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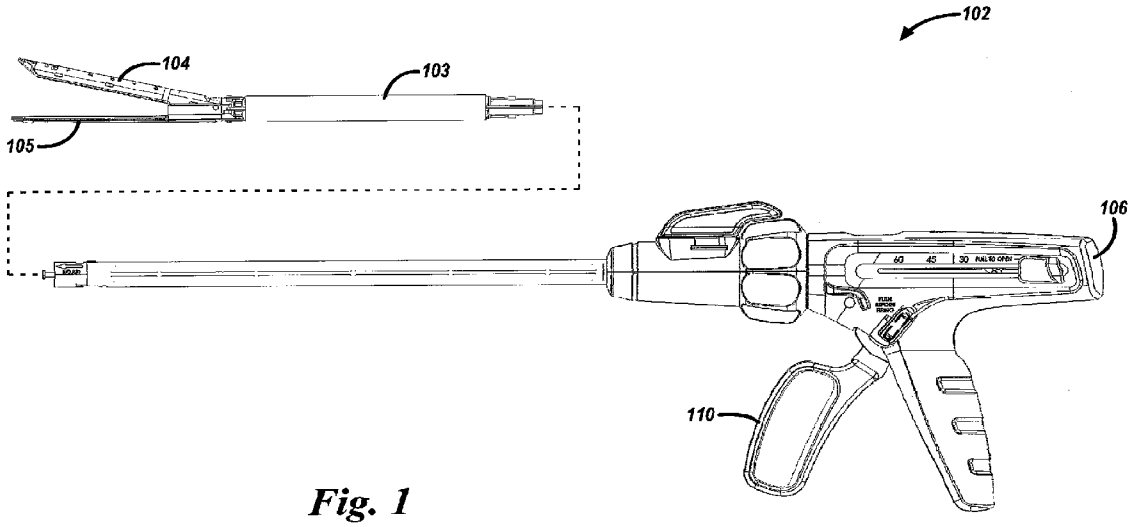

Fig. 1

(57) Abstract: The present disclosure includes apparatuses for a surgical handle assembly. An example apparatus includes a movable handle member and a switch configured to provide two or more modes of operation for the movable handle member and a driving pawl pivotally connected to a swing wheel configured to advance an actuation shaft linearly in a distal direction in response to actuation of the movable handle member.

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SURGICAL HANDLE ASSEMBLY

Technical Field

[0001] The present disclosure relates generally to a surgical handle assembly, and more particularly, to a surgical handle assembly configured to provide two or more modes of operation.

Background

[0002] A surgical handle assembly can be used in a number of surgical devices. One example includes use as a surgical stapler. A surgical stapler is a fastening device used to clamp tissue between opposing jaw structures to join tissue using surgical fasteners. Surgical staplers can include two elongated members used to clamp the tissue. One of the elongated members can include one or more reloadable cartridges and the other elongated member can include an anvil that can be used to form a staple when driven from the reloadable cartridge. A surgical stapler can receive one or more reloadable cartridges. An example of reloadable cartridges can include having rows of staples having a linear length. For example, a row of staples can have a linear length between 30mm and 60mm. A staple can be ejected by actuation of a movable handle member that is a part of the surgical handle assembly of the surgical stapler.

Brief Description of the Drawings

[0003] Figure 1 is a schematic diagram of a surgical stapling apparatus including a surgical handle assembly in accordance with a number of embodiments of the present disclosure.

[0004] Figure 2A is a schematic diagram of a surgical handle assembly in a first mode and a first movable handle member position in accordance with a number of embodiments of the present disclosure.

[0005] Figure 2B is a schematic diagram of a surgical handle assembly in a first mode and a second movable handle member position in accordance with a number of embodiments of the present disclosure.

[0006] Figure 3A is a schematic diagram of a surgical handle assembly in a second mode and a first movable handle member position in accordance with a number of embodiments of the present disclosure.

[0007] Figure 3B is a schematic diagram of a surgical handle assembly in a second mode and a second movable handle member position in accordance with a number of embodiments of the present disclosure.

[0008] Figure 4 is a schematic diagram of a surgical handle assembly including a first opening, a second opening, and a slot in accordance with a number of embodiments of the present disclosure.

[0009] Figure 5 is a schematic diagram of a surgical handle assembly including a coupling point opening in accordance with a number of embodiments of the present disclosure.

Detailed Description

[0010] The present disclosure includes apparatuses for a surgical handle assembly. An example apparatus includes a movable handle member and mode selection capability, e.g. a switch, configured to provide two or more modes of operation for the movable handle member. A driving pawl can be pivotally connected to a swing wheel to advance an actuation shaft linearly in a distal direction in response to actuation of the movable handle member.

[0011] In a number of embodiments, the mode selection capability can be a switch. The surgical handle assembly is described with the switch example throughout the present disclosure for ease of understanding and illustration; however embodiments are not limited to a switch. For example, the switch can include a first pin and a second pin to set modes of operation. While a first pin and a second pin are shown by example, more than two pins and/or two modes of operation are included in the embodiments disclosed herein. In this example, the first pin when set to a particular position can provide a first mode of operation for the movable handle member. The second pin when set to a particular position can provide a second mode of operation for the movable handle member. Use of the surgical handle assembly with a surgical stapler in the first mode of operation can advance an actuation shaft a first distance in the distal direction and coupled to a reloadable cartridge can deploy a first number of staples. Use of the surgical handle assembly with a surgical stapler in the second mode of operation can advance an actuation shaft a second distance in a distal direction and coupled to a reloadable cartridge can deploy a second, different number of staples. In a number of embodiments, the first mode of

operation or the second mode of operation can be selected based on the type of tissue being fastened, a number of staples to be deployed, speed of staples being deployed, and/or an amount of force to be applied by a user to actuate the movable handle member, for example. A mode of operation can be selected based on the type of tissue being fastened, for example, when the tissue is thick, the user may use a mode that requires less force to be applied. A mode that requires less force also may be used when the user is fatigued or physically unable to use a mode that requires more force, for example. A mode of operation can be selected based on speed of staples being deployed to lower edema, e.g. less blood in area being stapled, to allow stapling of tissue rather than blood.

[0012] In a number of embodiments, the movable handle member may be coupled to a swing wheel. In this manner, the movable handle member and swing wheel may pivot around the first pin at a first pivot point during a first mode. The first pin can be connected to the movable handle member via a first opening in the swing wheel and movable handle member to engage the movable handle member. In a number of embodiments, the movable handle member and swing wheel may pivot around the second pin at a second pivot point during a second mode. The second pin can be connected to the movable handle member via a second opening in the swing wheel and movable handle member to engage the movable handle member. The second pin is not coupled to the movable handle member via the second opening while in the first mode of operation. The first pin is not coupled to the movable handle member via the first opening while in the second mode of operation.

[0013] In a number of embodiments, transition from the first mode of operation to the second mode of operation can be accomplished by removing the first pin from the first opening while engaging the second pin with the second opening. The switch may be moved from a first position to a second position in order to engage and/or disengage the first and second pins with their respective openings. Transition from the second mode of operation to the first mode of operation can be accomplished by removing the second pin from the second opening while engaging the first pin with the first opening. Here, the switch may be moved from a second position to a first position to engage and/or disengage the first and second pins with their respective openings.

[0014] In the following detailed description of the present disclosure, reference is made to the accompanying drawings that form a part hereof, and in which is shown by way of illustration how one or more embodiments of the disclosure may be practiced. These embodiments are described in sufficient detail to enable those of ordinary skill in the art to practice the embodiments of this disclosure, and it is to be understood that other embodiments may be utilized and that process, electrical, and structural changes may be made without departing from the scope of the present disclosure.

