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(54) **Title:** METHOD OF SECURING THE SHAFT OF A SURGICAL INSTRUMENT TO THE INSTRUMENT HOUSING

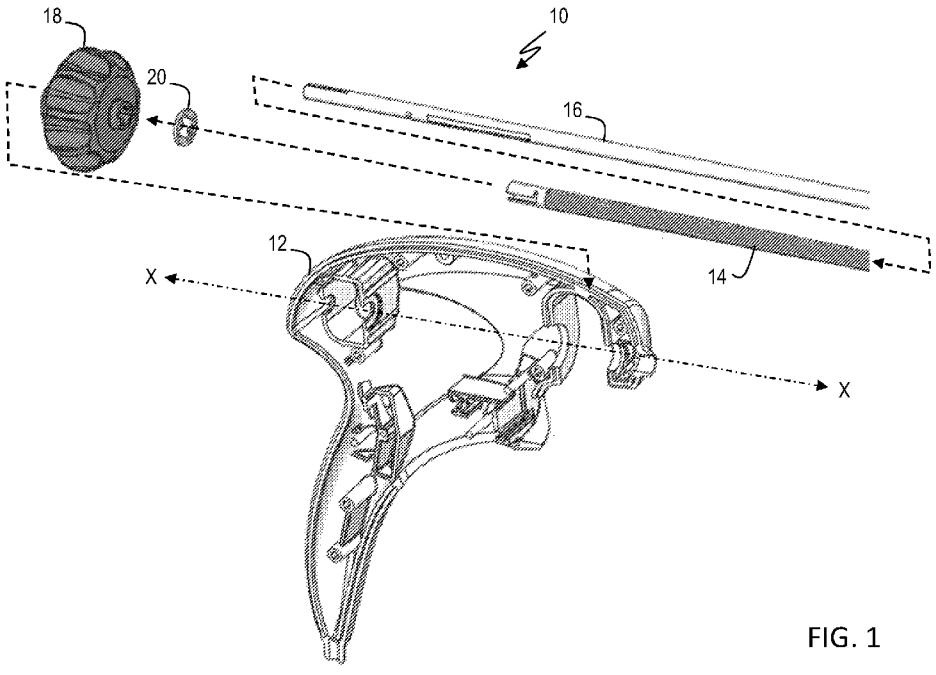


FIG. 1

(57) **Abstract:** A surgical instrument having a housing, an outer shaft extending from the housing along a longitudinal axis, an inner shaft extending within the outer shaft along the longitudinal axis, a rotator knob position about the outer shaft, and a tube stop coupling the rotator knob to the outer shaft for collective rotation about the longitudinal axis and fixed within the housing against movement along the longitudinal axis. The tube stop has a pair of bearing surfaces that extend into a pair of longitudinal tracks of the outer shaft, and the rotator knob includes a pair of rails that extend into the pair of tracks of the outer shaft and block the tube stop exiting the tracks. The tube stop is captured between a pair of ribs in the housing to hold the tube stop in place while allowing the rotator knob to rotate the outer shaft.

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[Continued on next page]

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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METHOD OF SECURING THE SHAFT OF A SURGICAL INSTRUMENT TO THE INSTRUMENT HOUSING

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority to U.S. Provisional No. 62/767014, filed on November 14, 2018.

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

[0002] The present invention relates to surgical instruments and, more specifically, to an approach for securing an elongated shaft to a housing for rotational movement.

2. DESCRIPTION OF THE RELATED ART

[0003] Surgical instruments, such as vessel sealers and like, include a handle from which a shaft extends and supports a surgical implement, such as a pair of jaws, that may be operated by a surgeon to perform a procedure. Positioning of the implement with a patient may require rotation of the entire surgical instrument to rotate the implement at the end of the shaft. For example, in order to position the jaws of a vessel sealer about a vessel, the jaws may need to be rotated by the surgeon so that the jaws can encompass the vessel prior to closing the jaws. As a result, there is a need in the art for an approach that can allow a user to more easily rotate the implement at the end of the shaft during a procedure so that the instrument can be more properly aligned for the procedure.

