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- (71) **Applicant:** **COVIDIEN LP** [US/US]; 15 Hampshire Street, Mansfield, MA Massachusetts 02048 (US).
- (72) **Inventor; and**
- (71) **Applicant (for MG only):** **LIU, Chirong** [CN/CN]; 4F-6F, Bldg 3, Pujiang Hi-Tech Park, 2388 Chenhang Road, Minhang District, Shanghai 201114 (CN).
- (72) **Inventor:** **YANG, Qianhong**; 6F, Bldg 3, Pujiang Hi-Tech Park, 2388 Chenhang Road, Minhang District, Shanghai 201114 (CN).
- (74) **Agent:** **CCPIT PATENT AND TRADEMARK LAW OFFICE**; 8th Floor, Vantone New World Plaza, 2 Fuchengmenwai Street, Xicheng District, Beijing 100037 (CN).
- (81) **Designated States** (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW,

(54) **Title:** SAFETY FEATURE FOR SURGICAL STAPLING INSTRUMENT

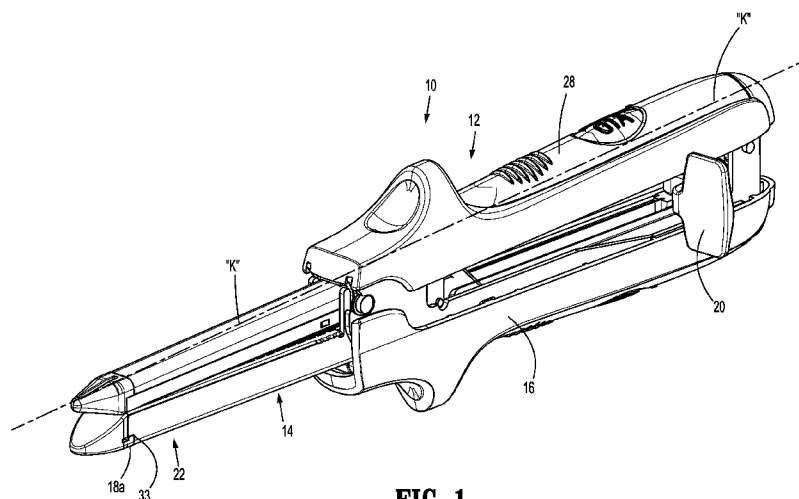


FIG. 1

(57) **Abstract:** A surgical stapling instrument (10) includes an anvil body (12) and a cartridge body (14) coupled to the anvil body (12). The cartridge body (14) includes first and second side walls (132, 134) defining a channel (131) between each of the first and second side walls (132, 134). Each of the first and second side walls (132, 134) includes an inner wall. The inner wall of the first side wall (132) includes a first safety feature. The surgical stapling instrument (10) further includes a staple cartridge (118) releasably mounted within the channel (131) of the cartridge body (14) and having first and second sides and having a first length. The first side of the staple cartridge (118) defines a second safety feature. The first and second safety features are configured to permit insertion of the staple cartridge (118) within the channel (131) of the cartridge body (14) if the staple cartridge (118) and the cartridge body (14) are compatible with each other.



SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN,
TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

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SAFETY FEATURE FOR SURGICAL STAPLING INSTRUMENT

FIELD

[0001] The disclosure relates to a surgical stapling instrument, and, more particularly, the disclosure relates to a method for ensuring loading of a proper staple cartridge into a cartridge support column of a surgical stapling instrument, and retention of the staple cartridge within a cartridge support column.

BACKGROUND

[0002] Surgical stapling instruments for dispensing staples to join tissue during surgical procedures are well known. Linear type surgical stapling instruments typically include a tool assembly that includes a staple cartridge that houses a plurality of staples, an anvil disposed in opposition to the staple cartridge, and a firing mechanism for ejecting the staples from the staple cartridge. The tool assembly is movable between spaced and clamped positions to clamp tissue between the staple cartridge and the anvil. The firing mechanism is configured to sequentially eject rows of staples from the staple cartridge through the tissue into the anvil for formation by the anvil. A knife may be utilized to sever tissue between the rows of staples. The surgical stapling instrument also includes a cartridge body that defines a channel that receives the staple cartridge. The staple cartridge is removable from the channel member to allow for replacement of a spent staple cartridge to facilitate reuse of the surgical stapling device.

[0003] The surgical stapling instruments may be provided in different sizes to accommodate staple cartridges of different sizes. It would be beneficial if the surgical stapling instruments and associated staple cartridges have a safety feature to ensure that the proper staple cartridge is loaded into the proper surgical stapling instrument. In addition, it would be beneficial if the safety feature is further configured to releasably secure the proper staple cartridge with the surgical stapling instrument.

SUMMARY

[0004] A surgical stapling instrument includes an anvil body and a cartridge body coupled to the anvil body. The cartridge body includes first and second side walls defining a channel between each of the first and second side walls. Each of the first and second side walls includes an inner wall.

The inner wall of the first side wall includes a first safety feature. The surgical stapling instrument further includes a staple cartridge releasably mounted within the channel of the cartridge body and having first and second sides and having a first length. The first side of the staple cartridge defines a second safety feature. The first and second safety features are configured to permit insertion of the staple cartridge within the channel of the cartridge body if the staple cartridge and the cartridge are compatible with each other.