[0015] As used herein, designators such as "X", "Y", "N", "M", etc., particularly with respect to reference numerals in the drawings, indicate that a number of the particular feature so designated can be included. It is also to be understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to be limiting. As used herein, the singular forms "a", "an", and "the" can include both singular and plural referents, unless the context clearly dictates otherwise. In addition, "a number of", "at least one", and "one or more" (e.g., a number of pivot points) can refer to one or more pivot points, whereas a "plurality of" is intended to refer to more than one of such things. Furthermore, the words "can" and "may" are used throughout this application in a permissive sense (i.e., having the potential to, being able to), not in a mandatory sense (i.e., must). The term "include," and derivations thereof, means "including, but not limited to". The terms "coupled" and "coupling" mean to be directly or indirectly connected physically or for access to and movement of the movable handle member, as appropriate to the context.

[0016] The figures herein follow a numbering convention in which the first digit or digits correspond to the figure number and the remaining digits identify an element or component in the figure. Similar elements or components between different figures may be identified by the use of similar digits. For example, 210 may reference element "10" in Figure 2A, and a similar element may be referenced as 310 in Figure 3A. As will be appreciated, elements shown in the various embodiments herein can be added, exchanged, and/or eliminated so as to provide a number of additional embodiments of the present disclosure. In addition, the proportion and/or the relative scale of the elements provided in

the figures are intended to illustrate certain embodiments of the present disclosure and should not be taken in a limiting sense.

[0017] Figure 1 is a schematic diagram of a surgical stapling apparatus 102 including a surgical handle assembly 106 in accordance with a number of embodiments of the present disclosure. In the example, a surgical stapler apparatus 102 can include a surgical handle assembly 106 and a reloadable cartridge assembly 103. As shown in the example of Figure 1, the reloadable cartridge assembly 103, e.g. a disposable loading unit, can be releasably secured to a distal end of an elongated body of the surgical handle assembly 106. In this example, the reloadable cartridge assembly 103 can include a first elongated member 104 and a second elongated member 105 that can be used to clamp tissue. One of the elongated members can house one or more staple cartridges. The other elongated member can have an anvil that can be used to form a staple when driven from the staple cartridge. As mentioned, a surgical stapling apparatus 102 can receive reloadable cartridge assemblies having rows of staples. In a number of embodiments, third party reloadable cartridge and/or reloadable cartridge assemblies may be used with the surgical handle assembly 106 and embodiments of surgical handle assembly 106 may be configured to receive the same. A staple can be ejected by actuation of a movable handle member 110 that is a part of a surgical handle assembly 106 to the surgical stapling apparatus 102. Actuation of the movable handle member 110 can actuate the actuation shaft (e.g. actuation shaft 240 in Fig. 2A) to eject a number of staples. For example, in a first mode of operation, actuation of the movable handle member 110 may eject 30 staples. In a second mode, actuation of the movable handle member 110 may eject 60 staples. However, embodiments are not limited to a particular number of staples ejected in the first or second mode. Further, embodiments are not limited to use with a surgical stapling apparatus. The surgical handle assembly 106 is described with the surgical stapling apparatus 102 example throughout the present disclosure for ease of understanding and illustration.

[0018] Figure 2A is a schematic diagram of a surgical handle assembly in a first mode and in a first movable handle member position (e.g., "ready" position) in accordance with a number of embodiments of the present disclosure. The surgical handle apparatus 206 can include a movable handle member 210, a

switch 220, and a driving pawl 230. The switch 220 can provide two or more modes of operation for the movable handle member 210. The driving pawl 230 in a number of embodiments can be pivotally connected to a swing wheel 226 and can be configured to advance an actuation shaft 240 linearly in a distal direction in response to actuation of the movable handle member 210.

[0019] In a number of embodiments, the surgical handle assembly 206 can be in a first mode, as shown in Figure 2A. The surgical handle assembly 206, in a first mode, can have a first distance (e.g. distance 513 in Fig. 5) between a pivot point around first pin 222 to a coupling pin 232 of the driving pawl 230. The surgical handle assembly 206, in a second mode, can have a second distance (e.g. distance 515 in Fig. 5) between a pivot point around second pin 224 to the coupling pin 232 of the driving pawl 230. In this example, the second distance (e.g. distance 515 in Fig. 5) is longer than the first distance (e.g. first distance 513 in Fig. 5). In a number of embodiments, a number of pivot points can exist and a pivot point can be around a pin placed in an opening in the movable handle 210. In Figure 2A, in the first mode, a first pin 222 can be coupled to the movable handle member 210 in a first opening and a second pin 224 can be disengaged from the second opening (e.g. second opening 454 in Fig. 4) so as not to be coupled to the movable handle member 210. In the first mode the first pin 222 can serve as the pivot point for the movable handle member 210 with the first distance (e.g. distance 513 in Fig. 5) between the pivot point and coupling pin 232. In a second mode, a second pin 224 can be coupled to the movable handle member 210. In this example, the first pin 222 can be disengaged from the first opening (e.g. first opening 452 in Fig. 4) so as not to be coupled to the movable handle member 210. In the second mode the second pin 224 can serve as the pivot point for the movable handle member 210. In this example, the second distance (e.g. distance 515 in Fig. 5) is longer than the first distance (e.g. first distance 513 in Fig. 5). As such, in the first mode, when the first pin 222 is the pivot point, an amount of force used to advance the actuation shaft 240 linearly in a distal direction is less than an amount of force used to advance the actuation shaft 240 linearly in the distal direction in a second mode of operation, using the second pin 224 as the pivot point. In this example, the amount of force used is less in the first mode than in the second mode due to the

distance between the pivot point and the coupling pin 232 of the driving pawl 230 and because the travel distance is less.

[0020] In a number of embodiments, the surgical handle assembly 206 can be in a first mode. In a first mode, the surgical handle assembly 206 can operate to advance the actuation shaft 240 a third distance (e.g. distance 544 in Fig. 5). The third distance (e.g. distance 544 in Fig. 5) is a length of advance of the actuation shaft 240 in a distal direction, upon actuation of the movable handle member 210 in the first mode. The surgical handle assembly 206 can alternatively be changed to a second mode of operation. In a second mode, the surgical handle assembly 206 can operate to advance the actuation shaft 240 a fourth distance (e.g. distance 546 in Fig. 5). The fourth distance (e.g. distance 546 in Fig. 5) is a length of advance of the actuation shaft 240 in the distal direction upon actuation of the movable handle member 210 in the second mode. In this example, the fourth distance (e.g. distance 546 in Fig. 5) is longer than the third distance (e.g. third distance 544 in Fig. 5).

[0021] In a number of embodiments, the surgical handle assembly 206 can be in a ready position, as shown in Figure 2A. In the ready position, the surgical handle assembly 206 is ready to advance the actuation shaft 240 linearly in a distal direction upon actuation of the movable handle member 210.

[0022] Figure 2B is a schematic diagram of a surgical handle assembly in a first mode and a second movable handle member position (e.g. a "compressed" and/or "closed" position) in accordance with a number of embodiments of the present disclosure. The surgical handle assembly 206 can include a movable handle member 210, a switch 220, and a driving pawl 230. The switch 220 can provide two or more modes of operation for the movable handle member 210. The driving pawl 230 in a number of embodiments can be pivotally connected to a swing wheel 226 and can be configured to advance an actuation shaft 240 linearly in a distal direction in response to actuation of the movable handle member 210.

