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(54) **POWERED STAPLING DEVICE WITH MANUAL RETRACTION**

(71) Applicant: **Covidien LP**, Mansfield, MA (US)

(72) Inventors: **Xingrui Chen**, Glastonbury, CT (US); **David Chowaniec**, Rocky Hill, CT (US)

(73) Assignee: **Covidien LP**, Mansfield, MA (US)

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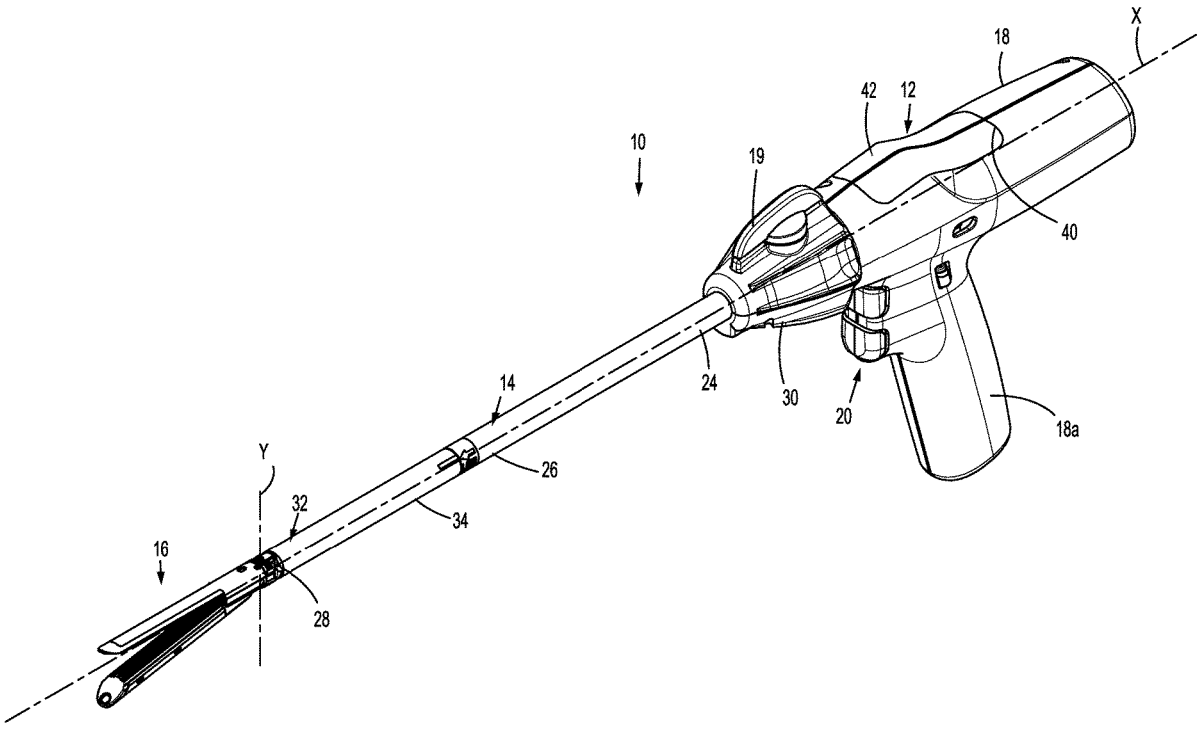
CPC ***A61B 17/0686*** (2013.01); ***A61B 17/00234*** (2013.01); *A61B 2017/00296* (2013.01); *A61B 2017/00367* (2013.01)

(57) **ABSTRACT**

A powered handle assembly includes a motor assembly, a rack, a spur gear, and a manual retract mechanism. The spur gear is movable from a position engaged with the motor assembly and the rack to a positioned disengaged from the motor assembly and engaged with the rack to facilitate manual retraction of the rack.



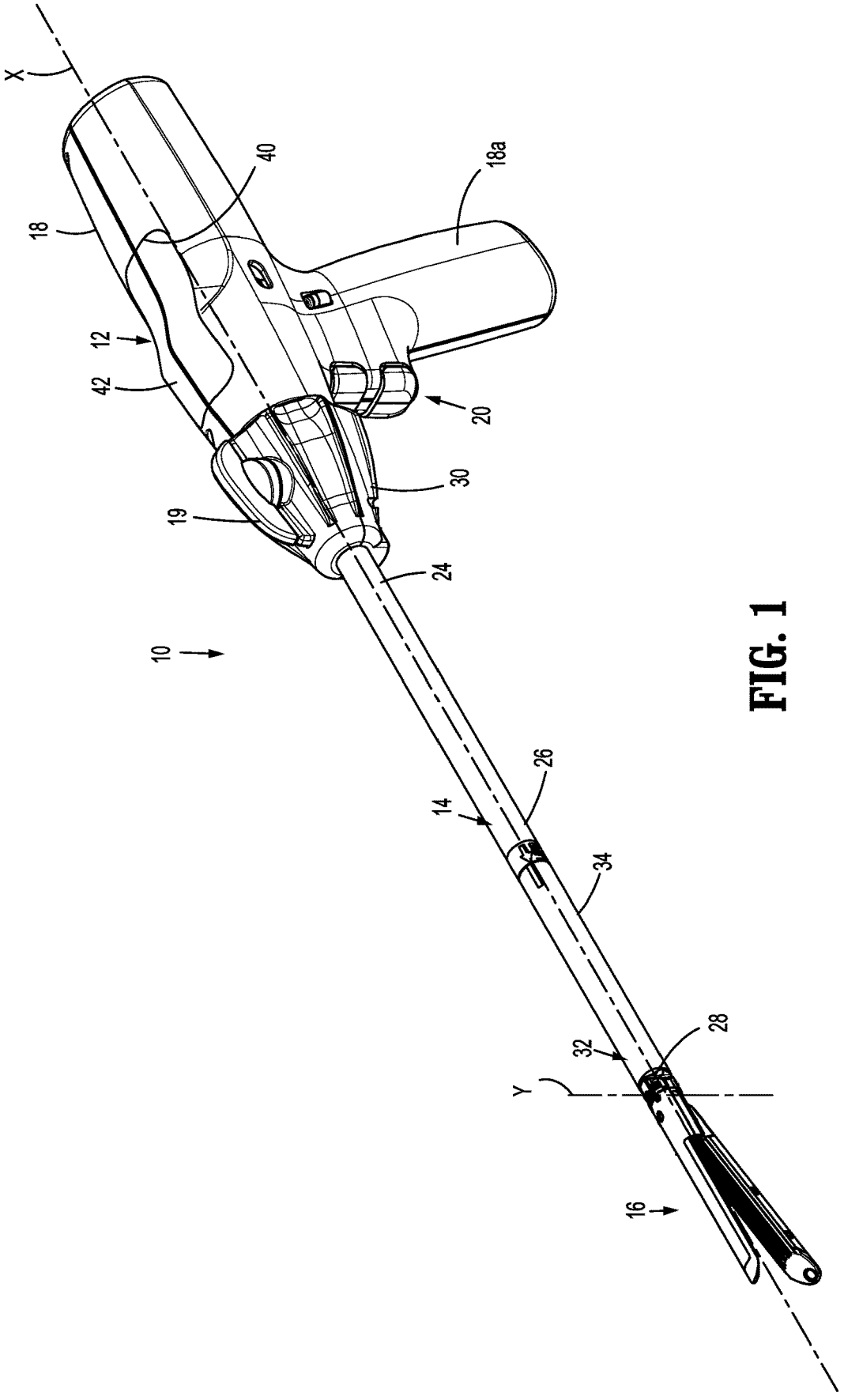


FIG. 1

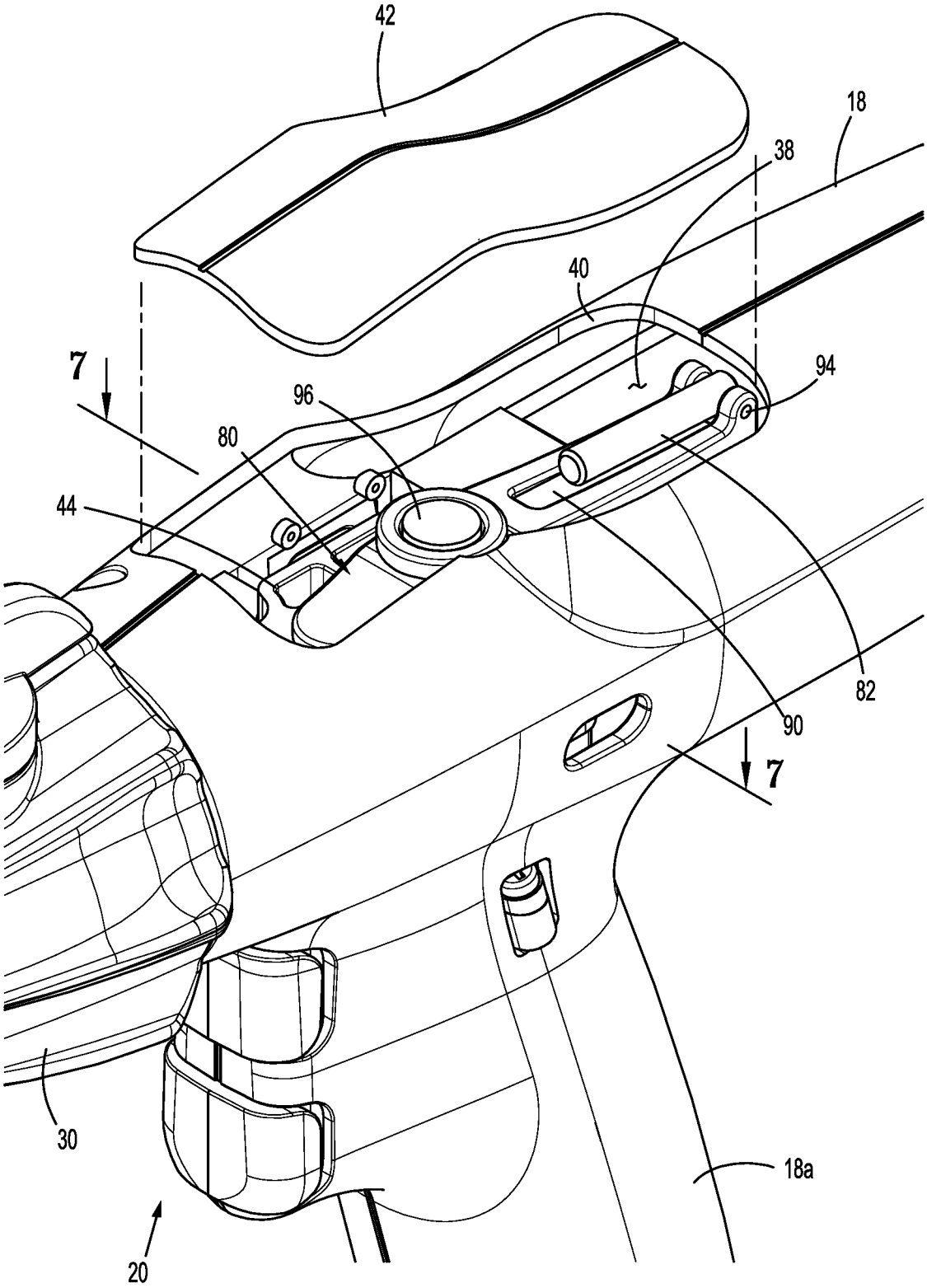


FIG. 2

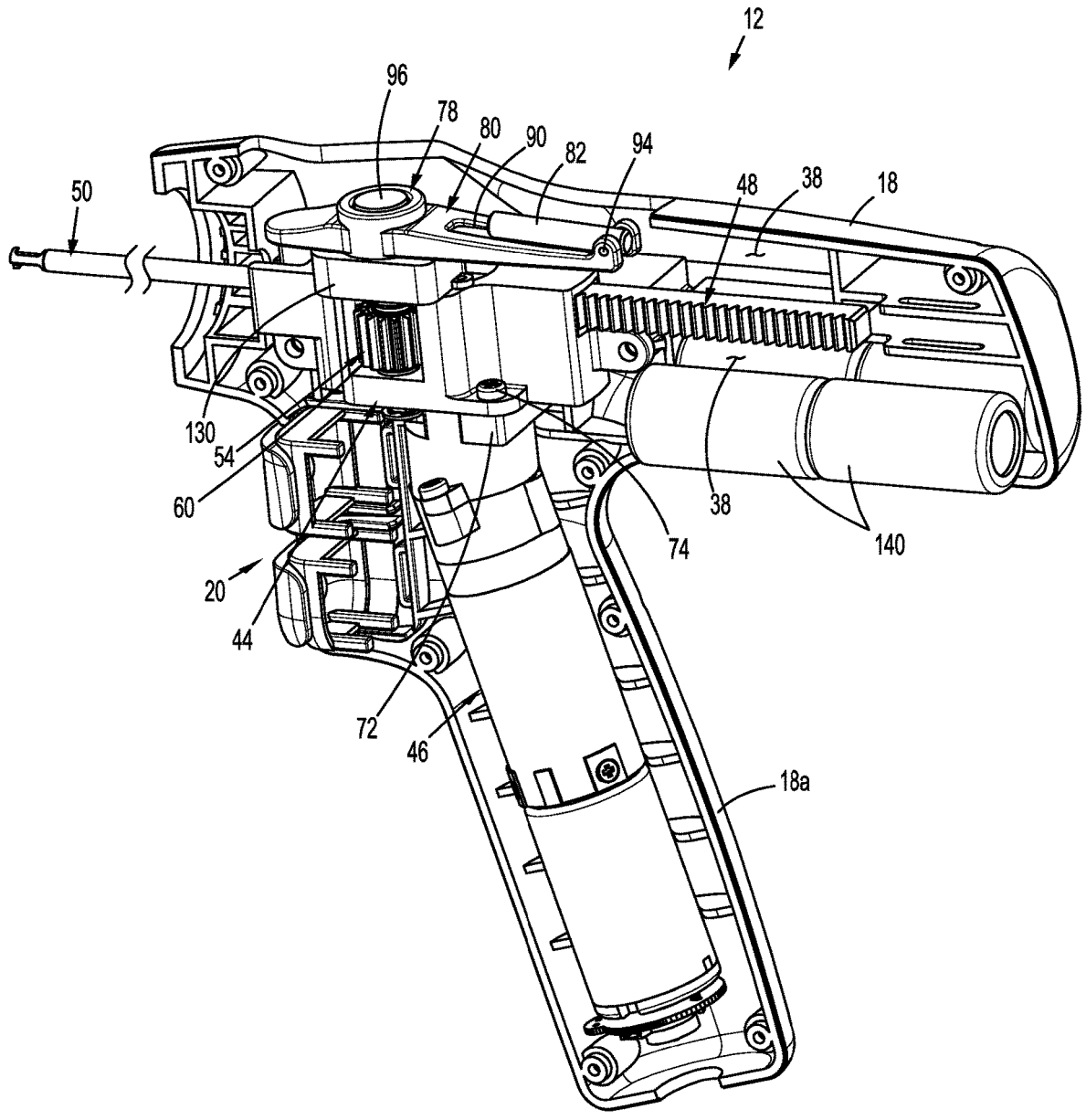


FIG. 3

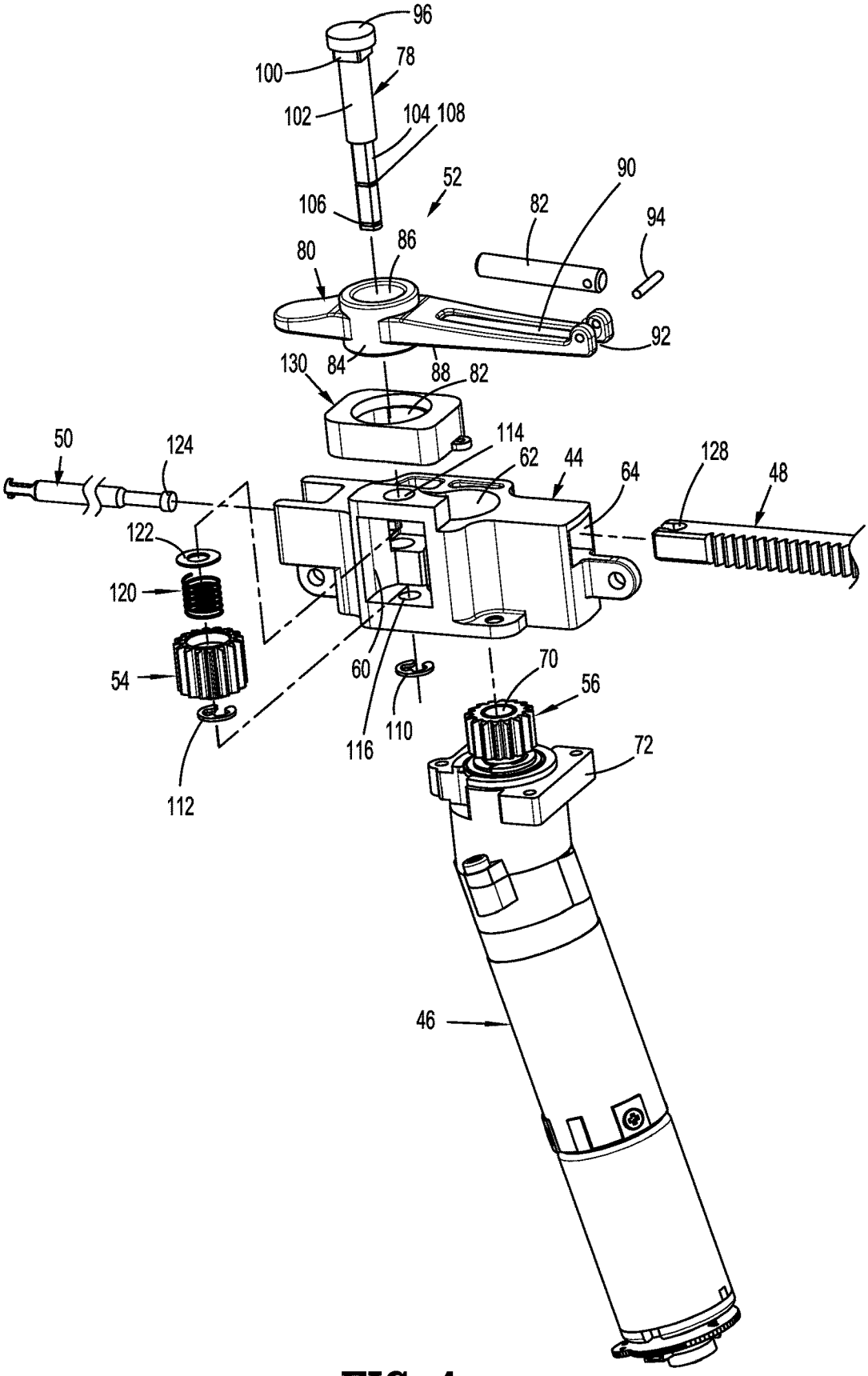

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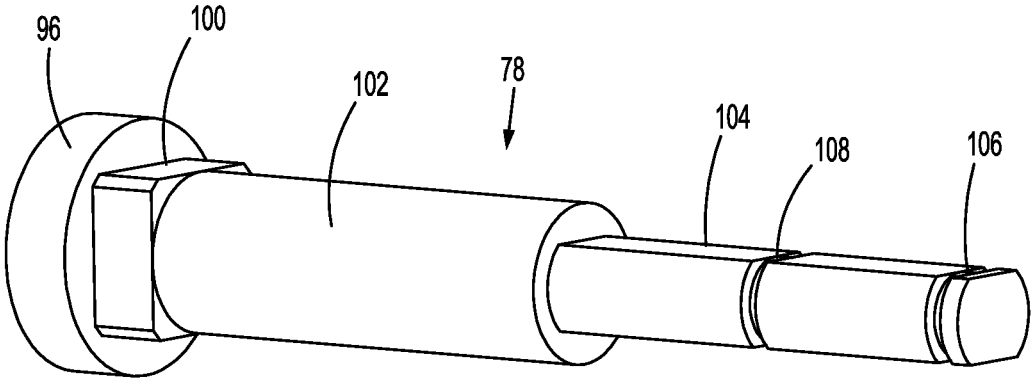
FIG. 4



