide member **506** may ride backward or retreat backward (e.g., proximally). In a forward deployment mode, the deployment slide member **506** may advance the wedge assembly member **302** and the cutting member **304** to deploy staples **306** in the staple cartridge **208**. In a retreat mode, the deployment slide member **506** may retract the wedge assembly member **302** and the cutting member **304** back to a reset position. FIG. **5**B illustrates a side view of the hydraulic drive system **500** positioned distally to the joint portion or articulation portion **210** (and within the end-effector **110** of the stapling device).

[0039] FIG. **6**A through FIG. **6**G illustrate the close-up views of the hydraulic drive system **500** which drives various control elements, e.g., **502**, **504** and **506**, to operate various components, e.g., **302** and **304** in the end-effector **110** of the surgical stapling device **100**, wherein the components include a wedge assembly **302** to deploy staples **306** and a knife member **304** to cut tissue, in accordance with features,

aspects or embodiments of the present invention. For example, FIG. **6**A illustrates a close-up side view of the hydraulic drive system **500** which drives various control elements, e.g., **502**, **504** and **506**, to operate various components, e.g., **302** and **304** in the end-effector **110** of the surgical stapling device **100**, wherein the components include a wedge assembly **302** to deploy staples **306** and a knife member **304** to cut tissue. FIG. **6**B illustrates a close-up perspective view of the hydraulic drive system **500** which drives various control elements, e.g., **502**, **504** and **506**, to operate various components, e.g., **302** and **304** in the end-effector **110** of the surgical stapling device **100**, wherein the components include a wedge assembly **302** to deploy staples **306** and a knife member **304** to cut tissue. FIG. **6**C illustrates another close-up perspective view of the hydraulic drive system **500** which drives various control elements, e.g., **502**, **504** and **506**, to operate various components, e.g., **302** and **304** in the end-effector **110** of the surgical stapling device **100**, wherein the components include a wedge assembly **302** to deploy staples **306** and a knife member **304** to cut tissue. FIG. **6**D illustrates a side-view of the hydraulic drive system **500** which drives various control elements, e.g., **502**, **504** and **506**, to operate various components, e.g., **302** and **304** in the end-effector **110** of the surgical stapling device **100**, wherein the components include a wedge assembly **302** to deploy staples **306** and a knife member **304** to cut tissue. FIG. **6**E illustrates a perspective view with a staple cartridge **208** along with the hydraulic drive system **500** which drives various control elements, e.g., **502**, **504** and **506**, to operate various components, e.g., **302** and **304** in the end-effector **110** of the surgical stapling device **100**, wherein the components include a wedge assembly **302** to deploy staples **306** and a knife member **304** to cut tissue. FIG. **6**F illustrates a perspective view with an exposed staple cartridge **208** along with the hydraulic drive system **500** which drives various control elements, e.g., **502**, **504** and **506**, to operate various components, e.g., **302** and **304** in the end-effector **110** of the surgical stapling device **100**, wherein the components include a wedge assembly **302** to deploy staples **306** and a knife member **304** to cut tissue. FIG. **6**G illustrates a close-up side view with an exposed staple cartridge **208** along with the hydraulic drive system **500** which drives various control elements, e.g., **502**, **504** and **506**, to operate various components, e.g., **302** and **304** in the end-effector **110** of the surgical stapling device **100**, wherein the components include a wedge assembly **302** to deploy staples **306** and a knife member **304** to cut tissue.

[0040] FIG. **7** illustrates yet another example of a hydraulic drive system **700** with dual-hydraulic turbo drive members **702** (e.g., gear, pulley and the like) positioned distally to the joint portion or articulation portion **210** (and within the end-effector **110** of the stapling device **100**) which allows for direct dual and independent operation of the control elements of the end-effector, in accordance with features, aspects or embodiments of the present invention. As illustrated, the hydraulic drive system **700** operates two hydraulic turbo drive members **702**, which each of the turbo drive members **702** may separately and independently operate a deployment control member **504** (such as a direct drive screw rod). Each of the deployment control members **504** may separately and independently operate a deployment slide member **706** to separately and independently advance or retract respective staple deployment wedge member and cutting member to deploy respective staples and cut respective portion or section of target tissue.