[0023] In a number of embodiments, the surgical handle assembly 206 can be in a first mode, as shown in Figure 2B. The surgical handle assembly 206, in a first mode, can have a first distance (e.g. distance 513 in Fig. 5) between the pivot point around first pin 222 to a coupling pin 232 of the driving pawl 230. The surgical handle assembly 206, in a second mode, can have a

second distance (e.g. distance 515 in Fig. 5) from the pivot point around second pin 224 to the coupling pin 232 of the driving pawl 230. In this example, the second distance (e.g. distance 515 in Fig. 5) is longer than the first distance (e.g. distance 513 in Fig. 5). In a number of embodiments, a number of pivot points can exist and a pivot point can be around a pin placed in an opening in the movable handle 210. In Figure 2B, in the first mode, the first pin 222 can be coupled to the movable handle member 210 in a first opening (e.g. first opening 452 in Fig. 4) and the second pin 224 can be disengaged from a second opening (e.g. second opening 454 in Fig. 4) so as not to be coupled to the movable handle member 2010. In the first mode, the first pin 222 can serve as the pivot point for the movable handle member 210 with the first distance (e.g. distance 513 in Fig. 5) between the pivot point and coupling pin 232. In the second mode the second pin 224 can serve as the pivot point for the movable handle member 210. In this example, the second distance (e.g. distance 515 in Fig. 5) is longer than the first distance (e.g. distance 513 in Fig. 5). Again, in the first mode, when the first pin 222 is the pivot point, an amount of force used to advance the actuation shaft 240 linearly in a distal direction is less than an amount of force used to advance the actuation shaft linearly in the distal direction in a second mode of operation, using the second pin 224 as the pivot point. In this example, the amount of force is less in the first mode than in the second mode due to the distance between the pivot point and the coupling pin 232 of the driving pawl 230 and the travel distance is less.

[0024] In a first mode, the surgical handle assembly 206 can operate to advance the actuation shaft 240 a third distance (e.g. third distance 544 in Fig. 5). The third distance (e.g. distance 544 in Fig. 5) is a length of advance of the actuation shaft 240 in a distal direction, upon actuation of the movable handle member 210. The surgical handle assembly 206 can be in a second mode. In a second mode, the surgical handle assembly 206 can operate to advance the actuation shaft 240 a fourth distance (e.g. distance 546 in Fig. 5). The fourth distance (e.g. distance 546 in Fig. 5) is a length of advance of the actuation shaft 240 in the distal direction. In this example, the fourth distance (e.g. distance 546 in Fig. 5) is longer than the third distance (e.g. distance 544 in Fig. 5). In a number of embodiments the fourth distance can be twice as long as the third

distance. As such, the actuation shaft 240 can be advanced twice as far in the second mode than in the first mode

[0025] In a number of embodiments, the surgical handle assembly 206 can be in a closed position, as shown in Figure 2B. As will be explained more in connection with Figure 4. In a closed position, the surgical handle assembly 206 can prevent the actuation shaft 240 from moving linearly in a distal and/or proximal direction upon release of the movable handle member 210 by having the driving pawl 230 disengage from teeth of a ratchet associated with the actuation shaft 240 and reengage with teeth further back at a starting point of the ratchet.

[0026] In a number of embodiments, the pivot point of the surgical handle assembly 206 can be changed using the switch 220. In an example, the switch 220, when actuated, can rotate a gear 223. The gear 223 can contact one or more gears of the first pin 222 and one or more gears of the second pin 224. The surgical handle assembly 206 can be placed in the first mode when the switch 220 is actuated in a first direction. When the switch 220 is actuated in the first direction, the gear 223 can rotate in a first rotational direction. When the gear 223 is rotated in a first rotational direction the gear 223 can insert the first pin 222 into a first opening (e.g. first opening 452 in Fig. 4) and can remove the second pin 224 from a second opening (e.g. second opening 454 in Fig. 4). The surgical handle assembly 206 can be placed in the second mode when the switch 220 is actuated in a second direction. When the switch 220 is actuated in the second direction the gear can rotate in a second rotational direction. When the gear 223 is rotated in a second rotational direction the gear 223can insert the second pin 224 into a second opening (e.g. second opening 454 in Fig. 4) and can remove the first pin 222 from the first opening (e.g. first opening 452 in Fig. 4). This example is used throughout the present disclosure for ease of understanding and illustration. Embodiments are not limited to a gear (e.g., gear 223 in Figure 2A, for example) to transition between modes of operation. A number of mechanisms (e.g. a switch) to insert and remove a number of pins in a number of openings in a moveable handle member for operation in a number of modes can be used in accordance with a number of embodiments of the present disclosure to transition between modes of operation. For example, a push pin can be used to switch the surgical handle assembly 206 from one mode to

another. A switch can be coupled to a first pin and a second pin such that when the first pin is pushed into the first opening (e.g. first opening 452 in Fig. 4) the second pin is removed from the second opening (e.g. second opening 454 in Fig. 4). As well as when the second pin is pushed into the second opening (e.g. second opening 454 in Fig. 4) the first pin is removed from the first opening (e.g. first opening 452 in Fig. 4).

[0027] Figure 3A is a schematic diagram of a surgical handle assembly in a second mode and a first movable handle position (e.g., "ready" position) in accordance with a number of embodiments of the present disclosure. The surgical handle assembly 306 can include a movable handle member 310, a switch 320, and a driving pawl 330. The switch 320 can provide two or more modes of operation for the movable handle member 310. The driving pawl 330 in a number of embodiments can be pivotally connected to the swing wheel 326 and can be configured to advance an actuation shaft 340 linearly in a distal direction in response to actuation of the movable handle member 310.

[0028] In a number of embodiments, the surgical handle assembly 306 can be in a second mode, as shown in Figure 3A. The surgical handle assembly 306, in a second mode, can have a second distance (e.g. distance 515 in Fig. 5) between the pivot point around a second pin 324 to the coupling pin 332 of the driving pawl 330. In this example, the second distance is longer than the first distance (e.g. distance 513 in Fig. 5). In a number of embodiments a number of pivot points can exist and a pivot point can be around a pin placed in an opening in the movable handle 310. In Figure 3A, in a second mode, a second pin 324 can be coupled to the movable handle member 310. In this example, the first pin 322 can be disengaged from the first opening (e.g. first opening 452 in Fig. 4) so as not to be coupled to the movable handle member 310. In the second mode the second pin 324 can serve as the pivot point for the movable handle member 310. In a number of embodiments, the driving pawl 330 is configured to contact a toothed rack 342 of the actuation shaft 340 to advance the actuation shaft linearly in a distal direction. The actuation shaft 340 can be advanced in response to actuation of the movable handle member 310. In this example, the second distance (e.g. distance 515 in Fig. 5) is longer than the first distance (e.g. first distance 513 in Fig. 5). As such, when the second pin 324 is the pivot point, the second mode operation advances twice as many ratchets of the toothed rack

342 than the first mode of operation. In this example, twice as many ratchets are advanced in the second mode due to the distance between the pivot point and the coupling pin 332 of the driving pawl 330.

[0029] In a number of embodiments, a swing wheel 326 is connected to the movable handle member 310. Also, in a number of embodiments, the movable handle member can include a coupling opening (e.g. coupling opening 516 in Fig. 5). The swing wheel 326 and the coupling opening (e.g. coupling opening 516 in Fig. 5) can be used in the second mode of operation to allow transfer of force from the movable handle member 310 to the driving pawl 330. Transferring the force from the movable handle member 310 to the driving pawl 330 allows the actuation shaft 340 to advance linearly in the distal direction.

[0030] In a number of embodiments, the surgical handle assembly 306 can be in a ready position, as shown in Figure 3A. In the ready position the surgical handle assembly 306 is ready to advance the actuation shaft 340 linearly in a distal direction upon actuation of the movable handle member 310.