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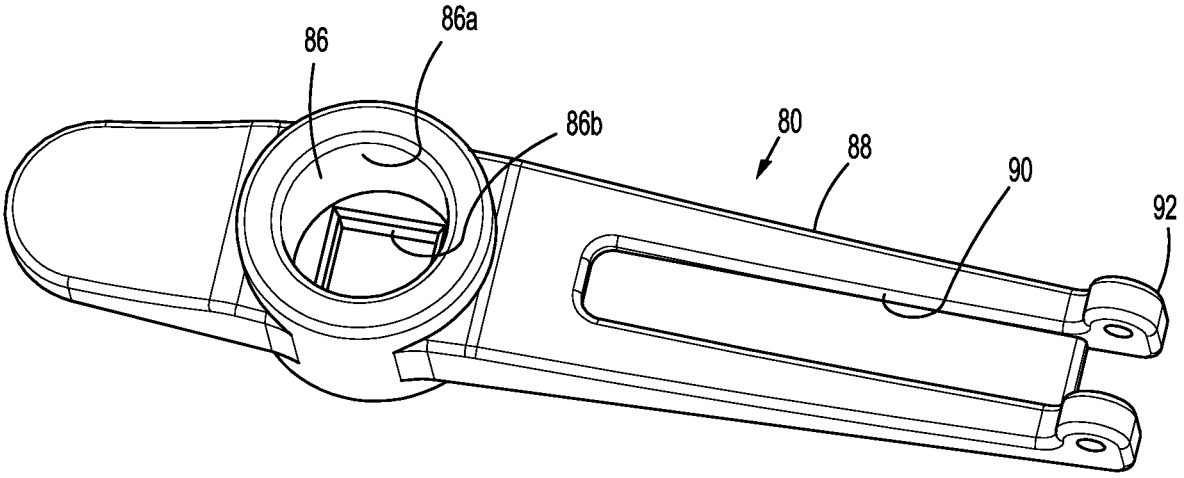

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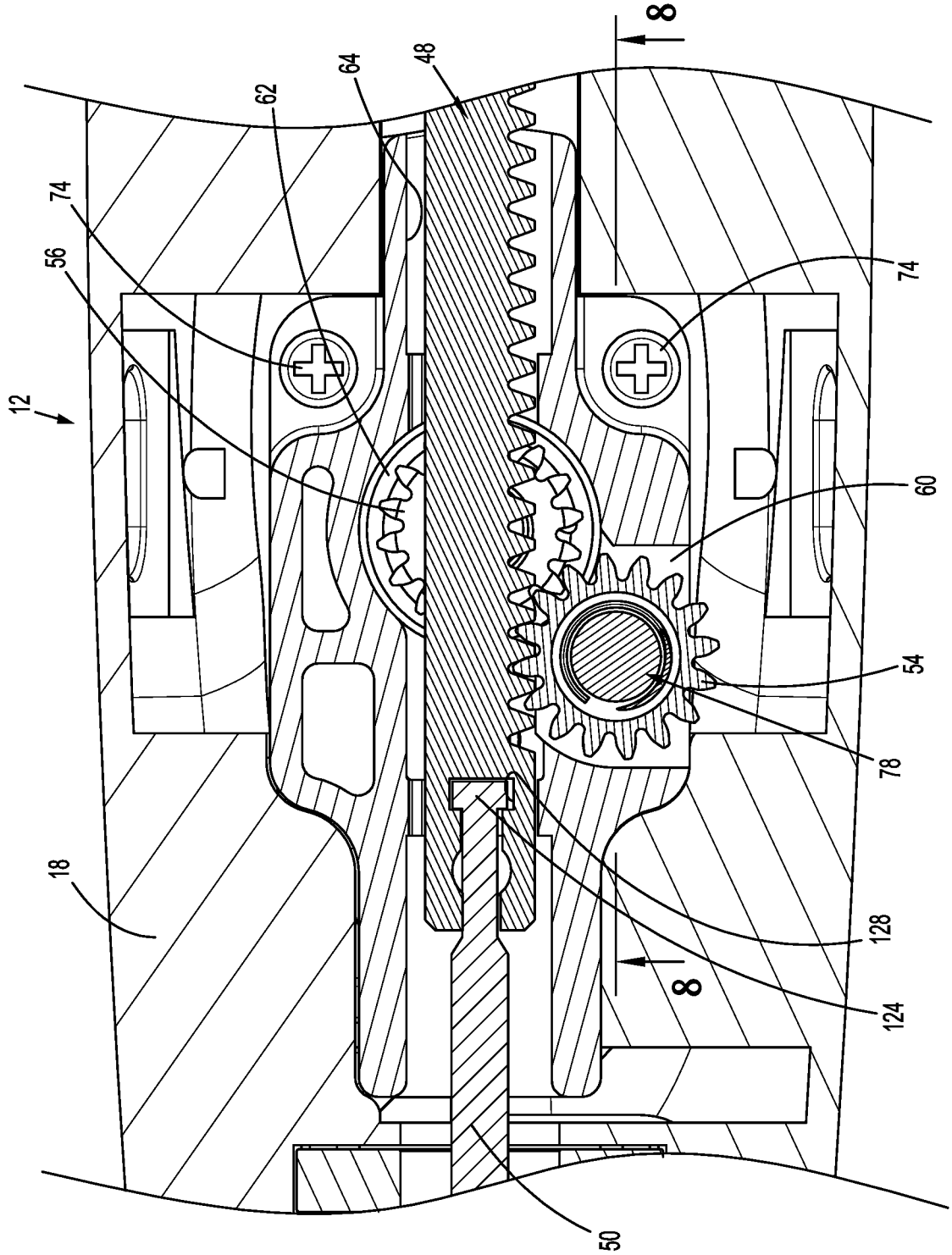

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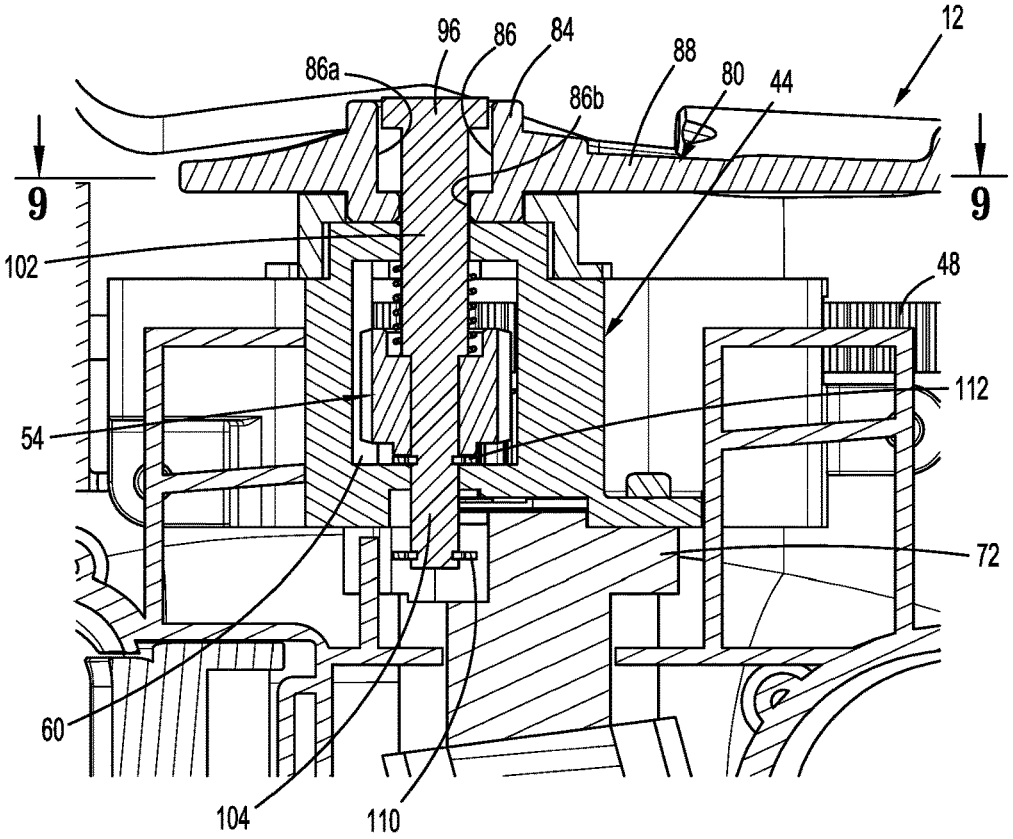
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FIG. 8

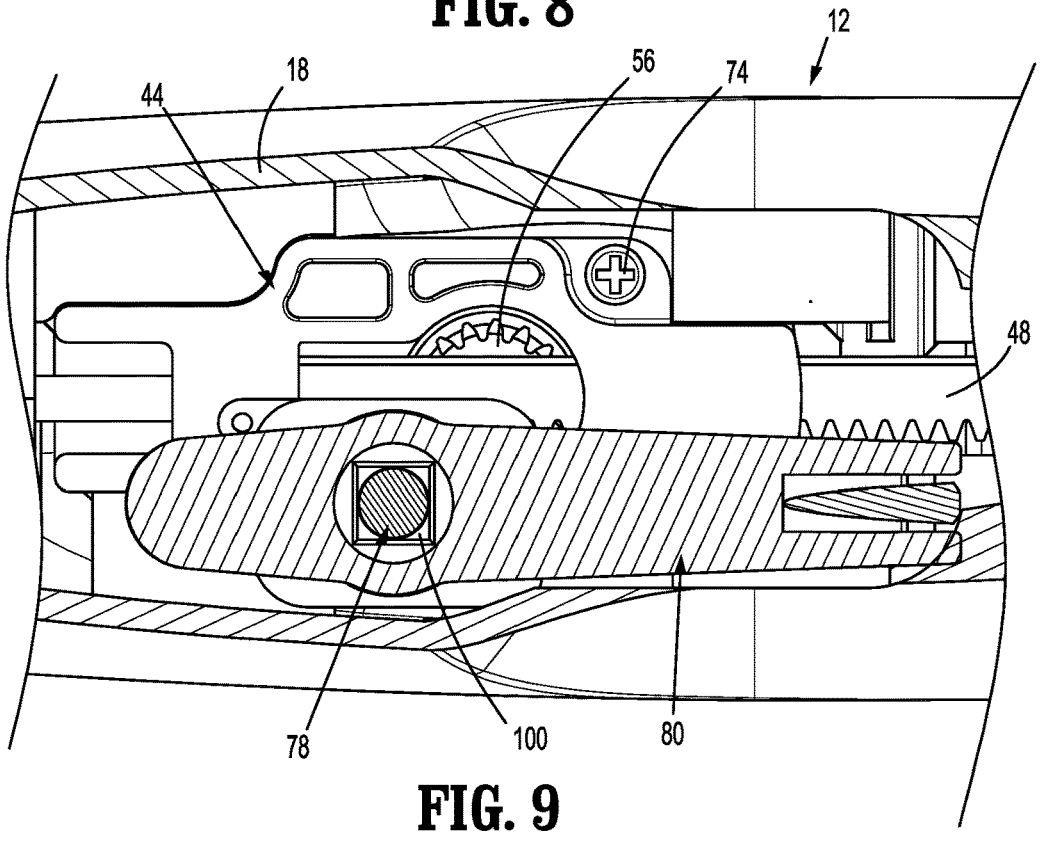
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FIG. 9

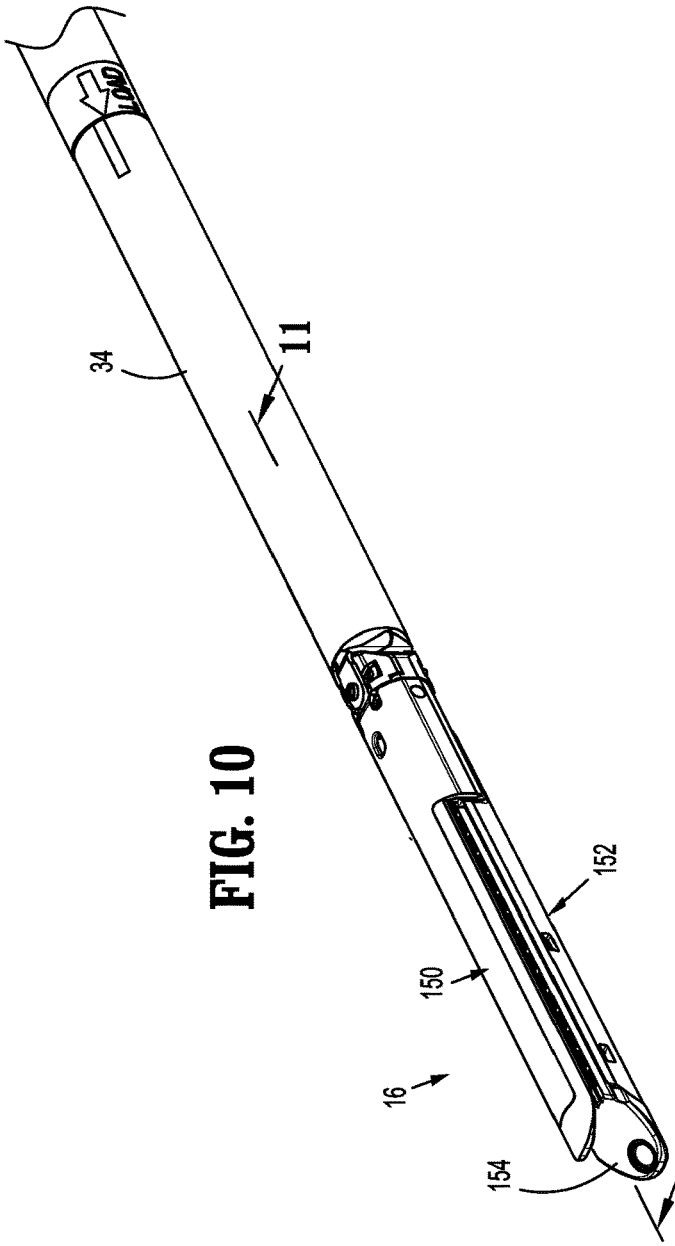
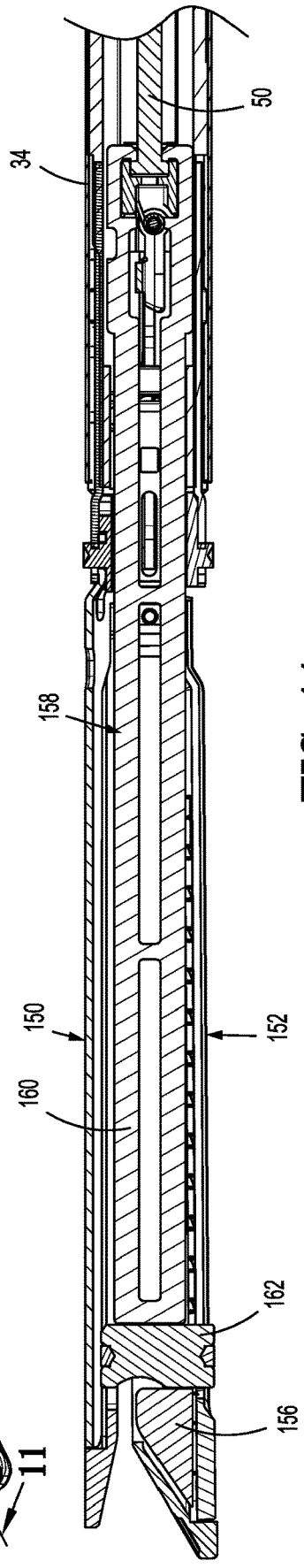