BRIEF SUMMARY OF THE INVENTION

[0004] The present invention secures the shaft of a surgical instrument to the housing of the instrument while allowing for rotation of the shaft via a rotator knob. More specifically, the present invention comprises a surgical instrument having a housing, an outer shaft extending from the housing along a longitudinal axis, an inner shaft extending within the outer shaft along the longitudinal axis, a rotator knob position about the outer shaft, and a tube stop coupling the rotator knob to the outer shaft for collective rotation about the longitudinal axis and fixed within the housing against movement along the longitudinal axis. A pair of tracks extend longitudinally in the outer shaft. The tube stop has a pair of bearing surfaces that extend into the pair of tracks, respectively. The rotator knob includes a pair of rails that extend into the pair of tracks of the outer shaft, respectively. Each of the pair of tracks include a first portion extending

longitudinally in the outer shaft and a second portion extending circumferentially from an end of the first portion. Each of the pair of bearing surfaces of the tube stop are positioned in the second portion of each of the pair of tracks, respectively. The rails of the rotator knob extend to the end of the portion of each of the tracks to block the tube stop from rotation out of the second portion of each of the tracks. The tube stop is captured between a pair of ribs in the housing. The tube stop includes a second pair of bearing surfaces that engage the outer shaft. The tube stop includes a third pair of bearing surfaces that engage the ribs of the rotator knob.

[0005] The present invention also includes a method of coupling elements of a surgical instrument for common rotation. The method includes the steps of providing a housing, an outer shaft extending from the housing along a longitudinal axis, an inner shaft extending within the outer shaft along the longitudinal axis, positioning a tube stop about the outer shaft, positioning a rotator knob about the outer shaft in abutment with the tube stop and in interlocking engagement with the outer shaft, and fixing the tube stop within the housing to prevent movement of the tube stop along the longitudinal axis. The rotator knob includes a pair of rails that extend within a pair of tracks of the outer shaft, respectively. A pair of bearing surfaces of the tube stop extend into the pair of tracks, respectively, and are fixed in place by the pair of rails of the rotator knob. Each of the pair of tracks includes a first portion that accepts one of the pair of rails of the rotator knobs and a second portion that extends circumferentially from the first portion and accepts one of the bearing surfaces of the tube stop.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

[0006] The present invention will be more fully understood and appreciated by reading the following Detailed Description in conjunction with the accompanying drawings, in which:

[0007] FIG. 1 is an exploded isometric view of a surgical instrument according to the present invention;

[0008] FIG. 2 is an end view of a tube stop according to the present invention;

[0009] FIG. 3 is a perspective view of the positioning of a tube stop over the inner and outer shafts of a surgical instrument according to the present invention;

[0010] FIG. 4 is a perspective view of the positioning of a tube stop over the inner and outer shafts of a surgical instrument according to the present invention;

[0011] FIG. 5 is a perspective view of the positioning of a tube stop over the inner and outer shafts of a surgical instrument according to the present invention;

[0012] FIG. 6 is a perspective view of the positioning of a rotator knob over the inner and outer shafts of a surgical instrument according to the present invention;

[0013] FIG. 7A is a side view a rotator knob according to the present invention;

[0014] FIG. 7B is a perspective view of a rotator knob according to the present invention;

[0015] FIG. 8 is side view of the inner surface of a housing according to the present invention; and

[0016] FIG. 9 is a side view of the inner surface of a housing with a rotator knob and tube stop in position according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0017] Referring to the figures, wherein like numeral refer to like parts throughout, there is seen in FIG. 1 a surgical instrument 10 having a housing 12. As in known in the art, housing 12 is shaped to allow a surgeon to grasp a proximal end of surgical instrument 10 for use during a surgical procedure. Surgical instrument 10 further comprises an outer shaft 14 that extends distally from a portion of housing 12 along a longitudinal axis X-X. An inner shaft 16 that extends within outer shaft 14. A rotator knob 18 is interconnected to outer shaft 14 to allow a user to rotate outer shaft 14. A tube stop 20 engages both outer shaft 14 and rotator knob 18 to interlock outer shaft 14 and rotator knob 18 for common rotation.

[0018] Referring to FIG. 2, tube stop 20 comprises a body 22 formed as a disk and including an opening 24 therethrough. Opening 24 is defined by a first set of bearing surfaces 26, a second set of bearing surfaces 28, and a third set of bearing surfaces 30. First set of bearing surfaces 26 engage the outer surface 32 of outer shaft 14. Second set of bearing surfaces 28 engage the outer surface 34 of inner shaft 16 via a corresponding pair of tracks 36 formed through outer shaft 14. Third set of surfaces 30 engage a pair of corresponding rails 40 extending longitudinally from rotator knob 18, as seen in FIGS. 7A and 7B.