[0031] Figure 3B is a schematic diagram of a surgical handle assembly in a second mode and a second movable handle member position (e.g. a "compressed" and/or "closed" position) in accordance with a number of embodiments of the present disclosure. The surgical handle assembly 306 can include a movable handle member 310, a switch 320, and a driving pawl 330. The switch 320 can provide two or more modes of operation for the movable handle member 310. The driving pawl 330 in a number of embodiments can be pivotally connected to the swing wheel 326 and can be configured to advance an actuation shaft 340 linearly in a distal direction in response to actuation of the movable handle member 310.

[0032] In a number of embodiments, the surgical handle assembly 306 can be in a second mode, as shown in Figure 3B. The surgical handle assembly 306, in the second mode, can have a second distance (e.g. second distance 515 in Fig. 5) from the pivot point around the second pin 324 to the coupling pin 332 of the driving pawl 330. In this example, the second distance (e.g. distance 515 in Fig. 5) is longer than the first distance (e.g. first distance 513 in Fig. 5). In a number of embodiments a number of pivot points can exist and a pivot point can be around a pin placed in an opening in the movable handle 310. In a second mode, a second pin 324 can be coupled to the movable handle member 310. In

this example, the first pin 322 can be disengaged from the first opening (e.g. first opening 452 in Fig. 4) so as not to be coupled to the movable handle member 310. In the second mode the second pin 324 can serve as the pivot point for the movable handle member 310. In the second mode the second pin 324 can serve as the pivot point for the movable handle member 310. In this example, the second distance (e.g. distance 515 in Fig. 5) is longer than the first distance (e.g. distance 513 in Fig. 5). In a number of embodiments, the driving pawl 330 is configured to contact a toothed rack 342 of an actuation shaft 340 to advance the actuation shaft linearly in a distal direction in response to actuation of the movable handle member 310. In this example, the second distance (e.g. distance 515 in Fig. 5) is longer than the first distance (e.g. first distance 513 in Fig. 5). As such, when the second pin 324 serves as the pivot point, the second mode of operation advances the actuation shaft 340 twice as far and advances twice as many ratchets of the toothed rack than the first mode of operation. In this example, the actuation shaft 340 is advanced twice as far and twice as many ratchets are advanced in the second mode due to the distance between the pivot point and the coupling pin 332 of the driving pawl 330.

[0033] In a number of embodiments, the surgical handle assembly 306 can be in a closed position, as shown in Figure 3B. In a closed position, the surgical handle assembly 306 can prevent the actuation shaft 340 from moving linearly in a distal and/or proximal direction upon release of the movable handle member 310.

[0034] Figure 4 is a schematic diagram of a surgical handle assembly including a first opening, a second opening, and a slot in accordance with a number of embodiments of the present disclosure. In Figure 4, the movable handle member 410 can include a first opening 452 and a second opening 454. The first pin (e.g. first pin 222 in Fig. 2A) can be inserted into the first opening 452 for the first mode. The second pin (e.g. second pin 224 in Fig. 2A) can be inserted into the second opening 454 for the second mode. In a number of embodiments, the swing wheel 426 can include a slot 428. The slot 428 can allow the swing wheel 426 to rotate whether the first pin (e.g. first pin 222 in Fig. 2A) is inserted into the first opening 452 or the first pin (e.g. first pin 222 in Fig. 2A) is removed from the first opening 452.

[0035] Figure 5 is a schematic diagram of a surgical handle assembly including a coupling opening 516 in accordance with a number of embodiments of the present disclosure. In a number of embodiments, the movable handle member 510 can include a coupling opening 516. The coupling pin (e.g. coupling pin 232 in Fig. 2A) can be pivotally connected to the coupling opening 516. The coupling opening 516 can allow the actuation shaft 540 to advance linearly in the distal direction without coupling pin 232 binding due to the shape of the coupling opening 516. The coupling opening 516 shape, for example, can be a "U" shape, e.g. saddle, allowing degrees of translation and movement in contrast to being a fixed point.

[0036] In a number of embodiments, the surgical handle assembly 506 can be in a first mode. In the first mode, the first pin (e.g. first pin 222 in Fig. 2A) serves as the pivot point, having a first distance 513. In a second mode, the second pin (e.g. second pin 224 in Fig. 2A) serves as the pivot point, having a second distance 515. In this example, the second distance 515 is longer than the first distance 513.

[0037] In a number of embodiments, the surgical handle assembly 506 can be in a first mode having a third distance 544. The third distance 544 is a length of advance of the actuation shaft 540 in the distal direction. The surgical handle assembly 506 can be in a second mode having a fourth distance 546. The fourth distance 546 is a length of advance of the actuation shaft 540 in the distal direction. In this example, the fourth distance 546 is longer than the third distance 544.

[0038] Figure 5 illustrates the surgical handle assembly 506 in a second mode and the movable handle member 510 in a closed position. The driving pawl (e.g. driving pawl 230 in Fig. 2A), in this example, is at the end of the fourth distance 546 and has fully advanced the actuation shaft 540 for an actuation of the movable handle member 510 in the second mode of operation. In a first mode and when the movable handle member 510 is in a closed position, the driving pawl (e.g. driving pawl 230 in Fig. 2A) can be at the end of the third distance 544 and has fully advanced the actuation shaft 540 for an actuation of the movable handle member 510 in the first mode of operation.

[0039] Although specific embodiments have been illustrated and described herein, those of ordinary skill in the art will appreciate that an

arrangement calculated to achieve the same results can be substituted for the specific embodiments shown. This disclosure is intended to cover adaptations or variations of one or more embodiments of the present disclosure. It is to be understood that the above description has been made in an illustrative fashion, and not a restrictive one. Combination of the above embodiments, and other embodiments not specifically described herein will be apparent to those of skill in the art upon reviewing the above description. The scope of the one or more embodiments of the present disclosure includes other applications in which the above structures and processes are used. Therefore, the scope of one or more embodiments of the present disclosure should be determined with reference to the appended claims, along with the full range of equivalents to which such claims are entitled.

[0040] In the foregoing Detailed Description, some features are grouped together in a single embodiment for the purpose of streamlining the disclosure. This method of disclosure is not to be interpreted as reflecting an intention that the disclosed embodiments of the present disclosure have to use more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive subject matter lies in less than all features of a single disclosed embodiment. Thus, the following claims are hereby incorporated into the Detailed Description, with each claim standing on its own as a separate embodiment.

What is claimed is:

1. A surgical handle assembly apparatus, comprising:

a movable handle member;

a switch configured to:

provide two or more modes of operation for the movable handle member; and

a driving pawl pivotally connected to a swing wheel configured to:

advance an actuation shaft linearly in a distal direction in response to actuation of the movable handle member.

2. The apparatus of claim 1, wherein an amount of force used to advance the actuation shaft linearly in the distal direction in a first mode of operation is less than an amount of force used to advance the actuation shaft linearly in the distal direction in a second mode of operation.

3. The apparatus of claim 1, wherein a length of advance of the actuation shaft in the distal direction in a first mode of operation is less than a length of advance of the actuation shaft in the distal direction in a second mode of operation.

4. The apparatus of claim 1, wherein the swing wheel is connected to the movable handle member.

5. The apparatus of claim 4, wherein the swing wheel is used in a second mode of operation to allow the actuation shaft to advance linearly in the distal direction.