FIG. 10



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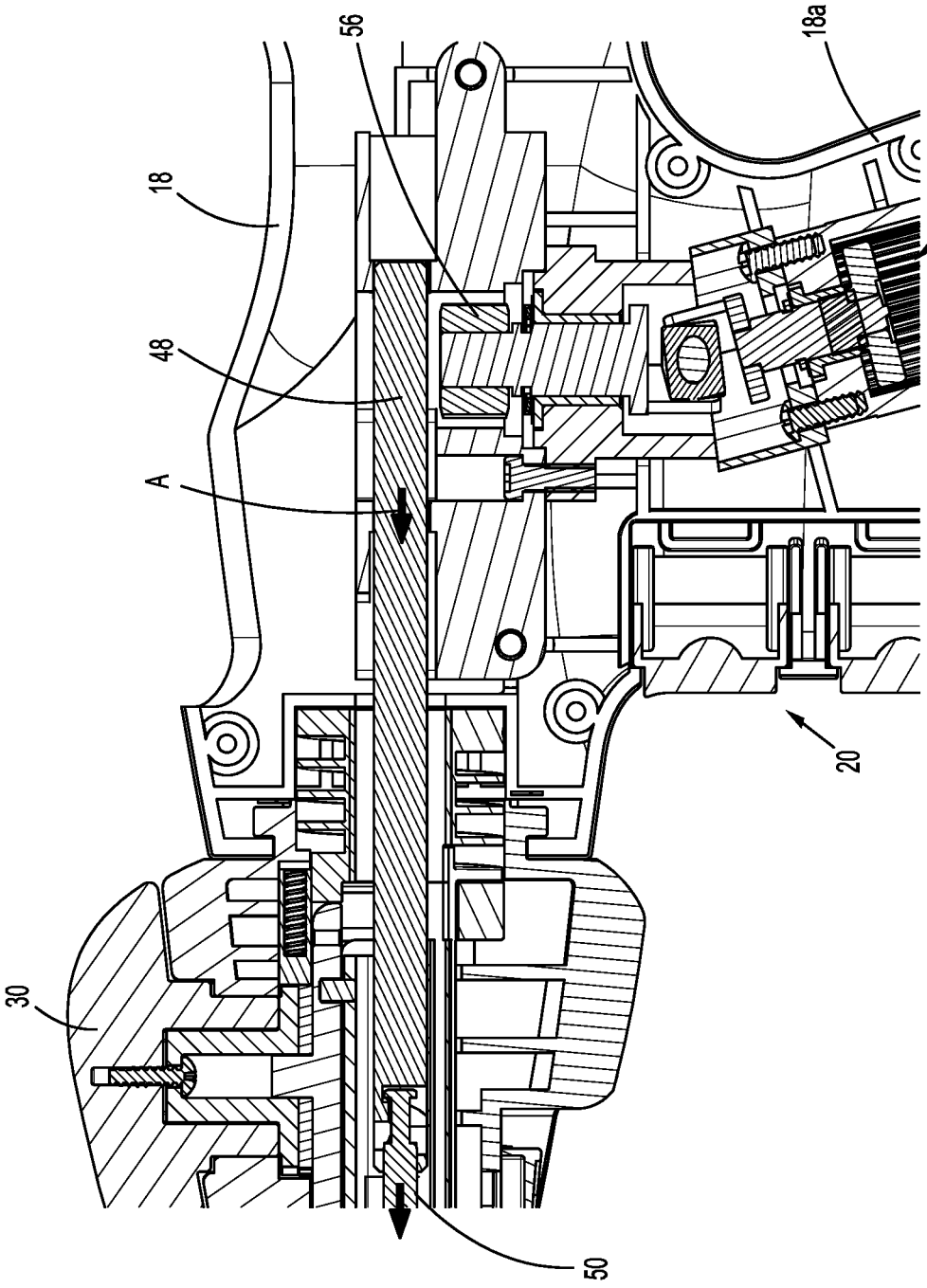

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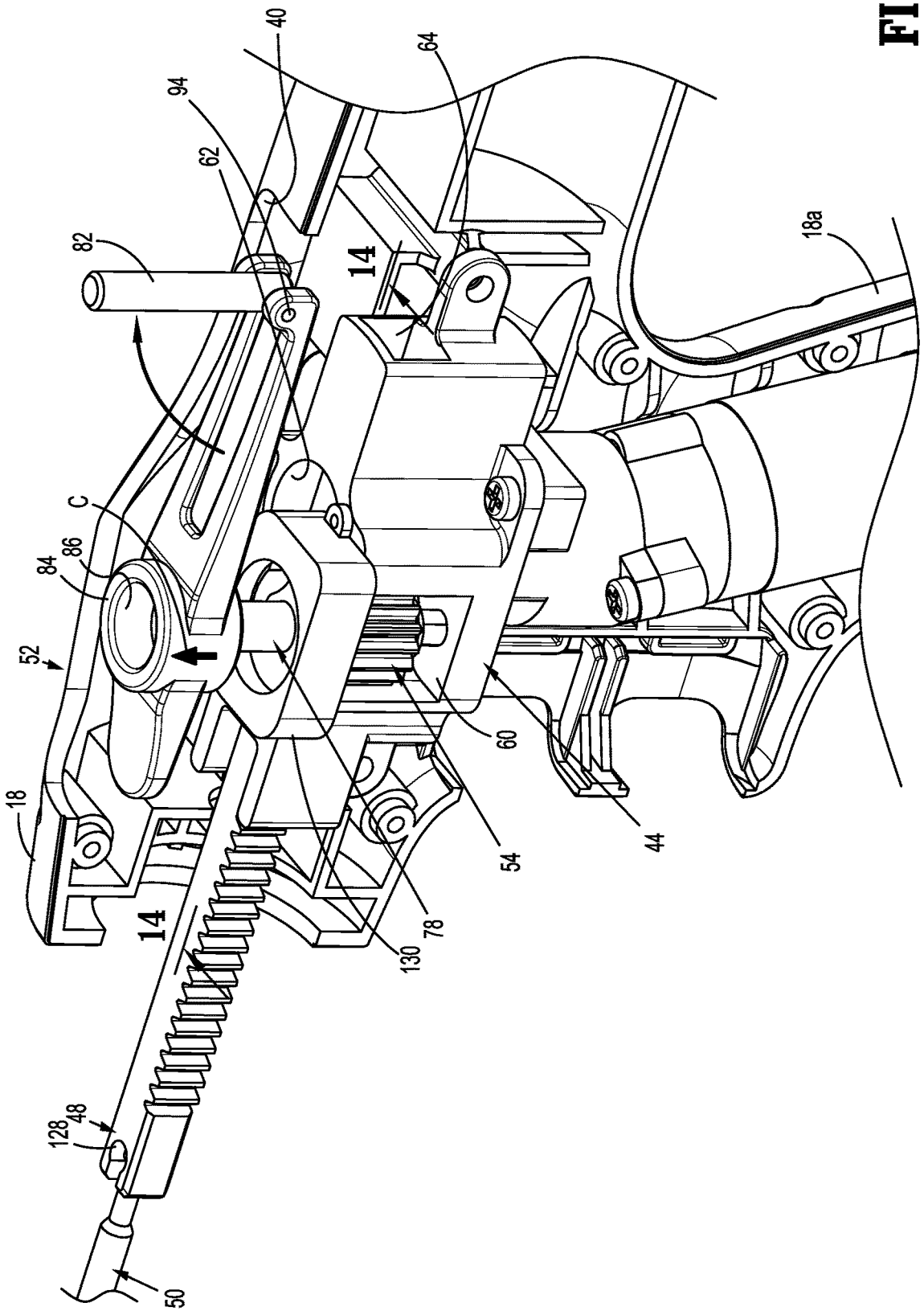

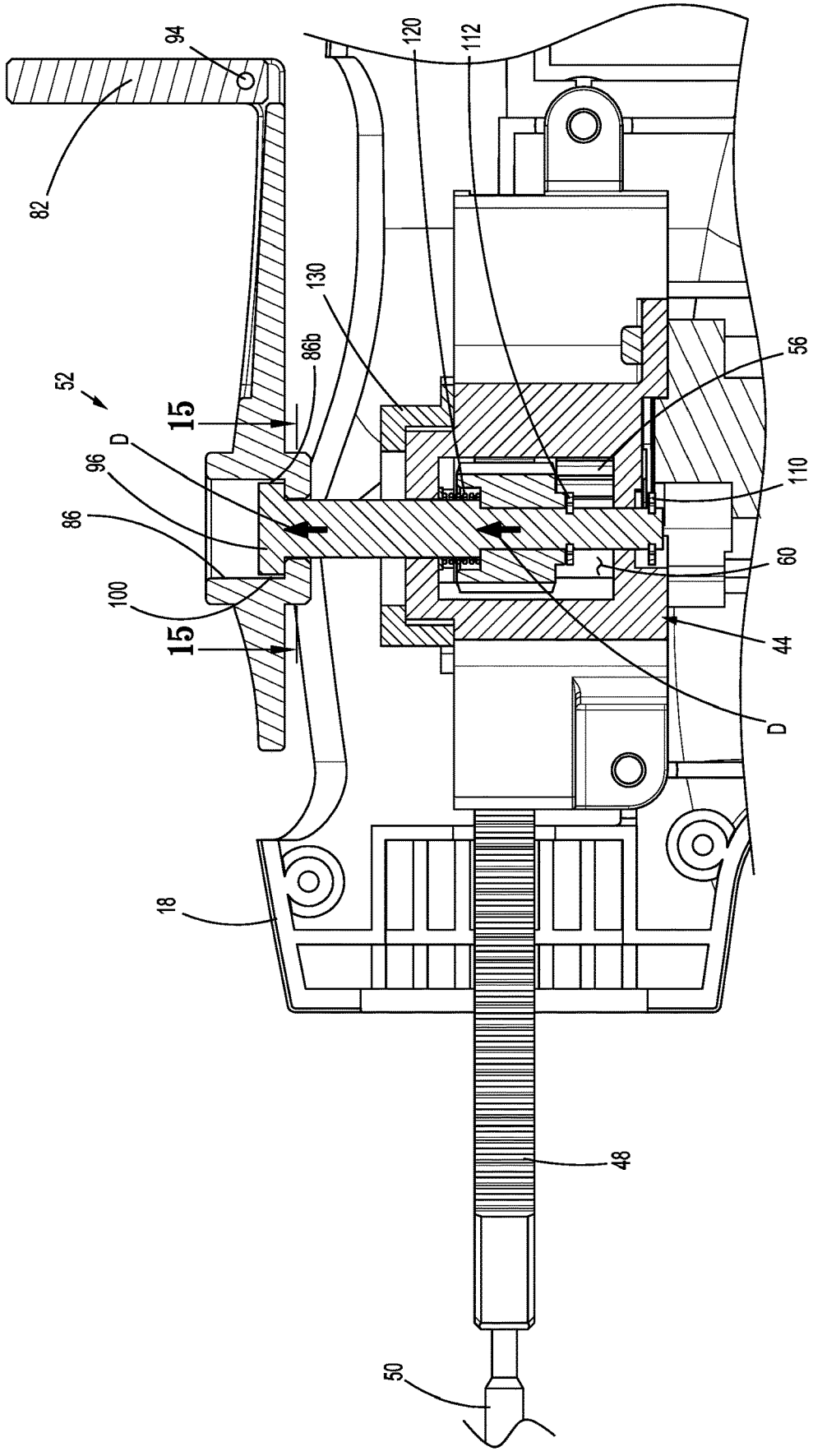

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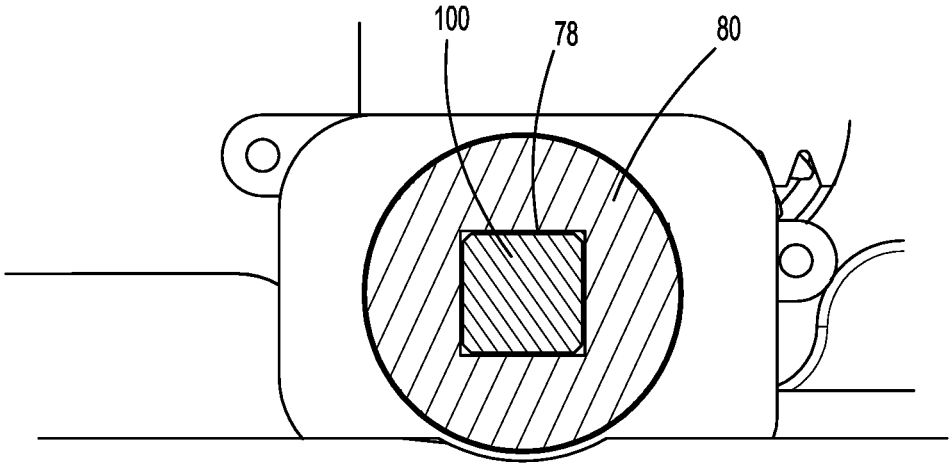