[0019] Referring to FIG. 3, tube stop 20 is positioned about outer shaft 14 and inner shaft 16 is positioned within outer shaft 14. Second set of bearing surfaces 28 are aligned with tracks 36 formed into the outer surface 38 of outer shaft 14. As seen in FIG. 4, tracks 36 include a first portion 42 that extends longitudinally in parallel with axis X-X from the end of outer shaft 14 from the end of outer shaft 14 to an internal end 46. A second portion 44 extends circumferentially about a portion of outer shaft 14 from end 46 of first portion 42 at right angles to first portion 42 and thus axis X-X. As seen in FIG. 5, second portion 44 is in communication

with first portion 42 so that second set of bearing surfaces 28 of tube stop 20 may be passed along first portion 42 and then rotated into second portion 44, thereby capturing second set of bearing surfaces 28 within second portion 44 of tracks 36 and preventing longitudinal movement of bearing surfaces 28.

[0020] Referring to FIG. 6, rotator knob 18 is passed over inner shaft 16 so that rails 40 engage third set of bearing surfaces 30. Rails 40 are shaped to slide along tracks 36 of outer shaft 14 to end 46 of first portion 42, thereby blocking tube stop 20 from rotating out of second portion 44 of tracks 36. The interconnection between rails 40 of rotator knob 18 and tracks 36 interlocks rotator knob 18 with outer shaft 14 for co-rotation therewith. Third set of bearing surfaces 30 capture rails 40 securely to hold rails within tracks 36.

[0021] Referring to FIG. 8, housing 12 includes a pair of spaced apart ribs 50 positioned to capture and hold tube stop 20 within housing 12. Ribs 50 thus prevent proximal or distal movement of tube stop 20 along axis X-X, thereby securing outer shaft 14 relative to housing 12, as seen in FIG. 9. Inner shaft 16 extends proximally through housing 12 and is capable of longitudinal movement along axis X-X while shaft 14 is fixed against movement. Rotation of rotator knob 18 will cause rotation of outer shaft 14 but not inner shaft 16. As is known in the art, inner shaft 16 may be coupled to a mechanism in housing 12 that can cause movement of inner shaft 16 relative to outer shaft 14 to drive a surgical implement positioned at the distal end of inner shaft 16, such as a pair of opposing jaws or the like.

CLAIMS

What is claimed is:

1. A surgical instrument, comprising:

a housing;

an outer shaft extending from the housing along a longitudinal axis;

an inner shaft extending within the outer shaft along the longitudinal axis;

a rotator knob positioned about the outer shaft; and

a tube stop coupling the rotator knob to the outer shaft for collective rotation about the longitudinal axis and fixed within the housing against movement along the longitudinal axis.

2. The surgical instrument of claim 1, further comprises a pair of tracks extending longitudinally in the outer shaft.

3. The surgical instrument of claim 2, wherein the tube stop comprises a pair of bearing surfaces extending into the pair of tracks, respectively.

4. The surgical instrument of claim 3, wherein the rotator knob includes a pair of rails.

5. The surgical instrument of claim 4, wherein the pair of rails of the rotator knob extend into the pair of tracks of the outer shaft, respectively.

6. The surgical instrument of claim 5, wherein each of the pair of tracks include a first portion extending longitudinally in the outer shaft and a second portion extending circumferentially from an end of the first portion.

7. The surgical instrument of claim 6, wherein each of the pair of bearing surfaces of the tube stop are positioned in the second portion of each of the pair of tracks, respectively.

8. The surgical instrument of claim 7, wherein the pair of rails of the rotator knob extend to the end of the portion of each of the tracks to block the tube stop from rotation out of the second portion of each of the tracks.

9. The surgical instrument of claim 8, where the tube stop is captured between a pair of ribs in the housing.

10. The surgical instrument of claim 9, wherein the tube stop includes a second pair of bearing surfaces that engage the outer shaft.

11. The surgical instrument of claim 10, wherein the tube stop includes a third pair of bearing surfaces that engage the pair of ribs of the rotator knob, respectively.

12. A method of coupling elements of a surgical instrument for common rotation, comprising the steps of:

providing a housing, an outer shaft extending from the housing along a longitudinal axis, an inner shaft extending within the outer shaft along the longitudinal axis;

positioning a tube stop about the outer shaft;

positioning a rotator knob about the outer shaft in abutment with the tube stop and in interlocking engagement with the outer shaft; and

fixing the tube stop within the housing to prevent movement of the tube stop along the longitudinal axis.

13. The method of claim 12, wherein the rotator knob includes a pair of rails that extend within a pair of tracks of the outer shaft, respectively.

14. The method of claim 13, wherein a pair of bearing surfaces of the tube stop extend into the pair of tracks, respectively, and are fixed in place by the pair of rails of the rotator knob.