6. The apparatus of claim 1, wherein the switch includes a first pin and a second pin.

7. A surgical handle assembly apparatus, comprising:

a movable handle member;

a swing wheel connected to the movable handle member;

a switch including a first pin to provide a first mode of operation for the movable handle member and a second pin to provide a second mode of operation for the movable handle member; and

a driving pawl pivotally connected to the swing wheel configured to advance an actuation shaft linearly in a distal direction in response to actuation of the movable handle member.

8. The apparatus of claim 7, wherein the first mode of operation deploys a first number of staples and the second mode of operation deploys a second number of staples.

9. The apparatus of claim 7, wherein the first mode of operation or the second mode of operation is selected based on type of tissue.

10. The apparatus of claim 7, wherein the handle pivots around the first pin at a first pivot point during a first mode.

11. The apparatus of claim 7, wherein the handle pivots around the second pin at a second pivot point during a second mode.

12. The apparatus of claim 10, wherein a first pin is connected to the movable handle member via a first opening in the movable handle member for the first mode of operation.

13. The apparatus of claim 12, wherein a second pin is connected to the movable handle member via a second opening in the movable handle member for the second mode of operation.

14. A surgical handle assembly apparatus, comprising:

a movable handle member;

a swing wheel connected to the movable handle member;

a switch configured to connect a first pin to the movable handle member via a first opening during a first mode of operation and to connect a second pin

to the movable handle member via a second opening during a second mode of operation; and

a driving pawl pivotally connected to the swing wheel configured to contact a toothed rack of an actuation shaft to advance the actuation shaft linearly in a distal direction in response to actuation of the movable handle member.

15. The apparatus of claim 14, wherein the first mode operation advances fewer ratchets of the toothed rack than the second mode of operation.

16. The apparatus of claim 14, wherein the movable handle member includes a first pivot point around the first pin and a second pivot point around the second pin.

17. The apparatus of claim 14, wherein the first pin is not coupled to the movable handle member via the first opening during the second mode of operation.

18. The apparatus of claim 14, wherein the second pin is not coupled to the movable handle member via the second opening during the first mode of operation.

19. The apparatus of claim 18, wherein the switch is configured to transition from the first mode of operation to the second mode of operation by removing the first pin from the first opening while engaging the second pin with the second opening.

20. The apparatus of claim 14, wherein actuation of the movable handle member in the first mode of operation uses less force than actuation of the movable handle member in the second mode of operation.