[0005] In certain aspects of the disclosure, the first safety feature is a bump feature and the second safety feature is a recess.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Various aspects of the disclosed surgical stapling instrument are described herein below with reference to the drawings, wherein:

[0007] FIG. 1 is a perspective view of an exemplary aspect of a surgical stapling instrument incorporating the safety features of the disclosure;

[0008] FIG. 2 is an exploded perspective view of the surgical stapling instrument illustrating the cartridge body, the anvil body, the staple cartridge, and the firing member

[0009] FIG. 3 is a perspective view of a cartridge support column of a cartridge body and a corresponding staple cartridge according to an aspect of the disclosure, with parts separated;

[0010] FIG. 4 is a perspective view of the cartridge support column and the staple cartridge shown in FIG. 3, secured to one another;

[0011] FIG. 5 is a cross-sectional end view taken along section line 5-5 shown in FIG. 4;

[0012] FIG. 6 is a cross-sectional side view taken along section line 6-6 shown in FIG. 4;

[0013] FIG. 7 is cross-sectional end view of a cartridge support column of a cartridge body and a corresponding staple cartridge according to another aspect of the disclosure;

[0014] FIG. 8 is a perspective side view of a staple cartridge according to another aspect of the disclosure; and

[0015] FIG. 9 is a cross-sectional end view of a cartridge support column of a cartridge body and the staple cartridge shown in FIG. 8.

DETAILED DESCRIPTION

5 [0016] Surgical stapling instruments including aspects of the disclosure 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. 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. The
10 term “clinician” is used generally to refer to medical personnel including doctors, nurses, and support personnel. In addition, the term “compatible” is used generally to refer to a staple cartridge if the staple cartridge is properly sized or includes the characteristics to allow the staple cartridge to be received within the cartridge support channel and for the surgical stapling instrument be fired.

[0017] The disclosed surgical stapling instruments include an anvil body, a cartridge body, an
15 actuator or lever that is configured to move the anvil body and the cartridge body between a spaced position and a clamped position, and a firing member. A staple cartridge, such as a single use loading unit (SULU) or multi-use loading unit (“MULU”), is mountable to the cartridge body. The stapling instrument further includes safety features which ensure that a proper staple cartridge is loaded within the cartridge body and is secured to the cartridge body.

20 [0018] FIGS. 1 and 2 illustrate an exemplary surgical stapling instrument designated generally as surgical stapling instrument 10 incorporating the safety features of the disclosure. The stapling instrument 10 includes an anvil body 12 defining a longitudinal axis “K”, a cartridge body 14 supporting a clamping lever 16, a staple cartridge or single use loading unit (“SULU”) 18 mountable to the cartridge body 14, and a firing assembly 20.

25 [0019] The cartridge body 14 of the stapling instrument 10 includes a cartridge support column 22 having a proximal segment 24 (FIG. 2) and a distal segment 26. The proximal segment 24 of the cartridge support column 22 receives the firing assembly 20 and pivotally supports the clamping lever 16 and the distal segment 26 receives the staple cartridge 18. The cartridge support column 22 includes a base wall 30 and first and second side walls 32, 34 extending from the base wall 30. The
30 base wall 30 and the first and second side walls 32, 34 define a channel 31 that extends along the

proximal and distal segments 24 and 26. The firing assembly 20 is received within the channel 31 in the proximal segment 24 and the staple cartridge 18 is received within the channel 31 in the distal segment 26. The first and second side walls 32, 34 have distal ends that define first and second notches 33, 35. The first and second notches 33, 35 receive respective first and second tab portions 18a (FIG. 1), 18b (FIG. 2) of the staple cartridge 18 with a snap-fit connection.

[0020] The anvil body 12 of the stapling instrument 10 includes an anvil hand grip 28 and an anvil plate 30. The clamping lever 16 of the stapling instrument 10 is pivotally supported on the cartridge body 14 and is engageable with the anvil body 12 such that movement of the clamping lever 16 from an unclamped position (FIG. 2) to a clamped position (FIG. 1) moves the anvil body 12 into close approximation with the cartridge body 14.

[0021] FIG. 2 illustrates the firing assembly 20 of the stapling instrument 10 which includes a firing lever 32 and a firing member 34 that extends from the firing lever 32. When the clamping lever 16 is in the clamped position with tissue to be joined positioned between the staple cartridge 18 and the anvil plate 30, the firing assembly 20 can be actuated by advancing the firing assembly 20 along the longitudinal axis “K” whereby the firing member 34 cooperates with staple pushers (not shown) within the staple cartridge 18 to eject a plurality of rows of staples from within the staple cartridge 18 for engagement and formation by the anvil plate 30. In certain aspects of the disclosure, and as shown, the staple cartridge 18 accommodates two sets of three rows of staples that are delivered through tissue. A knife (not shown) may be provided that traverses a knife slot defined by the staple cartridge 18 to sever tissue between the two sets of rows of staples.

[0022] For a detailed discussion of the construction and operation of an exemplary surgical stapling instrument, reference may be made to U.S. Pat. No. 8,505,801 to Ehrenfels et al.

[0023] FIGS. 3-9 illustrate staple cartridges having three different lengths, and the corresponding cartridge receiving support columns for receiving each of the respective staple cartridges. FIGS. 3-6 illustrate a first staple cartridge 118 having a first length “x”, and a first cartridge support column 122 of a surgical stapling instrument, e.g., surgical stapling instrument 10 (FIG. 1), that is configured to receive the first staple cartridge 118. FIG. 7 illustrates a second staple cartridge 218 having a second length “y”, and a second cartridge support column 222 of a surgical stapling instrument, e.g., surgical stapling instrument 10 (FIG. 1), that is configured to receive the second staple cartridge 218. FIGS. 8 and 9 illustrate a third staple cartridge 318 having a third

length “z”, and a third cartridge support column 322 of a surgical stapling instrument, e.g., surgical stapling instrument 10 (FIG. 1) that is configured to receive the third staple cartridge 318. The first, second, and third staple cartridges 118, 218, 318 and the first, second, and third cartridge support columns 122, 222, 322 are substantially similar to the staple cartridge 18 and the cartridge support column 22 described above, and will only be described in detail with regards to the differences therebetween.