FIG. 15

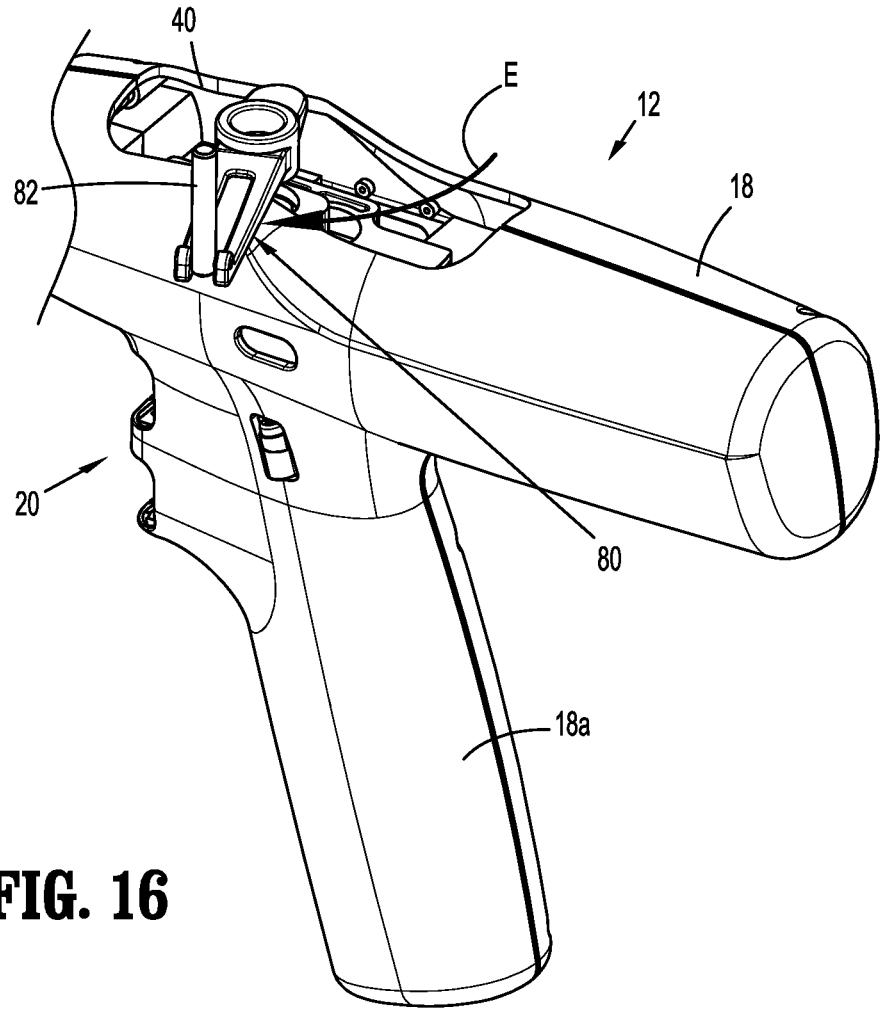
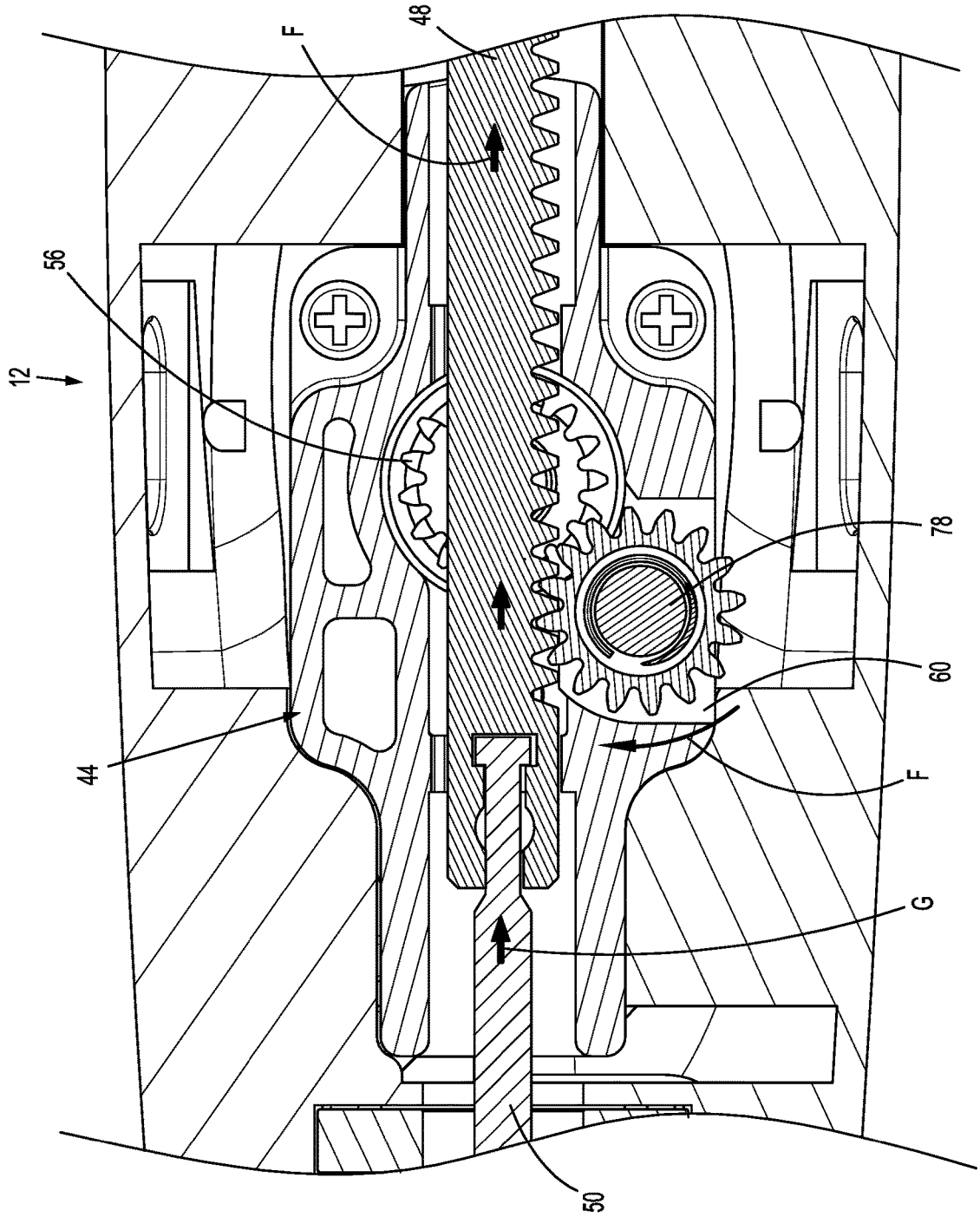
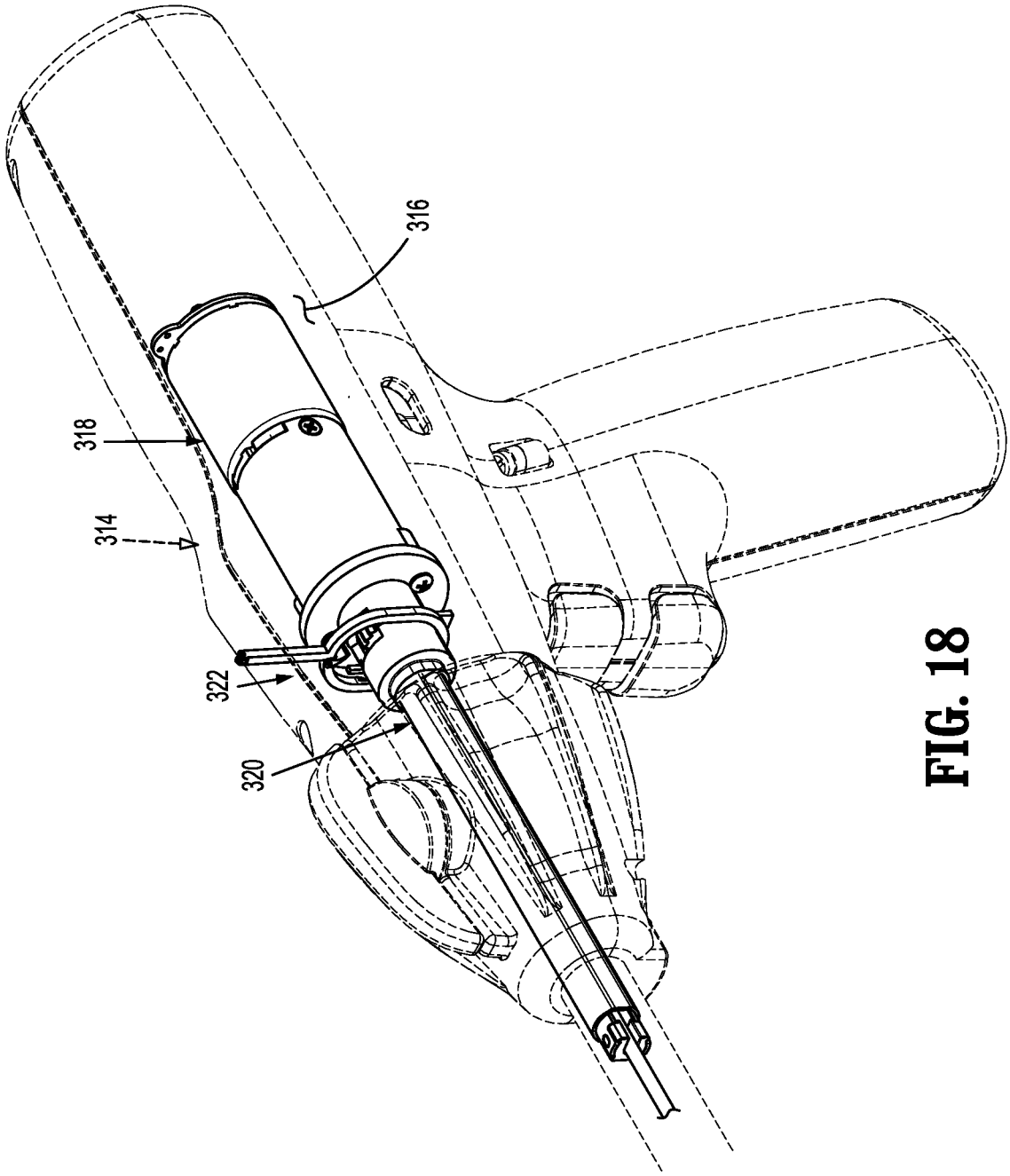


FIG. 16

FIG. 17





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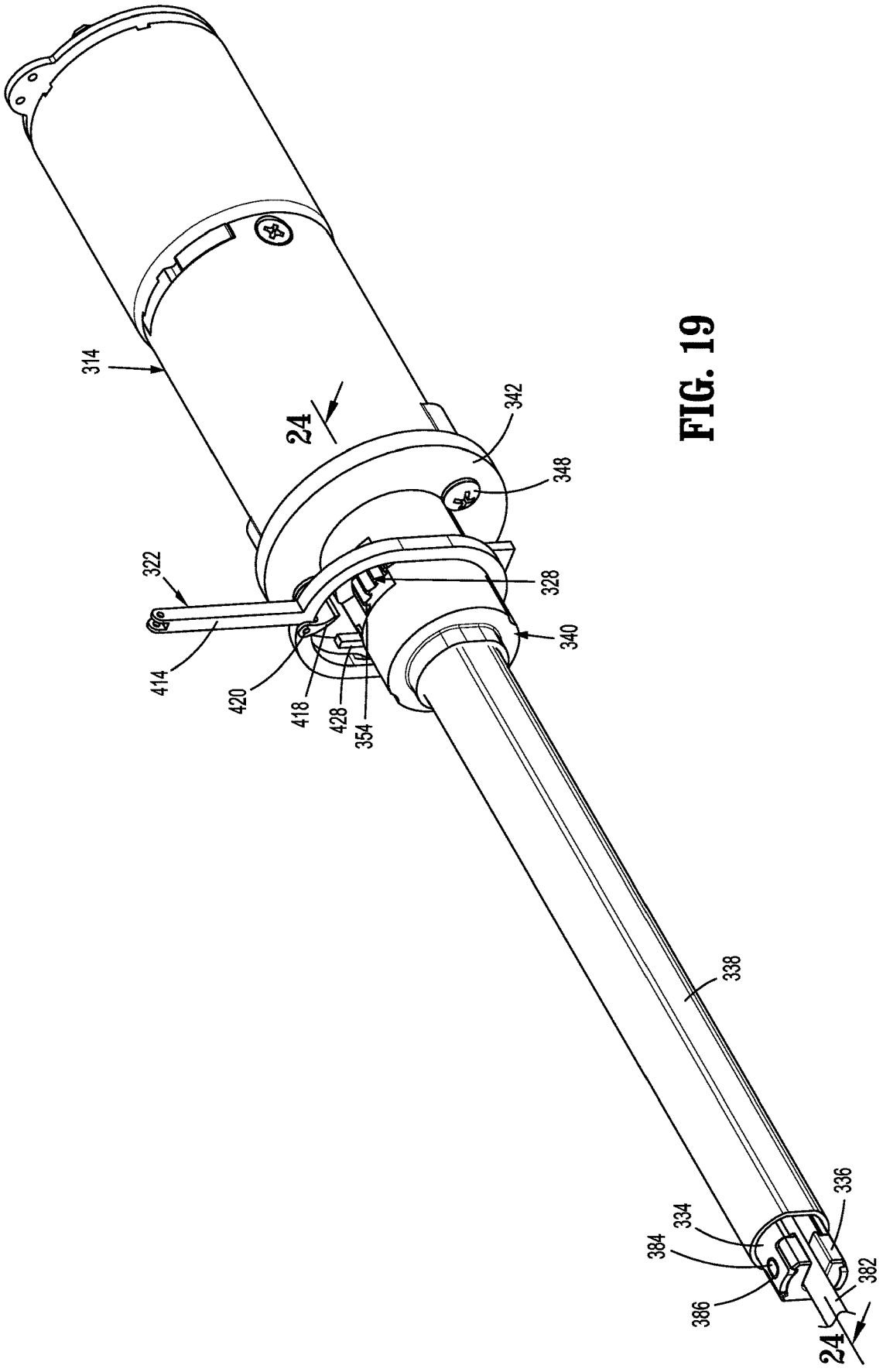
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FIG. 19

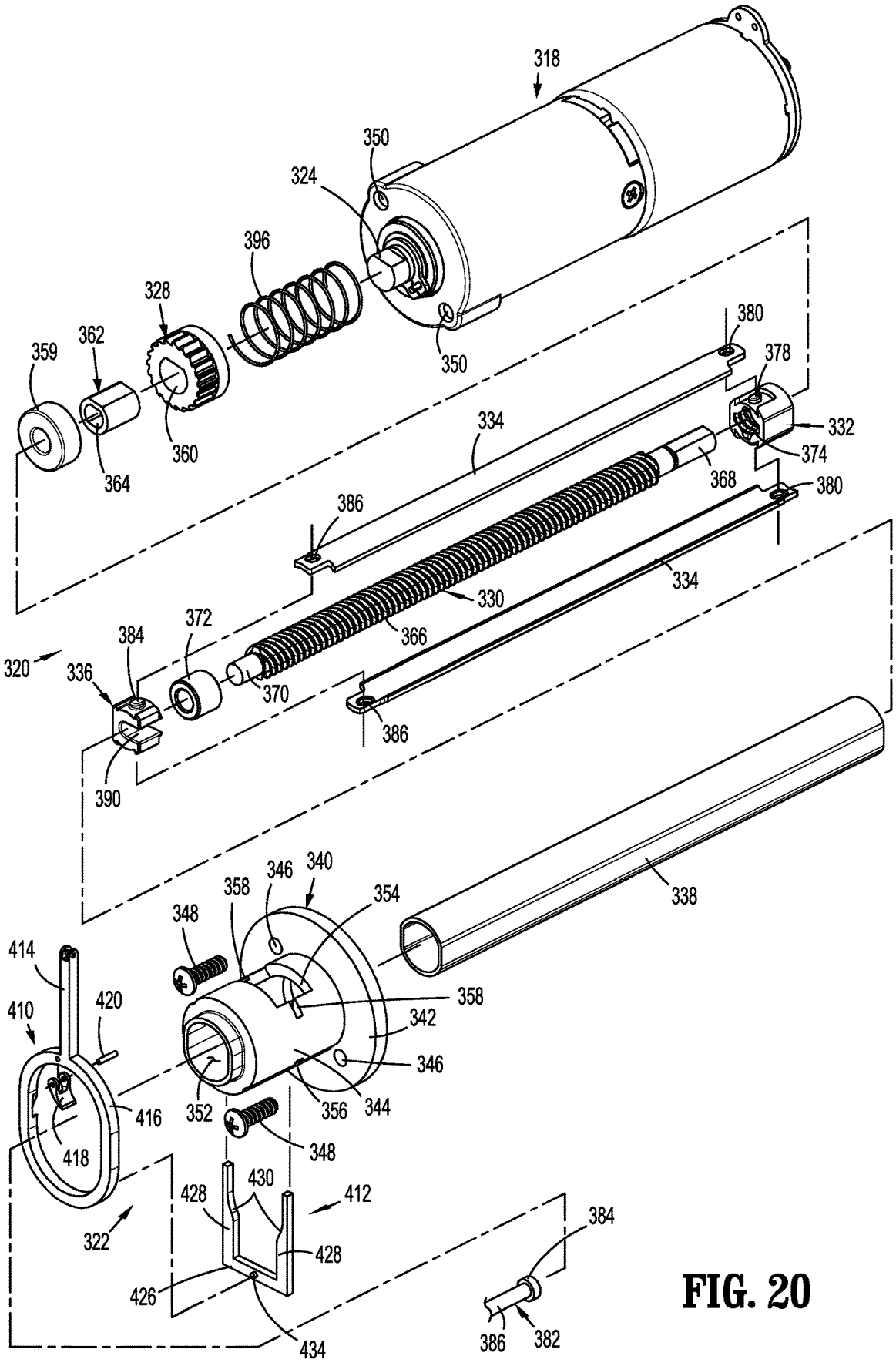
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FIG. 20

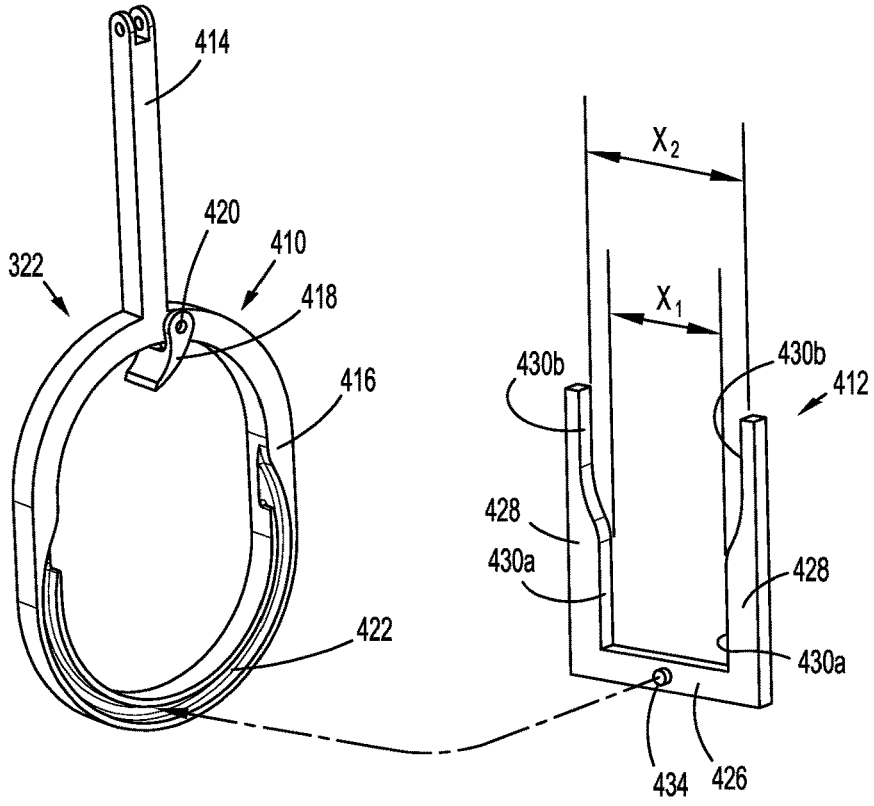
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FIG. 21