15. The method of claim 14, wherein each of the pair of tracks includes a first portion that accepts one of the pair of rails of the rotator knobs and a second portion that extends circumferentially from the first portion and accepts one of the bearing surfaces of the tube stop.

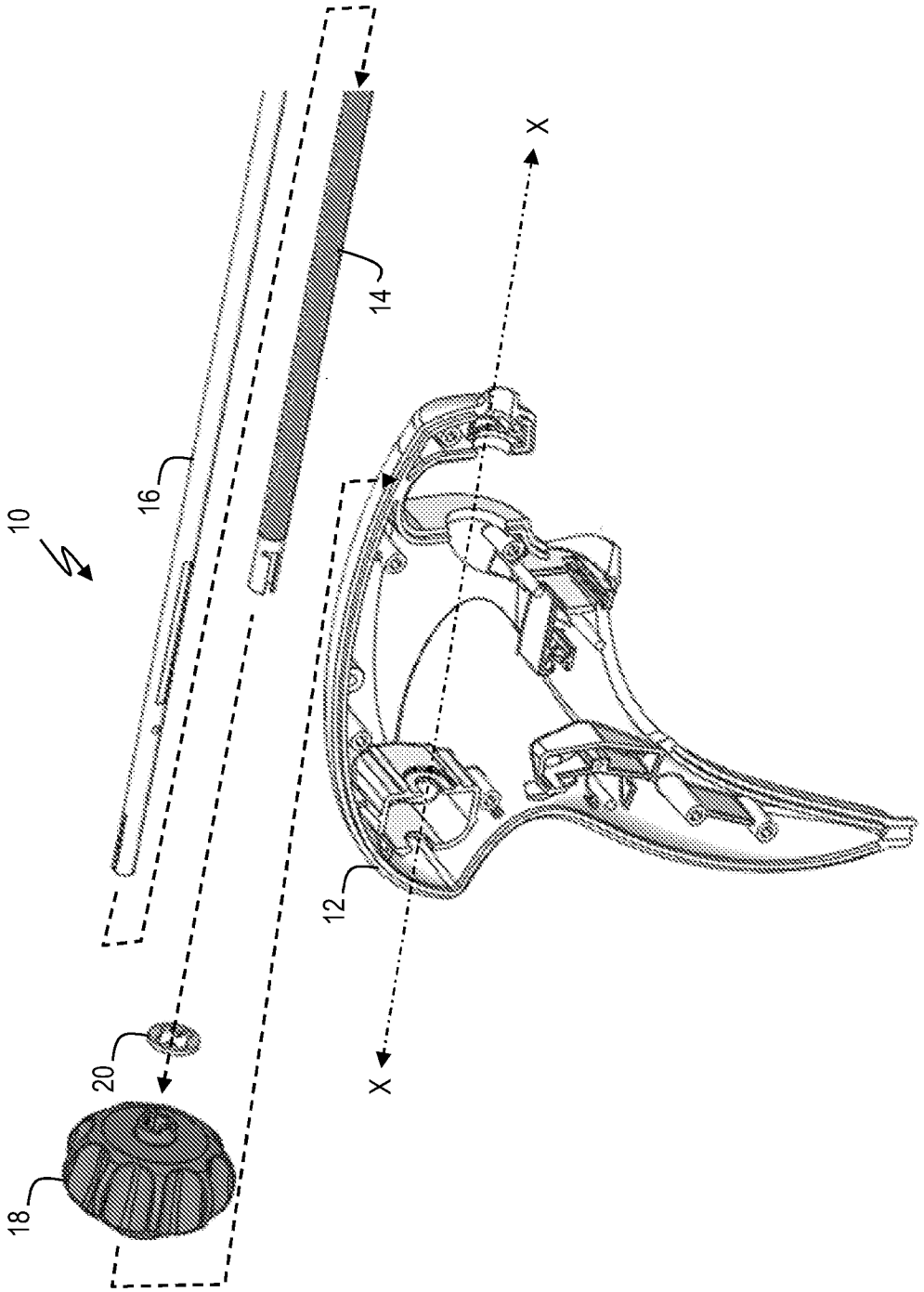


FIG. 1

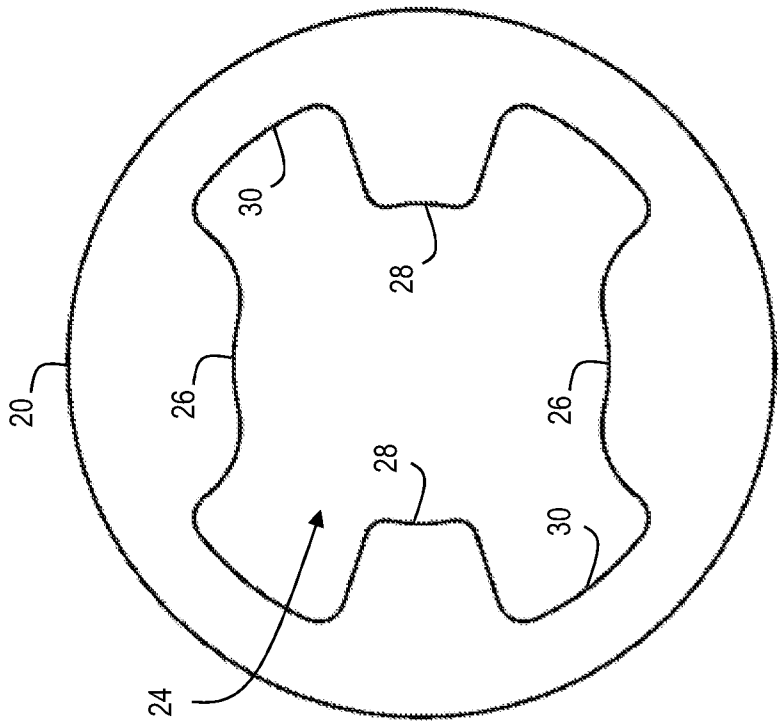


FIG. 2

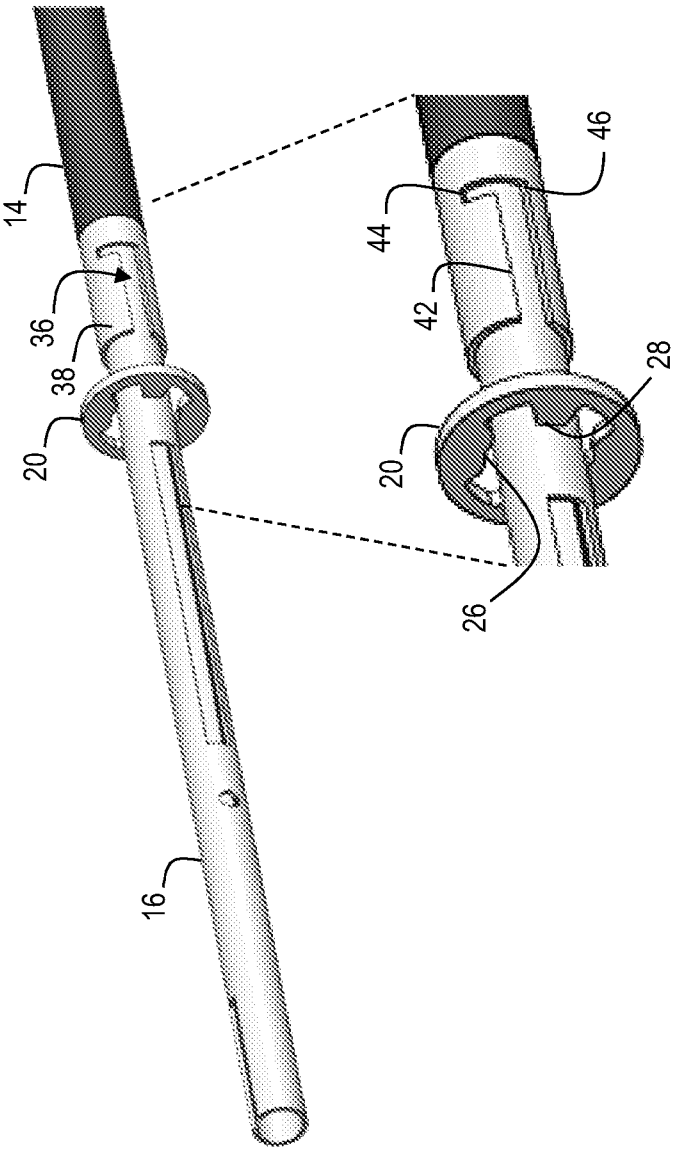


FIG. 3

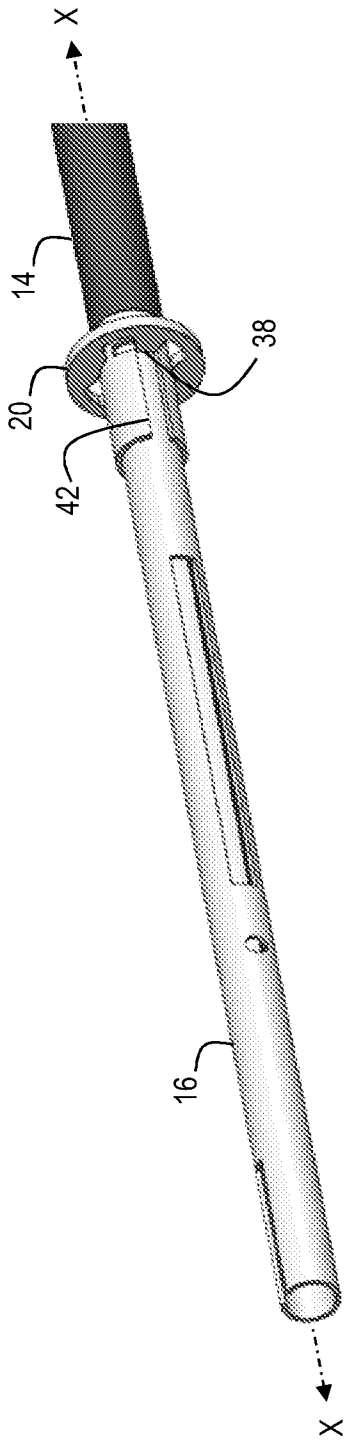


FIG. 4