[0024] In certain aspects of the disclosure, the first, second, and third lengths “x”, “y”, “z” of the first, second, and third staple cartridges 118, 218, 318, respectively, are 100 mm, 80 mm, and 60 mm, respectively, although other lengths are envisioned. As shown, the first, second, and third lengths “x”, “y”, “z” are the measurements of the staple lines of the respective first, second, and third staple cartridges 118, 218, 318. It is envisioned that the length may instead refer to the overall length of the of staple cartridge. It is further envisioned that the staple cartridges may be differentiated by staple size (height and/or width), number of rows, staple coating(s), staple material(s), etc.

[0025] Each of the first staple cartridge 118 and the first cartridge support column 122, the second staple cartridge 218 and the second cartridge support column 222, and the third staple cartridge 318 and the third cartridge support column 322, include a safety feature 140 (FIG. 5), 240 (FIG. 7), 340 (FIG. 9), respectively. The safety features 140, 240, 340 are configured to ensure that only the proper staple cartridge is received within the cartridge support column 122, 222, 322, respectively. The safety features 140, 240, 340 may further be configured to secure the first, second, and third staple cartridges 140, 240, 340 within the appropriate, e.g., properly sized, first, second, or third cartridge support column 122, 222, 322 using, for example, a snap-fit connection.

[0026] FIG. 3 illustrates the safety feature 140 of the first staple cartridge 118 and the first cartridge support column 122. More particularly, the first staple cartridge 118 defines a recess or cutout 151 formed on a first side 150 of the first staple cartridge 118. The recess 151 is configured to receive a bump feature 160 extending from an inner surface 132a of a first side wall 132 of the first cartridge support column 122. The recess 151 may include a contour or profile matching that of the bump feature 160. As shown, the recess 151 includes a rounded profile. Although shown formed in a distal portion of the first staple cartridge 118, it is envisioned that the recess 151 may be formed anywhere along the length of the first staple cartridge 118.

[0027] As note above, a bump feature 160 extends from the inner surface 132a of the first side wall 132 of the first cartridge support column 122. The bump feature 160 is positioned to be received within the recess 151 of the first staple cartridge 118 when the first staple cartridge 118 is properly received within a channel 131 of the first cartridge support column 122. More particularly, the bump feature 160 of the first cartridge support column 122 is positioned such that when first and second tabs portions 118a, 118b of the first staple cartridge 118 are received within first and second notches 133, 135 in the distal end of the first and second side walls 132, 134 of the first cartridge support column 122, and the first staple cartridge 118 is pivoted into the channel 131 of the first cartridge support column 122, the bump feature 160 is received within the recess 151 in the first staple cartridge 118 in a snap-fit manner.

[0028] FIG. 6 illustrates a flange 154 of the first staple cartridge 118 forming the distal side of the recess 151 and a pair of protrusions 156 formed at the open end of the recess 151. The protrusions 156 engage the bump feature 160 of the first cartridge support column 122 to releasably secure the first staple cartridge 118 within the first cartridge support column 122. The flange 154 is configured to flex outwardly to permit reception of the bump feature 160 of the first cartridge support column 122 within the recess 151 of the first staple cartridge. In aspects of the disclosure, the first staple cartridge 118 defines a relief 153 that is positioned adjacent the flange 154 to facilitate flexing of the flange 154. In certain aspects of the disclosure, the flange 154 is configured to flex 0.3 mm. The flange 154 may include a rib 154a or other structure support for maintaining the rigidity of the flange 154. The first staple cartridge 118 may include inclined surfaces 158a, 158b on either side of the recess 151 to facilitate receipt of (or guide) the bump feature 160 into the recess 151 during loading of the first staple cartridge 118 into the first cartridge support column 122.

[0029] FIG. 7 illustrates the safety feature 240 of the second staple cartridge 218 and the second cartridge support column 222. As noted above, the second staple cartridge 218 and the second cartridge support column 222 are substantially similar to the first staple cartridge 118 and the first cartridge support column 122 described hereinabove and will only be described as relates to the differences therebetween.

[0030] The second staple cartridge 218 includes a length “y”. The length “y” of the second staple cartridge 218 is shorter than the length “x” of the first staple cartridge 118 (FIG. 4). As such, the second staple cartridge would not function properly in the first cartridge support column 122, and the first staple cartridge 118 would not function properly in the second cartridge support column

222. As noted above, to prevent an incompatible staple cartridge, e.g., mis-sized staple cartridge, from being loaded into the wrong cartridge support column, the first and second staple cartridges 118, 218 and the respective first and second cartridge support columns 122, 222 include the respective first and second safety features 140, 240 that correspond to features of a staple cartridge having particular characteristics, e.g., a particular length. More particularly, the second cartridge support column 222 includes a bump feature 260 extending from an inner surface 234a of a second side wall 234 and the second staple cartridge 218 includes a recess 251 formed on a second side 252. Although not shown, the second staple cartridge 218 includes a flange for engaging the bump feature 260 in a snap-fit manner. By including the bump feature 260 on the second side wall 234 of the second cartridge support column 222 and the recess 251 on the second side 252 of the second staple cartridge 218, the second staple cartridge 218 is not compatible with and cannot be received within the first cartridge support column 122, and the first staple cartridge 118 is not compatible with and cannot be received within the second cartridge support column 222.

[0031] FIGS. 8 and 9 illustrate the safety feature 340 of the third staple cartridge 318 and the third cartridge support column 322. As noted above, the third staple cartridge 318 and the third cartridge support column 322 are substantially similar to the first and second staple cartridge 118, 218 and the first and second cartridge support column 122, 222 described hereinabove, and will only be described as relates to the differences therebetween.