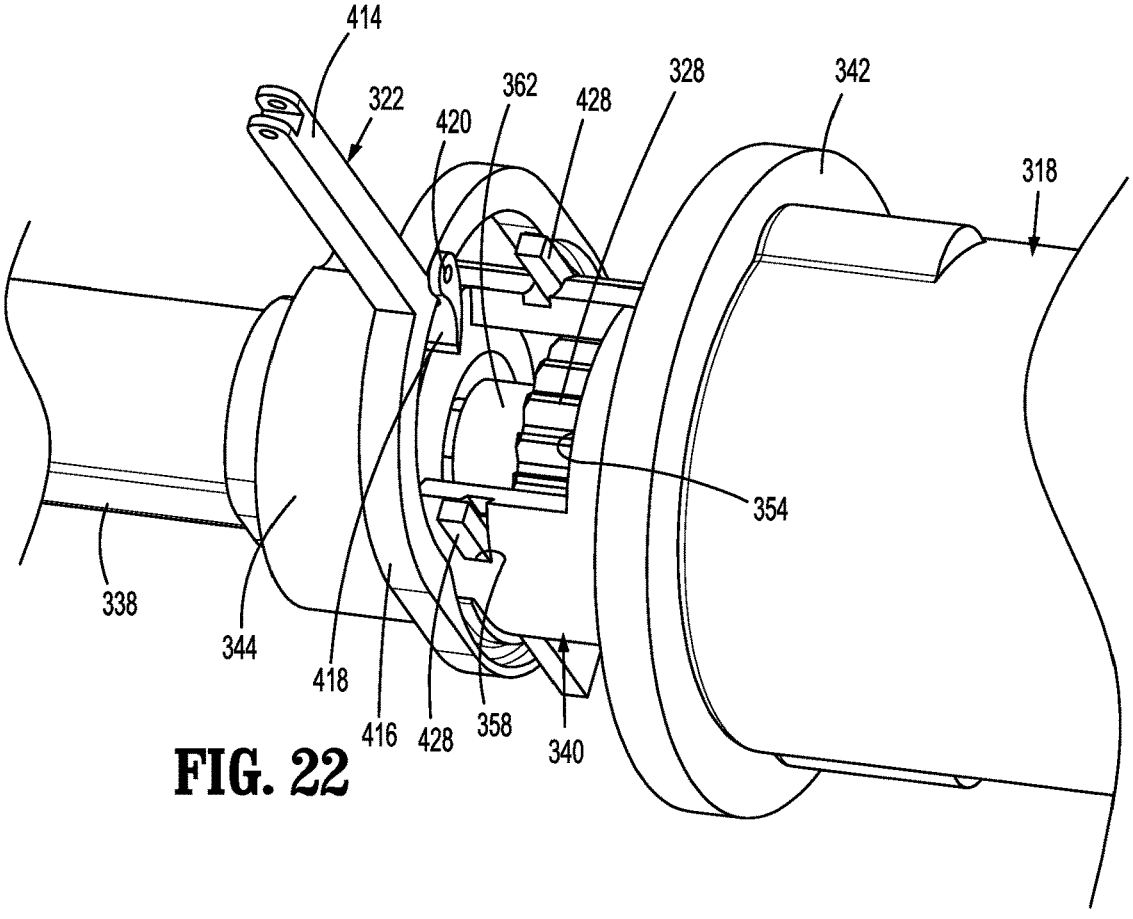
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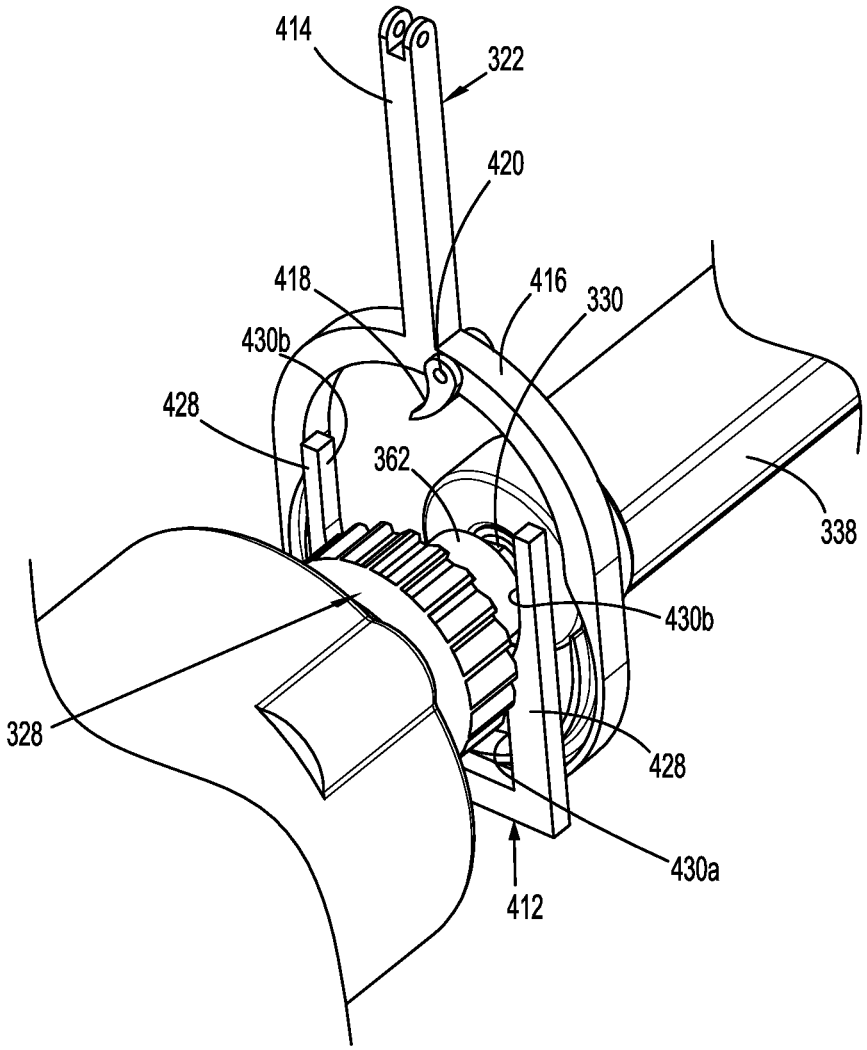
FIG. 22



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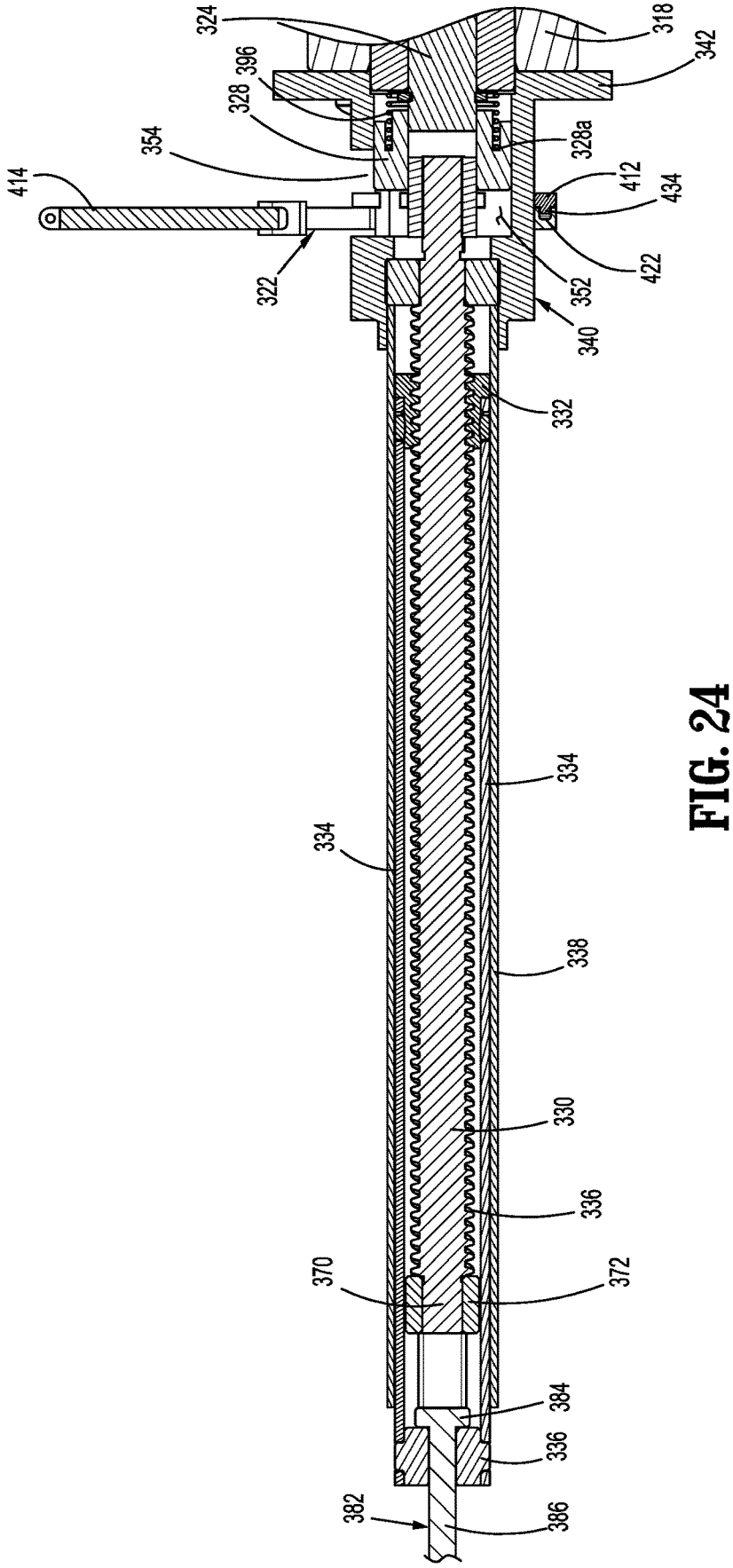
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FIG. 24

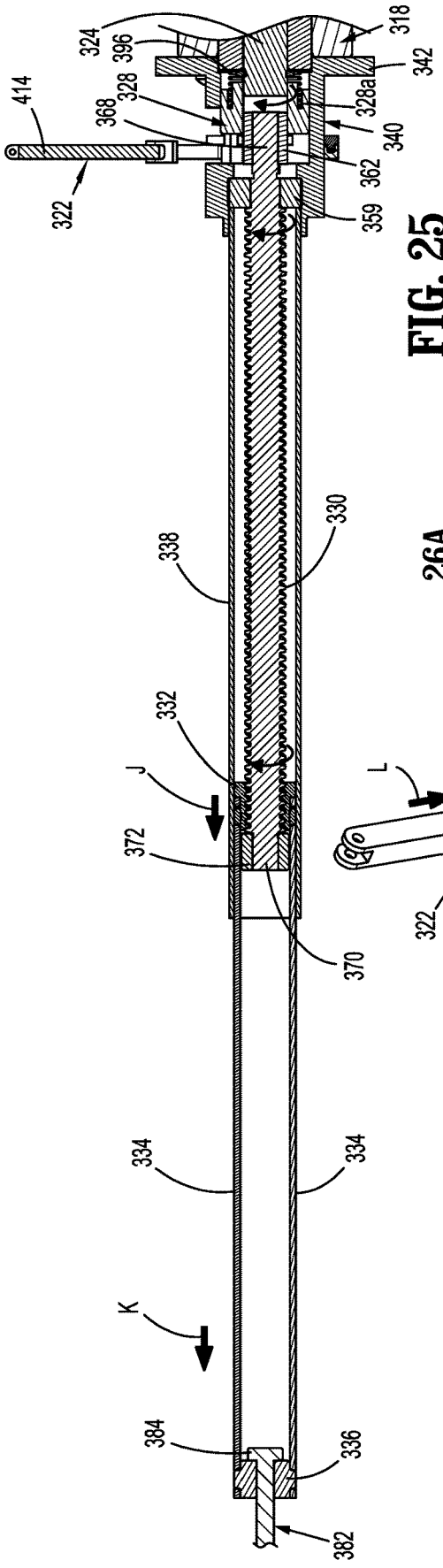
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FIG. 25

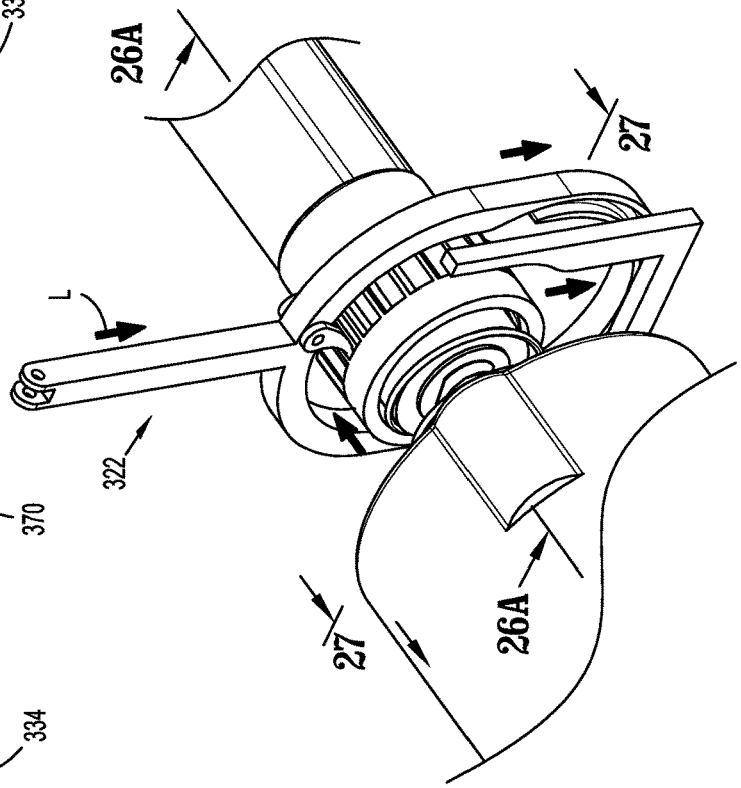
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FIG. 26

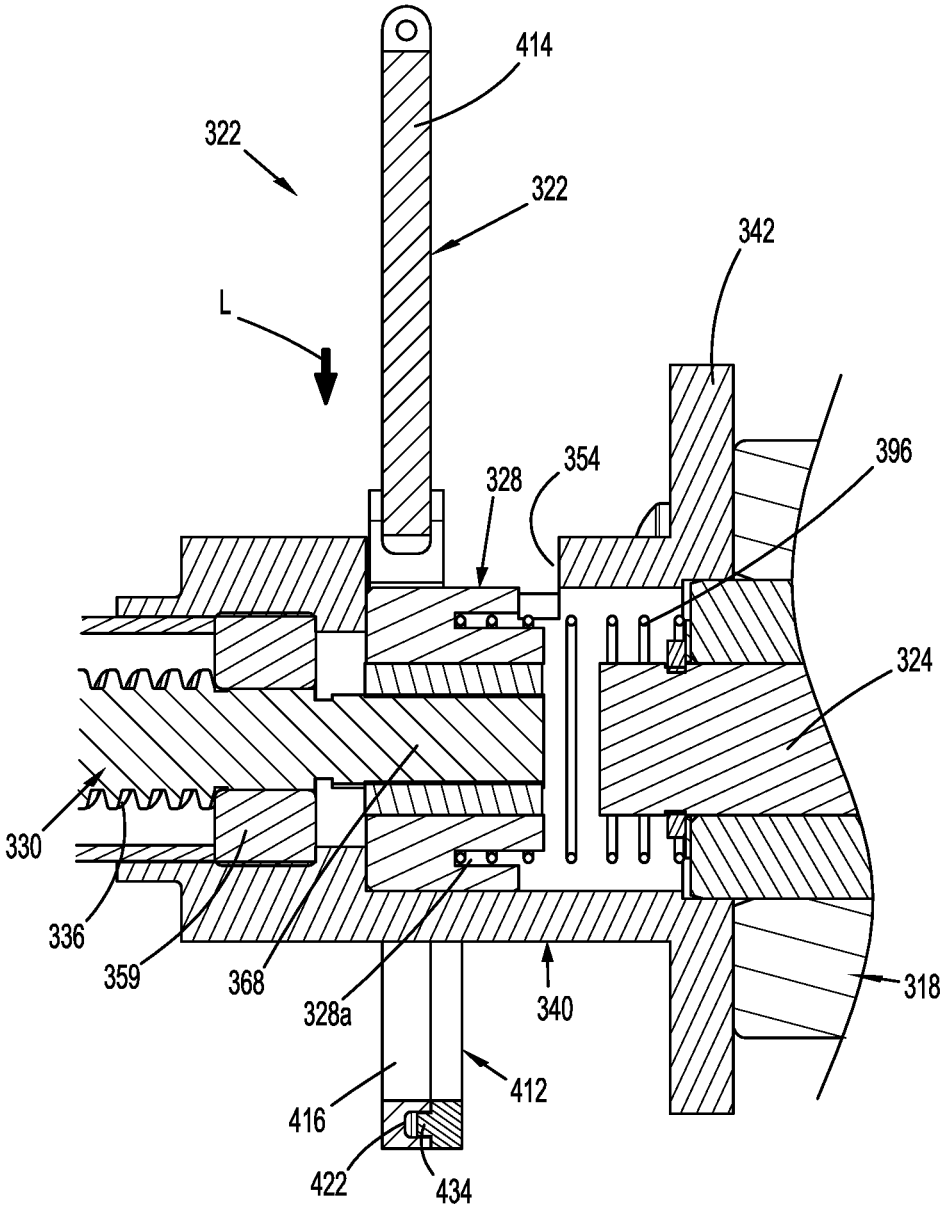
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FIG. 26A