[0041] FIG. **8**A through FIG. **8**C illustrate the close-up views of the hydraulic drive system **700** the dual control elements, e.g., **702**, **504** and **706**, to operate various components, e.g., **302** and **304**, in the end-effector **110** of the surgical stapling device **100**, wherein the components include a wedge assembly to deploy staples and a knife member to cut tissue, in accordance with features, aspects or embodiments of the present invention. For example, FIG. **8**A illustrates a close-up top view of the hydraulic drive system **700** with dual-hydraulic turbo drive members **702** positioned distally to the joint portion or articulation portion **210** (and within the end-effector **110** of the stapling device **100**) which allows for direct dual and independent operation of the control elements of the end-effector. FIG. **8**B illustrates a close-up perspective view of the hydraulic drive system **700** with dual-hydraulic turbo drive members **702** positioned distally to the joint portion or articulation portion **210** (and within the end-effector **110** of the stapling device **100**), with an exposed view of the staple cartridge **208**, which allows for direct dual and independent operation of the control elements of the end-effector. FIG. **8**C illustrates a close-up perspective view of the hydraulic drive system **700** with dual-hydraulic turbo drive members **702** positioned distally to the joint portion or articulation portion **210** (and within the end-effector **110** of the stapling device **100**), with an unexposed view of the staple cartridge **208**, which allows for direct dual and independent operation of the control elements of the end-effector.

[0042] Multiple features, aspects, and embodiments of the invention have been disclosed and described by the illustrated figures. Many combinations and permutations of the disclosed invention may be useful in operating a surgical stapling device, and the invention may be configured to support various surgical procedures. One of ordinary skill in the art having the benefit of this disclosure would appreciate that the foregoing illustrated and described features, aspects, and embodiments of the invention may be modified or altered, and it should be understood that the invention generally, as well as the specific features, aspects, and embodiments described herein, are not limited to the particular forms or methods disclosed, but also cover all modifications, equivalents and alternatives. Further, the various features and aspects of the illustrated embodiments may be incorporated into other embodiments, even if not so described herein, as will be apparent to those ordinary skilled in the art having the benefit of this disclosure.

[0043] Although particular features, aspects, and embodiments of the present invention have been illustrated and described, it should be understood that the above disclosure is not intended to limit the present invention to these features, aspects, and embodiments. It will be obvious to those skilled in the art that various changes and modifications may be made without departing from the spirit and scope of the present invention. Thus, the present invention is intended to cover alternatives, modifications, and equivalents that may fall within the spirit and scope of the following claims and their equivalents.

What is claimed:

1. A stapling device, comprising:

an end-effector with an upper jaw member and a lower jaw member;

a deployment assembly member within the end-effector for deploying staples; and

a rotary hydraulic drive system disposed within the end-effector to provide direct driving of the deployment assembly to deploy the staples.

2. The stapling device of claim **1** further comprising a shaft member coupled to the end-effector, wherein the shaft member includes a flexible segment to allow articulation of the end-effector,

wherein hydraulic supply lines are routed from within the shaft member to the end-effector to operate the rotary hydraulic drive system within the end-effector.

3. The stapling device of claim **1**, wherein the rotary hydraulic drive system is disposed within the lower jaw member of the end-effector.

4. The stapling device of claim **1**, wherein the hydraulic drive system includes a drive power member to operate a drive control member that advances or retracts the deployment assembly member to execute deployment operations or to execute reset operations.

5. The stapling device of claim **4**, wherein the drive power member is a drive gear or a drive pulley, and

wherein the drive control member is cable.

6. The stapling device of claim **4**, wherein the drive power member is a drive gear, and

wherein the drive control member is screw drive rod.

7. The stapling device of claim **1**, wherein the hydraulic drive system includes a pair of drive power members, wherein each of the pair of drive power members operates a respective drive control member that advances or retracts a corresponding sub-assembly member of the deployment assembly member to execute deployment operations or to execute reset operations.

8. The stapling device of claim **7**, wherein the corresponding sub-assembly member comprises of a wedge member configured to deploy staples.

9. The stapling device of claim **7**, wherein the hydraulic drive system can selectively drive one or both of the pair of drive power members, such that each of the pair of drive power members can be operated separately or independently.

10. The stapling device of claim **7**, wherein each of the pair of the drive power members is a drive gear, and

wherein the respective drive control member is screw drive rod.

* * * * *

专利名称(译)	具有远侧定位的液压驱动的装订装置 - 旋转操作系统和方法		
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[标]申请(专利权)人(译)	CARDICA		
申请(专利权)人(译)	CARDICA INC.		
当前申请(专利权)人(译)	AESCULAP AG		
[标]发明人	KNODEL BRYAN D		
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摘要(译)

外科缝合装置构造成用于开放式和/或腹腔镜外科手术中。该装置包括手柄组件，连接到手柄组件的轴组件，以及连接到轴组件的末端执行器。末端执行器包括钳口组件，钳口组件构造成夹紧，缝合和/或切割目标组织。手柄组件包括触发器构件，该触发器构件可以激活控制构件以闭合钳口组件以夹紧，缝合和/或切割目标组织。末端执行器还包括旋转液压驱动系统，以在末端执行器的远端部分旁边提供直接驱动动力，以驱动展开操作，例如展开钉和切割组织。