[0032] The third staple cartridge 318 includes the length “z”. The length “z” is shorter than the length “y” of the second staple cartridge 218 (FIG. 7) and the length “x” of the first staple cartridge 118. Because of the difference in length and the safety features 350, the third staple cartridge 318 is not compatible with and is unable to be received in either the first or second cartridge support columns 122, 222, and neither the first nor second staple cartridge 118, 218 is compatible with and properly receivable within the third cartridge support column 322. The first, second, and third safety features 140, 240, 340 of the respective first, second, and third staple cartridges 118, 218, 318 and the respective first, second, and third cartridge support columns 122, 222, 322 prevent the improper staple cartridge from being loaded into the cartridge support column.

[0033] The third cartridge support column 322 includes a bump feature 360 (FIG. 9) extending from an inner surface 332a of a first side wall 332 and a bump feature 370 (FIG. 9) extending from an inner surface 334a of a second side wall 334. The third staple cartridge 318 includes a first recess 351 formed on a first side 350 and a second recess 361 formed on a second side 252. Only

one of the first and second recess 351, 361 includes protrusions 356. In this manner, the same force is necessary to separate each of the first and second staple cartridges 118, 218 from their respective first and second cartridge support columns 122, 218 as is required to separate the third staple cartridge 318 from the third cartridge support column 322.

5 [0034] By including the first bump feature 360 on the first side wall 332 of the third cartridge support column 322 and the second bump feature 370 on the second side wall 334 of the third cartridge support column 322, and the respective first and second recess 351, 261 on the respective first and second sides 250, 252 of the third staple cartridge 318, the third staple cartridge 318 is not compatible with the first or second cartridge support column 122, 222, and the third cartridge support column 322 is not capable of receiving either of the first or second staple cartridge 118, 218.

[0035] During a surgical stapling procedure, a clinician can ensure that the proper staple cartridge is being used with the proper cartridge support column by receiving the respective first and second tab portions 118a, 218a, 318a (only one shown) of the respective first, second, and third staple cartridges 118, 218, 318 in the respective first and second notches 133, 233, 333 (only one shown) in the distal end of the respective first, second, and third cartridge support columns, 122, 222, 322, and pivoting the respective first, second or third cartridge 118, 218, 318 downward into the respective channels 131, 231, 331 in the first, second, and third cartridge support columns 122, 222, 322. If the first, second, or third cartridge 118, 218, 318 is received within the respective channel 131, 231, 331 in a snap-fit manner, the staple cartridge and cartridge support column are the same size. If the staple cartridge does not engage the cartridge support column the snap-fit manner, the staple cartridge and the cartridge support column are not the same size, and another staple cartridge is necessary. The snap-fit connection may create an audible, a visual, and/or a tactical feedback to indicate to the clinician proper connection.

25 [0036] Although the disclosed surgical stapling instrument 10 is illustrated as an open-type linear surgical stapler, it is envisioned that the benefits of the disclosure may be incorporated into a variety of different types of surgical stapling instruments including, e.g., endoscopic linear staplers.

[0037] 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 aspects. It is envisioned that the elements and features illustrated or described in connection with one exemplary aspect of the disclosure 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 aspects. Accordingly, the disclosure is not to be limited by what has been particularly shown and described, except as indicated by the appended claims.

WHAT IS CLAIMED

1. A surgical stapling instrument, comprising:
an anvil body defining a longitudinal axis;
a cartridge body coupled to the anvil body, the cartridge body including first and second side walls defining a channel between each of the first and second side walls, each of the first and second side walls including an inner wall, the inner wall of the first side wall including a first safety feature; and
a staple cartridge releasably mounted within the channel of the cartridge body and including first and second sides and having a first length, the first side of the staple cartridge defining a second safety feature;
wherein the first and second safety features are configured to permit insertion of the staple cartridge within the channel of the cartridge body if the staple cartridge and the cartridge are compatible with each other.
2. The surgical stapling instrument of claim 1, wherein the first safety feature is a bump feature.
3. The surgical stapling instrument of claim 2, wherein the second safety feature is a recess.