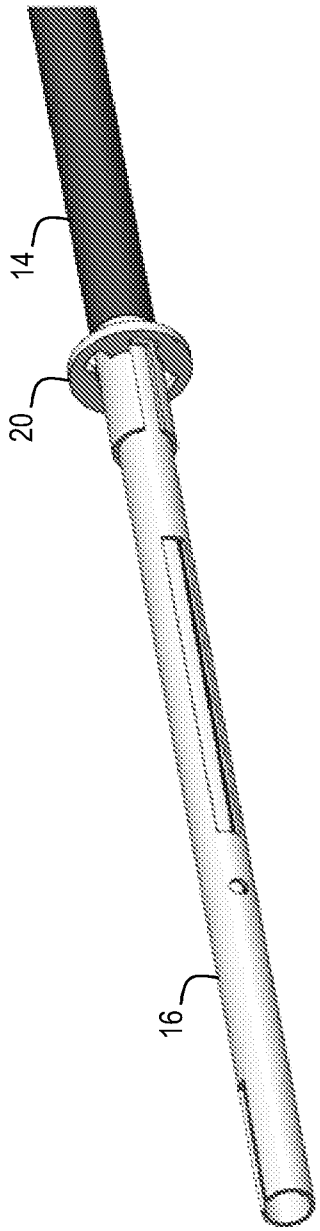


FIG. 5

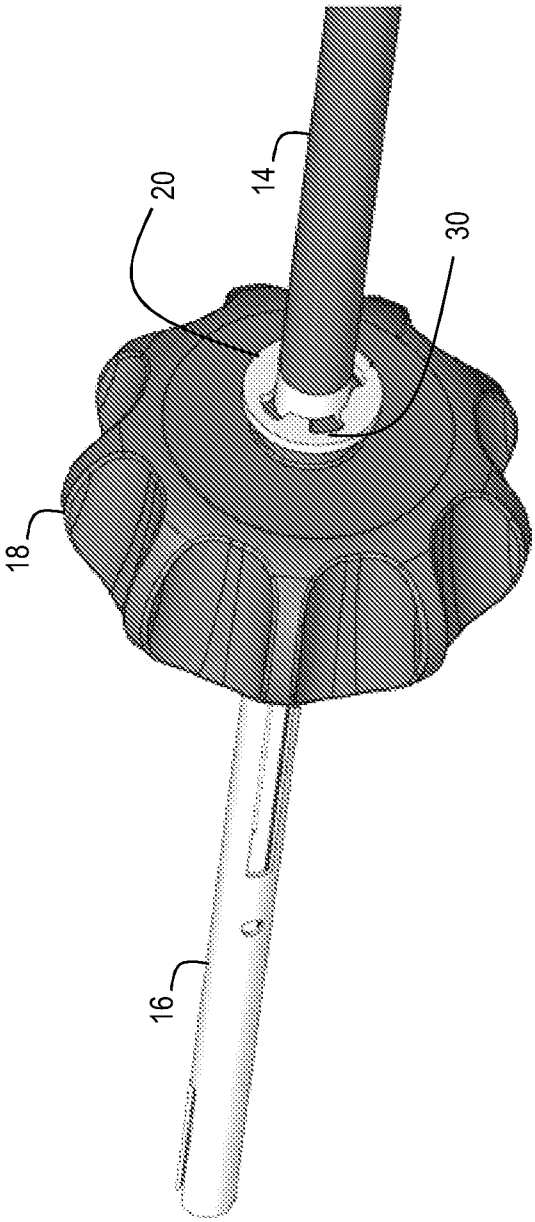


FIG. 6

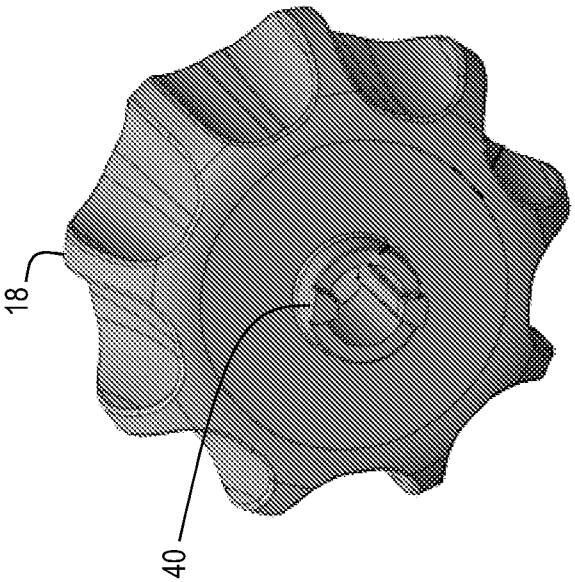


FIG. 7B

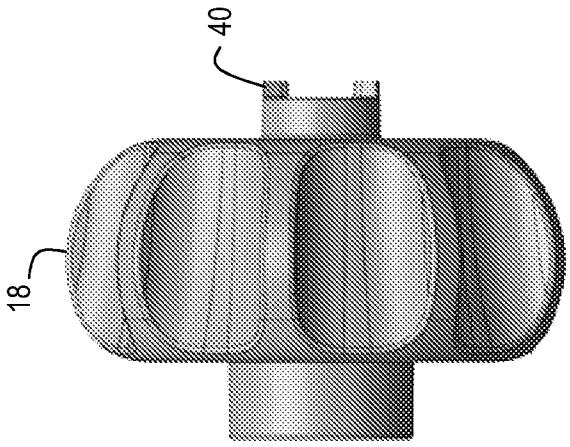


FIG. 7A

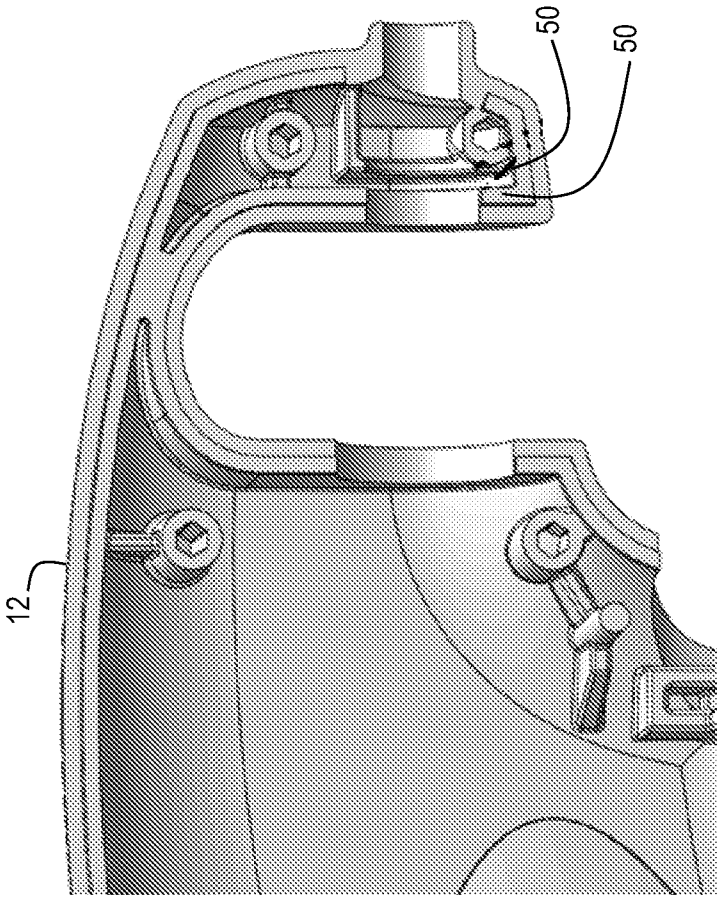


FIG. 8

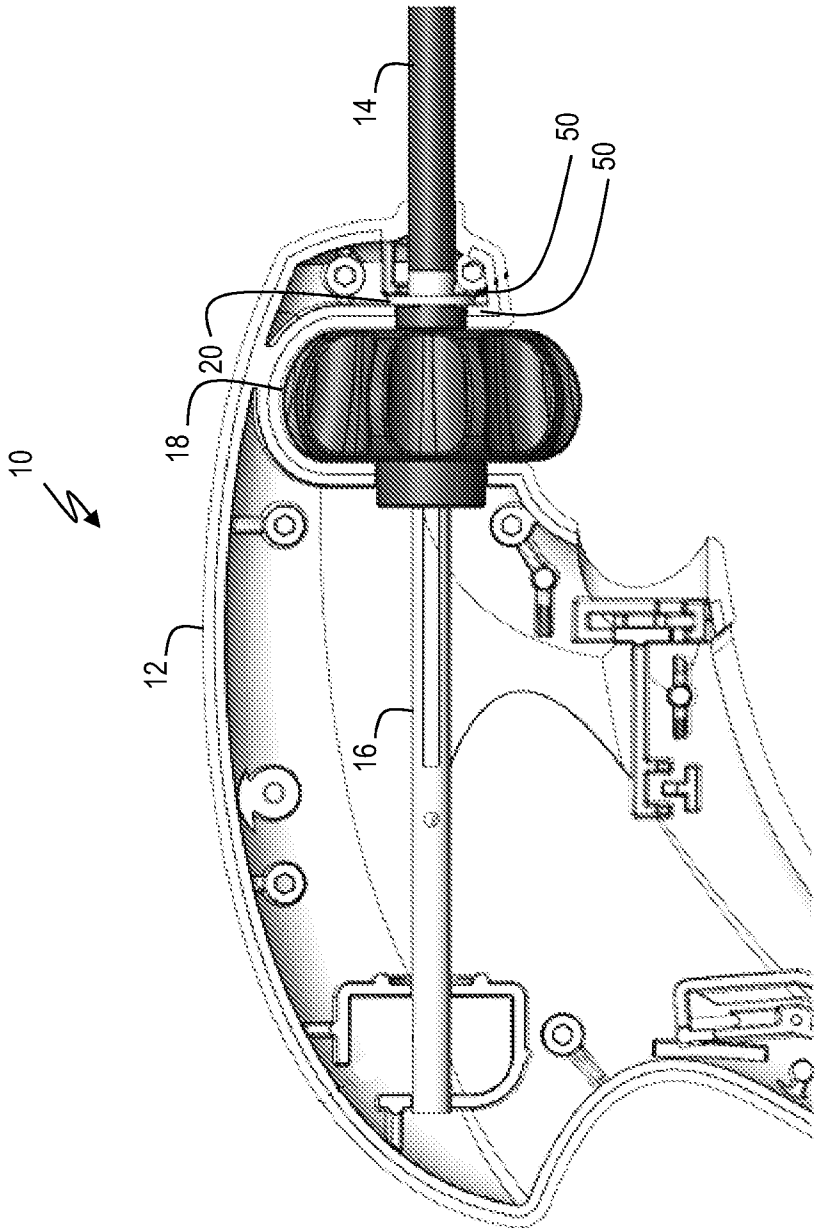


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2019/061075

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B17/29
ADD. A61B17/00

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)
A61B