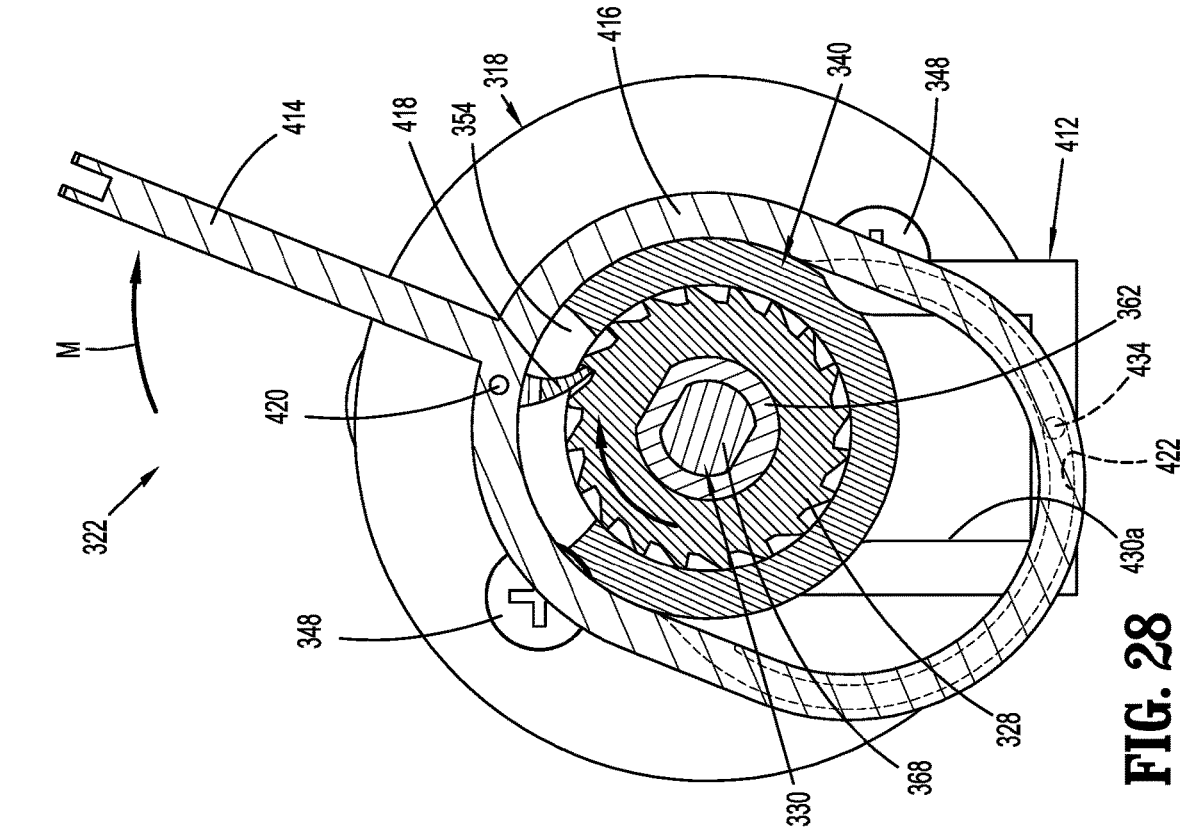
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FIG. 28

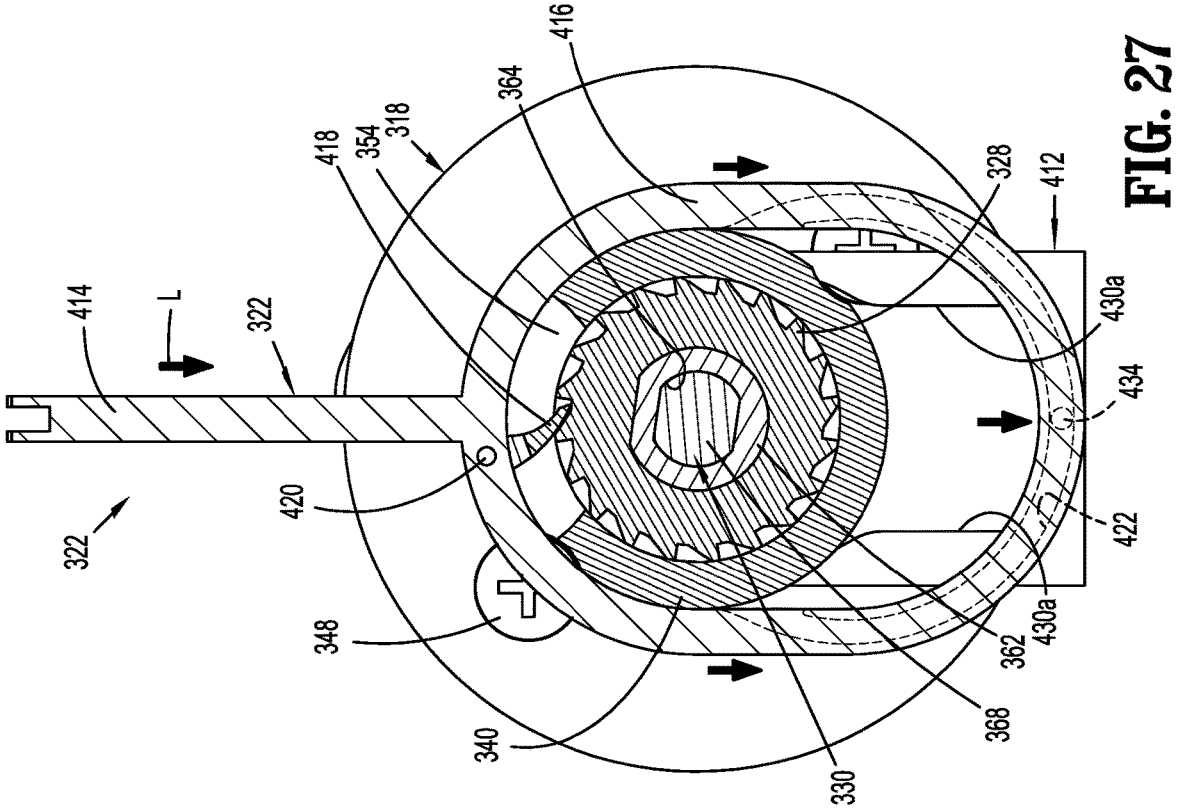
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FIG. 27

POWERED STAPLING DEVICE WITH MANUAL RETRACTION

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application is a continuation of U.S. patent application Ser. No. 17/329,711, filed May 25, 2021, now U.S. Pat. No. 11,771,423, the disclosure of which is incorporated by reference herein in its entirety.

FIELD

[0002] This disclosure is directed to surgical devices and, more particularly, to powered surgical stapling devices.

BACKGROUND

[0003] Various types of surgical devices used to endoscopically treat tissue are known in the art, and are commonly used, for example, for closure of tissue or organs in transection, resection, and anastomoses procedures, for occlusion of organs in thoracic and abdominal procedures, and for electrosurgically fusing or sealing tissue.

[0004] One example of such a surgical device is a surgical stapling device. Typically, surgical stapling devices include a tool assembly having an anvil assembly and a cartridge assembly, and a drive assembly. Typically, the drive assembly includes a flexible drive beam and a clamp member that is supported on a distal end of the drive beam. The drive assembly is movable to advance the clamp member through the tool assembly to approximate the cartridge and anvil assemblies and to advance an actuation sled through the cartridge assembly to eject staples from the cartridge assembly.

[0005] Surgical stapling devices can be manually actuated devices in which a clinician squeezes a trigger to actuate the stapling device, or powered stapling devices in which a clinician activates a motor within the stapling device to actuate the stapling device. Although powered stapling devices require less force to operate, difficulties may arise when the device loses power or components of the device break. In such instances, the device can remain clamped about tissue preventing removal of the device from a patient.

[0006] A continuing need exists in the art for a powered stapling device that includes a drive assembly that can be manually retracted when power is lost or when the device is not operational.

SUMMARY

[0007] A surgical device includes a powered handle assembly having a motor assembly, a rack, a spur gear, and a manual retract mechanism. The spur gear is movable from a position engaged with the motor assembly and the rack to a positioned disengaged from the motor assembly and engaged with the rack to facilitate manual retraction of the rack.

[0008] One aspect of the disclosure is directed to a powered handle assembly for a surgical device that includes a housing, a gear casing, a motor assembly, a rack, a rotating shaft, and a spur gear. The housing defines a cavity. The gear casing is supported within the cavity of the housing and defines a longitudinal channel, a first cavity, and a second cavity that communicate with each other. The motor assembly includes an output shaft and a drive gear that is secured to the output shaft. The motor assembly is secured to the gear casing, and the drive gear is positioned within the second cavity of the gear casing. The rack is received within the longitudinal channel of the gear casing and is movable between retracted and advanced positions. The rotating shaft extends through the first cavity of the gear casing. The spur gear is coupled to the rotating shaft and is received within the first cavity of the gear casing. The spur gear is movable within the first cavity from a first position in which the spur gear is engaged with the drive gear and the rack to a second position in which the spur gear is disengaged from the drive gear and engaged with the rack.

[0009] Other aspects of the disclosure are directed to a powered handle assembly for a surgical device that includes a housing, a motor assembly, a rack, a rotating shaft, and a spur gear. The housing defines a cavity. The motor assembly is supported within housing and includes an output shaft and a drive gear that is secured to the output shaft. The rack is supported within the housing and is movable longitudinally between retracted and advanced positions. The rotating shaft is supported within the housing. The spur gear is coupled to the rotating shaft and received within the housing such that the spur gear is movable from a first position in which the spur gear is engaged with the drive gear and the rack to a second position in which the spur gear is disengaged from the drive gear and engaged with the rack.

[0010] In aspects of the disclosure, the crank lever is coupled to the rotating shaft and is movable to move the spur gear from the first position to the second position.

[0011] In some aspects of the disclosure, a biasing member is engaged with the spur gear and urges the spur gear towards the first position.

[0012] In certain aspects of the disclosure, the rotating shaft includes a first portion and a second portion, wherein the first portion is rotatably fixed to the spur gear and the second portion receives the crank lever.

[0013] In aspects of the disclosure, the housing defines an opening and includes a removable cover that is positioned over the opening such that the crank lever is accessible through the opening.

[0014] In some aspects of the disclosure, the crank lever is movable along the second portion of the rotating shaft from a first position in which the rotating shaft can rotate independently of the crank lever to a second position in which the crank lever is rotatably fixed to the rotating shaft.

[0015] In certain aspects of the disclosure, the crank lever includes a hub that defines a through bore having a rectangular portion and the second portion of the rotating shaft includes a rectangular portion that is received within the rectangular portion of the through bore when the crank lever is in its second position.

[0016] In aspects of the disclosure, the handle assembly includes first and second C-clips, and the second portion of the rotating shaft defines spaced annular grooves that receive the first and second C-clips, respectively.

[0017] In some aspects of the disclosure, the spur gear is received about the second portion of the rotating shaft atop the first C-clip within the first cavity of the gear casing and the second C-clip is positioned externally of the first cavity of the gear casing to secure the rotating shaft to the gear casing.

[0018] Another aspect of the disclosure is directed to surgical stapling device that includes a powered handle assembly, an adapter assembly, and a tool assembly. The powered handle assembly includes a housing, a gear casing,

a motor assembly, a rack, a rotating shaft, and a spur gear. The housing defines a cavity. The gear casing is supported within the cavity of the housing and defines a longitudinal channel, a first cavity, and a second cavity that communicate with each other. The motor assembly includes an output shaft and a drive gear secured to the output shaft. The motor assembly is secured to the gear casing, and the drive gear is positioned within the second cavity of the gear casing. The rack is received within the longitudinal channel of the gear casing and is movable between retracted and advanced positions. The rotating shaft extends through the first cavity of the gear casing. The spur gear is coupled to the rotating shaft and is received within the first cavity of the gear casing. The spur gear is movable within the first cavity from a first position in which the spur gear is engaged with the drive gear and the rack to a second position in which the spur gear is disengaged from the drive gear and engaged with the rack. The adapter assembly has a proximal portion coupled to the handle assembly and a distal portion. The adapter assembly includes a firing rod that is coupled to the rack and is movable between retracted and advanced positions in response to movement of the rack between its retracted and advanced positions. The tool assembly is supported on the distal portion of the adapter assembly.

[0019] In aspects of the disclosure, the tool assembly includes an anvil and a cartridge assembly that are movable between open and clamped positions.

[0020] In some aspects of the disclosure, the stapling device includes a drive assembly that is coupled to the firing rod and includes a working end having an I-beam configuration.

[0021] In certain aspects of the disclosure, the working end of the drive assembly is movable in relation to the anvil and the cartridge assembly in response to movement of the firing rod between its retracted and advanced positions.

[0022] Other aspects of the disclosure are directed to a powered handle assembly for a surgical device that includes a housing, a gear casing, a motor assembly, a drive screw, a drive nut, a connecting rod, and a spur gear. The housing defines a cavity. The gear casing is supported within the cavity of the housing and defines a channel. The motor assembly includes an output shaft and a drive gear secured to the output shaft. The motor assembly is secured to the gear casing, and the drive gear is positioned within the cavity of the gear casing. The drive screw is supported within the housing and is rotatable in response to activation of the motor assembly. The drive nut is supported on and movable along the drive screw between retracted and advanced positions. The connecting rod is coupled to the drive nut. The spur gear is movable within the channel of the gear casing from a first position in which the spur gear is engaged with the output shaft and the drive screw to a second position in which the spur gear is disengaged from the output shaft and engaged with the drive screw.

[0023] Other aspects of the disclosure are directed to a powered handle assembly for a surgical device that includes a housing, a motor assembly, a drive screw, a drive nut, a connecting rod, a spur gear, a locking clip, and a pawl assembly. The housing defines a cavity. The motor assembly includes an output shaft and a drive gear secured to the output shaft. The motor assembly is positioned within the housing and the drive gear is positioned within the cavity of the gear casing. The drive screw is supported within the housing and is rotatable in response to activation of the motor assembly. The drive nut is supported on and movable along the drive screw between retracted and advanced positions. The connecting rod is coupled to the drive nut. The spur gear is movable within the channel of the gear casing from a first position in which the spur gear is engaged with the output shaft and the drive screw to a second position in which the spur gear is disengaged from the output shaft and engaged with the drive screw. The locking clip is movable from a first position retaining the spur gear in its first position to a second position allowing movement of the spur gear from its first position to its second position. The pawl assembly includes an annular body portion and a ratcheting pawl coupled to the body portion.

[0024] In aspects of the disclosure, the handle assembly includes a biasing member that is positioned to urge the spur gear to the second position.

[0025] In some aspects of the disclosure, the handle assembly includes a locking clip that is movable from a first position retaining the spur gear in its first position to a second position allowing movement of the spur gear from its first position to its second position.

[0026] In certain aspects of the disclosure, the handle assembly includes a pawl assembly that includes a body portion and a ratcheting pawl coupled to the body portion.

[0027] In aspects of the disclosure, the gear casing defines a window and the body portion of the pawl assembly is positioned about the gear casing adjacent the window such that the pawl assembly is movable from a first position in which the ratcheting pawl is spaced from the spur gear to a second position in which the ratcheting pawl is engaged with the spur gear.

[0028] In some aspects of the disclosure, the connecting rod includes a proximal portion coupled to the drive nut and a distal portion coupled to a coupling member.

[0029] In certain aspects of the disclosure, the coupling member is adapted to engage a firing rod of the surgical device.

[0030] In aspects of the disclosure, the pawl assembly is coupled to the locking clip such that movement of the pawl assembly from its first position to its second position moves the locking clip from its first position to its second position.

[0031] In some aspects of the disclosure, the gear casing defines spaced openings, and the locking clip includes legs that are received within the openings.

[0032] Still other aspects of the disclosure are directed to a stapling device including a powered handle assembly, an adapter assembly, and a tool assembly. The powered handle assembly includes a housing, a gear casing, a motor assembly, a drive screw, a drive nut, a connecting rod, and a spur gear. the housing defines a cavity. The gear casing is supported within the cavity of the housing and defines a channel. The motor assembly includes an output shaft and a drive gear secured to the output shaft. The motor assembly is secured to the gear casing, and the drive gear is positioned within the cavity of the gear casing. The drive screw is supported within the housing and is rotatable in response to activation of the motor assembly. The drive nut is supported on and movable along the drive screw between retracted and advanced positions. The connecting rod is coupled to the drive nut. The spur gear is movable within the channel of the gear casing from a first position in which the spur gear is engaged with the output shaft and the drive screw to a second position in which the spur gear is disengaged from the output shaft and engaged with the drive screw. The

adapter assembly has a proximal portion coupled to the handle assembly and a distal portion. The adapter assembly includes a firing rod that is coupled to the drive nut and is movable between retracted and advanced positions in response to movement of the drive nut between its retracted and advanced positions. The tool assembly is supported on the distal portion of the adapter assembly.

[0033] Other features of the disclosure will be appreciated from the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0034] Various embodiments of the disclosed staple cartridge are described herein below with reference to the drawings, wherein:

[0035] FIG. **1** is a side perspective view of a first version of a stapling device according to aspects of the disclosure with the stapling device in a non-articulated, unclamped position;

[0036] FIG. **2** is a side cutaway view of a handle assembly of the stapling device shown in FIG. **1** with a cover of the handle assembly removed;

[0037] FIG. **3** is a side perspective view of the handle assembly of the stapling device shown in FIG. **1** with a housing half-section removed;

[0038] FIG. **4** is an exploded side perspective view of internal components of the handle assembly shown in FIG. **3**;

[0039] FIG. **5** is a side perspective view of a rotating shaft of the handle assembly shown in FIG. **3**;

[0040] FIG. **6** is a perspective view of a crank lever of the handle assembly shown in FIG. **3**;

[0041] FIG. **7** is a cross-sectional view taken along section line **7-7** of FIG. **2**;

[0042] FIG. **8** is a cross-sectional view taken through a portion of the handle assembly shown in FIG. **3** with the stapling device in an unclamped position;

[0043] FIG. **9** is a cross-sectional view taken along section line **9-9** of FIG. **8**;

[0044] FIG. **10** is a side perspective view of a reload assembly of the stapling device shown in FIG. **1** in the clamped and fired position;

[0045] FIG. **11** is a cross-sectional view taken along section line **11-11** of FIG. **10**;

[0046] FIG. **12** is a cross-sectional view through a portion of the handle assembly shown in FIG. **3** with the stapling device in the clamped and fired position;

[0047] FIG. **13** is a side perspective view of a portion of the handle assembly shown in FIG. **3** as the stapling device is manually retracted from the clamped and fired position;

[0048] FIG. **14** is a cross-sectional view taken along section line **14-14** of FIG. **13**;

[0049] FIG. **15** is a cross-sectional view taken along section line **15-15** of FIG. **14**;

[0050] FIG. **16** is a side perspective view of the handle assembly of the stapling device shown in FIG. **1** with the cover of the handle assembly removed as the stapling device is manually retracted;

[0051] FIG. **17** is a cutaway, cross-sectional view taken through the handle assembly shown in FIG. **16** as the stapling device is manually retracted;

[0052] FIG. **18** is an alternate version of the handle assembly of the stapling device shown in FIG. **1** with a housing of the handle assembly shown in phantom;

[0053] FIG. **19** is an assembled view of the internal components of the handle assembly shown in FIG. **18**;

[0054] FIG. **20** is an exploded side perspective view of internal components of the handle assembly shown in FIG. **19**;

[0055] FIG. **21** is a side perspective view of a pawl assembly and locking clip of the handle assembly shown in FIG. **19**;

[0056] FIG. **22** is a side perspective view from the proximal end of an interface between a motor assembly and a drive assembly of the handle assembly shown in FIG. **19** showing a manual retract mechanism with the locking clip in the locked position;

[0057] FIG. **23** is a side perspective view from the distal end of the interface between the motor assembly and the drive assembly of the handle assembly shown in FIG. **20** with a gear casing removed showing the manual retract mechanism with the locking clip in the locked position;

[0058] FIG. **24** is a cross-sectional view taken along section line **24-24** of FIG. **19**;

[0059] FIG. **25** is a side cross-sectional view of the drive assembly of the handle assembly of the stapling device shown in FIG. **24** in the fired position;

[0060] FIG. **26** is a side perspective view from the proximal end of the interface between the motor assembly and the drive assembly of the handle assembly shown in FIG. **19** showing the manual retract mechanism with the locking clip in the unlocked position;

[0061] FIG. **26**A is a side cross-sectional view taken along section line **26**A-**26**A of FIG. **26** illustrating the manual retract mechanism in the unlocked position;

[0062] FIG. **27** is a cross-sectional view taken along section line **27-27** of FIG. **26** illustrating the manual retract mechanism as the manual retract mechanism is operated to move the locking clip from the locked position to the unlocked position; and

[0063] FIG. **28** is a cross-sectional view taken along section line **27-27** of FIG. **26** illustrating the manual retract mechanism as the manual retract mechanism is operated to retract the drive assembly.