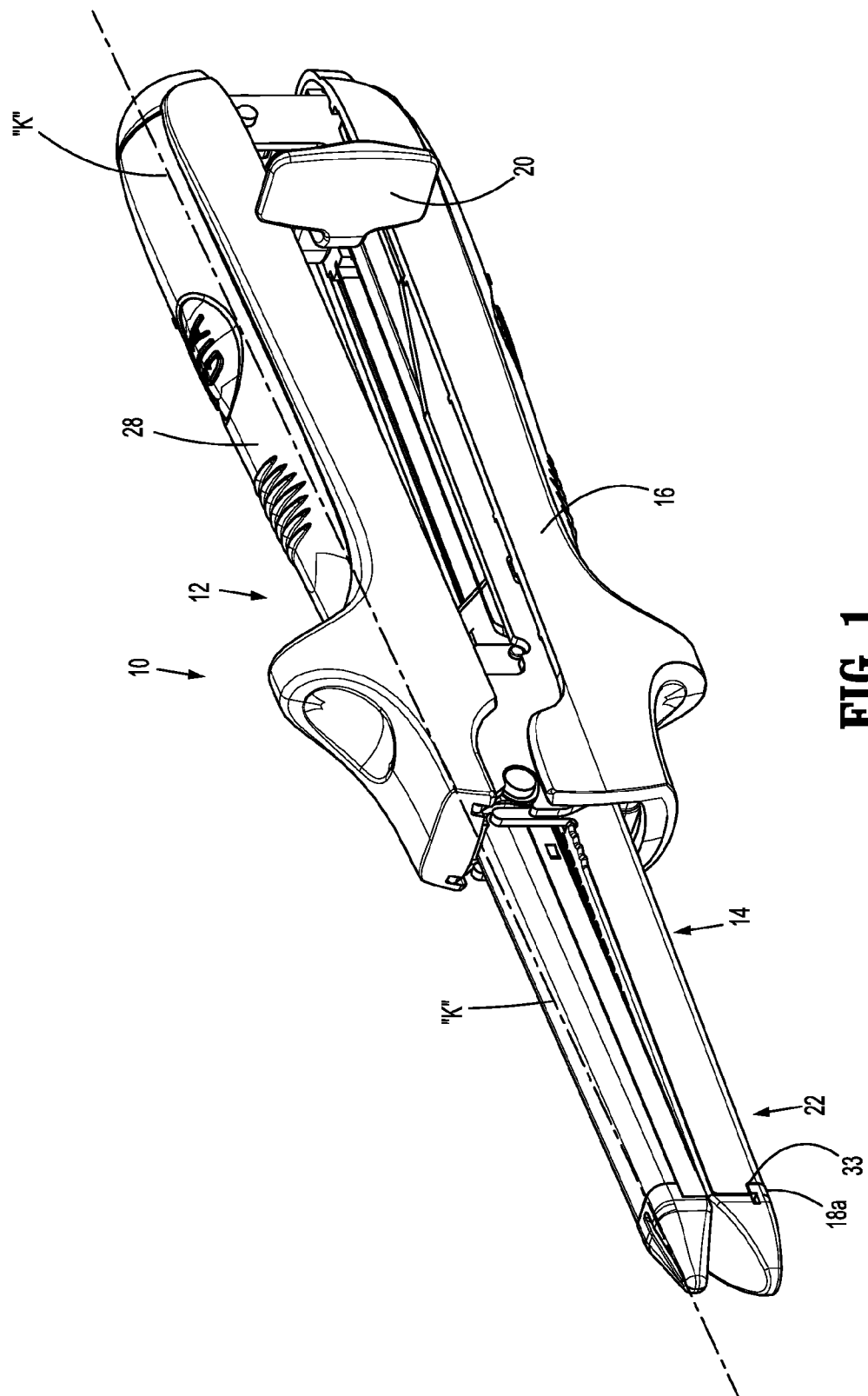


FIG. 1

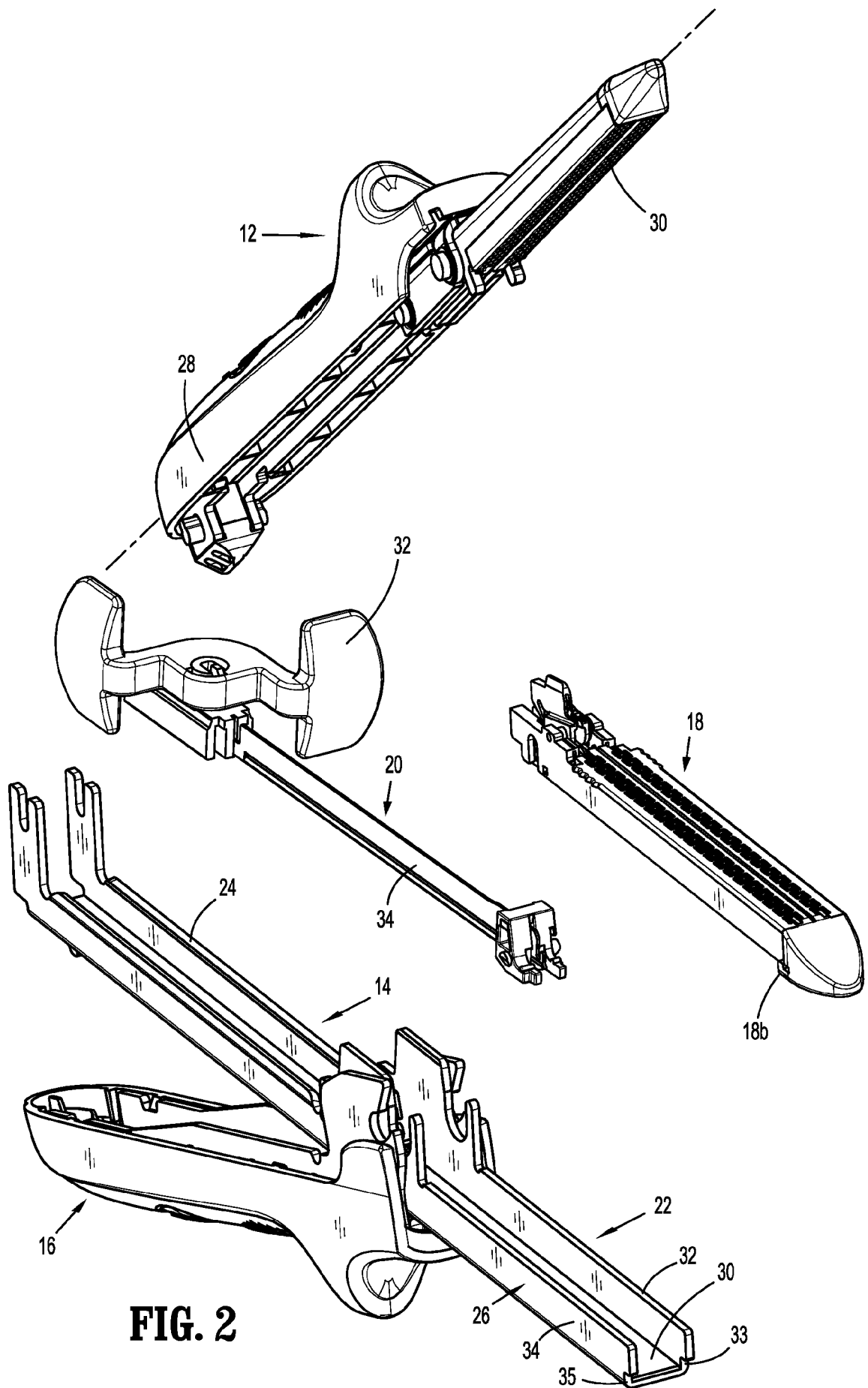