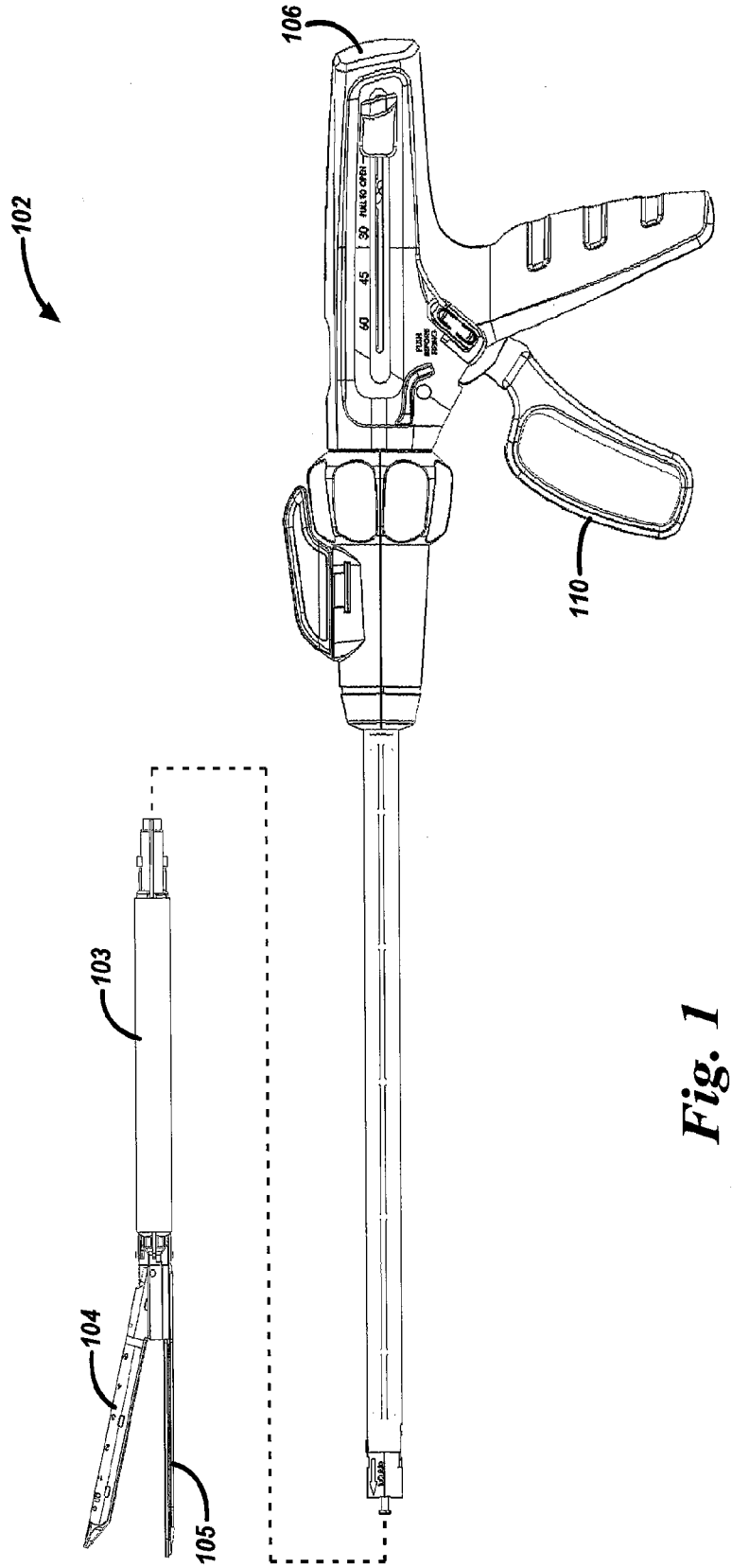

Fig. 1

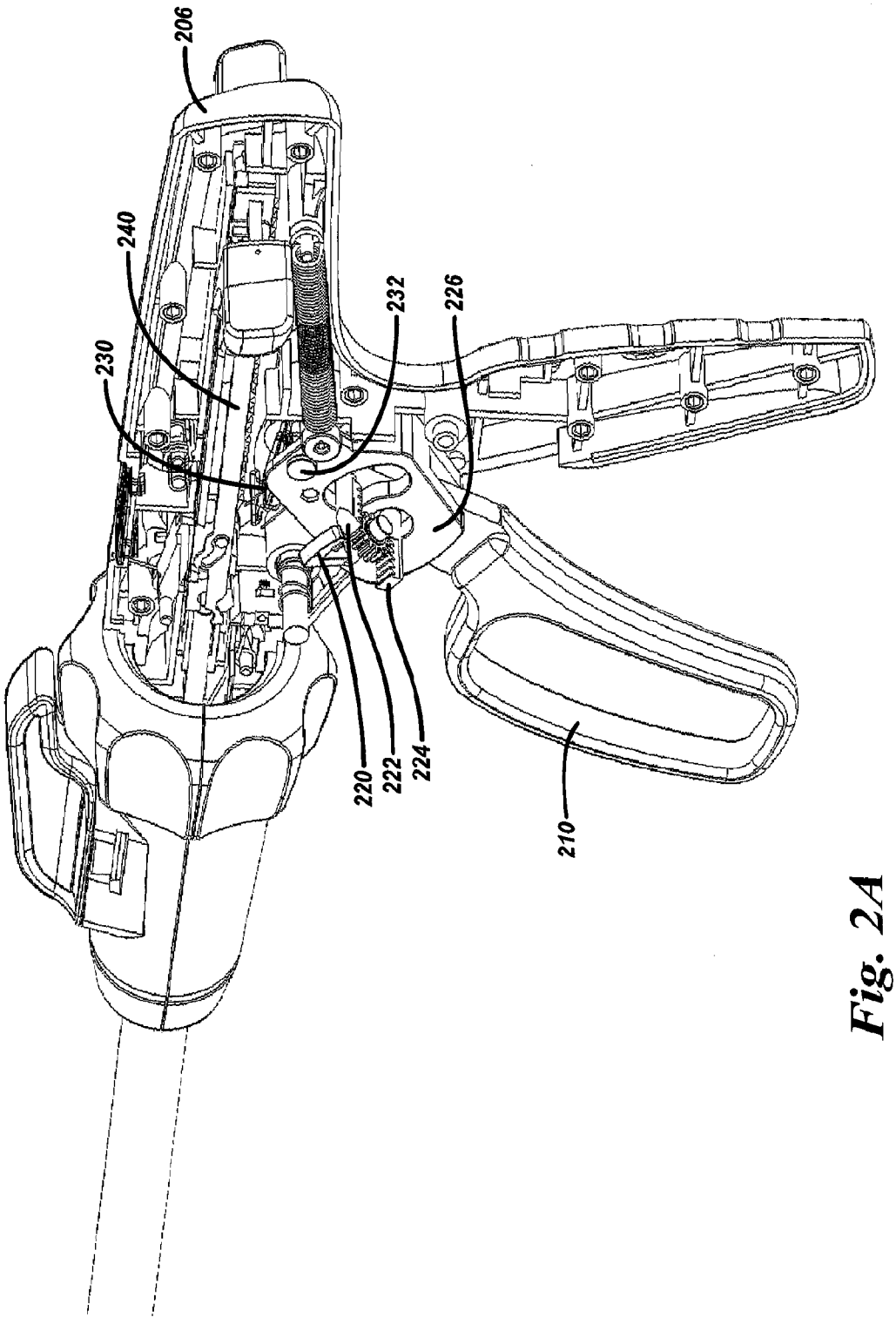

Fig. 2A

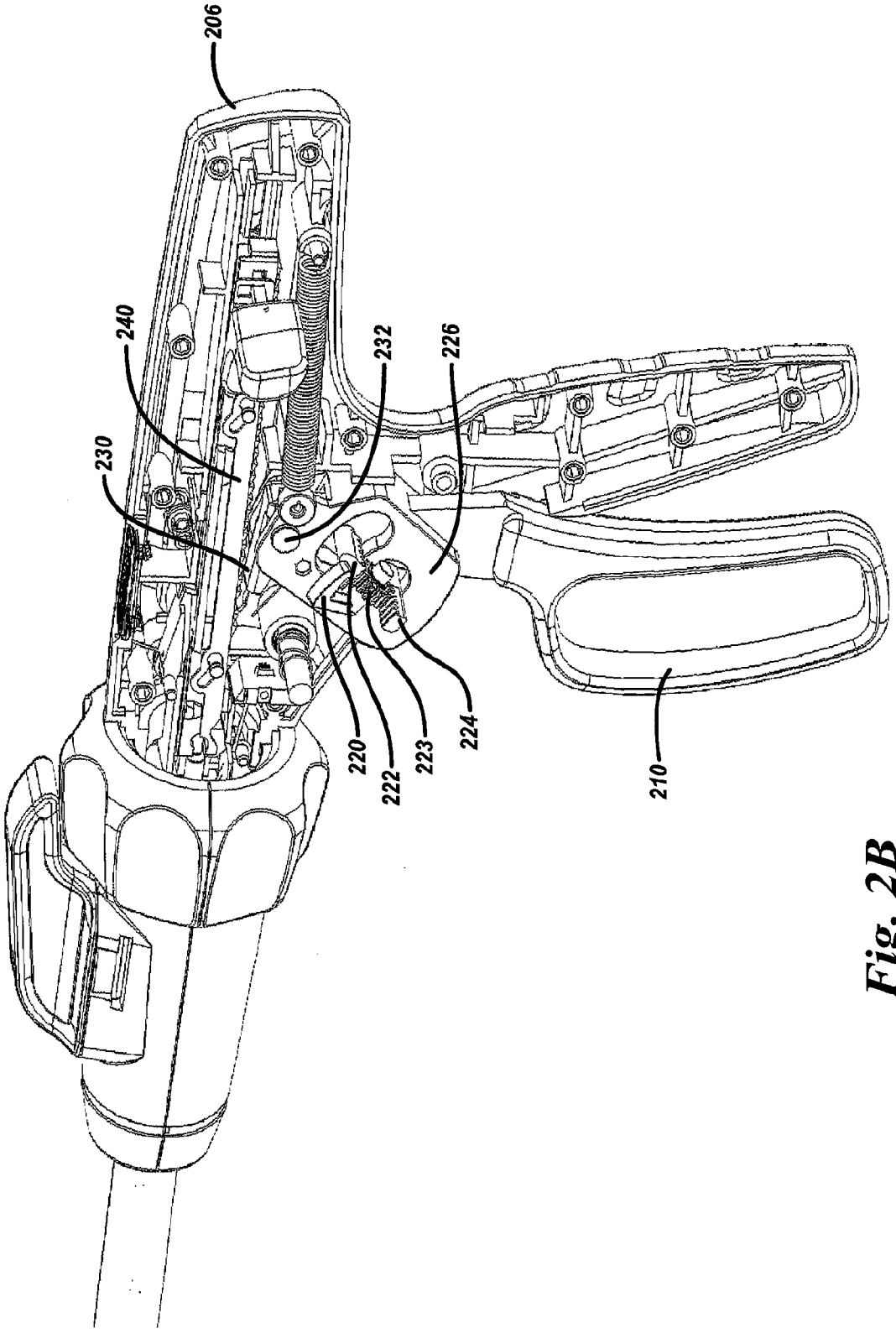

Fig. 2B

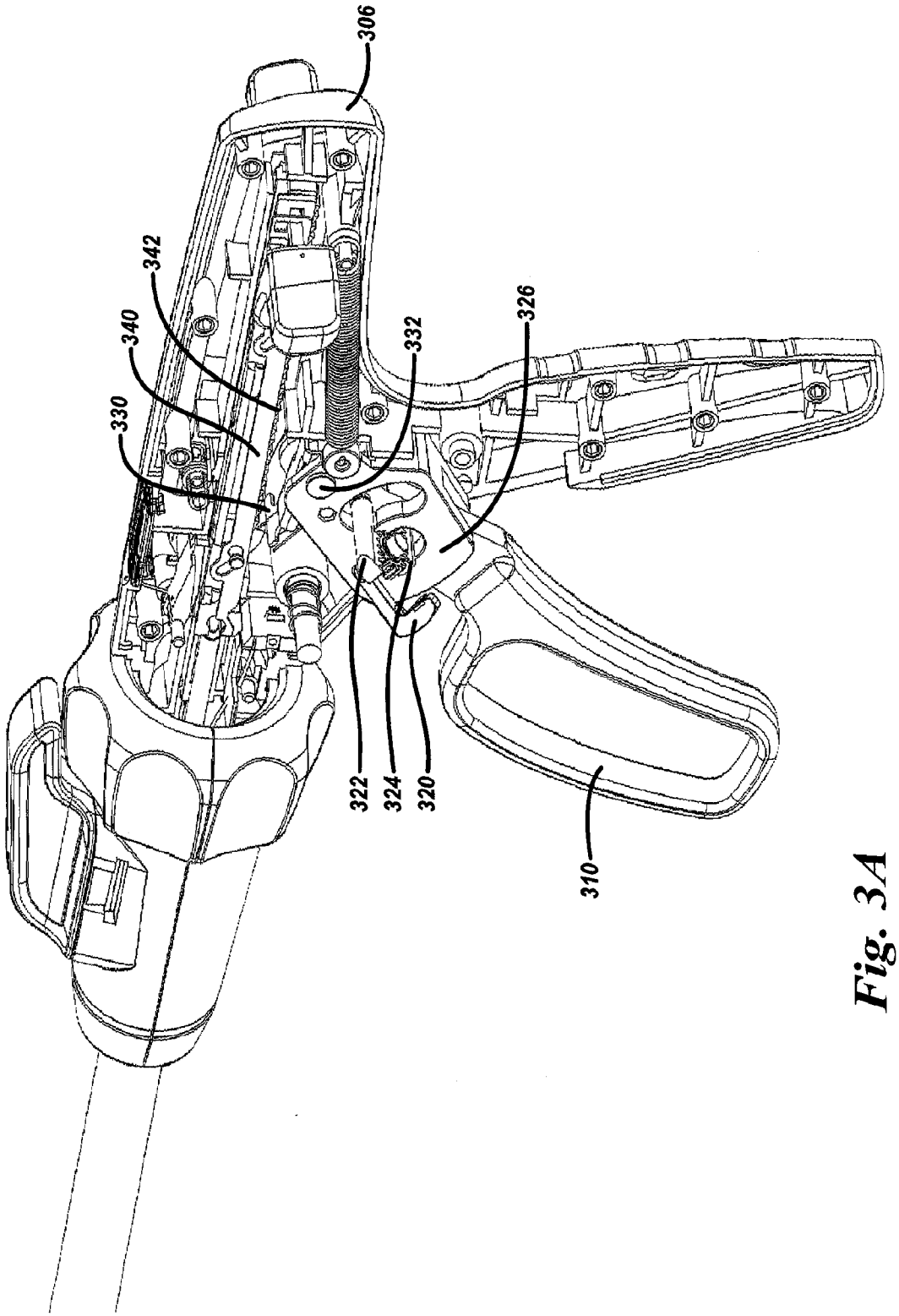

Fig. 3A

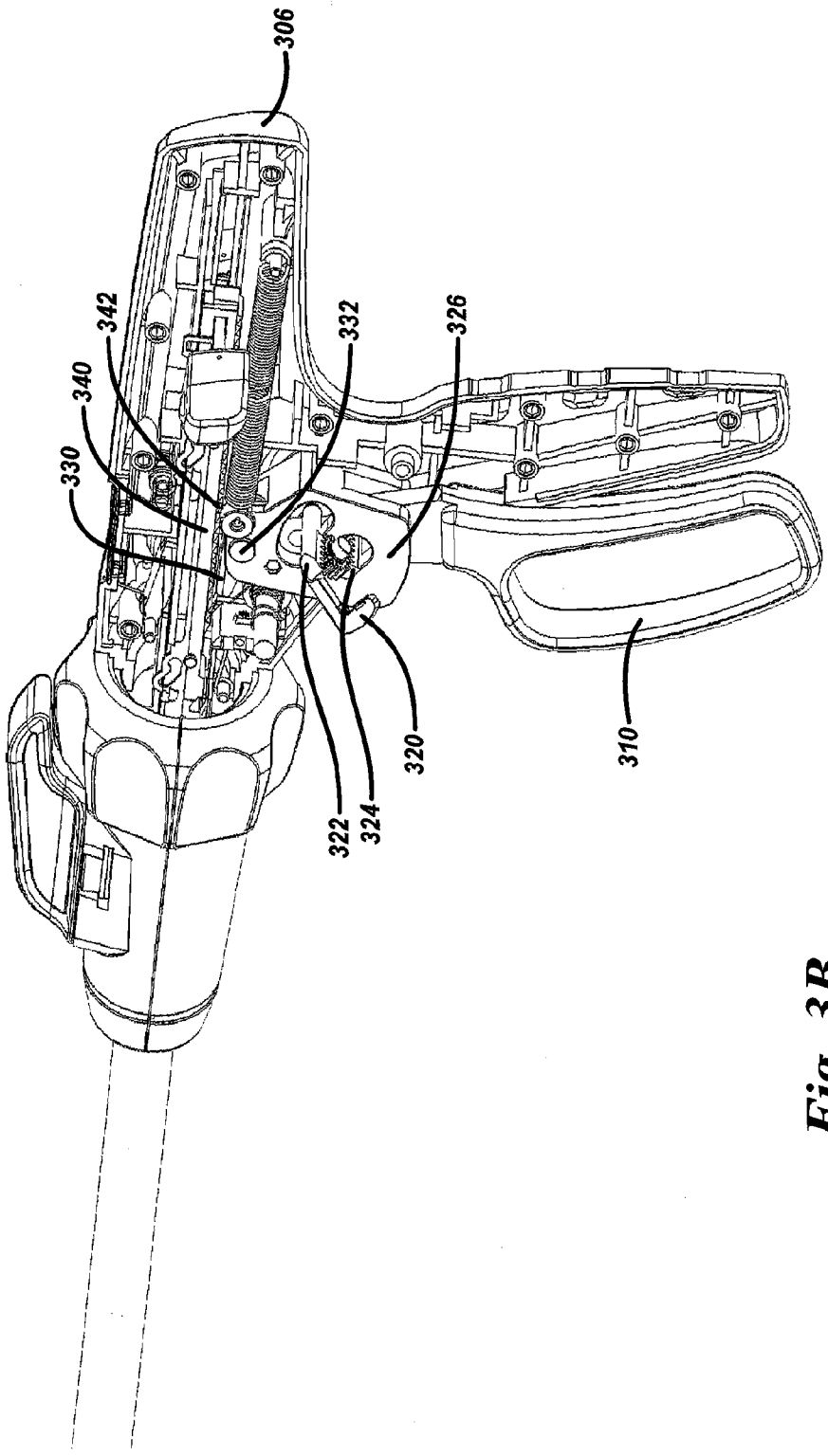

Fig. 3B

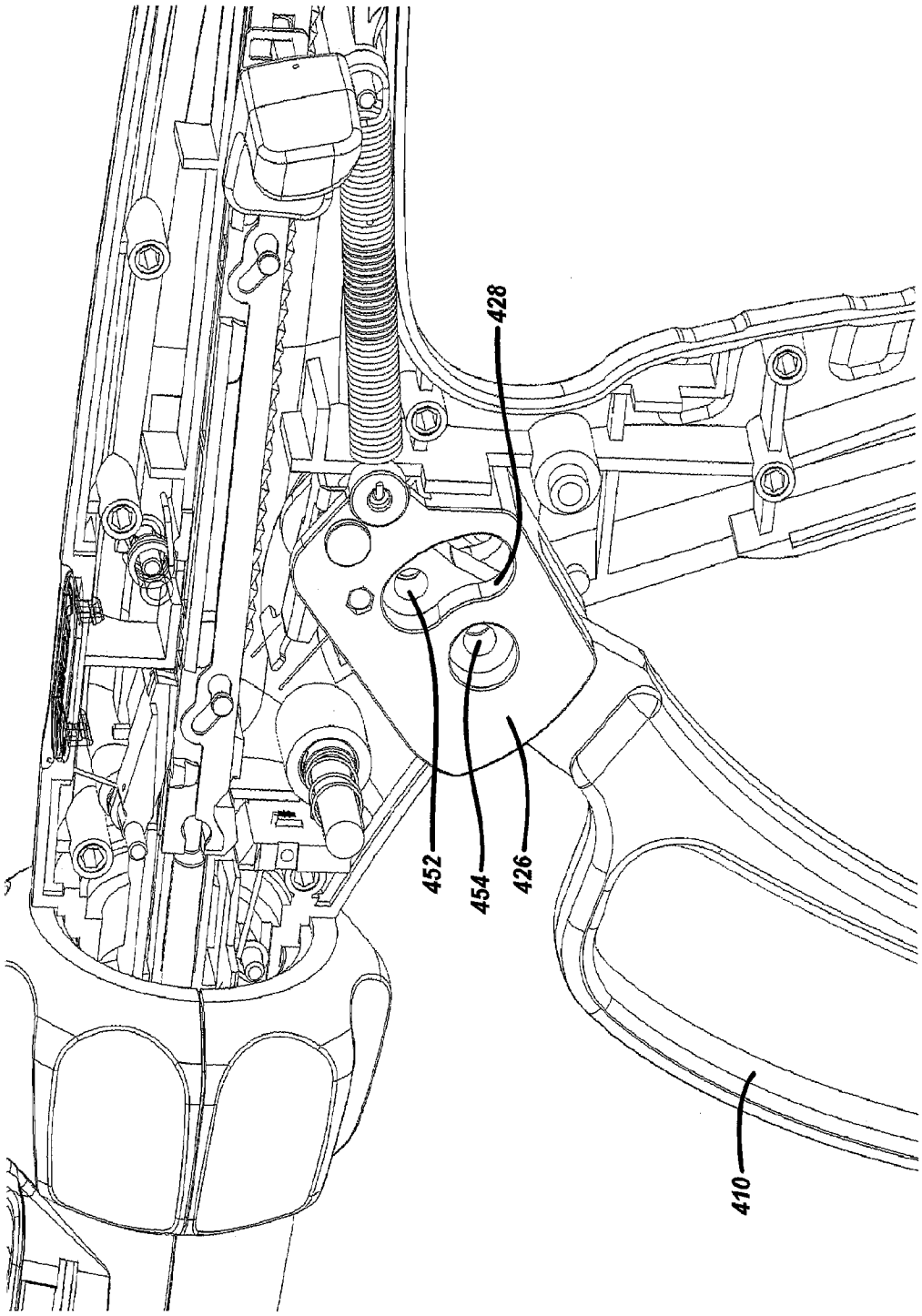

Fig. 4

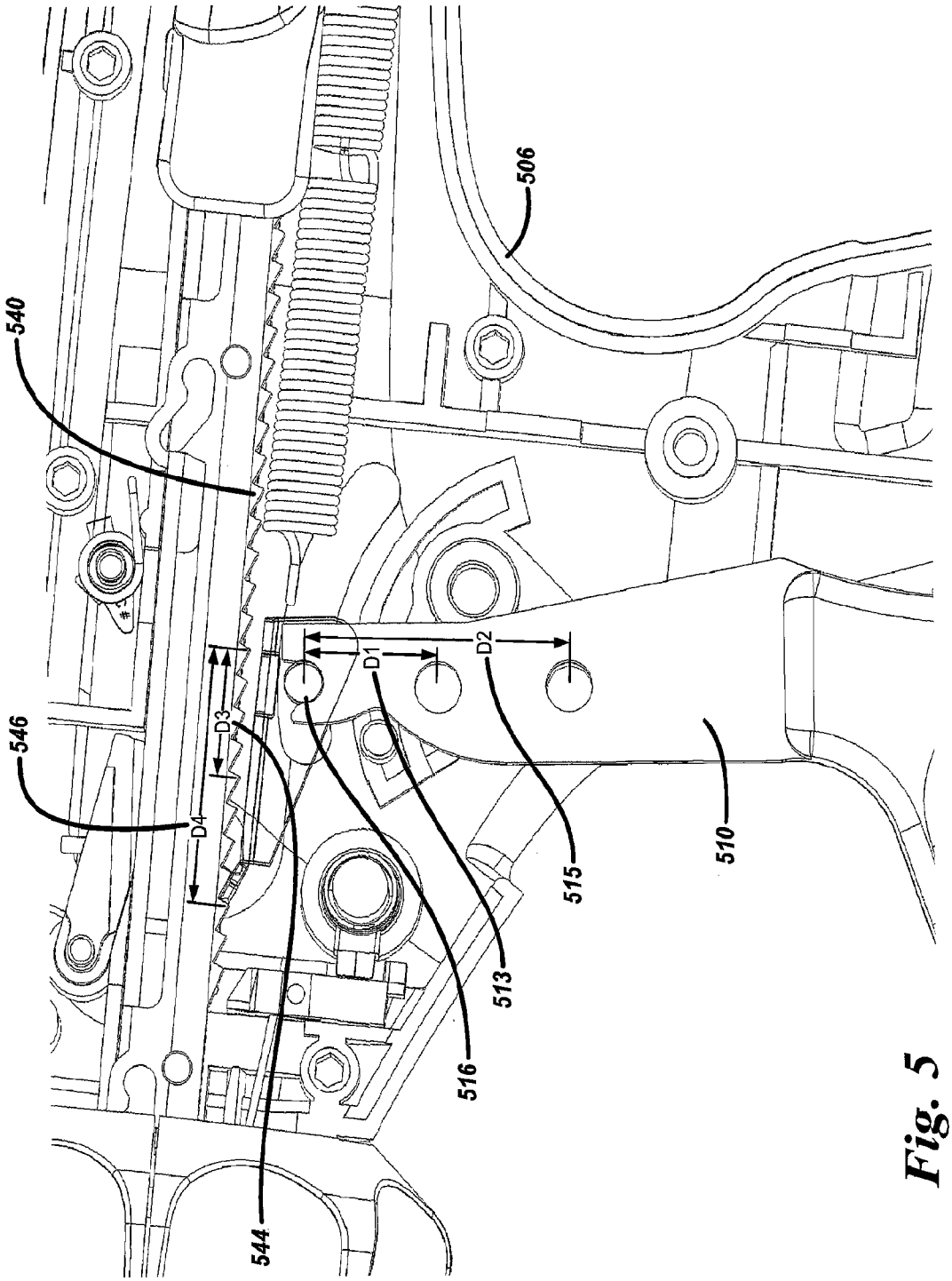

Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2018/025988

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A61B 17/068; A61B 17/00; A61B 17/29; A61B 17/32 (2018.01)
CPC - A61B 17/10; A61B 17/068; A61B 17/115; A61B 17/2909; A61B 2090/0811 (2018.05)

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC - 227/176; 227/175; 227/178; 606/1; 606/142 (keyword delimited)

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 2010/0264193 A1 (HUANG et al) 21 October 2010 (21.10.2010) entire document	1, 3, 4, 6, 7, 14, 15 --- 2, 8, 9, 20
Y	US 5,489,292 A (TOVEY et al) 06 February 1996 (06.02.1996) entire document	2, 20
Y	US 2007/0262116 A1 (HUEIL et al) 15 November 2007 (15.11.2007) entire document	8, 9
A	EP 2 886 020 A1 (FREUDENREICH) 24 June 2015 (24.06.2015) entire document	1-20
A	US 8,328,822 B2 (HUITEMA et al) 11 December 2012 (11.12.2012) entire document	1-20
A	US 5,300,081 A (YOUNG et al) 05 April 1994 (05.04.1994) entire document	1-20

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 May 2018	18 JUN 2018
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300	Authorized officer Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774