DETAILED DESCRIPTION

[0064] The disclosed surgical device will now be described in detail with reference to the drawings in which like reference numerals designate identical or corresponding elements in each of the several views. However, it is to be understood that the aspects of the disclosure are merely exemplary of the disclosure and may be embodied in various forms. Well-known functions or constructions are not described in detail to avoid obscuring the disclosure in unnecessary detail. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to variously employ the disclosure in virtually any appropriately detailed structure. In addition, directional terms such as front, rear, upper, lower, top, bottom, and similar terms are used to assist in understanding the description and are not intended to limit the disclosure.

[0065] In this description, the term "proximal" is used generally to refer to that portion of the device that is closer to a clinician, while the term "distal" is used generally to refer to that portion of the device that is farther from the clinician. In addition, the term "endoscopic" is used gener-

ally to refer to endoscopic, laparoscopic, arthroscopic, and/or any other procedure conducted through a small diameter incision or cannula. Further, the term "clinician" is used generally to refer to medical personnel including doctors, nurses, surgeons, and support personnel.

[0066] This disclosure is directed to a surgical device that includes a powered handle assembly having a motor assembly, a rack, a spur gear, and a manual retract mechanism. The spur gear is movable from a position engaged with the motor assembly and the rack to a positioned disengaged from the motor assembly and engaged with the rack to facilitate manual retraction of the rack.

[0067] FIGS. **1** and **2** illustrate a surgical device shown generally as stapling device **10** which includes a handle assembly **12**, an elongate body or adapter assembly **14**, and a tool assembly **16**. The handle assembly **12** includes a housing **18** that forms a stationary handle portion **18***a*, and articulation lever **19**, and actuation buttons **20**. The adapter assembly **14** defines a longitudinal axis "X" and includes a proximal portion **24** that is coupled to the handle assembly **12**, and a distal portion **26** that supports the tool assembly **16**. The tool assembly **16** is secured to the distal portion **26** of the adapter assembly **14** by a pivot member **28** that defines an axis "Y" that is transverse to the longitudinal axis "X". The articulation lever **19** is operatively coupled to the tool assembly **16** via an articulation linkage (not shown) such that manipulation of the articulation lever **19** causes articulation of the tool assembly **16** about the axis "Y" between an articulated position in which the tool assembly **16** is aligned with the longitudinal axis "Y" and non-articulated positions in which a longitudinal axis of the tool assembly and the longitudinal axis "X" define acute angles in response to manipulation of the articulation lever **19**. The adapter assembly **14** is supported within a rotation knob **30** that is rotatably coupled to a distal portion of the handle assembly **12**. The rotation knob **30** is manually rotatable about the longitudinal axis "X" to rotate the adapter assembly **14** and the tool assembly **16** about the longitudinal axis "X". The actuation buttons **20** control operation of the different functions of the stapling device **10** including clamping and firing of the stapling device **10**.

[0068] In aspects of the disclosure, the tool assembly **16** forms part of a reload assembly **32** that includes a proximal body portion **34** and the tool assembly **16**. The proximal body portion **34** of the reload assembly **32** forms an extension of the adapter assembly **14** and includes a proximal end that is adapted to be releasably coupled to a distal end of the adapter assembly **14** and a distal end that supports the tool assembly **16** for articulation. In aspects of the disclosure, the tool assembly **16** can be fixedly coupled to a distal portion of the adapter assembly **14**.

[0069] In aspects of the disclosure, the housing **18** of the handle assembly **12** is formed from half-sections that are coupled together such as by welding of with screws to define a cavity **38** that receives internal components of the handle assembly **12** which are described in further detail below. The housing **18** defines an upper opening **40** that provides access to the internal components of the handle assembly **12**. The upper opening **40** is enclosed by a cover **42** that is removably supported within the upper opening **40**.

[0070] FIGS. **3** and **4** illustrate the internal components of the handle assembly **12** which include a gear casing **44**, a motor assembly **46**, a rack **48**, a firing rod **50**, a manual retract mechanism **52** and intermediate spur gear **54**, and a drive gear **56**. The gear casing **44** is secured within the cavity **38** of the housing **18** using screws or the like and defines a first cavity **60** and a second cavity **62** that intersect with each other and a longitudinally extending channel **64**. The first cavity **60** of the gear casing **44** receives the drive gear **56** and the second cavity **62** of the gear casing **44** receives the intermediate spur gear **54**. The drive gear **56** and the intermediate spur gear each include gear teeth that mesh such that rotation of the drive gear **56** within the first cavity **60** causes corresponding rotation of the intermediate spur gear **54** within the second cavity **62**. The rack **48** is received within the channel **64** of the gear casing **44** and includes gear teeth that mesh with the gear teeth of the intermediate spur gear **54**. When the drive gear **56** is rotated to rotate the intermediate spur gear **54**, engagement between the intermediate spur gear **56** and the rack **48** causes the rack **48** to move longitudinally through the channel **64** in the gear casing **44**.

[0071] The motor assembly **46** includes an output shaft **70** (FIG. **4**) that is secured to the drive gear **56** and can be activated via the actuation buttons **20** (FIG. **1**) to rotate the drive gear **56**. In aspects of the disclosure, the motor assembly **46** is positioned within a portion of the cavity **38** of the housing **18** defined by the stationary handle portion **18***a*. The motor assembly **46** includes a mounting bracket **72** that is secured to the gear casing **44** with screws **74** such that the drive gear **56** is received within the second cavity **62** of the gear casing **44**.

[0072] FIGS. **4-6** illustrate the manual retract mechanism **52** which includes a rotating shaft **78**, a crank lever **80**, and a grip member **82**. The crank lever **80** includes a central hub portion **84** that defines a through bore **86** that receives the rotating shaft **78**. The through bore **86** includes a cylindrical portion **86***a* and a rectangular portion **86***b*. The crank lever **80** also includes a lever portion **88** that defines a slot **90** and forms a clevis **92**. The grip member **82** is supported within the clevis **92** by a pivot member **94** and is pivotable between a first position located within the slot **90** and a second position extending orthogonally from the lever portion **88**.

[0073] The rotating shaft **78** includes a head portion **96** and a shaft portion **98** that extends downwardly from the head portion **96** as viewed in FIG. **4** through the through bore **86** in the crank lever **80**. The shaft portion **98** includes a first rectangular portion **100**, a cylindrical portion **102**, and a second rectangular portion **104**. The second rectangular portion **104** includes spaced annular grooves **106** and **108** that receive C-clips **110** and **112**, respectively. The intermediate spur gear **54** is received about the second rectangular portion **104** of the rotating shaft **78** atop the C-clip **112** within the first cavity **60** of the gear casing **44**. The C-clip **112** is positioned externally of the first cavity **60** and secures the rotating shaft **78** to the gear casing **44**. Although the rotating shaft **78** is shown to have first and second rectangular portions, it is envisioned that other shaft configurations are envisioned.

[0074] The gear casing **44** defines first and second openings **114** and **116** that communicate with upper and lower ends of the first cavity **60** of the gear casing **44**. The cylindrical portion **102** of the rotating shaft **78** is received within the first opening **114** of the gear casing **44** and the second rectangular portion **104** of the rotating shaft **78** extends through the second opening **116** of the gear casing **44**. The C-clip **110** is secured to the lower end of the second rectangular portion **104** of the rotating shaft **78** adjacent a

lower surface of the gear casing **44** and the C-clip **112** is secured to the second rectangular portion **104** of the rotating shaft **78** within the first cavity **60** of the gear casing **44**. The C-clips **110** and **112** secure the intermediate spur gear **54** to the rotating shaft **78** and secure the rotating shaft **78** to the gear casing **44**. The second rectangular portion **104** of the rotating shaft **78** is received within a rectangular bore in the intermediate spur gear **54** to rotatably fix the intermediate spur gear **54** to the rotating shaft **78**.

[0075] The intermediate spur gear **54** is received within the first cavity **60** of the gear casing **44** and is movable within the first cavity between a first or lower position and a second or upper position. In the lower position (FIG. **8**), the teeth of the intermediate spur gear **54** simultaneously engage the teeth of the rack **48** and the teeth of the drive gear **56**. In the upper position, the teeth of the intermediate spur gear **54** engage only the teeth of the rack **48**.

[0076] The manual retract mechanism **52** includes a biasing member **120** that is positioned between an upper surface of the intermediate spur gear **54** and the inner surface of the gear casing **44**. The biasing member **120** urges the intermediate spur gear **54** towards its lower position in which the intermediate spur gear **54** is engaged with both the drive gear **56** and the rack **48**. In some aspects of the disclosure, a washer **122** is positioned between an upper surface of the biasing member **120** and the inner surface of the gear casing **44**. In some aspects of the disclosure, the biasing member **120** includes a coil spring. It is envisioned that other types of biasing members could be incorporated into the stapling device **10** (FIG. **1**).

[0077] The rack **44** includes a distal portion that is coupled to the firing rod **50**, In aspects of the disclosure, the proximal portion of the firing rod **50** is formed with a head **124** that has a diameter that is larger than a body of the firing rod **50** and the distal portion of the rack **48** defines a slot **128**. The head **124** of the firing rod **50** is received within the slot **128** of the rack **48** to couple the firing rod **50** to the rack **48** such that longitudinal movement of the rack **48** causes longitudinal movement of the firing rod **50**. The coupling of the head **124** and the slot **128** allows the firing rod **50** to rotate in relation to the rack **48**.

[0078] In some aspects of the disclosure, the manual retract mechanism **52** includes a base member **130** that defines a circular bore **132**. The base member **130** is secured to an upper surface of the gear casing **44** and the hub portion **84** of the crank lever **80** is aligned within the circular bore **132**. The crank lever **80** is movable from a lowered position to a raised position. In the lowered position, the hub portion **84** of the crank lever **80** is received within the circular bore **132** and in the raised position, the hub portion **84** of the crank lever **80** is positioned above the circular bore **132** of the base member **130**.

[0079] The head **96** of the rotating shaft **78** of the manual retract mechanism **52** is received within the bore **86** of the crank lever **80**. When the crank lever **80** is in its lowered position, the cylindrical portion **102** of the rotating shaft **78** is received within the rectangular portion **86***b* (FIG. **6**) of the through bore **86** of the crank lever **80**. In this position, the rotating shaft **78** can rotate within the through bore **86** of the crank lever **80** without causing rotation of the crank lever **80**. When the crank lever **80** is moved to its raised position, the first rectangular portion **100** of the rotating shaft **78** is received within the rectangular portion **86***b* of the through bore **86** of the crank lever **80**, In this position, rotation of the crank lever **80** causes corresponding rotation of the rotating shaft **78**, and thus, rotation of the intermediate spur gear **54**. The head **96** of the rotating shaft **78** has a diameter that is larger than the width of the rectangular portion **86***b* of the through bore **86** of the crank lever **80**. Thus, movement of the crank lever **80** to its raised position causes the rotating shaft **78** to its upper position in which the teeth of the intermediate spur gear **54** are only engaged with the teeth of the rack **48**.

[0080] The handle assembly **12** (FIG. **1**) also includes one or more batteries **140** which are received within the cavity **38** of the housing **18** of the handle assembly **12**. The batteries **140** provide power to the motor assembly **46** via the actuation switches and control circuitry (not shown), e.g., a printed circuit board and one or more controllers, within the handle assembly **12** to control firing of the stapling device **10**.

[0081] FIGS. **7-9** illustrate the handle assembly **12** of the stapling device **10** (FIG. **1**) with the stapling device in an unclamped position prior to firing of the stapling device. In this position, the rack **48** is in a retracted position within the channel **64** of the gear casing **44** and the intermediate spur gear **54** is in its lowered position and is engaged with the rack **48** and the drive gear **56**.

[0082] FIGS. **10** and **11** illustrate the reload assembly **32** when the stapling device **10** is in a fired position. As described above, the reload assembly **32** includes the tool assembly **16** and the proximal body portion **34**. In aspects of the disclosure, the tool assembly **16** includes an anvil assembly **150** and a cartridge assembly **152**. The cartridge assembly **152** includes a staple cartridge **154** that supports a plurality of staples and pushers (not shown), and an actuation sled **156**. The proximal body portion **32** includes a drive assembly **158** that includes a flexible beam **160** and a working end **162**. The working end **162** of the drive assembly **158** has an I-beam configuration and is secured to a distal end portion of the flexible beam **160**. The flexible beam **160** has a proximal end portion that is releasably coupled to a distal portion of the firing rod **50**. When the firing rod **50** is moved from a retracted position to an advanced position, the drive assembly **158** moves from a retracted position to an advanced position to move the working end **162** of the drive assembly **158** through the tool assembly **16** to advance the actuation sled **156** through the tool assembly **16**. As the actuation sled **156** moves through the tool assembly **16**, the actuation sled **156** engages the pushers (not shown) to eject staples (not shown) from the staple cartridge **154** into the anvil assembly **150**. In the fired position, the working end **162** of the drive assembly **158** and the actuation sled **156** are in their advanced positions within the tool assembly and the tool assembly is in the clamped position clamped about tissue (not shown). For a more detailed description of the operation of the drive assembly **158** and its interaction with the tool assembly, see U.S. Pat. No. 8,132,706.

[0083] FIG. **12** illustrates the handle assembly **12** of the stapling device **10** (FIG. **1**) as the stapling device **10** is fired. When the stapling device **10** is fired, the intermediate spur gear **54** (FIG. **8**) is engaged with the rack **48** and with the drive gear **56**. When the motor assembly **46** is activated, the drive gear **56** rotates the intermediate spur gear **54** to advance the rack **48** in the direction indicated by arrows "A". The rack **48** is coupled to the firing rod **50** such that advancement of the firing rod **50** advancement of the rack **48**

causes advancement of the firing rod **50** in the direction of arrows "A" to advance the drive assembly **158** (FIG. **11**) within the tool assembly **16**.

[0084] FIGS. **13-15** illustrate the manual retract mechanism **52** as it is readied for use. When the stapling device **10** loses power or gets damaged such that the motor assembly **46** cannot retract the drive assembly **158** to release tissue clamped between the anvil and cartridge assemblies **150** and **152** (FIG. **11**), the manual retract mechanism **52** can be operated to retract the drive assembly **158** (FIG. **11**). In order to access the manual retract mechanism **52**, the cover **42** (FIG. **2**) must be removed to uncover the upper opening **40** in the housing **18** of the handle assembly **12**. Once the cover is removed, the crank lever **80** is pulled upwardly in the direction of arrow "C" in FIG. **13** to move the crank lever **80** from its lowered position to its raised position. As the crank lever **80** is moved towards its raised position, the first rectangular portion **100** of the rotating shaft **78** is received in the rectangular portion **86***b* of the through bore **86** in the crank lever **80**. Once the first rectangular portion **100** of the rotating shaft **78** is received in the rectangular portion **86***b* of the through bore **86** in the crank lever **80**, continued movement of the crank lever **80** in the direction of arrow "C" will lift the rotating shaft **78** and the intermediate spur gear **54** in the direction of arrows "D" in FIG. **14** to their upper positions compressing the biasing member **120**. In the upper position, the intermediate spur gear **54** is disengaged from the drive gear **56** and is engaged only with the rack **48**. Once the crank lever **80** is in its raised position, the grip member **82** can be pivoted about the pivot member **94** to an operational position.