FIG. 2

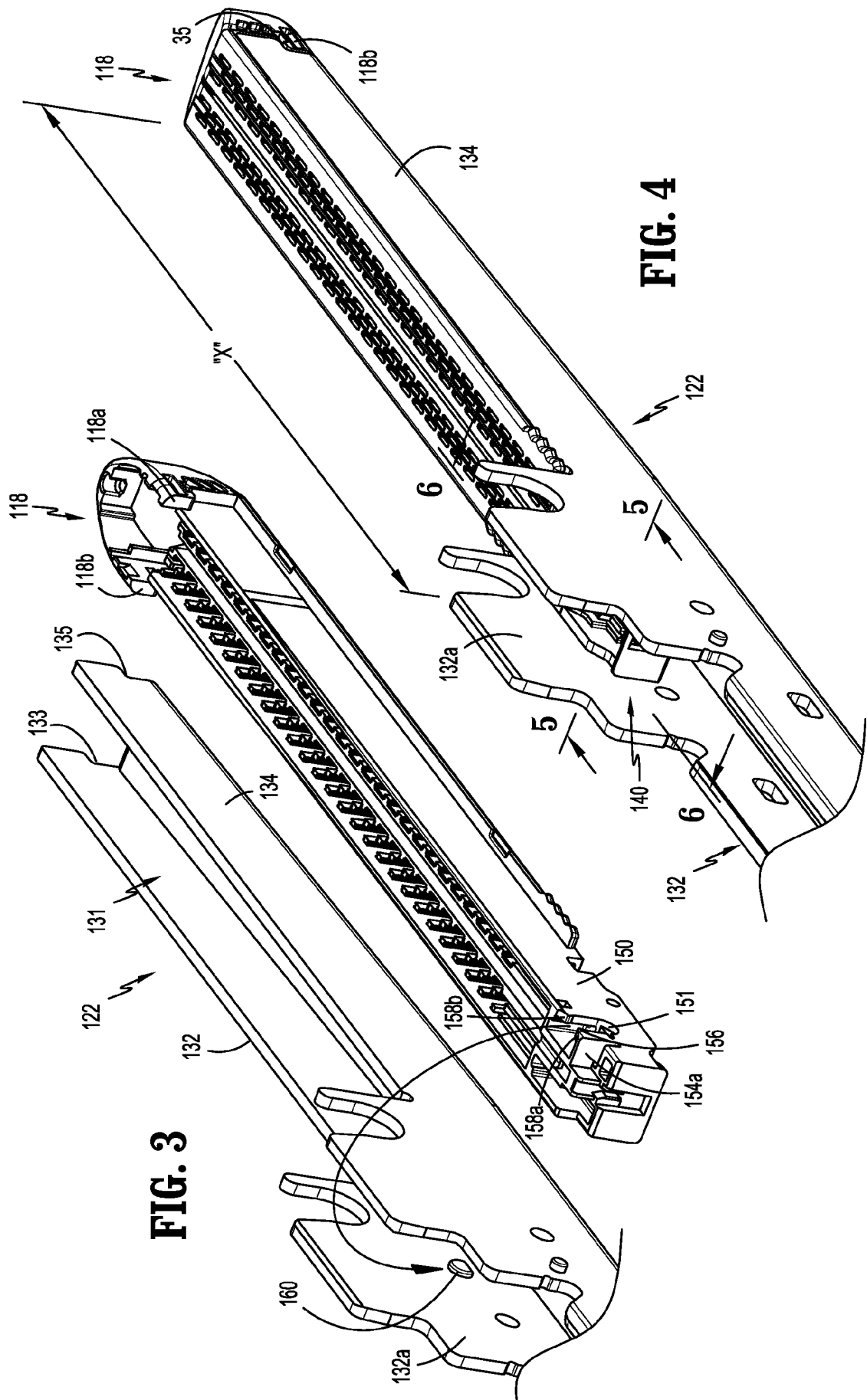


FIG. 3

FIG. 4

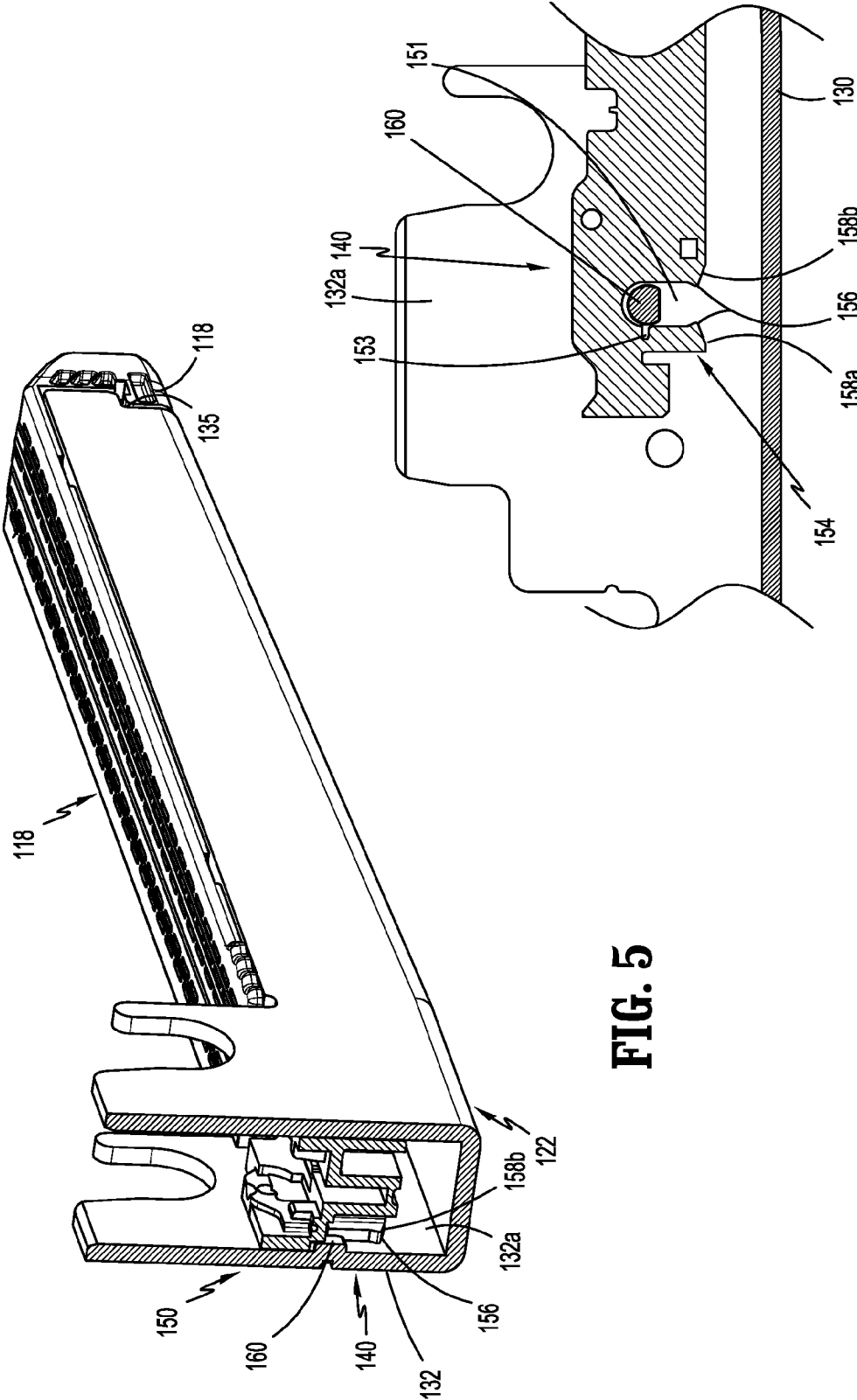