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)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 101 56 917 A1 (GUENTER BISSINGER MEDIZINTECHN [DE]) 12 June 2003 (2003-06-12)	1-5,12
A	paragraphs [0005], [0022]; figures 3,6	6-11,13, 15

X	EP 3 241 510 A1 (COVIDIEN LP [US]) 8 November 2017 (2017-11-08)	1-5,12
A	paragraphs [0027], [0032]; figures 5,13	6-11, 13-15

X	WO 2017/100412 A1 (REACH SURGICAL INC [CN]; BEAUPRE JEAN [US]) 15 June 2017 (2017-06-15)	1-5,12
A	figures	6-11, 13-15

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"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

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"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

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Date of the actual completion of the international search	Date of mailing of the international search report
13 February 2020	20/02/2020

Name and mailing address of the ISA/	Authorized officer
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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2019/061075

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 10156917 A1	12-06-2003	NONE	
EP 3241510 A1	08-11-2017	EP 3241510 A1	08-11-2017
		JP 6433535 B2	05-12-2018
		JP 2017200582 A	09-11-2017
		US 2017319229 A1	09-11-2017
		US 2019343550 A1	14-11-2019
WO 2017100412 A1	15-06-2017	CN 109068937 A	21-12-2018
		EP 3386371 A1	17-10-2018
		TW 201726067 A	01-08-2017
		US 2018360486 A1	20-12-2018
		WO 2017100412 A1	15-06-2017