[0085] FIGS. **16** and **17** illustrate the manual retract mechanism **52** as it is operated to retract the firing rod **50**. Once the crank lever **80** is moved to its raised position, the crank lever **80** can be rotated in the direction indicated by arrow "E" in FIG. in FIG. **16** to rotate the rotating shaft **78** and the intermediate spur gear **54** in the direction indicted by arrow "F" in FIG. **17** to retract the rack **48**. More specifically, when the crank lever **80** is rotated, receipt of the first rectangular portion **100** of the rotating shaft **78** in the rectangular portion **86***b* of the through bore **86** of the crank lever **80** rotatably fixes the crank lever **80** to the rotating shaft **78**. Thus, when the crank lever **80** rotates, the rotating shaft also rotates. The intermediate spur gear **54** is rotatably fixed to the rotating shaft **78** via receipt of the second rectangular portion **104** of the rotating shaft **78** in the rectangular bore **54***a* of the intermediate spur gear **54** such that rotation of the rotating shaft **78** causes rotation of the intermediate spur gear **54**. In its upper position, the intermediate spur gear **54** is only engaged with the rack **48**, and as such, rotation of the intermediate spur gear **54** causes retract of the rack **48**.

[0086] FIGS. **19-28** illustrate an alternate version of the handle assembly **12** (FIG. **18**) of the stapling device **10** shown generally as handle assembly **312**. The handle assembly **312** includes a housing **314** that is substantially similar to housing **18** (FIG. **1**) of stapling device **10** and will not be described in further detail herein. The housing **314** defines a cavity **316** that receives the internal components of the handle assembly **312**.

[0087] FIGS. **18-20** illustrate the internal components of the handle assembly **312** which includes a motor assembly **318**, a drive assembly **320**, and a manual retract mechanism **322**. The motor assembly **318** is supported within the cavity **316** (FIG. **18**) of the housing **314** and includes an output shaft **324** that has a flat surface **324***a*. In some aspects of the disclosure, the output shaft **324** has a D-shaped configuration although other configurations are envisioned.

[0088] The drive assembly **320** is coupled to the output shaft **324** of the motor assembly **318** and includes a one-way spur gear **328**, a drive screw **330**, a drive nut **332**, connecting rods **334**, a coupling member **336**, a guide tube **338**, and a gear casing **340**. The gear casing **340** includes a mounting flange **342** and a cylindrical body **344**. The mounting flange **342** of the gear casing **340** defines bores **346** that receive screws **348**. The screws **348** are received in threaded bores **350** formed in a distal face of the motor assembly **318** to secure the gear casing **340** to the motor assembly **318**. The cylindrical body **344** of the gear casing **340** defines a cavity **352** and a window **354** that communicates with the cavity **352**. The cylindrical body **344** of the gear casing **340** defines two openings **356** (only one is shown) and two cutouts **358**. One of the openings **356** and one of the cutouts **358** is positioned on each side of the window **354** in vertical alignment. The cavity **352** of the cylindrical body **344** of the gear casing **340** receives the one-way spur gear **328**. The distal portion of the cylindrical body **344** of the gear casing **340** supports a bearing **359**.

[0089] The one-way spur gear **328** defines a central through bore **360** that receives a bearing **362**. In aspects of the disclosure, the central through bore **360** and the bearing **362** have corresponding non-circular configurations, e.g., D-shaped configurations, such that the bearing **362** is slidably received within the central through bore **360** of the one-way spur gear **328**. The corresponding configurations of the one-way spur gear **328** and the bearing **362** rotatably fix the components to each other. The bearing **362** also defines a central through bore **364** that has a non-circular configuration.

[0090] The drive screw **330** includes a threaded outer surface **366**, a proximal extension **368**, and a distal extension **370**. The proximal extension **368** of the drive screw **330** extends through the bearing **359** within the gear casing **340** and is received and secured within the central through bore **364** of the bearing **364**. The distal extension **370** of the drive screw **330** is received within a bearing **372** that is supported within the housing **314** (FIG. **18**) to rotatably support the drive screw **330** within the housing **314**.

[0091] When the motor assembly **318** is activated to rotate the output shaft **324**, rotation of the output shaft **324**, when engaged with the one-way spur gear **328**, causes corresponding rotation of the one-way spur gear **328**. As described above, the one-way spur gear **328** is rotatably fixed to the bearing **362** which is secured to and rotatably fixed to the drive screw **330**. As such, rotation of the one-way spur gear **328** causes corresponding rotation of the drive screw **330**.

[0092] The drive nut **332** includes a threaded bore **374** that receives and is threadably engaged with the threaded outer surface **366** of the drive screw **330**. The drive nut **332** is coupled to a proximal portion of the connecting rods **334**. In aspects of the disclosure, the drive nut **332** includes protrusions **378** that are received within openings **380** formed in the proximal portions of the connecting rods **334** to connect the drive nut **332** to the connecting rods **334**. The connecting rods **334** extend distally from the drive nut **332** and include distal portions that are connected to the coupling member **336**. In aspects of the disclosure, the coupling member **336** includes protrusions **384** that are received within openings

386 formed in the distal portions of the connecting rods 334 to connect the coupling member 336 to the connecting rods 334. The drive nut 332 and the connecting rods 334 are received within the guide tube 338.

[0093] When the drive screw 330 is rotated, engagement between the outer threaded surface 366 of the drive screw 330 and the inner threaded bore 374 of the drive nut 332 causes the drive nut 332 to translate longitudinally along the drive screw 330 within the guide tube 338. The drive nut 332 is connected to the connecting rods 334 such that longitudinal translation of the drive nut 332 along the drive screw 330 causes the connecting rods 334 to move longitudinally within the guide tube to advance to coupling member 336.

[0094] The coupling member 336 is coupled to a firing rod 382 such that longitudinal movement of the coupling member 336 causes longitudinal movement of the firing rod 382. In aspects of the disclosure, the firing rod 382 includes a head portion 384 and an elongate body 386. The head portion 384 has a diameter that is greater than a diameter of the elongate body 386. The coupling member 336 defines a slot 390 that has a width that is greater than the diameter of the elongate body 386 but less than the diameter of the head portion 384. The elongate body 386 of the firing rod 382 is received through the slot 390 in the coupling member 336 to axially fix the firing rod 382 to the coupling member 336 while allowing relative rotation of the firing rod 382 and the coupling member 336.

[0095] The one-way spur gear 328 is movably positioned within the cavity 352 of the cylindrical body 344 of the gear casing 340 between a retracted position (FIG. 24) and an advanced position (FIG. 26A). In the advanced position, the one-way spur gear is engaged with the proximal extension 368 of the drive screw 330 and the output shaft 324 of the motor assembly 318 such that rotation of the output shaft 324 of the motor assembly 324 causes rotation of the drive screw 330. In the advanced position, the one-way spur gear 328 is disengaged from the output shaft 324 of the motor assembly 318 but still engaged with the drive screw 330. A biasing member 396, e.g., a coil spring, is positioned between the distal surface of the motor assembly 318 and a proximal surface of the one-way spur gear 328 to urge the one-way spur gear 328 towards the advanced position. In aspects of the disclosure, the proximal surface of the one-way spur gear 328 defines a recess 328*a* (FIG. 26A) that receives the biasing member 396.

[0096] FIGS. 20 and 21 illustrate the manual retract mechanism 322 includes a pawl assembly 410 and a locking clip 412. The pawl assembly 410 includes a handle 414 and a body portion 416. In aspects of the disclosure, the body portion has an oval or annular configuration and supports a ratcheting pawl 418 that is pivotably secured to an upper portion of the body portion 416 by a pivot member 420. The ratcheting pawl 418 extends downwardly into a circular opening defined by the body portion 416. The body portion 416 is received about the gear casing 340 with the ratcheting pawl 418 positioned over the window 354 in the gear casing 340 above the one-way spur gear 328. A lower portion of the body portion 416 defines a circular slot 422.

[0097] The locking clip 412 has a rectangular shape and includes a base portion 426 and spaced legs 428 that extend upwardly from the base portion 426. Each of the legs 428 of the locking clip 412 includes a stepped inner surface 430 that includes a first surface 430*a* and a second surface 430*b*. The first surfaces 430*a* of the legs 428 define a first width X1 and the second surfaces 430*b* define a second width X2 that is greater than the first width X2. Each of the legs 428 is received through one of the openings 356 and cutouts 358 of the gear casing 340 such that the stepped inner surfaces 430 of the legs 428 of the locking clip 412 are positioned within the cavity 352 of the gear casing 340. The locking clip 322 is movable from a first position (FIG. 23) in which the first surfaces 430*a* of the legs 428 of the locking clip 322 are aligned with the one-way spur gear 328 and a second position in which the second surfaces 430*b* of the legs 428 of the locking clip 322 are spaced from the one-way spur gear 328. The width X1 between the first surfaces 430*a* of the legs 428 of the locking clip 322 is such to prevent movement of the one-way spur gear 322 to its advanced position, whereas the width X2 between the second surfaces 430*b* of the legs 428 of the locking clip 322 allows movement of the one-way spur gear 322 to the advanced position.

[0098] The base portion 426 of the locking clip 322 includes a protrusion 434 that is received within the circular slot 422 in the body portion 416 of the pawl assembly 410. Receipt of the protrusion 434 couples the pawl assembly 410 to the locking clip 322 to retain the pawl assembly 410 in a stable position about the gear casing 340. In aspects of the disclosure, the protrusion 434 has an enlarged head and the circular slot includes overhanging ledges that retain the enlarged head of the protrusion 434 within the circular slot 422. The protrusion 434 is configured to slide within the circular slot 422 as described in further detail below.

[0099] FIGS. 22-24 illustrate the handle assembly 12 (FIG. 18) in a pre-fired position with the pawl assembly 322 positioned about the gear casing 340 and the ratcheting pawl 418 positioned above the window 354 in the gear casing 340. When the handle assembly 12 is assembled, the one-way spur gear 328 is pressed proximally towards the motor assembly 318 to compress the biasing member 396 and position the one-way spur gear 328 in its retracted position. After the one-way spur gear 328 is in its retracted position, the legs 428 of the locking clip 412 are inserted from a side of the gear casing 340 opposite to the ratcheting pawl 418 into the openings 356 and cutouts 358 formed in the gear casing 340 to its first position. In the first position of the locking clip 412, the first surfaces 430*a* of the legs 428 of the locking clip 412 engage a distal face of the one-way spur gear 328 to retain the one-way spur gear 328 in its retracted position against the urging of the biasing member 396. In its retracted position, the one-way spur gear 328 is engaged with both the output shaft 324 of the motor assembly 318 and the one-way spur gear 328. When the locking clip 412 is in its first position, the protrusion 434 on the locking clip 412 is pressed into the circular slot 422 on the body portion 416 of the pawl assembly 322 to couple the pawl assembly 322 to the locking clip 412 (FIG. 24).

[0100] In the pre-fired position of the handle assembly 12 (FIG. 18), the drive nut 322 is positioned near the proximal end of the drive screw 330 and the coupling member 336 is positioned adjacent the distal end of the guide tube 338 such that the connecting rods 334 are in retracted positions and the firing rod 382 is in its retracted position.

[0101] FIG. 25 illustrates the handle assembly 12 (FIG. 1) in a fired position. When the stapling device 10 (FIG. 1) is fired by pressing the actuation buttons 20 (FIG. 1), the motor assembly 318 is activated to rotate the output shaft 324. Rotation of the output shaft 324 causes corresponding rotation of the one-way spur gear 328 and the drive screw

330 to advance the drive nut 322 along the drive screw 330 in the direction of arrow "J". As the drive screw 330 advances the drive nut 322, the drive nut 322 advances the connecting rods 334 to advance the firing rod 382 in the direction of arrow "K" and actuate the tool assembly 16 (FIG. 1) as described above regarding stapling device 10 (FIG. 1).

[0102] When the tool assembly 16 is in the clamped and fired position (FIG. 11) and the powered stapling device 10 (FIG. 1) becomes inoperable and cannot be unclamped using the motor assembly 318, the manual retract mechanism 322 allows the tool assembly to be manually unclamped. FIGS. 26-28 illustrate operation of the manual retract mechanism 322. In order to operate the manual retract mechanism 322, the pawl assembly 322 is pressed downwardly in the direction of arrows "L" in FIGS. 26-27. When the pawl assembly 322 is pressed downwardly, the locking clip 412, which is coupled to the pawl assembly 322 by the protrusion 434, is moved from its first position to its second position. In its second position, the locking clip 412 disengages from the one-way spur gear 328 such that the biasing member 396 moves the one-way spur gear 328 from its retracted position to its advanced position. In its advanced position, the one-way spur gear 328 is disengaged from the output shaft 324 of the motor assembly 318. When the pawl assembly 322 is pressed downwardly, the ratcheting pawl 418 moves through the window 354 of the gear housing 340 into engagement with the one-way spur gear 328.

[0103] After the one-way spur gear 328 is in its advanced position, the handle 414 of the pawl assembly 322 can be rotated in the direction of arrow "M" in FIG. 28 to rotate the one-way spur gear 328 and the drive screw 330 to retract the firing rod 382. As the pawl assembly 322 is rotated, the protrusion 434 moves within the circular slot 422 of the pawl assembly 322.

[0104] Persons skilled in the art will understand that the devices and methods specifically described herein and illustrated in the accompanying drawings are non-limiting exemplary embodiments. It is envisioned that the elements and features illustrated or described in connection with one exemplary embodiment may be combined with the elements and features of another without departing from the scope of the disclosure. As well, one skilled in the art will appreciate further features and advantages of the disclosure based on the above-described embodiments. Accordingly, the disclosure is not to be limited by what has been particularly shown and described, except as indicated by the appended claims.

1. (canceled)

2. A powered handle assembly for a surgical device comprising:

a housing defining a cavity;

a motor assembly including an output shaft and a drive gear secured to the output shaft, the motor assembly supported within the housing;

a rack received within the housing and movable between a retracted position and an advanced position;

a rotating shaft supported within the housing; and

a spur gear coupled to the rotating shaft such that rotation of the rotating shaft causes rotation of the spur gear, the rotating shaft movable from a first shaft position to a second shaft position to move the spur gear from a first gear position in which the spur gear is engaged with the drive gear and the rack to a second gear position in which the spur gear is disengaged from the drive gear and engaged with the rack.

3. The powered handle assembly of claim 2, further including a crank lever coupled to the rotating shaft, the crank lever movable to move the spur gear from the first gear position to the second gear position.

4. The powered handle assembly of claim 3, further including a biasing member engaged with the spur gear, the biasing member positioned to urge the spur gear towards the first gear position.

5. The powered handle assembly of claim 4, wherein the rotating shaft includes a first portion and a second portion, the first portion rotatably fixed to the spur gear, and the second portion engaged with the crank lever.

6. The powered handle assembly of claim 5, wherein the housing defines an opening and includes a removable cover positioned over the opening, the crank lever accessible through the opening.

7. The powered handle assembly of claim 6, wherein the crank lever is movable along the second portion of the rotating shaft from a first lever position in which the rotating shaft can rotate independently of the crank lever to a second lever position in which the crank lever is rotatably fixed to the rotating shaft.

8. The powered handle assembly of claim 7, wherein the crank lever includes a hub that defines a through bore having a rectangular portion, and the second portion of the rotating shaft includes a rectangular portion that is received within the rectangular portion of the through bore when the crank lever is in the second lever position.

9. The powered handle assembly of claim 5, further including first and second C-clips, the second portion of the rotating shaft defining spaced annular grooves that receive the first and second C-clips.

10. A powered handle assembly for a surgical device comprising:

a housing defining a cavity;

a motor assembly including an output shaft and a drive gear secured to the output shaft, the motor assembly supported within the housing;

a rack received within the housing and movable between retracted and advanced positions;

a rotating shaft supported within the housing and accessible through the housing; and

a spur gear coupled to the rotating shaft such that rotation of the rotating shaft causes rotation of the spur gear, the spur gear received within the housing, the spur gear movable from a first gear position in which the spur gear is engaged with the drive gear and the rack to a second gear position in which the spur gear is disengaged from the drive gear and engaged with the rack.

11. The powered handle assembly of claim 10, further including a crank lever coupled to the rotating shaft, the crank lever movable to move the spur gear from the first gear position to the second gear position.

12. The powered handle assembly of claim 11, further including a biasing member engaged with the spur gear, the biasing member positioned to urge the spur gear towards the first gear position.

13. The powered handle assembly of claim 12, wherein the rotating shaft includes a first portion and a second portion, the first portion rotatably fixed to the spur gear, and the second portion engaged with the crank lever.

14. The powered handle assembly of claim **13**, wherein the housing defines an opening and includes a removable cover positioned over the opening, the crank lever accessible through the opening.

15. The powered handle assembly of claim **14**, wherein the crank lever is movable along the second portion of the rotating shaft from a first lever position in which the rotating shaft can rotate independently of the crank lever to a second lever position in which the crank lever is rotatably fixed to the rotating shaft.

16. The powered handle assembly of claim **15**, wherein the crank lever includes a hub that defines a through bore having a rectangular portion, and the second portion of the rotating shaft includes a rectangular portion that is received within the rectangular portion of the through bore when the crank lever is in the second lever position.

17. The powered handle assembly of claim **13**, further including first and second C-clips, the second portion of the rotating shaft defining spaced annular grooves that receive the first and second C-clips.

18. A powered handle assembly for a surgical device comprising:

a motor assembly including an output shaft and a drive gear secured to the output shaft;

a rack movable in relation to the motor between retracted and advanced positions;

a rotating shaft; and

a spur gear coupled to the rotating shaft, the rotating shaft movable from a first shaft position to a second shaft position to move the spur gear from a first gear position in which the spur gear is engaged with the drive gear and the rack to a second gear position in which the spur gear is disengaged from the drive gear and engaged with the rack.

19. The powered handle assembly of claim **18**, further including a crank lever coupled to the rotating shaft, the crank lever movable to move the spur gear from the first gear position to the second gear position.

20. The powered handle assembly of claim **19**, further including a biasing member engaged with the spur gear, the biasing member positioned to urge the spur gear towards the first gear position.

21. The powered handle assembly of claim **18**, wherein the rotating shaft includes a first portion and a second portion, the first portion rotatably fixed to the spur gear, and the second portion engaged with the crank lever.

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