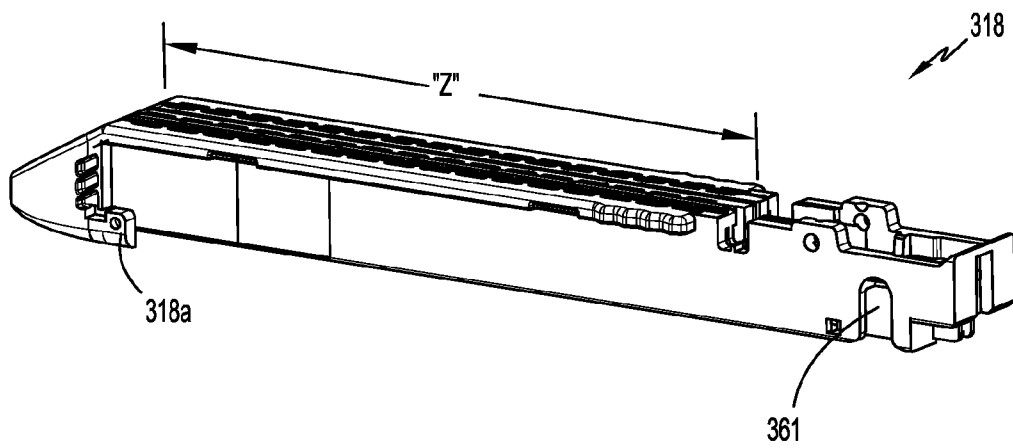
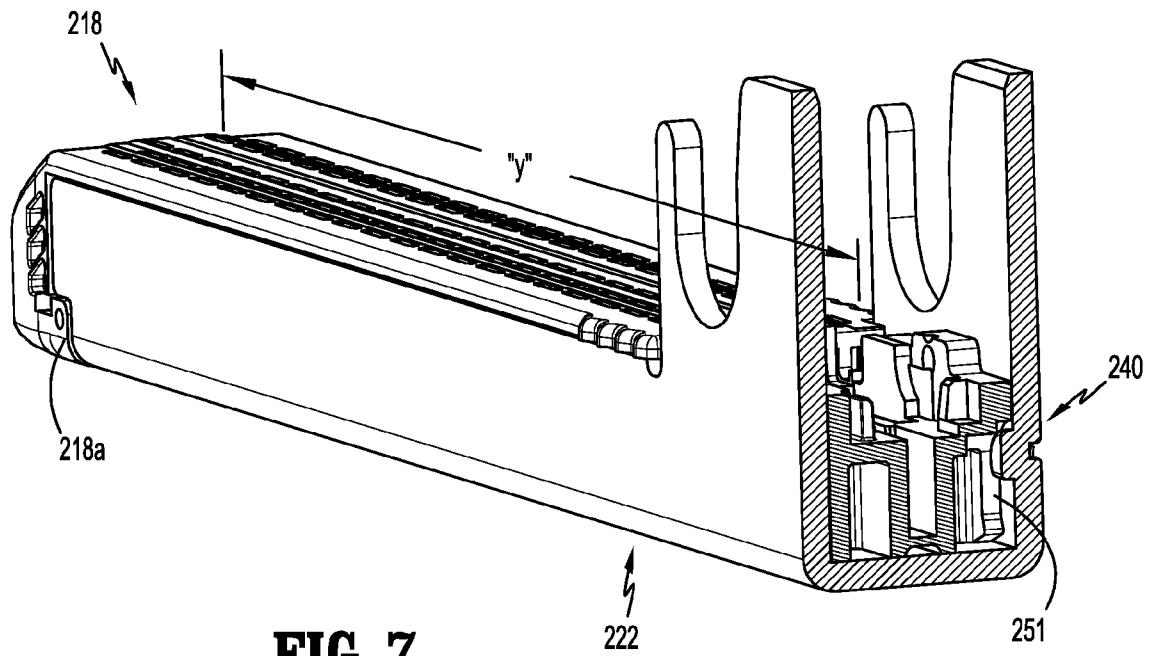


FIG. 5

FIG. 6



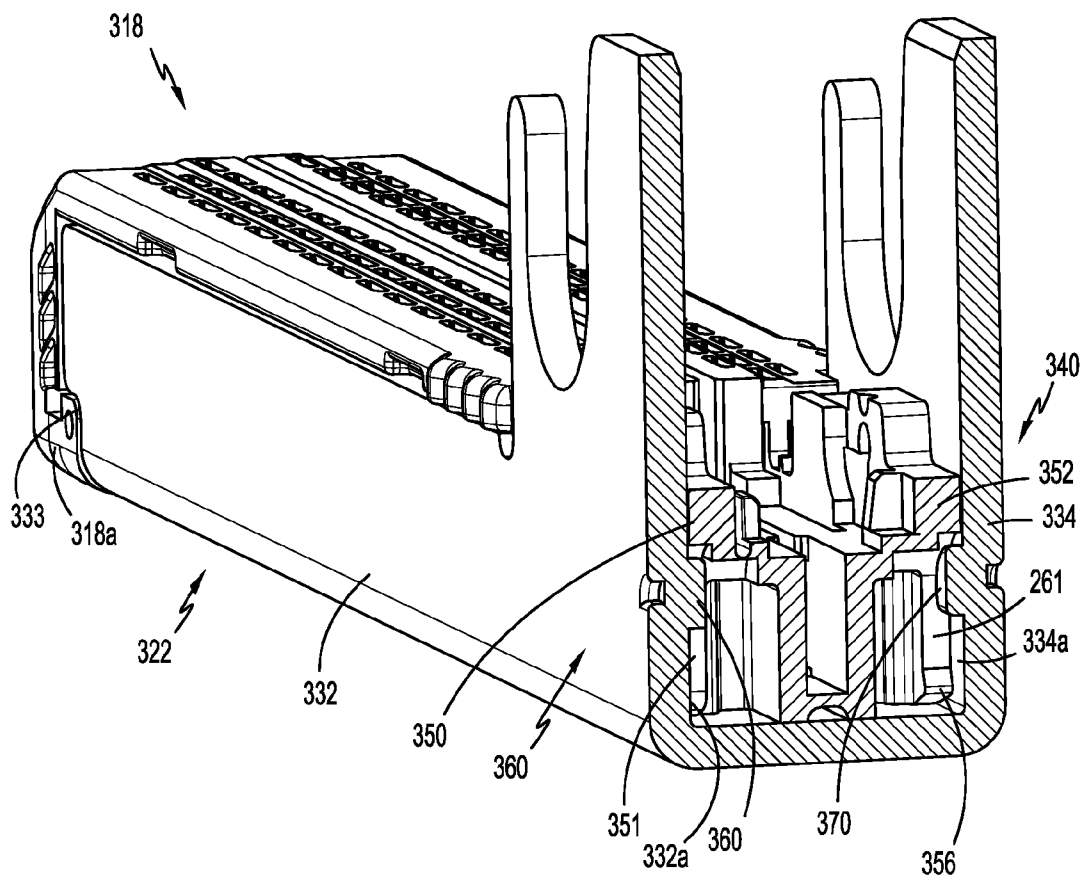


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/100995

A. CLASSIFICATION OF SUBJECT MATTER

A61B 17/068(2006.01)i; A61B 17/072(2006.01)i

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)

A61B17/-

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

CNKI, CNPAT, WPI, EPODOC: COVIDIEN LP, stapl+, cartridge, body, safety feature, recess, slot, groove, bump, tab, single use loading unit, SULU, side wall, match+, compatible, snap, channel

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	CN 109674502 A (JIANGSU TOPSUPER MINIMALLY INVASIVE MEDICAL TECH. CO., LTD.) 26 April 2019 (2019-04-26) paragraphs [0021]-[0022] in the description, figures 1-5	1-3
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A	CN 104224259 A (JIANGSU QIANJING MEDICAL EQUIPMENT CO., LTD.) 24 December 2014 (2014-12-24) the whole document	1-3
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A	US 10376264 B2 (COVIDIEN L.P.) 13 August 2019 (2019-08-13) the whole document	1-3

☒ 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

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Date of the actual completion of the international search

19 March 2021

Date of mailing of the international search report

25 March 2021

Name and mailing address of the ISA/CN

National Intellectual Property Administration, PRC
6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing
100088
China

Facsimile No. (86-10)62019451

Authorized officer

WANG, Tingting

Telephone No. 86-(10)-53962420

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/100995

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2018125484 A1 (COVIDIEN L.P.) 10 May 2018 (2018-05-10) the whole document	1-3

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2020/100995

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